# ROD AND WIRE MILL ANNUAL INTERIM MEASURE 2024 PROGRESS REPORT

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SPARROWS POINT, MARYLAND

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# TABLE OF CONTENTS

1.0 Introduction ..... 1
1.1. TPA Site Background ..... 1
1.2. Site Ownership History ..... 1
1.3. Regulatory Process ..... 2
2.0 Rod and Wire Mill ..... 3
2.1. Site Description ..... 3
2.1.1. Historical RWM Industrial Activities ..... 3
2.1.2. Site Geology/Hydrogeology ..... 3
2.2. Historical Interim Measures for Groundwater Conditions ..... 4
3.0 Interim Measures and Groundwater Conditions ..... 6
3.1. Interim Measure Remedial Approach ..... 6
3.2. Groundwater Well Network ..... 7
3.3. Groundwater Conditions in 2024 ..... 9
3.3.1. Shallow Groundwater Zone ..... 9
3.3.2. Intermediate Groundwater Zone ..... 12
3.3.3. Focused Well Pairs J-K-L ..... 15
3.4. Statistical Evaluation – Trend Analysis ..... 17
3.5. Contaminant Reduction ..... 19
3.5.1. Shallow Zone ..... 20
3.5.2. Intermediate Zone ..... 20
4.0 Summary and Conclusions ..... 22
4.1. Focused Wells ..... 22
4.2. Interior Wells ..... 22
4.3. Downgradient Perimeter Wells ..... 23
5.0 References ..... 24

## List of Figures (Following Text)

Figure 1 Tradepoint Atlantic—Rod and Wire Mill Location Map
Figure 2 Location of Historical Activities
Figure 3 Typical Treatment Trench Backfill Profile Section View
Figure 4 Shallow Zone Groundwater Elevation Contours Q1 2024
Figure 5 Shallow Zone Groundwater Elevation Contours Q3 2024
Figure 6 Shallow Zone Zinc Concentrations 2024
Figure 7 Shallow Downgradient Perimeter Zinc Concentrations (Original Wells)
Figure 8 Shallow Downgradient Perimeter Zinc Concentrations (Supplemental Wells)
Figure 9 Shallow Interior Zinc Concentrations (Original Wells)
Figure 10 Shallow Interior Zinc Concentrations (Supplemental Wells)
Figure 11 Shallow Delineation Wells Zinc Concentrations
Figure 12 Shallow Upgradient Zinc Concentrations
Figure 13 Shallow Zone Cadmium Concentrations 2024
Figure 14 Shallow Downgradient Perimeter Cadmium Concentrations (Original Wells)
Figure 15 Shallow Downgradient Perimeter Cadmium Concentrations (Supplemental Wells)
Figure 16 Shallow Interior Cadmium Concentrations (Original Wells)
Figure 17 Shallow Interior Cadmium Concentrations (Supplemental Wells)
Figure 18 Shallow Delineation Wells Cadmium Concentrations
Figure 19 Shallow Upgradient Cadmium Concentrations
Figure 20 Shallow Zone pH Measurements 2024
Figure 21 Intermediate Zone Groundwater Elevation Contours Q1 2024
Figure 22 Intermediate Zone Groundwater Elevation Contours Q3 2024
Figure 23 Intermediate Zone Zinc Concentrations 2024
Figure 24 Intermediate Downgradient Perimeter Zinc Concentrations (Original Wells)
Figure 25 Intermediate Downgradient Perimeter Zinc Concentrations (Supplemental Wells)
Figure 26 Intermediate Interior Zinc Concentrations (Original Wells)
Figure 27 Intermediate Interior Zinc Concentrations (Supplemental Wells)
Figure 28 Intermediate Delineation Wells Zinc Concentrations
Figure 29 Intermediate Upgradient Zinc Concentrations
Figure 30 Intermediate Zone Cadmium Concentrations 2024
Figure 31 Intermediate Downgradient Perimeter Cadmium Concentrations (Original Wells)
Figure 32 Intermediate Downgradient Perimeter Cadmium Concentrations (Supplemental Wells)
Figure 33 Intermediate Interior Cadmium Concentrations (Original Wells)
Figure 34 Intermediate Interior Cadmium Concentrations (Supplemental Wells)
Figure 35 Intermediate Delineation Wells Cadmium Concentrations
Figure 36 Intermediate Upgradient Cadmium Concentrations
Figure 37 Intermediate Zone pH Measurements 2024

Figure 38 RWJ-MWS, RWK-MWS, and RWL-MWS pH Measurements
Figure 39 RWJ-MWI, RWK-MWI, and RWL-MWI pH Measurements
Figure 40 RWJ-MWS, RWK-MWS, and RWL-MWS Zinc Concentrations
Figure 41 RWJ-MWI, RWK-MWI, and RWL-MWI Zinc Concentrations
Figure 42 RWJ-MWI, RWK-MWI, and RWL-MWI Cadmium Concentrations

## List of Tables (Following Text)

Table 1 Monitoring Well Construction Summary
Table 2 Shallow Zone Sampling Frequency
Table 3 Intermediate Zone Sampling Frequency
Table 4 Shallow Zinc Concentrations
Table 5 Shallow Cadmium Concentrations
Table 6 2024 Shallow Field Parameter Data
Table 7 Intermediate Zinc Concentrations
Table 8 Intermediate Cadmium Concentrations
Table 9 2024 Intermediate and Deep Field Parameter Data
Table 10 Statistically Significant Trends
Table 11 Average Historical Shallow Zone Concentrations
Table 12 Average Historical Intermediate Zone Concentrations

## List of Appendices (Following Text)

Appendix A 2024 Laboratory Analytical Reports
Appendix B Individual Shallow Wells Time-Series Graphs
Appendix C Individual Intermediate Wells Time-Series Graphs
Appendix D Mann-Kendall Trend Analysis ChemStat® Results

# 1.0 INTRODUCTION

This Progress Report has been prepared by ARM Group LLC (ARM), which presents the 2024 Interim Measure (IM) conducted for the Rod and Wire Mill (RWM) located at the Tradepoint Atlantic (TPA) property. This report includes:

- a brief history of the RWM area,
- a description of historical interim measures that operated at the RWM,
- a description of additional remedial efforts that were completed in 2016 and 2017 to treat soil and groundwater in the RWM area,
- the groundwater flow patterns and contaminant distribution, and
- an evaluation of the effectiveness of the interim measure to date.

## 1.1. TPA SITE BACKGROUND

The TPA property is located in Baltimore County, Maryland at the southeastern corner of the Baltimore metropolitan area, approximately nine miles from the downtown area. The property encompasses approximately 3,100 acres located on a peninsula situated on the Patapsco River near its confluence with the Chesapeake Bay, physically positioned in the mouth of the heavily industrialized and urbanized Baltimore Harbor/Patapsco River region. A land connection to the northeast links the peninsula with the adjacent community of Edgemere.

From the late 1800s until 2012, the property was used for the production and manufacturing of steel. Iron and steel production operations and processes at the RWM (the Site) included raw material handling, coke production, sinter production, iron production, steel production, and semi-finished and finished product preparation. In 1970, Sparrows Point was the largest steel facility in the United States, producing hot and cold rolled sheets, coated materials, pipes, plates, and rod and wire. The steelmaking operations at the facility ceased in fall 2012, and current plans for the Site include demolition and redevelopment over the next several years. Some portions of the Site have already undergone remediation and/or redevelopment.

The original topography of the peninsula was relatively flat with elevations not exceeding 15 feet based on the North American Vertical Datum 1988 (NAVD88). The peninsula has been significantly altered since the inception of steel manufacturing activities. Creeks have been filled in and new land has been added to various areas of the Site by building up near-shore areas of the river.

## 1.2. SITE OWNERSHIP HISTORY

Bethlehem Steel Corporation operated an integrated steelmaking facility at the Site from approximately 1916 through 2003. As a result of multiple market factors, Bethlehem Steel declared bankruptcy in 2001 and the facility was subsequently operated by a succession of owners, the last

of which (RG Steel Sparrows Point, LLC) filed for bankruptcy in 2012. The Site was subsequently purchased by Sparrows Point, LLC (SPLLC) at a bankruptcy sale on August 7, 2012. Sparrows Point Terminal, LLC (SPT) purchased the real property on September 18, 2014. SPT has subsequently undergone a name change and is now doing business as TPA.

### 1.3. REGULATORY PROCESS

Environmental responses for the RWM are being implemented pursuant to the following:

- Multi-Media Consent Decree (Decree) between Bethlehem Steel Corporation, the United States Environmental Protection Agency (EPA), and the Maryland Department of the Environment (MDE) (effective October 8, 1997); this Decree has been modified in accordance with a stipulated order entered into by SPLLC and the respective agencies effective July 28, 2014;
- Administrative Consent Order between SPT and the MDE (effective September 12, 2014); and,
- Settlement Agreement and Covenant Not to Sue between SPT and the EPA (effective November 25, 2014).

The original Consent Decree for the Sparrows Point facility dealt with many issues associated with ongoing iron-making, steel-making, coking, byproduct, plating, and finishing operations. To the extent that these operations are no longer conducted, and the associated facilities no longer exist, many specific requirements of the Decree are no longer applicable and have been removed in accordance with the stipulated order implementing modifications to the Decree. The RWM is part of the acreage that remains subject to the requirements of the Decree as documented in correspondence received from EPA on September 12, 2014.

# 2.0 ROD AND WIRE MILL

## 2.1. SITE DESCRIPTION

### 2.1.1. Historical RWM Industrial Activities

The RWM is located in the northwestern portion of the TPA property. This area has also been given the designation of Parcel A3, as the TPA property as a whole has been divided into several separate parcels. Parcel A3 (the RWM), is shown in **Figure 1.**

The RWM is the location of the former mill that produced rods and wire products from the 1940s to the early 1980s. All manufacturing activities at the RWM ceased operation in the early 1980s with subsequent demolition of all structures between 1994 and 2000, based on historical aerial photos.

Manufacturing activities at the RWM included leaching of zinc ore and a subsequent treatment process to remove cadmium impurities. The leaching process was implemented in large tanks located inside the north end of the former RWM building. From the 1950s, the acidic leach residue was stored in the Northwest Pond until about 1959 when filters were utilized to dewater the residues. Dewatered sludge generated from this process was temporarily stored on the ground outside the north end of the mill in the Former Sludge Bin Storage Area. Filtrate from the dewatering process was recycled to the wire plating process. Excess filtrate was discharged to the East Pond until 1971, after which it was sent to the Humphrey Creek Wastewater Treatment Plant (HCWWTP) for treatment. These operations ended in the early 1980s when the RWM was shut down. The former locations of the Northwest Pond, the Sludge Bin Storage Area, and the East Pond are shown in **Figure 2.**

### 2.1.2. Site Geology/Hydrogeology

In general, the subsurface geology at the RWM includes slag fill materials overlying natural soils, which include fine-grained sediments (clays and silts) and coarse-grained sediments (sands). Groundwater occurrence at the Site has been segregated into three horizons identified as shallow, intermediate, and deep hydrogeologic zones.

The shallow hydrogeologic zone includes slag fill material or recent sedimentary deposits and the unconfined water table at the Site. Monitoring wells and piezometers designated as shallow are screened within this uppermost, unconfined water bearing unit. The “shallow” bottom-of-screen elevations generally range from +5 to -20 feet above mean sea level (amsl). In some areas of the Site, the slag fill is directly underlain by and hydrologically connected to, the coarser-grained beds or lenses within the Talbot Formation that comprise the Upper Talbot Channel unit. In these areas, the slag fill and Upper Talbot Channel units form a single groundwater flow system. In much of the investigation area, the slag fill material is underlain by finer-grained silts and clays that

comprise the Talbot Clay Aquitard. In these areas, shallow groundwater flow may be separated from groundwater in any underlying coarse-grained beds or lenses.

The intermediate hydrogeologic zone was the focus of the pump and treat interim measure formerly used at the Site (1986-1999/2001-2016) and is therefore also referred to as the intermediate pumping zone. The intermediate zone includes the unconfined to partially confined groundwater in the Pleistocene-aged Upper Talbot unit. The "intermediate" bottom-of-screen elevations range from approximately -20 to -50 feet amsl. The presence of clay and silt layers within the intermediate hydrogeologic zone likely retard the vertical recharge of groundwater from the upper fill material and Upper Talbot Channel unit.

The lower hydrogeologic zone includes the confined groundwater in the Lower Talbot or Upper Patapsco Sand unit. One well (RW06R-MWD), has been installed in this deep hydrogeologic unit, with a total depth of 62 feet below ground surface. However, the deep hydrogeologic zone is not a primary focus of this groundwater investigation. Hydrogeologic zones at greater depth are known to exist based on a review of the regional geology; however, these deeper units are isolated from the upper three units and impacts associated with the former iron and steel operations have not been identified.

## 2.2. HISTORICAL INTERIM MEASURES FOR GROUNDWATER CONDITIONS

The historical operations within the RWM resulted in releases of cadmium and zinc to soil and groundwater. In 1986, a soil and groundwater remediation program was initiated to address groundwater exhibiting elevated levels of cadmium and zinc, as well as residual soil contamination in the Sludge Bin Storage Area. Remediation initially consisted of a soil flushing program and associated pumping and treatment of groundwater from shallow and intermediate wells. The groundwater pumping was discontinued, and the treatment plant was dismantled in 1999 to support the demolition of the RWM, allowing for reassessment of the IM. A work plan to re-establish interim measures was submitted to the reviewing agencies (MDE and EPA) in July 2000, and the work plan was approved in November 2000. Re-establishment of the interim measures included the following:

- Institutional controls for soils were established to provide a "Restricted Work Area" to control the exposure of onsite workers to soils in the Former Sludge Bin Storage Area.
- A groundwater monitoring network consisting of 31 wells was installed to monitor the performance of the groundwater pump and treat system. This monitoring network was used to collect water level and groundwater quality data.
- A groundwater pump and treatment system was operated and maintained, which consisted of two intermediate zone recovery wells (RW10-PZM020 and RW15-PZM020) that removed water at a combined rate of between 5 and 12 gallons per minute (gpm). The expected normal operating rate for the treatment system was set at a combined rate of 8 to 12 gpm, with a maximum design flow of 25 gpm.

- Recovered groundwater was transported via a pipeline to the HCWWTP for subsequent treatment and discharge in accordance with the National Pollutant Discharge Elimination System permit requirements for the facility.

The pumping and treatment of groundwater resumed in September 2001, and continued until September 2016, when it was stopped to support the construction activities at the RWM. In particular, the pumping wells and associated pumps, piping, and pipe racks were shut down and removed in order to install the alkaline charged remediation trenches. The remediation trenches were constructed between October and December 2017 (*Interim Measures Construction Report, In-Situ Groundwater Treatment*, Advanced GeoServices Corp. [AGS], January 2018).

# 3.0 INTERIM MEASURES AND GROUNDWATER CONDITIONS

## 3.1. INTERIM MEASURE REMEDIAL APPROACH

AGS was contracted to design and install remediation trenches to serve as the interim measure for remediating groundwater at the RWM. The full details of the remediation design are presented in the AGS work plan, *Interim Measure Work Plan In-Situ Groundwater Treatment* (AGS, 2016). The primary purpose of this interim measure, which focused on groundwater in the intermediate zone, was to reduce concentrations of dissolved metals and to minimize contaminant discharges from this zone to surface water. In the IM design, the groundwater velocities were expected to be slow, in the range of 5 to 10 feet per year (later calculated to be less than five feet per year in the *RWM Interim Measure Supplemental Investigation Report* (ARM 2020). Groundwater in the shallow zone was noted to have a higher pH compared to the intermediate zone due to the presence of slag fill, and as a result, the distribution of metals impacts in the shallow zone groundwater indicates limited mobility (i.e., lack of migration). Therefore, the intermediate zone was the primary focus of the interim measure.

Groundwater extraction from the pumping wells ceased in September 2016 to support the construction of the remediation trenches. The objective of the remediation trenches is to address the elevated dissolved cadmium and zinc in the intermediate groundwater zone by precipitating the dissolved metals *in-situ*. This is achieved by raising the existing groundwater pH from approximately 4 to above 7.0 through the addition of alkaline reagents into the intermediate groundwater zone at select high concentration areas. To accomplish this, excavated soils were replaced with alkaline charges that react with acidic groundwater to create alkaline conditions within the aquifer and remove the dissolved cadmium and zinc from solution. The alkaline charges utilized a combination of fast acting TerrabondMG (40% by weight) in conjunction with limestone aggregate (60% by weight). The reagents were placed in trenches in a staggered/offset alignment perpendicular to the anticipated groundwater flow. A typical cross-section of a remediation trench is provided as **Figure 3**, and the approximate locations of the trenches are shown on the various maps provided as part of this report.

Paving at the RWM, completed around the end of March 2018, has reduced aquifer recharge from precipitation. While the whole Site is not paved, and it is possible there is some recharge to the intermediate zone via shallow zone groundwater draining through the trenches, the potentiometric surface is nearly flat in the intermediate zone. A lack of gradient in the intermediate zone results in a slow groundwater velocity which controls the rate of treatment by the trenches. As part of creating an updated conceptual site model in the *RWM Interim Measure Supplemental Investigation Report* (ARM 2020), lateral groundwater flow velocities were calculated based on groundwater level measurements in May 2019. Groundwater flow velocity was calculated at 33.8 ft/year in the shallow zone and 4.94 ft/year in the intermediate zone. Details of these calculations can be found in the *RWM Interim Measure Supplemental*

*Investigation Report* (ARM 2020). Groundwater flow velocities were verified with 2023 data; there were no changes to the results.

Approximately 2,392 cubic yards of contaminated soil were removed from the RWM during construction of the trenches and disposed of at an offsite facility. Construction of the trenches was completed in January 2017. In addition, approximately 27,000 CY of contaminated soil were excavated and removed from the RWM in 2017 during hot spot excavations (metals excavations and non-aqueous phase liquid [NAPL]/oil and grease excavations).

The interim groundwater treatment goals are to increase the pH in the intermediate groundwater zone in order to precipitate the dissolved metals and achieve a reduction in dissolved concentrations of cadmium and zinc within and downgradient of the source areas. Ultimately the treatment goal is to demonstrate that the concentrations of the primary contaminants (cadmium and zinc) in groundwater discharging at the shoreline/property boundary are acceptable.

### 3.2. GROUNDWATER WELL NETWORK

In 2024, the monitoring network for the shallow and intermediate zones at the Site included 70 existing wells and three to be reinstalled. Well construction details for all wells are included in **Table 1**. A "well pair" refers to one shallow zone well and one intermediate zone well installed adjacent to each other whose well names begin with the same prefix (e.g., RWA-MWS and RWA-MWI). Shallow zone wells have been assigned a well name ending in "-MWS" while intermediate zone wells have been assigned a well name ending in "-MWI". The sampling frequencies for the shallow zone and intermediate zone wells are included in **Tables 2 and 3**. Note that deep well RW06R-MWD is sampled annually, but does not fall into the shallow or intermediate zones. It is included on **Table 1** and **Table 3**. Also note that perched well RW21-MWP is included on **Table 1** and **Table 2**, but is generally not sampled because it was installed for NAPL monitoring and does not fall into the shallow or intermediate zones.

For the purpose of evaluating trends in groundwater, monitoring wells at the Site have been categorized into four groups:

- The "upgradient" wells are located farthest upgradient, generally farthest to the east.
- The "delineation" wells are located along the northern boundary of the Site.
- The "interior" wells are located in the central portion of the Site. The focused well pairs (RWJ, RWK, and RWL) are a subset of interior wells that were installed directly adjacent to one of the trenches to help assess the trench performance. Their proximity to the trench is very important due to the slow intermediate zone groundwater velocity calculated for the Site.
- The "downgradient perimeter" wells are generally located farthest to west (downgradient), running north-south.

Well categories are shown below in Table 3.2.1.

**Table 3.2.1 - Well Categories**

| Upgradient | Delineation | Interior/Focused | Downgradient Perimeter |
|---|---|---|---|
| RW19-MWS/RW19-MWI | RW21-MWS/RW21-MWI | RW09-MWS/RW09-MWI | RW01-MWS*/RW01-MWI* |
| RWR-MWS/RWR-MWI | RWH-MWS/RWH-MWI | RW10-MWI | RW03R-MWS/RW03R-MWI |
| RWS-MWS/RWS-MWI | RWI-MWS/RWI-MWI | RW11-MWS/RW11-MWI | RW04-MWS |
| | RWO-MWS/RWO-MWI | RW12-MWS/RW12-MWI | RW05-MWS*/RW05R-MWI |
| | RWP-MWI | RW13-MWI | RW06R-MWS |
| | RWQ-MWS/RWQMWI | RW14-MWS | RW07-MWS/RW07-MWI |
| | | RW15-MWS/RW15-MWI | RW08-MWS/RW08-MWI |
| | | RW16-MWS/RW16-MWI | RW22R-MWS/RW22R-MWI |
| | | RW18-MWS/RW18-MWI | RWA-MWS/RWA-MWI |
| | | RW23-MWS/RW23-MWI | RWB-MWS/RWB-MWI |
| | | RW24-MWS/RW24-MWI | RWD-MWS/RWD-MWI |
| | | RW25-MWS/RW25-MWI | RWE-MWS/RWE-MWI |
| | | RWJ-MWS/RWJ-MWI | RWF-MWS/RWF-MWI |
| | | RWK-MWS/RWK-MWI | RWG-MWS/RWG-MWI |
| | | RWL-MWS/RWL-MWI | |
| | | RWM-MWS/RWM-MWI | |
| | | RWN-MWS | |

*note that RW01-MWS, RW01-MWI, and RW05-MWS will be reinstalled.

As detailed in the *RWM Supplemental Investigation Report* (ARM, 2020), well pairs J-K-L were installed in close proximity to the western most trench in order to evaluate the trench performance. Well pair RWJ was installed directly adjacent to the trench. The other two well pairs (RWK and RWL) were installed progressively further from the RWJ pair in the southwestern direction, with the RWK pair approximately 10 feet away and the RWL pair approximately 25 feet away. These three well pairs, along with the RW12 well pair (located immediately upgradient of the western-most trench and approximately collinear with the J-K-L pairs), are used to assess the near-field effect of one of the remediation trenches.

Groundwater samples were collected from all existing shallow and intermediate wells on a monthly basis from February 2017 up to January 2018. Following the January 2018 sampling event, groundwater samples were collected from all existing shallow and intermediate wells on a quarterly basis.

ARM submitted a *RWM Monitoring Well Network Update Letter* dated March 8, 2021 (MNU Letter, 2021a) to outline an updated groundwater sampling plan for the calendar year of 2021 and beyond. This plan consisted of collecting samples from some wells on a semiannual basis and others on an annual basis. The MNU Letter included tables showing the updated sampling frequency for the wells and the rationale for each. These tables are included as **Table 2** (shallow

wells) and **Table 3** (intermediate wells). For 2024, samples collected for the first quarter sampling event (Q1) were collected from March 19 to April 11, 2024, and samples collected for the third quarter sampling event (Q3) were collected from September 10-19, 2024.

As part of roadway expansion associated with Riverside Drive, monitoring wells RW01-MWS-RW01-MWI, RW02-MWS, RW02-MWI, and RW06-MWI were properly abandoned on April 25, 2023, in accordance with the *Parcel A3 Well Abandonment Request Letter* (ARM 2023). Therefore, these locations were last sampled during the Spring 2023 event. Monitoring well RW05-MWS was destroyed as part of this roadway expansion work between the Spring 2023 and Fall 2023 sampling events. Three of the monitoring wells (RW01R-MWS, RW01R-MWI, and RW05R-MWS) were proposed for reinstallation in the *Parcel A3 Well Reinstallation Letter Request* (ARM 2023a). Agency approval was received on October 2, 2023 via email. This work was delayed due to roadway expansion work and is currently scheduled to be performed in 2025.

This IM Progress Report summarizes groundwater conditions following remediation trench installation, with focus on the results of the two semiannual sampling events carried out in 2024.

## 3.3. GROUNDWATER CONDITIONS IN 2024

### 3.3.1. Shallow Groundwater Zone

#### *3.3.1.1 Groundwater Elevations*

A synoptic round of groundwater level measurements was collected for the Q1 and Q3 sampling events. Based on the field measurements, groundwater potentiometric surface maps were constructed for the shallow zone for the Q1 and Q3 events and are included as **Figure 4** and **Figure 5**, respectively. As shown on the figures, the predominant flow direction for the shallow zone in the eastern portion of the Site is to the west. In the central and west portions of the Site groundwater flow is predominantly to the west and northwest. In the southwest portion of the Site (south of RW06R-MWS) flow is predominantly to the west and southwest.

#### *3.3.1.2 Zinc*

Results for zinc concentrations in shallow wells are shown in **Table 4.** Laboratory reports for samples collected during 2024 are included as **Appendix A.**

**Figure 6** displays the distribution of zinc concentrations in the shallow zone during the 2024 sampling events. Note that, due to access restrictions, some annually-sampled wells were sampled during the Q1 sampling event, while others were sampled during the Q3 sampling event. Therefore, the maximum values for each well sampled during the 2024 sampling events were used to complete the concentration map. All zinc results are compared to the relevant surface water criterion of 81 µg/L.

Time series graphs of zinc concentrations in shallow wells are shown in **Figures 7** through **12**. For all charts, the y-axes are shown on logarithmic scales. Note that non-detects are plotted showing one half (1/2) of the detection limit. The charts include the four well groups discussed above and are divided up further based on installation date. Wells installed in 2017 or prior are termed "original wells", and wells installed in 2019 are termed "supplemental wells".

- **Figure 7**: shallow downgradient perimeter wells, original wells
- **Figure 8**: shallow downgradient perimeter wells, supplemental wells
- **Figure 9**: shallow interior wells, original wells
- **Figure 10**: shallow interior wells, supplemental wells
- **Figure 11**: shallow delineation wells, all wells
- **Figure 12**: shallow upgradient wells, all wells

Individual time-series graphs for each shallow zone monitoring well are presented in **Appendix B**.

Several items to note include:

- Downgradient perimeter wells: Concentrations of zinc in perimeter shallow wells were below the relevant surface water criterion of 81 µg/L in four of nine perimeter shallow wells sampled in the 2024 event: RW03R-MWS, RW06R-MWS, RWB-MWS, and RWD-MWS. The highest detected zinc concentration in shallow downgradient wells was at RW22R-MWS (88,690 µg/L in Q1 and 196,900 µg/L in Q3), located northwest of the remediation trenches. Zinc concentrations in RWA-MWS, located to the west (downgradient) of RW22R-MWS and closer to the shoreline, are significantly lower (152 µg/L in Q1 and 184 µg/L in Q3).
- Interior wells: The highest detected zinc concentration was at RWN-MWS (662,200 µg/L), located directly east of the western-most remediation trench. Two shallow interior wells had zinc results higher than historical concentrations: RW23-MWS (539 µg/L versus previous maximum of 38.6 µg/L) and RWL-MWS (24,050 µg/L versus previous maximum of 19,240 µg/L). RW23-MWS was resampled in February 2025; zinc was not detected at a reporting limit of 10 µg/L (in line with previous sampling events). Trends will continue to be monitored.
- Upgradient/delineation wells: Zinc was detected at high concentrations (compared to other shallow well concentrations during 2024) east of the trenches near the southern edges of the Former East Pond at RWR-MWS (280,800 µg/L in Q1 and 455,600 µg/L in Q3). The Q3 2024 zinc result in well RWR-MWS was the maximum concentration detected in that well. The zinc concentration at RWH-MWS (153,900 µg/L) was also the maximum concentration detected in that well. RWH-MWS was resampled in February 2025. The February 2025 sample returned to historic levels; therefore, the September 2024

concentration appears to be anomalous as shown on **Figure 11**. Trends will continue to be monitored.

Refer to Section 3.4 for trend analysis.

#### *3.3.1.3 Cadmium*

Cadmium concentrations in shallow wells are shown in **Table 5.** Laboratory reports for samples collected during 2024 are included as **Appendix A.**

**Figure 13** displays a map of the distribution of cadmium concentrations in the shallow zone during the 2024 sampling events. The maximum values for each well sampled during the 2024 sampling events were used to complete the concentration map. All cadmium results are compared to the relevant surface water criterion of 7.9 µg/L.

Time series graphs of cadmium concentrations in shallow wells are shown in **Figures 14** through **19**. For all charts, the y-axes are shown on logarithmic scales. Note that non-detects are plotted showing one half (1/2) of the detection limit. The charts include the four different well groups and have been divided up further based on installation date. Wells installed in 2017 or prior are termed "original wells", and wells installed in 2019 are termed "supplemental wells".

- **Figure 14**: shallow downgradient perimeter wells, original wells
- **Figure 15**: shallow downgradient perimeter wells, supplemental wells
- **Figure 16**: shallow interior wells, original wells
- **Figure 17**: shallow interior wells, supplemental wells
- **Figure 18**: shallow delineation wells, all wells
- **Figure 19**: shallow upgradient wells, all wells

Individual time-series graphs for each shallow zone monitoring well are presented in **Appendix B.**

Several items to note include:

- Downgradient perimeter wells: Concentrations of cadmium in perimeter shallow wells were below the relevant surface water criterion of 7.9 µg/L in eight out of nine perimeter shallow wells sampled in the Q1 and Q3 2024 events, with the only exception being RW22R-MWS (28.1 µg/L and 26.7 µg/L for Q1 and Q3 2024, respectively). Cadmium concentrations in RWA-MWS and RWB-MWS, located to the northwest and southwest of RW22R-MWS and closer to the shoreline, were below the relevant surface water criterion of 7.9 µg/L.
- Interior wells: The highest detected cadmium concentration was at RWN-MWS (2,350 µg/L in Q1), located within the Former Sludge Bin Storage Area. Cadmium in shallow

interior well RW23-MWS was detected above the relevant surface water criterion of 7.9 µg/L for the first time (8.46 µg/L in Q3 2024). RW23-MWS was resampled in February 2025; cadmium was detected at 0.0766 J µg/L (in line with previous sampling events). The September 2024 concentration appears to be anomalous as shown on **Figure 17**. Trends will continue to be monitored.

- Upgradient/delineation wells: The Q3 2024 zinc result in delineation well RWH-MWS (2,316 µg/L) was the maximum historical concentration detected in that well. RWH-MWS was resampled in February 2025; cadmium was detected at 189 µg/L (within the historical range). (refer to **Figure 18**). Trends will continue to be monitored.

Refer to Section 3.4 for trend analysis.

#### *3.3.1.4 pH*

All 2024 shallow zone field parameter data, including pH, for the wells that were sampled are summarized in **Table 6**. Average measurements of pH in the shallow groundwater zone from the 2024 sampling events, shown on **Figure 20**, ranged from 4.77 to 11.66. Wells RWJ-MWS and RW03R-MWS had relatively high pH values (with 2024 averages of 11.66 and 10.62, respectively).

### 3.3.2. Intermediate Groundwater Zone

#### *3.3.2.1 Groundwater Elevations*

A synoptic round of groundwater level measurements was collected for each of the Q1 and Q3 2024 sampling events. Based on these field measurements, groundwater elevation contour maps were constructed for the intermediate zone for the two semiannual events (included as **Figure 21** and **Figure 22**, respectively). Due to tidal influences of the groundwater in the RWM area, the upcoming Q1 2025 gauging event will look to minimize the time taken to complete synoptic gauging events. The groundwater elevations reveal that the potentiometric surface in the intermediate zone was nearly flat during both 2024 events, with very little variation (generally less than a foot of difference) amongst most calculated groundwater elevations across the Site.

Groundwater elevations in the intermediate zone are generally lower than in the shallow zone, indicating an overall downward vertical gradient. The RWF location showed a higher groundwater elevation in Q1 in the intermediate well than in the shallow well, indicating a potential localized upward vertical gradient. Localized upward vertical gradients have been observed during several gauging events at various well pairs prior to 2024.

#### *3.3.2.2 Zinc*

All intermediate well zinc results are included in **Table 7.** Laboratory reports for samples collected during 2024 are included as **Appendix A.**

**Figure 23** displays a map of the distribution of zinc concentrations in the intermediate zone during the 2024 sampling events. The maximum values for each well sampled during the 2024 sampling events were used to complete the concentration map. All zinc results are compared to the relevant surface water criterion of 81 µg/L.

Time series graphs of zinc concentrations in intermediate wells are shown in **Figures 24** through **29**. For all charts, the y-axes are shown on logarithmic scales. Note that non-detects are plotted showing one half (1/2) of the detection limit. The charts include the four different well groups and are divided up based on installation date. Wells installed in 2017 or prior are termed "original wells", and wells installed in 2019 are termed "supplemental wells".

- **Figure 24**: intermediate downgradient perimeter wells, original wells
- **Figure 25**: intermediate downgradient perimeter wells, supplemental wells
- **Figure 26**: intermediate interior wells, original wells
- **Figure 27**: intermediate interior wells, supplemental wells
- **Figure 28**: intermediate delineation wells, all wells
- **Figure 29**: intermediate upgradient wells, all wells

Individual time-series graphs for each intermediate zone monitoring well are presented in **Appendix C.**

Several items to note include:

- Downgradient perimeter wells: Concentrations of zinc in perimeter intermediate wells were above the relevant surface water criterion of 81 µg/L in 10 of 11 intermediate wells sampled in the Q1 and Q3 2024 events, with the only exception of RWB-MWI (20.3 µg/L and 14.6 µg/L for Q1 and Q3 2024, respectively). The zinc concentrations in all wells are similar to historic concentrations (refer to **Table 7** and **Figure 24** and **Figure 25**), with the exception of RW08-MWI. Prior to 2024, the highest zinc concentration at RW08-MWI was in Q3 2018 at 2,540 µg/L, while the zinc concentration in Q1 2024 was 62,090 µg/L. This location will be monitored closely in 2025 to determine if this measurement was anomalous. The highest zinc concentration amongst perimeter wells in 2024 was consistently measured in well RWA-MWI (379,700 µg/L in the Q1 event and 337,700 µg/L in the Q3 event).
- Interior wells: Three intermediate interior wells had zinc results higher than historical concentrations: RW24-MWI (651,300 µg/L versus previous maximum of 650,000 µg/L), RW25-MWI (773,300 µg/L versus previous maximum of 477,000 µg/L), and RW13-MWI (540,700 µg/L versus previous maximum of 479,900 µg/L). Historically, significant zinc concentration fluctuations have been observed at RW13-MWI. However, since May 2021, this zinc concentrations in this well have increased without fluctuations.
- Upgradient/delineation wells:

- During the 2024 events, the zinc concentrations from RW19-MWI, RWP-MWI and RWQ-MWI returned to levels previously observed prior to the significantly lower (by several orders of magnitude) levels observed in 2023 spring event, which are presumed to be anomalous. The typically observed levels indicate that the former East Pond area acted as a source of contaminant mass to the intermediate zone groundwater.
- Former Northwest Pond Area: **Figure 23** shows that the contaminant plume in the intermediate zone extends beyond the northern limits of the treatment trenches and that the former Northwest Pond area may have acted as a source of contaminant mass to the intermediate zone groundwater. This impacted area was discussed in the *RWM IM 2020 Progress Report* (ARM 2021b) and *Parcel A3 NAPL Semi-Annual Monitoring Report* (ARM 2024); it was identified in previous sampling and delineation events but was unable to be completely excavated due to the presence of overhead electric lines. Elevated zinc concentrations continue to be observed in the northwest pond area, as shown at wells RWH-MWI, RWI-MWI and RW21-MWI.

Refer to Section 3.4 for trend analysis.

#### *3.3.2.3 Cadmium*

Cadmium results for all samples from the intermediate zone are included in **Table 8.** Laboratory reports for samples collected during 2024 are included as **Appendix A**.

**Figure 30** displays a map of the distribution of cadmium concentrations in the intermediate zone during the 2024 sampling events. The maximum values for each well sampled during the 2024 sampling events were used to complete the concentration map. All cadmium results are compared to the relevant surface water criterion of 7.9 µg/L.

Time series graphs of cadmium concentrations in intermediate wells are shown in **Figures 31** through **36**. For all charts, the y-axes are shown on logarithmic scales. Note that non-detects are plotted showing one half (1/2) of the detection limit. The charts include the four different well groups and are divided up based on installation date. Wells installed in 2017 or prior are termed "original wells", and wells installed in 2019 are termed "supplemental wells".

- **Figure 31**: intermediate downgradient perimeter wells, original wells
- **Figure 32**: intermediate downgradient perimeter wells, supplemental wells
- **Figure 33**: intermediate interior wells, original wells
- **Figure 34**: intermediate interior wells, supplemental wells
- **Figure 35**: intermediate delineation wells, all wells
- **Figure 36**: intermediate upgradient wells, all wells

Individual time-series graphs for each intermediate zone monitoring well are presented in **Appendix C**.

Several items to note include:

- Downgradient perimeter wells: Cadmium concentrations in three of 11 tested intermediate perimeter wells were below the relevant surface water criterion of 7.9 µg/L during the 2024 event in RWB-MWI, RW03R-MWI, and RW22R-MWI. The highest cadmium concentration in perimeter wells in 2024 was consistently measured in well RWA-MWI (8,386 µg/L in the Q1 event and 8,451 µg/L in the Q3 event).
- Interior wells: Concentrations of cadmium in intermediate interior wells remain within the range of historical concentrations except for an increase in RW13-MWI concentrations and slight increases in RW23-MWI, RW24-MWI RW25-MWI, and RWK-MWI. The highest cadmium concentration was detected in RW13-MWI (38,540 µg/L in Q1), located in the former Sludge Bin Storage Area.
- Upgradient/delineation wells: Two intermediate upgradient wells had cadmium results higher than historical concentrations: RWQ-MWI (89.6 µg/L versus previous maximum of 62.4 µg/L) and RWR-MWI (1,203 µg/L versus previous maximum of 753 µg/L). These wells are located on the northeastern and southeastern sides of the parcel area, respectively.

Refer to Section 3.4 for trend analysis.

#### *3.3.2.4 pH*

All 2024 shallow zone field parameter data, including pH, for the wells that were sampled are summarized in **Table 9**. Average measurements of pH in the intermediate groundwater zone from the 2024 sampling events, shown on **Figure 37**, ranged from 4.65 to 11.34. Wells RW15-MWI and RW16-MWI had relatively high pH values (with 2024 averages of 11.34 and 8.66, respectively). Unlike in years prior to 2023, there were no intermediate zone monitoring wells with pH values less than 4.0.

Across the whole Site, pH is generally lower in the intermediate zone than in the shallow zone. However, the pH in the intermediate wells in the RWK and RWL well pairs was higher than it was in the corresponding shallow wells in the Q3 sampling event.

### 3.3.3. Focused Well Pairs J-K-L

**Figure 20** and **Figure 37** show the locations of the focused wells (well pairs J-K-L) relative to the trench, along with the pH average measurements for the shallow and intermediate zones, respectively. These focused wells were installed in 2019, more than two years following the trench installation.

Time series graphs for the focused well pairs are shown in **Figures 38** through **42**. For zinc and cadmium charts, the y-axes are shown on logarithmic scales.

- **Figure 38**: shallow zone, pH
- **Figure 39**: intermediate zone, pH
- **Figure 40**: shallow zone, zinc
- **Figure 41**: intermediate zone, zinc
- **Figure 42**: intermediate zone, cadmium

Cadmium concentrations are generally not detected above the surface water criteria in the shallow zone. Therefore, no time-series graph was made for cadmium concentrations in the shallow wells. Several items to note include:

- pH:. In both the Q1 and Q3 events, RWJ-MWS has the highest pH of the focused shallow wells (12.08 and 11.24, respectively) while RWL-MWS has significantly lower pH (6.41 and 6.19, respectively for RWK-MWS, and 6.47 and 5.58, respectively for RWL-MWS). Measured pH values exhibit decreasing gradient moving away from the trench in the shallow and intermediate zone focused wells
- Shallow zone: Zinc concentrations in RWJ-MWS (closest to the trench) are significantly lower than zinc concentrations in RWK or RWL. Zinc concentrations in the shallow zone focused wells remain similar to historic concentrations since 2019. Cadmium concentrations are generally not detected above the reporting limits in the shallow focused wells, or are detected at levels below the cadmium surface water criteria.
- Intermediate zone: The zinc concentration in RWJ-MWI, directly adjacent and downgradient of the trench, was detected at 7,502 µg/L in the Q1 sampling event and 3,130 µg/L in the Q3 sampling event. As the distance downgradient from the trench increased, the zinc concentration was observed to increase. The zinc concentrations were 38,260 µg/L and 35,070 µg/L in RWK-MWI (~10 feet downgradient of RWJ-MWI) and 47,080 µg/L and 101,000 µg/L in RWL-MWI (~20 feet downgradient from RWJ-MWI) in the Q1 and Q3 sampling events, respectively. Likewise, cadmium concentrations were observed to increase with distance downgradient from the trench. The cadmium concentrations were 110 µg/L and 30.2 µg/L in RWJ-MWI, 169 µg/L and 239 µg/L in RWK-MWI (~10 feet downgradient of RWJ-MWI), and 788 µg/L and 1,114 µg/L in RWL-MWI (~20 feet downgradient from RWJ-MWI) in the Q1 and Q3 sampling events, respectively. This suggests that the trenches are effective at reducing zinc and cadmium concentrations in the intermediate zone wells. For comparison purposes, upgradient groundwater concentrations are significantly higher (540,700 µg/L zinc and 38,540 µg/L cadmium in RW13-MWI in Q1 2024).

The zinc concentrations, cadmium concentrations, and pH measurements in the intermediate zone suggest that the permeable reactive barrier treatment technology and the reagent appears to be

effective in raising the pH of the groundwater and removing the dissolved metals concentrations from the groundwater.

The groundwater elevations of the focused well pairs provide evidence that groundwater may be draining through the trenches from the shallow zone to the intermediate zone. During both the Q1 and Q3 2024 events, there is a slight groundwater elevation gradient towards the trench (from L toward J) in the shallow zone and away from the trench in the intermediate zone. This gradient in the shallow zone is depicted by the groundwater elevations shown on **Figure 4** and **Figure 5**. The differences in groundwater elevations between the three shallow zone wells are within 0.3 feet, which is consistent with historical observations. This gradient in the intermediate zone is depicted by the groundwater elevations shown on **Figure 21** and **Figure 22**. The difference in groundwater elevations between the three intermediate zone wells is less than 0.1 feet.

### 3.4. STATISTICAL EVALUATION – TREND ANALYSIS

For the purpose of evaluating the distribution of parameter concentrations over time, parameters were subjected to a trend analysis. Trend analysis was performed for cadmium and zinc for all existing wells using the Mann-Kendall test.

The Mann-Kendall test is a non-parametric test for identifying linear trends in data. The test is suitable for non-normally distributed data and is not limited by sample size. The test pairs measurements and assigns a score to each possible pair based on comparing the average of the pair in question to the average of a pair of earlier measurements. If the average of a particular pair of measurements is lower than the average of an earlier pair it is assigned a score of -1, if it is tied it is assigned a score of 0, and if it is higher it is assigned a score of 1. The sum of these scores is computed to obtain the Mann-Kendall Statistic (S). If S is positive it implies an upward trend over time, if it is negative it implies a downward trend over time, an S value near zero roughly indicates that there is no apparent trend in data. As the absolute value of S gets larger, the stronger the evidence for a real increasing or decreasing trend. For larger data sets (greater than 10), the behavior of S tends to approximate a normal distribution in accordance to the central limit theorem, and a standardized statistic, Z, is used for trend identification. For higher levels of significance, the larger the absolute value of Z or S needs to be to conclude the presence of a trend in data over time. A significance level of 95 percent was used for all Mann-Kendall Tests performed for this evaluation. Data points that were below the detection limits were replaced with the laboratory reporting limit divided by two. No wells were excluded as a result of having too few samples. The results of the trend tests were reviewed to remove any trends that were the result of changing detection limits over time. Statistical analyses were performed using the ChemStat® statistical analysis software (version 6.3.0.2, Starpoint Software, Inc., ©1996-2013). A trend was identified as statistically significant if the Mann-Kendall Test identified it as increasing or decreasing at a 95% confidence factor.

Statistically significant trends for cadmium and zinc in existing monitoring wells are summarized **Table 10**. If no statistically significant trend was identified for a parameter, it is not shown in **Table 10**. Historical sampling dates included in the statistical trend analysis covered events from well installation (2017 to 2019) to present. The results of all trend tests are included in **Appendix D** and are summarized below.

Upgradient wells:

- Shallow
  - Downward trend for cadmium in RW19-MWS, RWR-MWS, and RWS-MWS
  - Upward trend for zinc in RWS-MWS
- Intermediate
  - Downward trend for cadmium in RW19-MWI
  - Downward trend for zinc in RWS-MWI

Delineation wells:

- Shallow
  - Downward trend for cadmium in RW21-MWS and RWO-MWS
  - Downward trend for zinc in RWI-MWS and RWO-MWS
- Intermediate
  - Downward trend for cadmium in RWO-MWI
  - Downward trend for zinc in RW21-MWI and RWO-MWI
  - Upward trend for cadmium in RWH-MWI

Interior wells:

- Shallow
  - Downward trend for cadmium in RW12-MWS, RW15-MWS, RW16-MWS, RW18-MWS, RW23-MWS, and RWN-MWS
  - Downward trend for zinc in RW15-MWS, RW16-MWS, RW18-MWS, and RWN-MWS
  - Upward trend for cadmium at RW14-MWS
  - Upward trend for zinc at RW09-MWS, RW11-MWS, and RW14-MWS
- Intermediate
  - Downward trend for cadmium RW10-MWI, RW11-MWI, RW12-MWI, RW16-MWI, and RW18-MWI
  - Downward trend for zinc in RW10-MWI, RW11-MWI, RW12-MWI, RW16-MWI, RW24-MWI and RWM-MWI
  - Upward trend for cadmium at RW23-MWI, RW25-MWI, and RWM-MWI
  - Upward trend for zinc at RW09-MWI

Focused (J-K-L) wells:

- Shallow
  - Downward trend for cadmium in RWJ-MWS, RWK-MWS, and RWL-MWS

  - Upward trend for zinc in RWK-MWS
- Intermediate
  - Downward trend for cadmium in RWL-MWI
  - Downward trend for zinc in RWL-MWI
  - Upward trend for zinc in RWJ-MWI

Downgradient Perimeter wells:

- Shallow
  - Downward trend for cadmium in RW06R-MWS, RW08-MWS, RW22R-MWS, RWB-MWS, RWD-MWS, and RWF-MWS
  - Downward trend for zinc in RWB-MWS and RWF-MWS
  - Upward trend in cadmium in RWE-MWS
  - Upward trend for zinc in RW07-MWS and RWE-MWS
- Intermediate
  - Downward trend for cadmium in RW05R-MWI, RWB-MWI, and RWE-MWI
  - Downward trend for zinc in RW08-MWI and RWE-MWI
  - Upward trends for cadmium in RW07-MWI, RW22R-MWI, RWA-MWI, and RWG-MWI
  - Upward trends for zinc in RW07-MWI, RW22R-MWI, and RWG-MWI

For the Focused J-K-L wells, several downward trends were identified, and two upward trends (zinc in RWK-MWS and RWJ-MWI) were identified.

For interior wells, trends were evaluated in nine shallow wells and 15 intermediate wells (based on wells with 2024 sampling results). For cadmium in the 24 interior wells, 11 wells had downward trends, four wells had upward trends, and nine wells had no statistically significant trend. For zinc in the 24 interior wells, 10 wells had downward trends, four wells had upward trends, and 10 wells had no statistically significant trend.

This indicates that for the wells within the remediation trench area (interior and focused wells), the majority of wells have either stable or downward trends for both cadmium and zinc.

### 3.5. CONTAMINANT REDUCTION

The interim groundwater treatment goals are to increase the pH in the intermediate groundwater zone in order to precipitate the dissolved metals and achieve a reduction in dissolved concentrations of cadmium and zinc within and downgradient of the source areas.

The time-series graphs show that the cadmium and zinc concentrations have, in some cases, fluctuated by orders of magnitude between consecutive sampling events. As a result, the comparison of individual quarterly values for some wells can indicate an increase or decrease depending on which specific quarterly values are compared (which may not be representative of

the overall trend for the well). For ease in visualizing overall trends and magnitude of reductions, annual average concentrations of cadmium and zinc were calculated for each well for which multiple years of data are available.

### 3.5.1. Shallow Zone

**Table 11** summarizes average annual groundwater cadmium and zinc concentrations at each shallow zone well installed prior to 2017. Note that the data from original wells and reinstalled wells are combined for RW06-MWS/RW06R-MWS and RW03-MWS/RW03R-MWS.

#### *3.5.1.1 Cadmium*

For the interior shallow zone well group, average cadmium concentrations increased for RW12-MWS, and average cadmium concentrations decreased for RW11-MWS, RW16-MWS and RW18-MWS. For the downgradient perimeter shallow zone well group, average cadmium concentrations decreased for RW03R-MWS and RW06R-MWS but increased for RW07-MWS. However, the 2024 cadmium results for each well were below the relevant surface water criterion of 7.9 µg/L.

#### *3.5.1.2 Zinc*

For the interior shallow zone well group, average zinc concentrations increased for RW12-MWS. Average zinc concentrations decreased for RW11-MWS, RW16-MWS, and RW18-MWS. For the downgradient perimeter shallow zone well group, average zinc concentrations decreased for RW03R-MWS and RW06R-MWS but increased for RW07-MWS.

### 3.5.2. Intermediate Zone

**Table 12** summarizes average annual groundwater cadmium and zinc concentrations at each intermediate zone well installed prior to 2017. Note that the data from the original well and reinstalled well are combined for RW03-MWI/RW03R-MWI.

#### *3.5.2.1 Cadmium*

For upgradient and interior intermediate wells, average cadmium concentrations decreased for all wells except RW15-MWI. The 2024 cadmium result for RW15-MWI was below the applicable surface water screening level. For the downgradient perimeter intermediate wells, average cadmium concentrations increased for RW07-MWI and RW08-MWI and decreased for RW03R-MWI. However, the 2024 cadmium result for RW08-MWI was only slightly above the relevant surface water criterion of 7.9 µg/L..

#### *3.5.2.2 Zinc*

For upgradient and interior intermediate wells, average zinc concentrations decreased for all wells except RW09-MWI and RW19-MWI. For downgradient perimeter intermediate wells, average zinc concentrations decreased for RW03R-MWI but increased for RW07-MWI.

# 4.0 SUMMARY AND CONCLUSIONS

The current approach for addressing elevated dissolved cadmium and zinc concentrations in the intermediate groundwater zone beneath and downgradient of the source areas is to precipitate the dissolved metals *in-situ* by raising the groundwater pH above 7.0. This approach relies on the impacted groundwater coming into contact with the trenches, which will raise the pH, and then precipitate the dissolved metals in the intermediate zone. The effectiveness of the interim measure is expected to be observed first in the intermediate zone wells closest to the trenches. However, the groundwater velocity is relatively slow (less than 5 ft/year), and most wells (with the exception of the focused well pairs) are located more than 50 feet from any of the trenches.

## 4.1. FOCUSED WELLS

The three focused well pairs, wells J - K - L, were installed directly adjacent to the western most treatment trench to help evaluate overall trench performance. Monitoring well RWJ-MWI located closest to the trench exhibited increased pH values and, most notably, significantly lower zinc concentrations when compared to the upgradient groundwater concentrations relative to the trench. Furthermore, it is notable that the pH was higher in intermediate wells RWK-MWI and RWL-MWI than in their paired shallow wells RWK-MWS and RWL-MWS in Q3 of 2024. This suggests that treated groundwater from the trench may be starting to reach the RWK-MWI and RWL-MWI wells.

It is still early in the generation and evaluation of the groundwater monitoring data, especially due to the relatively flat groundwater gradient in the intermediate zone (as shown on **Figure 21** and **Figure 22**). Flow through the trenches is what affects the treatment of the groundwater, and the flow of groundwater is slow due to the flat hydraulic gradient. However, the trend analysis identified several downward trends (cadmium in RWJ-MWS, RWK-MWS, RWL-MWS, and RWL-MWI, and zinc in RWL-MWI) in the focused J-K-L wells, and only two upward trends (zinc in RWK-MWS and RWJ-MWI) (refer to Section 3.4).

## 4.2. INTERIOR WELLS

For the interior wells, trends were evaluated in nine shallow wells and 15 intermediate wells (based on wells with 2024 sampling results). For cadmium in the 24 interior wells, 11 wells had downward trends, four wells had upward trends, and nine wells had no statistically significant trend. For zinc in the 24 interior wells, 10 wells had downward trends, four wells had upward trends, and 10 wells had no statistically significant trend. **Table 12** shows also that there have been concentration reductions in the majority of interior intermediate wells since the installation of the trenches.

This indicates that for the wells within the remediation trench area, the majority of wells have either stable or downward trends for both cadmium and zinc. Groundwater monitoring data and the overall trend will continue to be monitored and evaluated to assess the effectiveness of the treatment trenches in precipitating the dissolved cadmium and zinc from the groundwater.

### 4.3. DOWNGRADIENT PERIMETER WELLS

In the shallow wells along the western shoreline (downgradient perimeter wells), cadmium concentrations in nearly all wells (eight out of nine) are below the ambient surface water quality criterion. In addition, zinc concentrations in four of nine shallow wells sampled in 2024 are below the ambient surface water quality criterion.

In the intermediate wells along the western shoreline (downgradient perimeter wells), cadmium concentrations in three of 11 intermediate wells were below the relevant surface water criterion. In addition, the concentration of zinc in one of 11 intermediate wells sampled in 2024 was below the ambient surface water quality criterion.

The *RWM IM Supplemental Investigation Report* (ARM 2020) identified some areas that may be outside the intended effective zone of the remediation trenches. The long-term effectiveness of the interim measure and the need for additional or alternative remedial measures will be evaluated further as described in the *RWM Groundwater Corrective Measures Study (CMS) Work Plan* (Revision 1, dated January 14, 2021). The forthcoming RWM Groundwater CMS Report will also evaluate the existing monitoring well network for both the shallow and intermediate groundwater zones.

Groundwater sampling at the RWM for dissolved cadmium and zinc will continue in 2025 in accordance with the schedule as presented in the MNU Letter.

# 5.0 REFERENCES

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# FIGURES

LEGEND

Site Boundary

Rod & Wire Mill (RWM)

RWM

# Tradepoint Atlantic
# Rod & Wire Mill Location Map

February 19, 2025

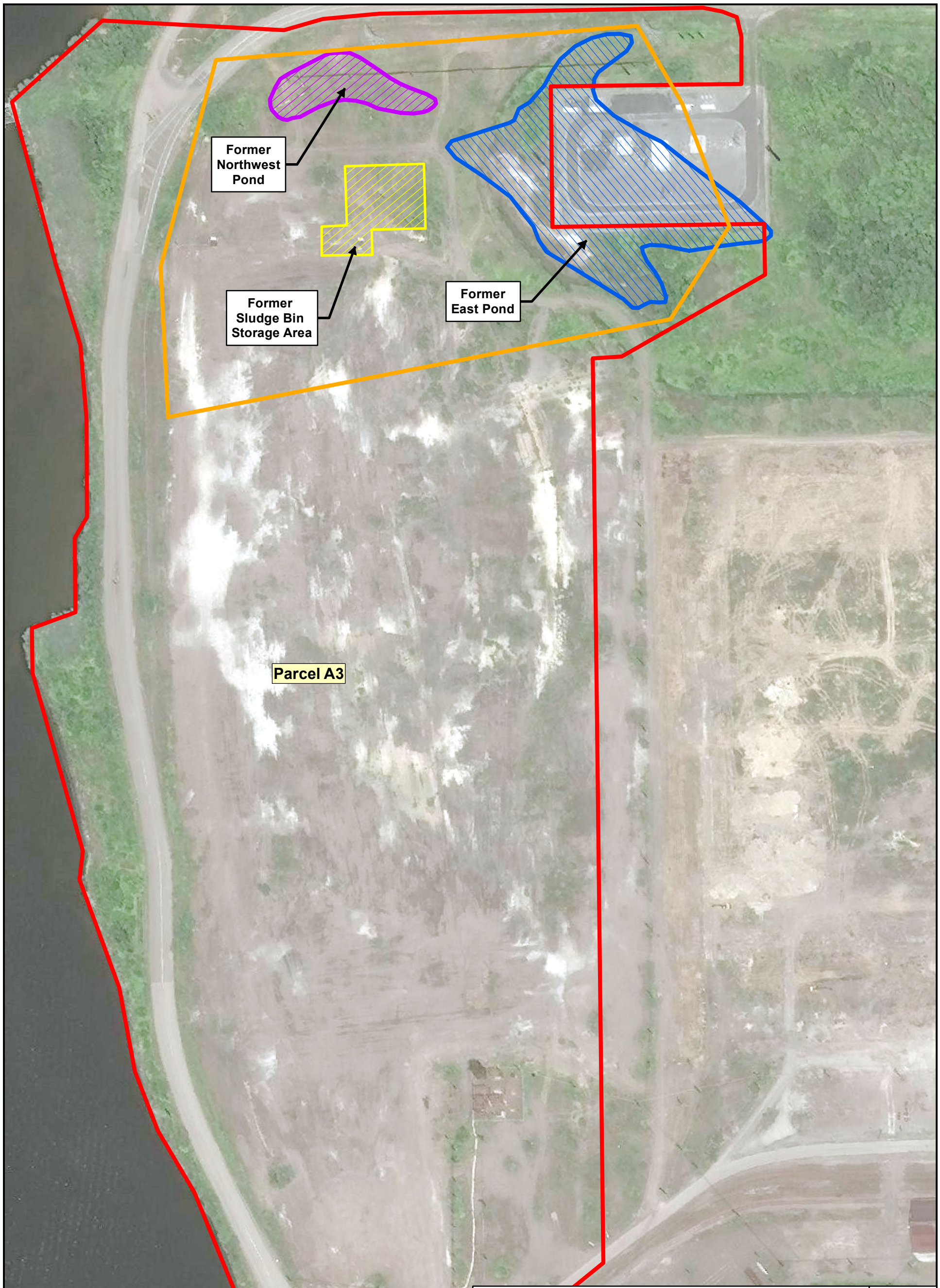
**Figure 1**

ARM Group LLC
Engineers and Scientists

0 500 1,000 2,000 Feet

| |
|---|
| Tradepoint Atlantic |
| Sparrows Point |
| Baltimore County, MD |
| ARM Project 21010103 |

P:\EnviroAnalytics Group\160443M EAG_TPA Redevelopment\GIS\Site-wide Figures.mxd




# Parcel A3 (Rod & Wire Mill)
# Location of Historical Activities

January 13, 2020

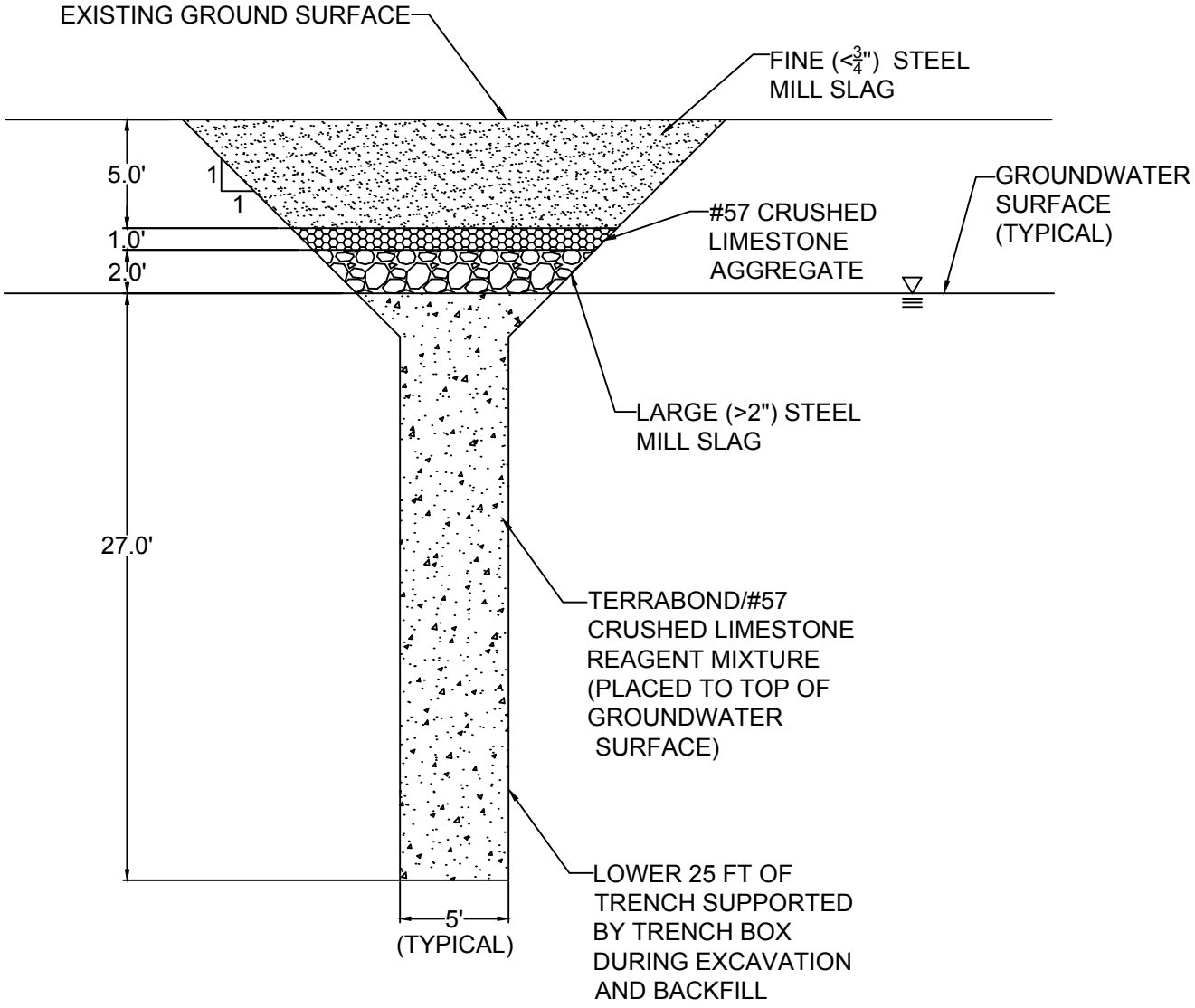
**Figure 2**

| | |
|---|---|
| Tradepoint Atlantic | Sparrows Point |
| ARM Project 21010103 | Baltimore County, MD |

ARM Group LLC
Engineers and Scientists

0 75 150 300
Feet

- Former Northwest Pond
- Former East Pond
- Former Sludge Bin Storage Area
- Approximate Boundary of Remedial Design Area
- Parcel A3 (RWM) boundary

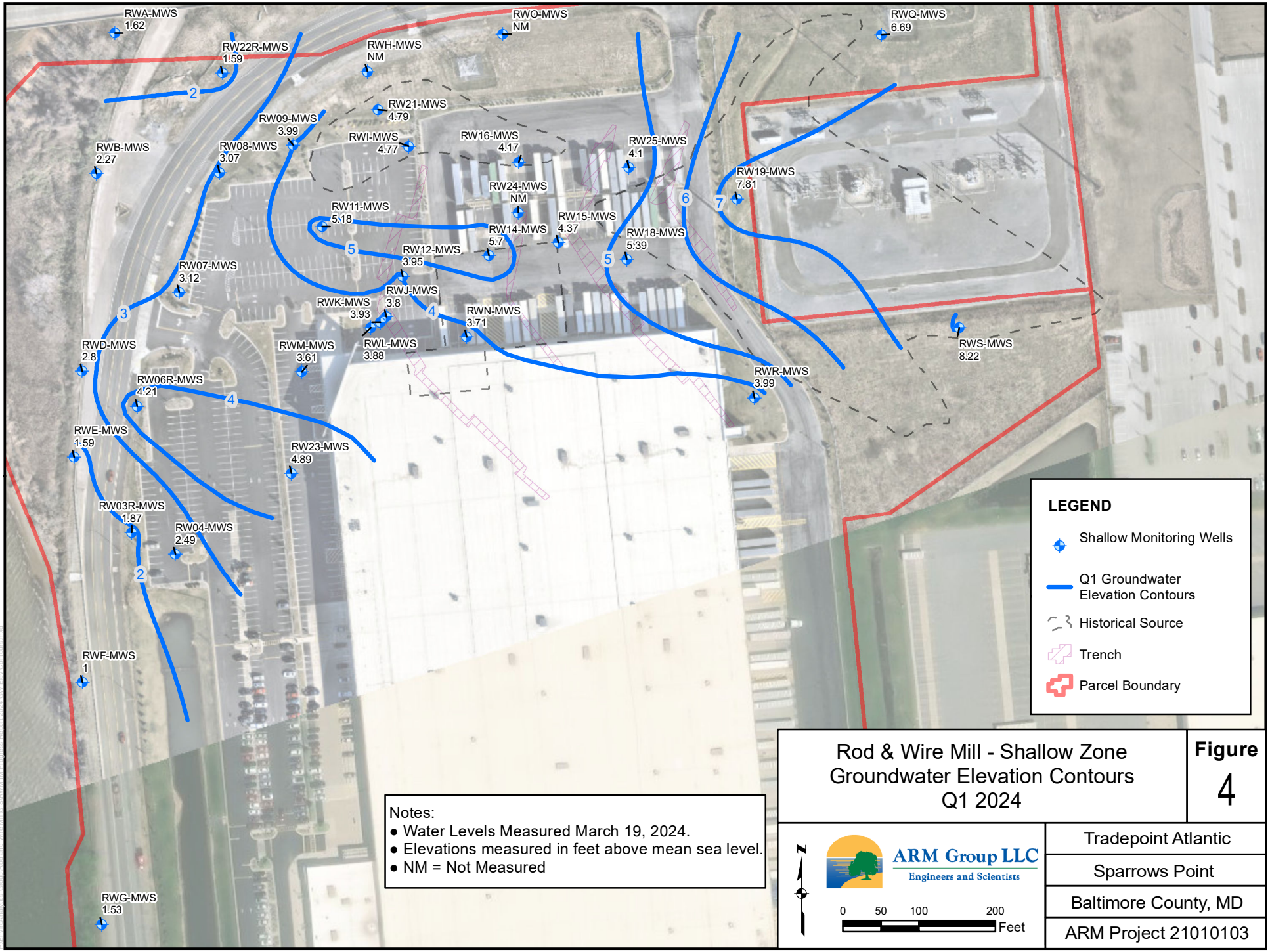


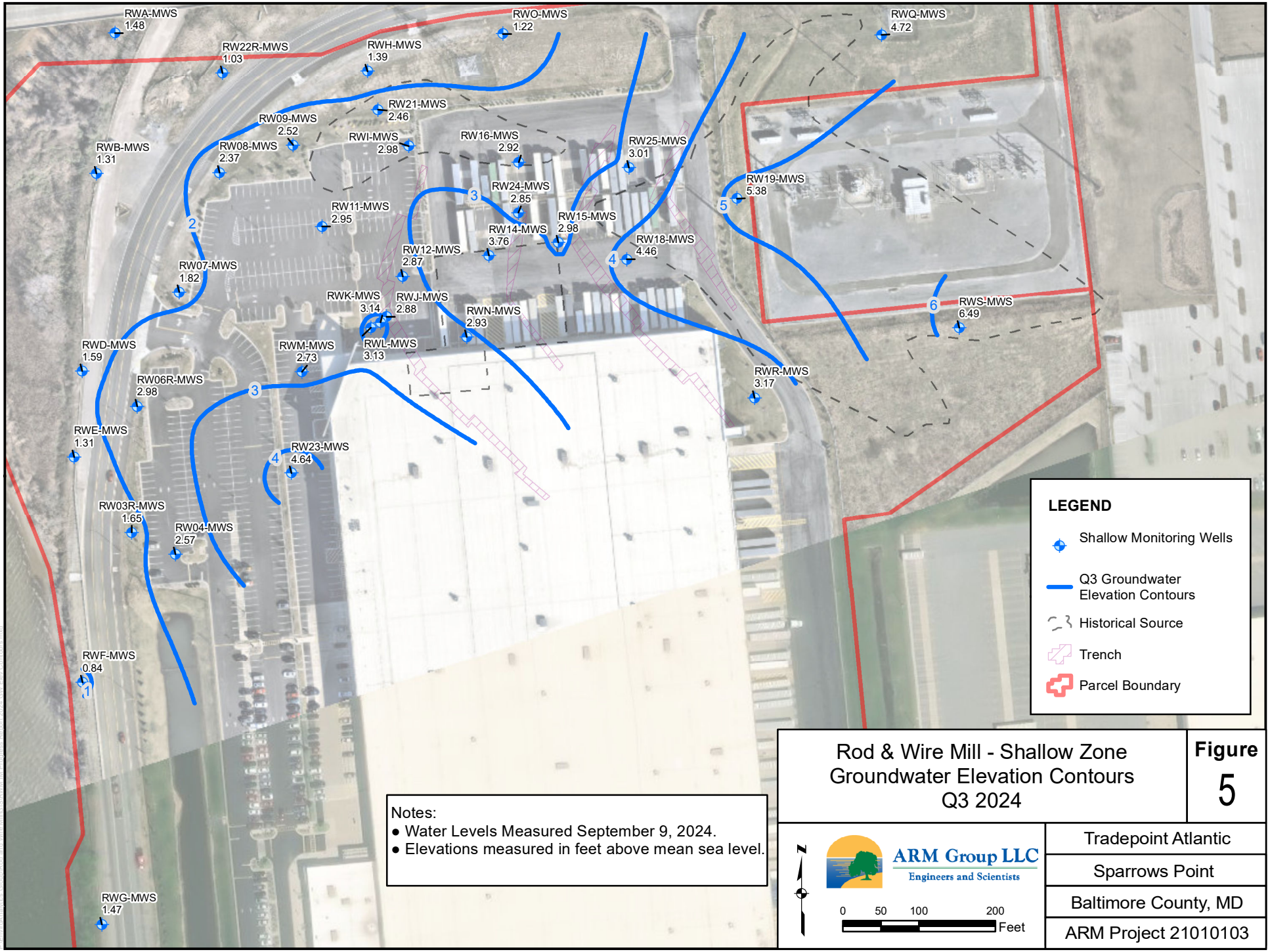

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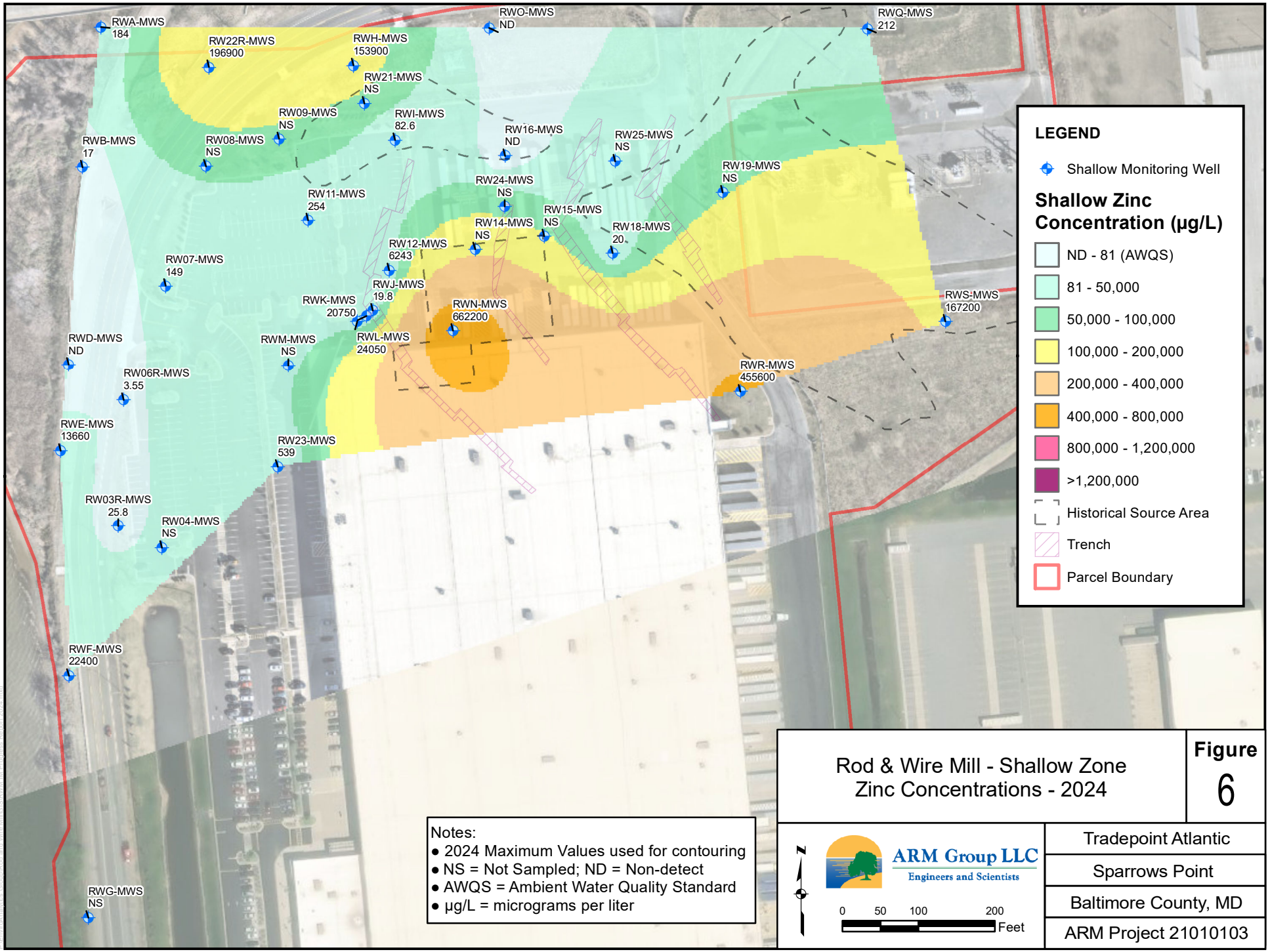
TYPICAL TREATMENT TRENCH BACKFILL PROFILE SECTION VIEW

FORMER ROD AND WIRE MILL AREA

| | | | |
|---|---|---|---|
| PROJECT ENGINEER: | JSD | SCALE: | 1" = 8' |
| CHECKED BY: | | PROJECT NUMBER: | 2016-3421 |
| DRAWN BY: | EEE | DATE: 3/23/2017 | FIGURE: 3 |


RWA-MWS 1.62
RW22R-MWS 1.59
RWH-MWS NM
RWO-MWS NM
RWQ-MWS 6.69
RW21-MWS 4.79
RW09-MWS 3.99
RWB-MWS 2.27
RW08-MWS 3.07
RWI-MWS 4.77
RW16-MWS 4.17
RW25-MWS 4.1
RW19-MWS 7.81
RW24-MWS NM
RW11-MWS 5.18
RW15-MWS 4.37
RW14-MWS 5.7
RW18-MWS 5.39
RW12-MWS 3.95
RW07-MWS 3.12
RWJ-MWS 3.8
RWK-MWS 3.93
RWN-MWS 3.71
RWD-MWS 2.8
RWM-MWS 3.61
RWL-MWS 3.88
RWS-MWS 8.22
RW06R-MWS 4.21
RWR-MWS 3.99
RWE-MWS 1.59
RW23-MWS 4.89
RW03R-MWS 1.87
RW04-MWS 2.49
RWF-MWS 1
RWG-MWS 1.53
2
3
4
5
6
7
LEGEND
Shallow Monitoring Wells
Q1 Groundwater Elevation Contours
Historical Source
Trench
Parcel Boundary
Notes:
• Water Levels Measured March 19, 2024.
• Elevations measured in feet above mean sea level.
• NM = Not Measured
Rod & Wire Mill - Shallow Zone
Groundwater Elevation Contours
Q1 2024
Figure
4
N
ARM Group LLC
Engineers and Scientists
0 50 100 200
Feet
Tradepoint Atlantic
Sparrows Point
Baltimore County, MD
ARM Project 21010103

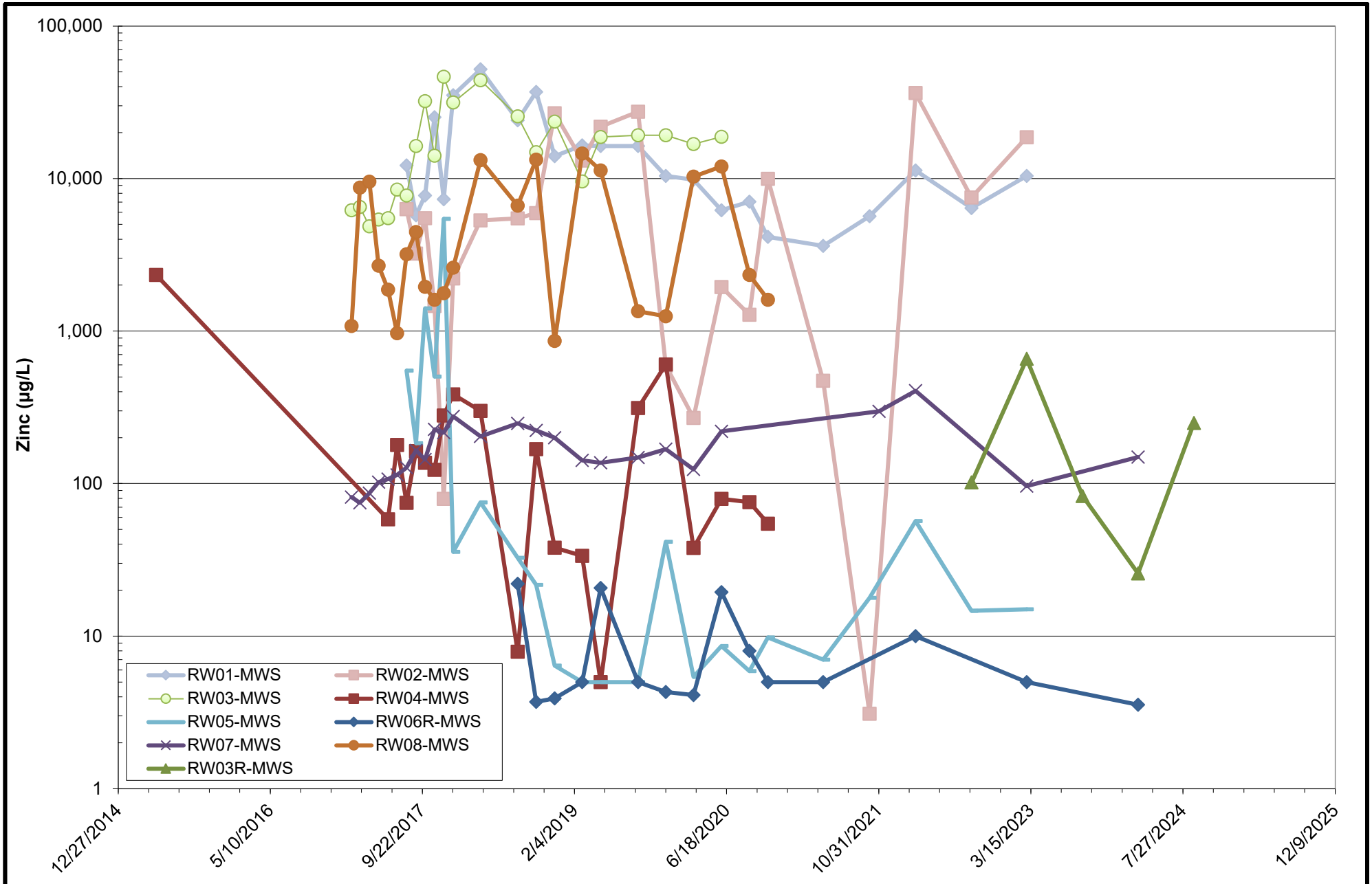

RWA-MWS 1.48
RW22R-MWS 1.03
RWH-MWS 1.39
RWO-MWS 1.22
RWQ-MWS 4.72
RW21-MWS 2.46
RW09-MWS 2.52
RWI-MWS 2.98
RW16-MWS 2.92
RW25-MWS 3.01
RWB-MWS 1.31
RW08-MWS 2.37
RW24-MWS 2.85
RW19-MWS 5.38
RW11-MWS 2.95
RW15-MWS 2.98
RW14-MWS 3.76
RW18-MWS 4.46
RW12-MWS 2.87
RW07-MWS 1.82
RWK-MWS 3.14
RWJ-MWS 2.88
RWN-MWS 2.93
RWS-MWS 6.49
RWD-MWS 1.59
RWM-MWS 2.73
RWL-MWS 3.13
RWR-MWS 3.17
RW06R-MWS 2.98
RWE-MWS 1.31
RW23-MWS 4.64
RW03R-MWS 1.65
RW04-MWS 2.57
RWF-MWS 0.84
RWG-MWS 1.47
1
2
3
4
5
6
LEGEND
Shallow Monitoring Wells
Q3 Groundwater Elevation Contours
Historical Source
Trench
Parcel Boundary
Notes:
• Water Levels Measured September 9, 2024.
• Elevations measured in feet above mean sea level.
Rod & Wire Mill - Shallow Zone Groundwater Elevation Contours Q3 2024
Figure 5
ARM Group LLC
Engineers and Scientists
0 50 100 200 Feet
Tradepoint Atlantic
Sparrows Point
Baltimore County, MD
ARM Project 21010103




# Rod & Wire Mill - Shallow Zone Zinc Concentrations - 2024

**Figure 6**

Tradepoint Atlantic
Sparrows Point
Baltimore County, MD
ARM Project 21010103




ARM Group LLC
Engineers and Scientists

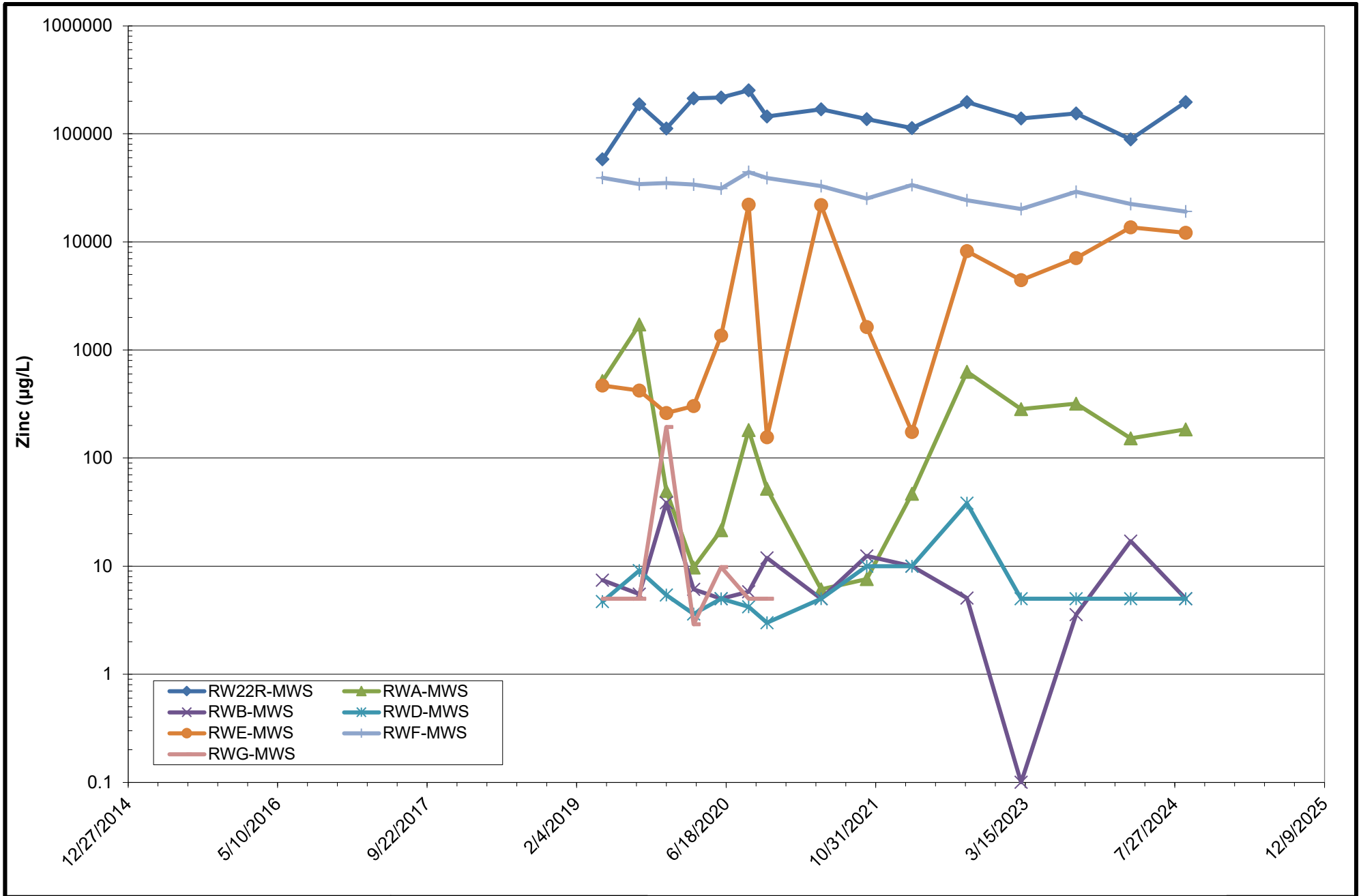
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# Shallow Downgradient Perimeter Zinc Concentrations (Original Wells)

January 2025

**Figure 7**




ARM Group LLC
Engineers and Scientists

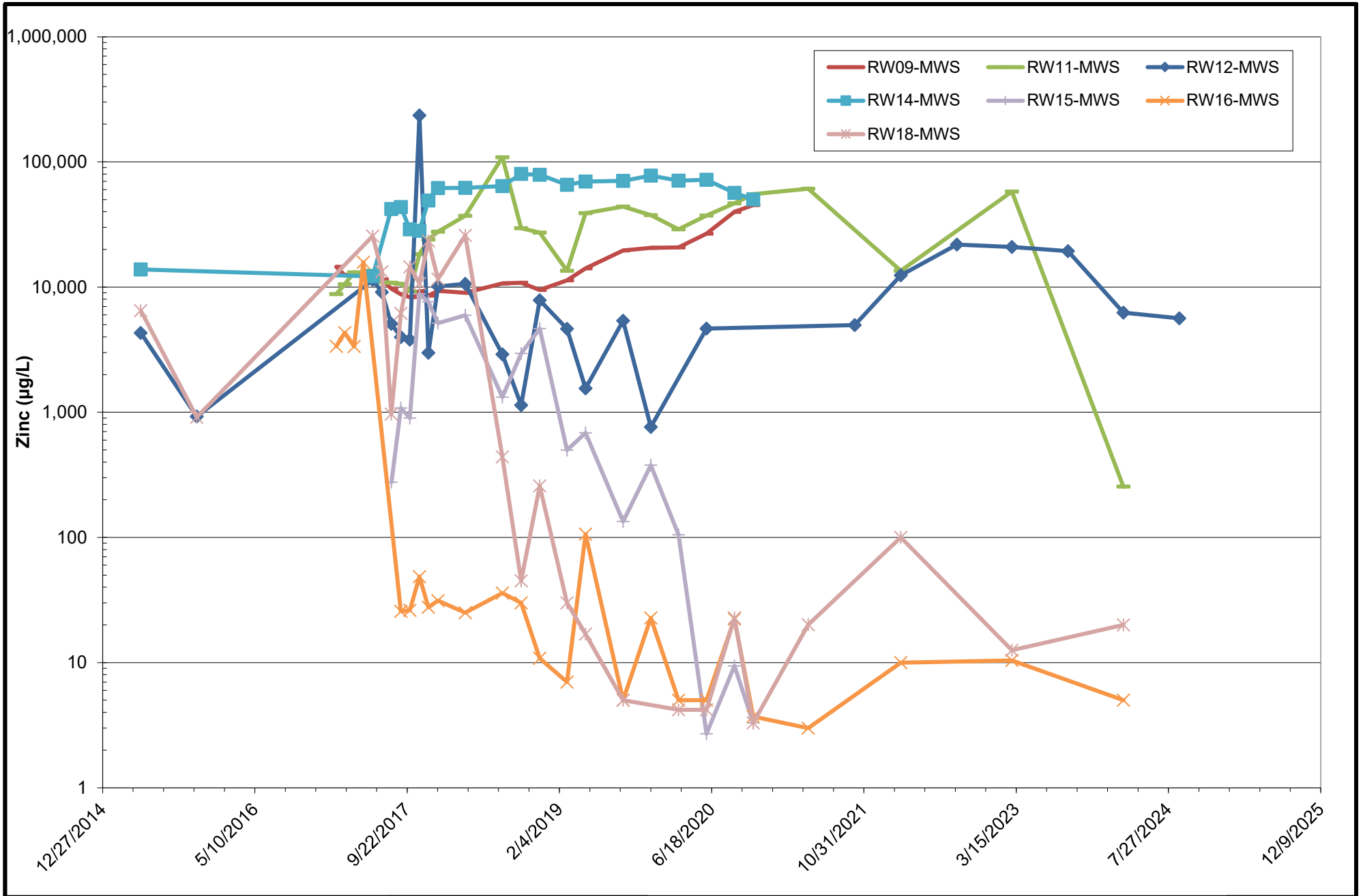
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# Shallow Downgradient Perimeter Zinc Concentrations (Supplemental Wells)

January 2025

**Figure 8**




ARM Group LLC
Engineers and Scientists

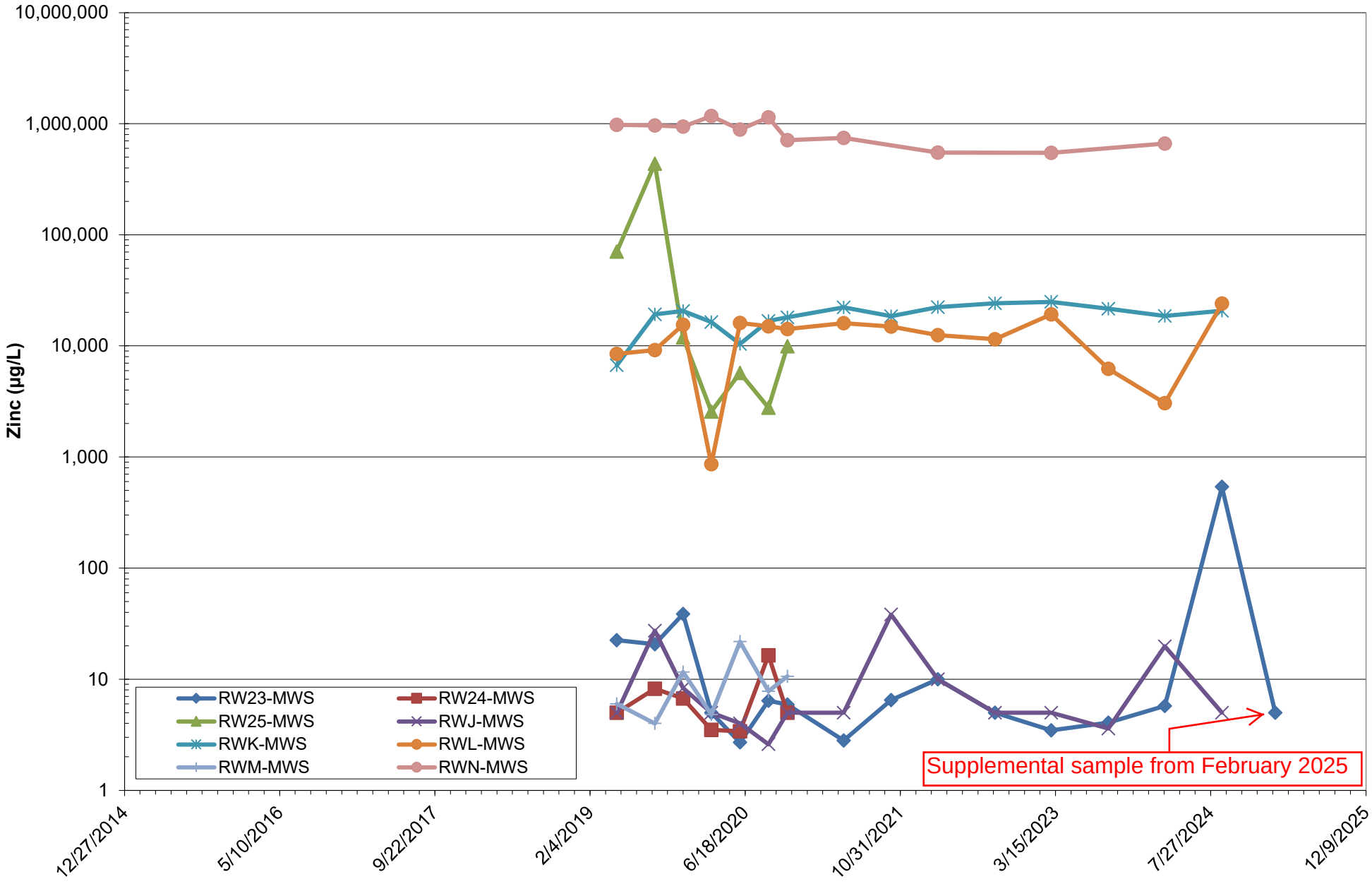
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# Shallow Interior Zinc Concentrations (Original Wells)

January 2025

**Figure 9**




ARM Group LLC
Engineers and Scientists

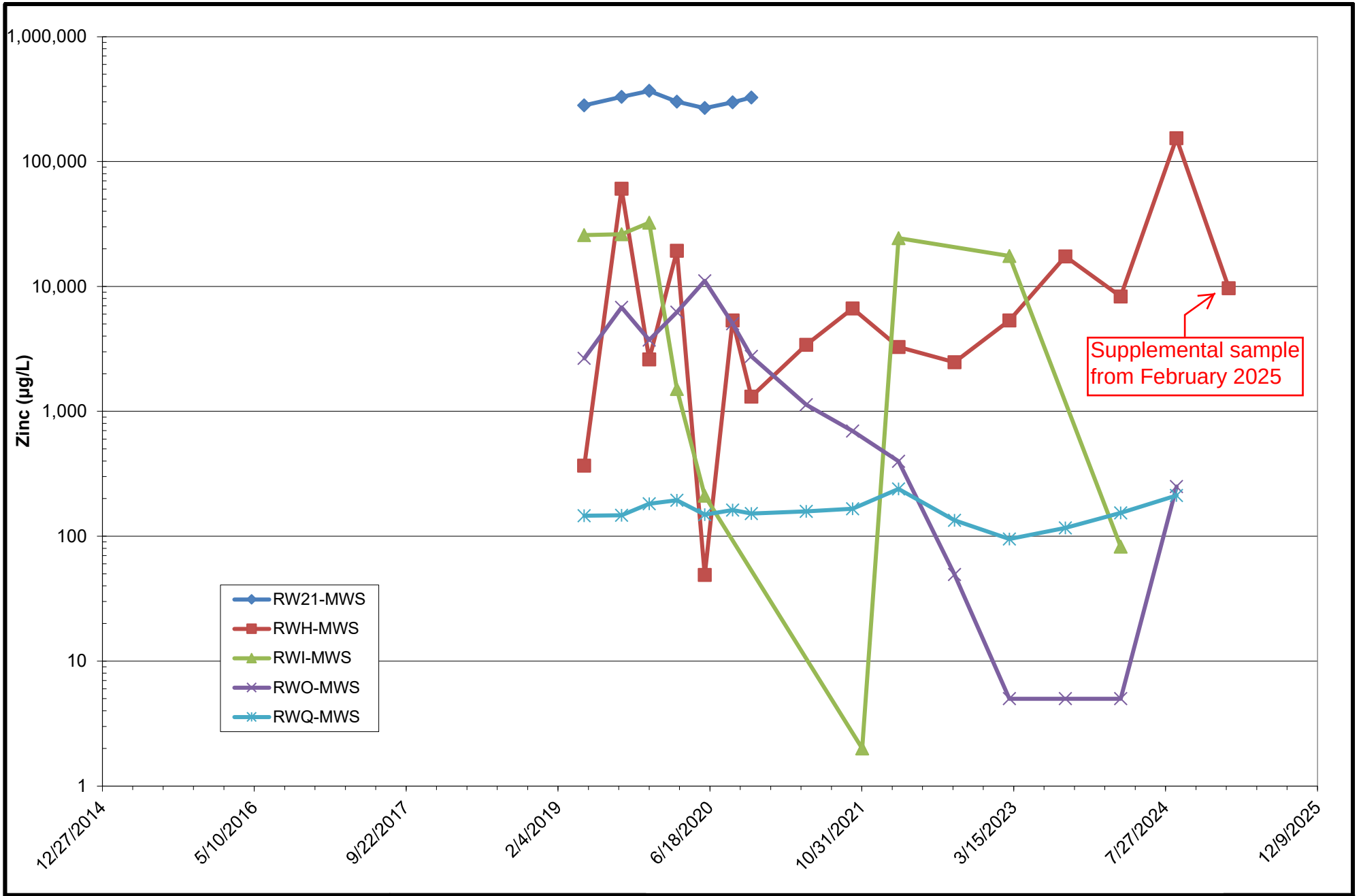
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# Shallow Interior Zinc Concentrations (Supplemental Wells)

January 2025

**Figure 10**




ARM Group LLC
Engineers and Scientists

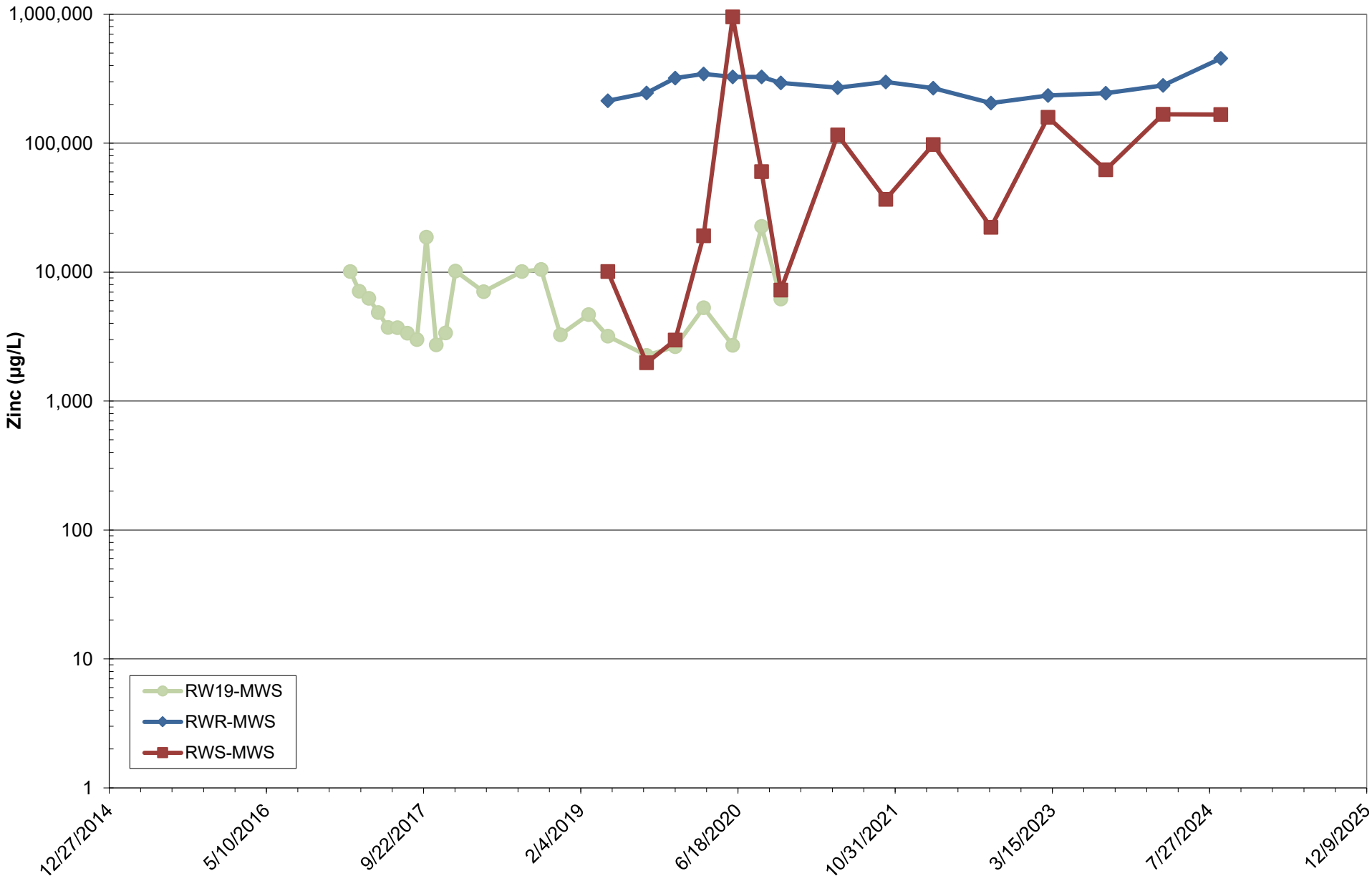
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# Shallow Delineation Wells Zinc Concentrations

January 2025

**Figure 11**




ARM Group LLC
Engineers and Scientists

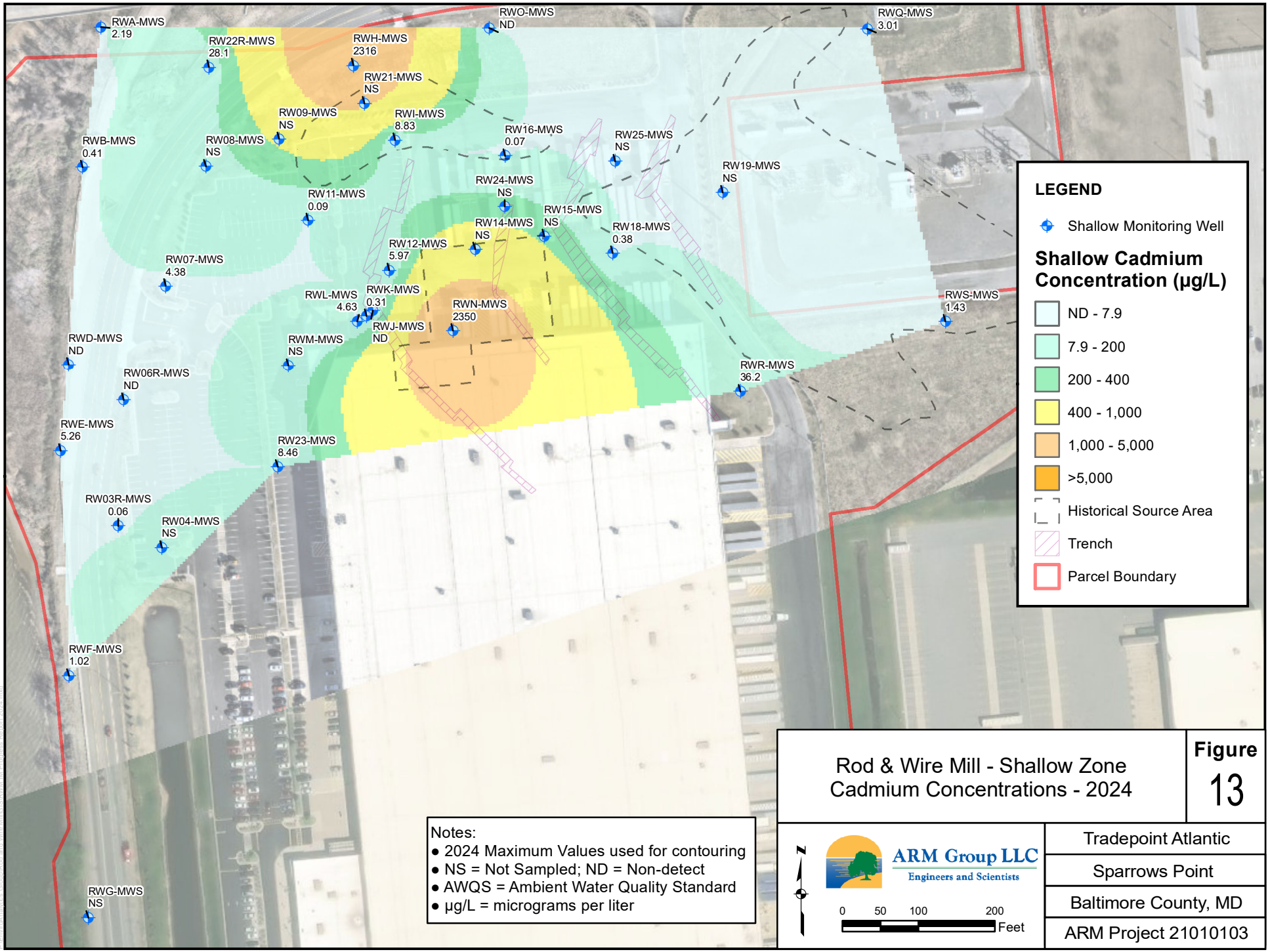
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# Shallow Upgradient Zinc Concentrations

January 2025

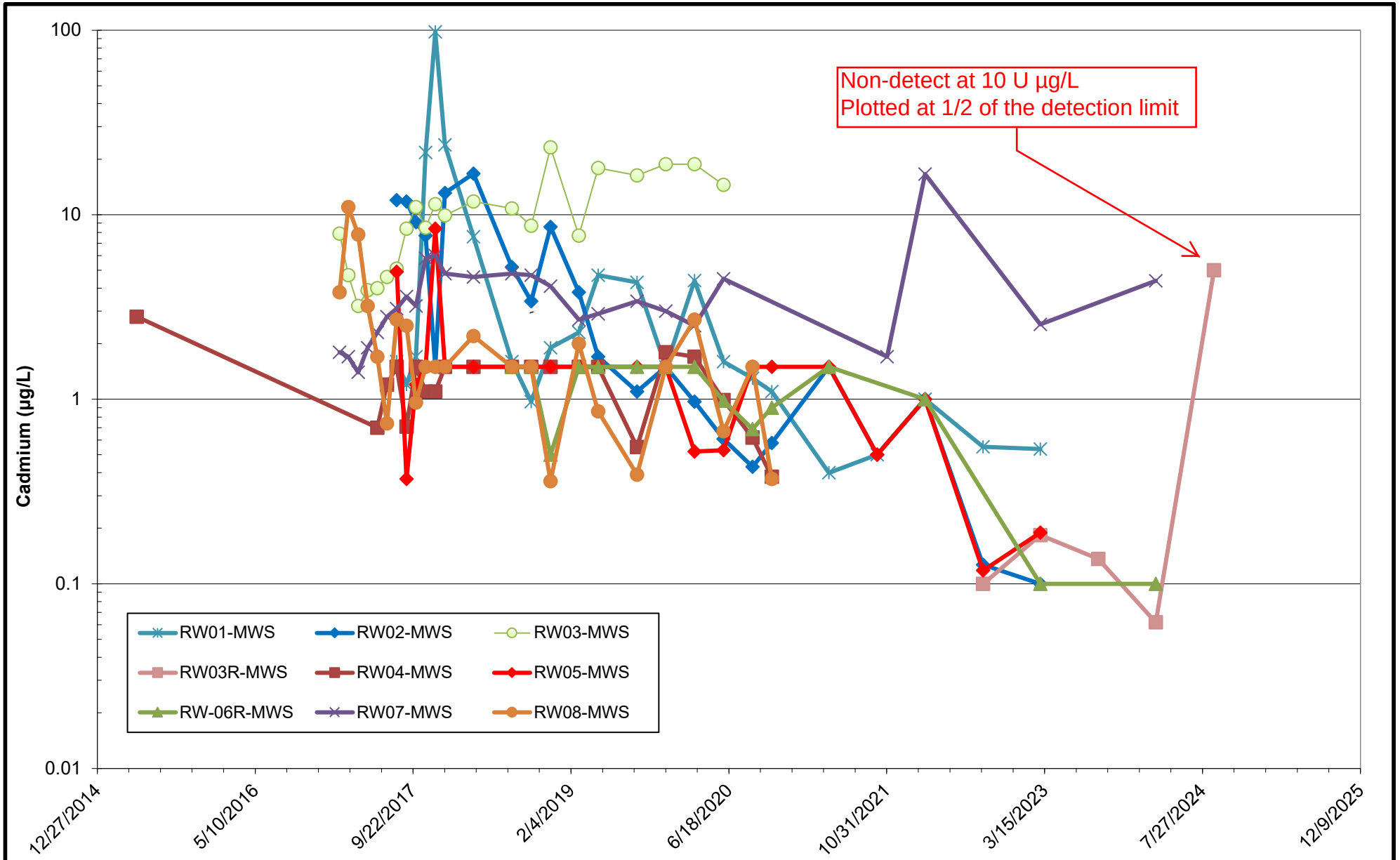
**Figure 12**




# Rod & Wire Mill - Shallow Zone Cadmium Concentrations - 2024

**Figure 13**

Tradepoint Atlantic
Sparrows Point
Baltimore County, MD
ARM Project 21010103




ARM Group LLC
Engineers and Scientists

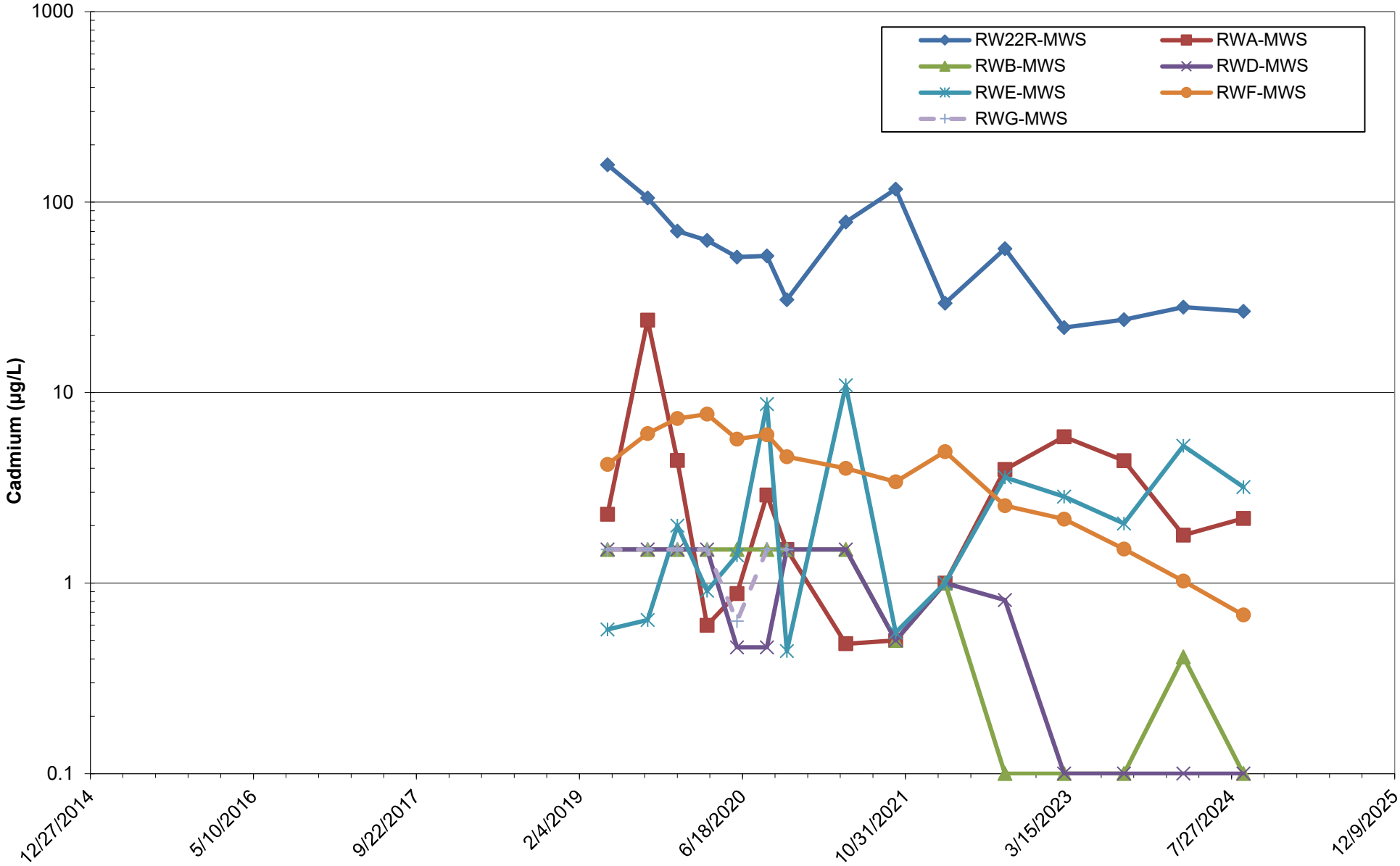
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# Shallow Downgradient Perimeter Cadmium Concentrations (Original Wells)

January 2025

**Figure 14**




ARM Group LLC
Engineers and Scientists

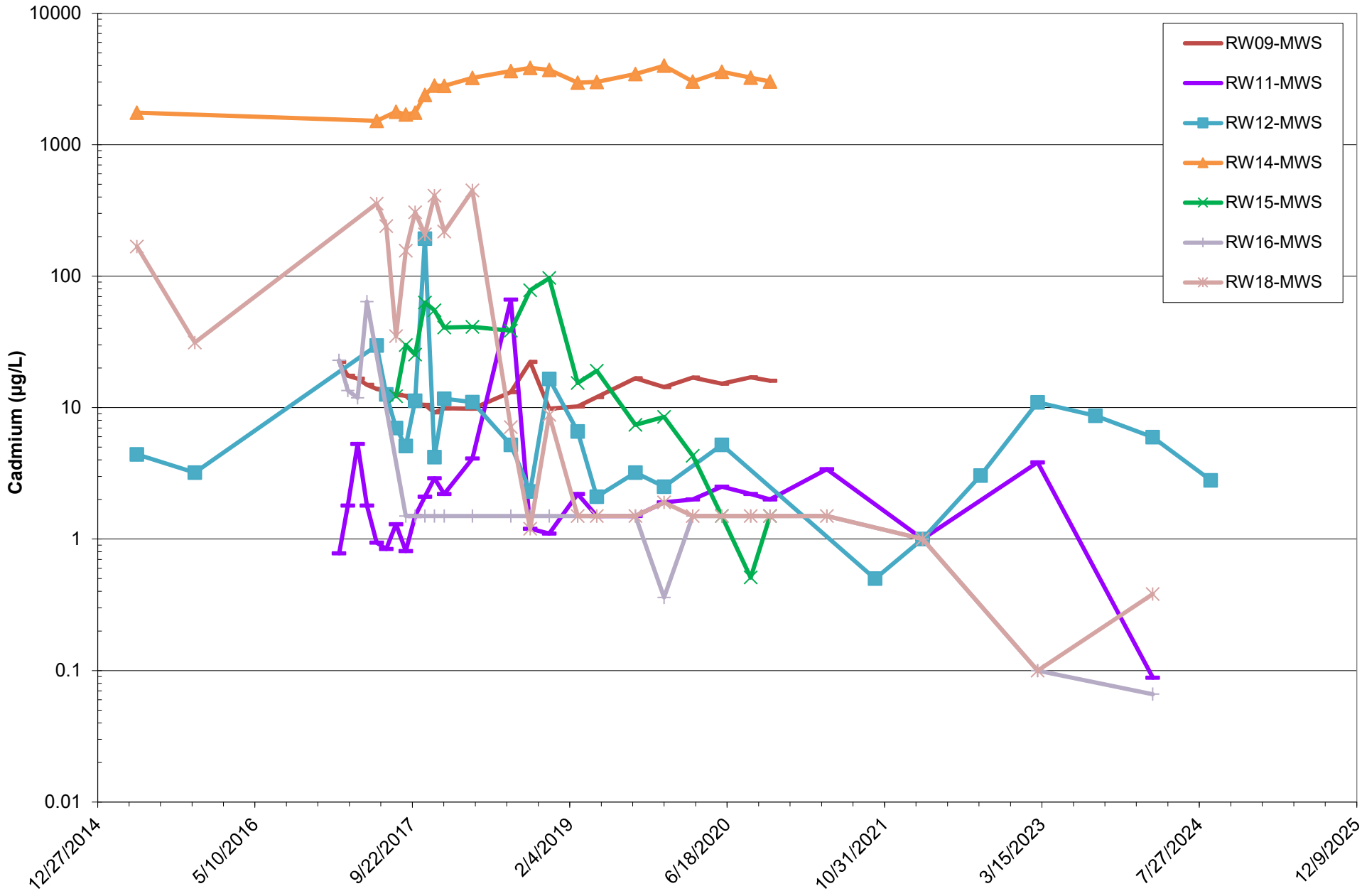
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# Shallow Downgradient Perimeter Cadmium Concentrations (Supplemental Wells)

January 2025

**Figure 15**




ARM Group LLC
Engineers and Scientists

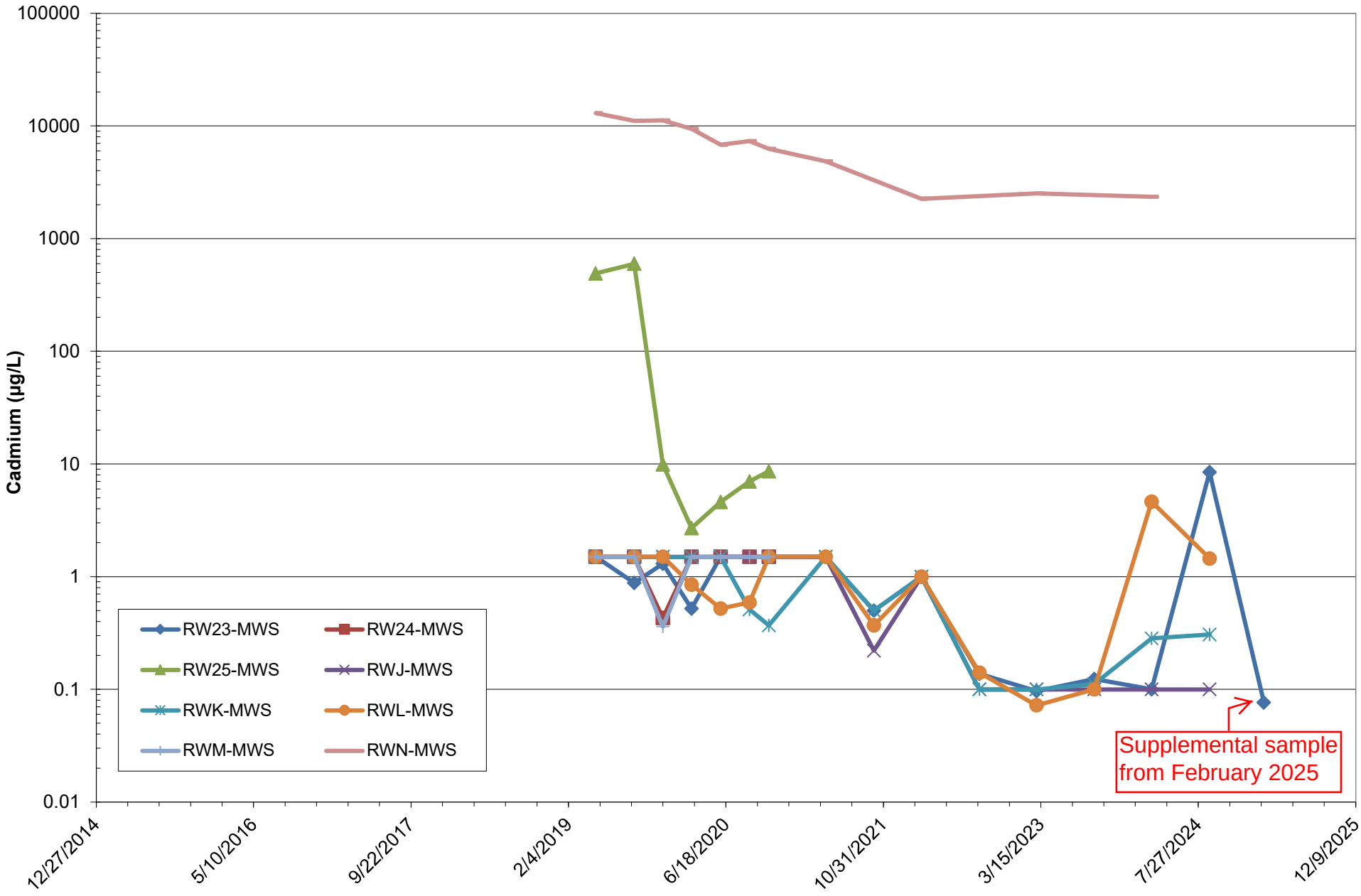
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# Shallow Interior Cadmium Concentrations (Original Wells)

January 2025

**Figure 16**




ARM Group LLC
Engineers and Scientists

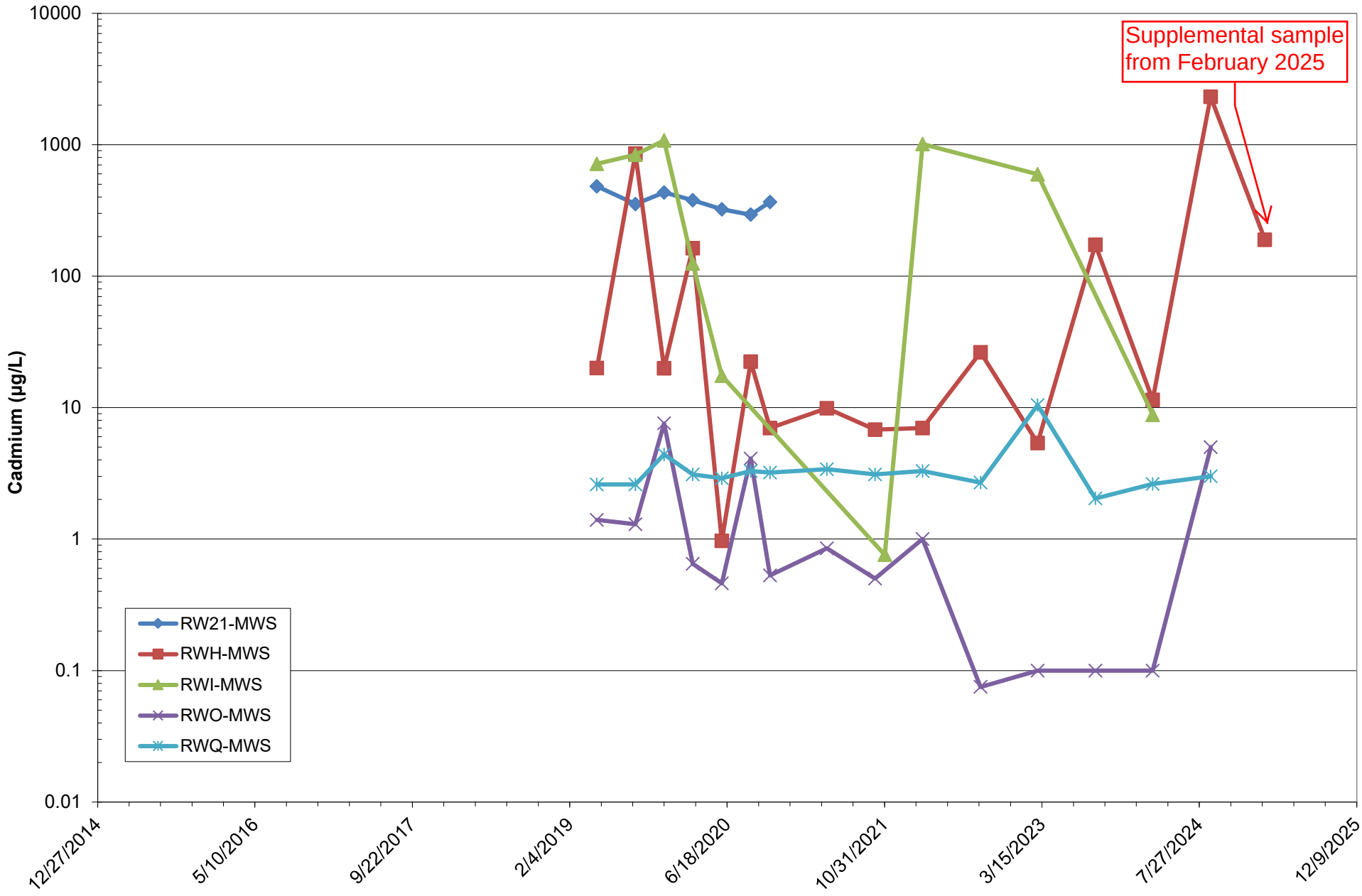
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# Shallow Interior Cadmium Concentrations (Supplemental Wells)

January 2025

**Figure 17**




ARM Group LLC
Engineers and Scientists

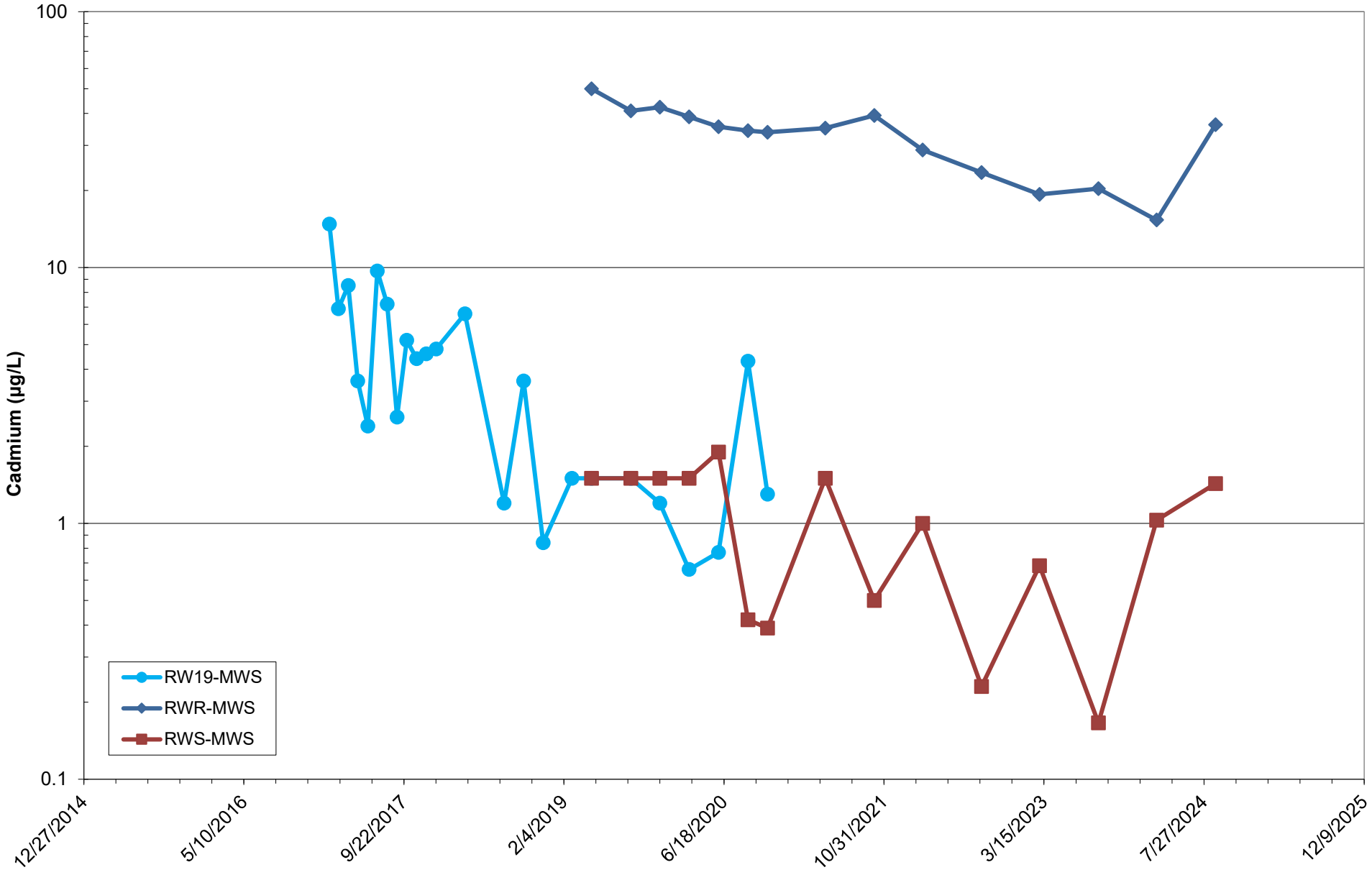
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# Shallow Delineation Wells Cadmium Concentrations

January 2025

**Figure 18**




ARM Group LLC
Engineers and Scientists

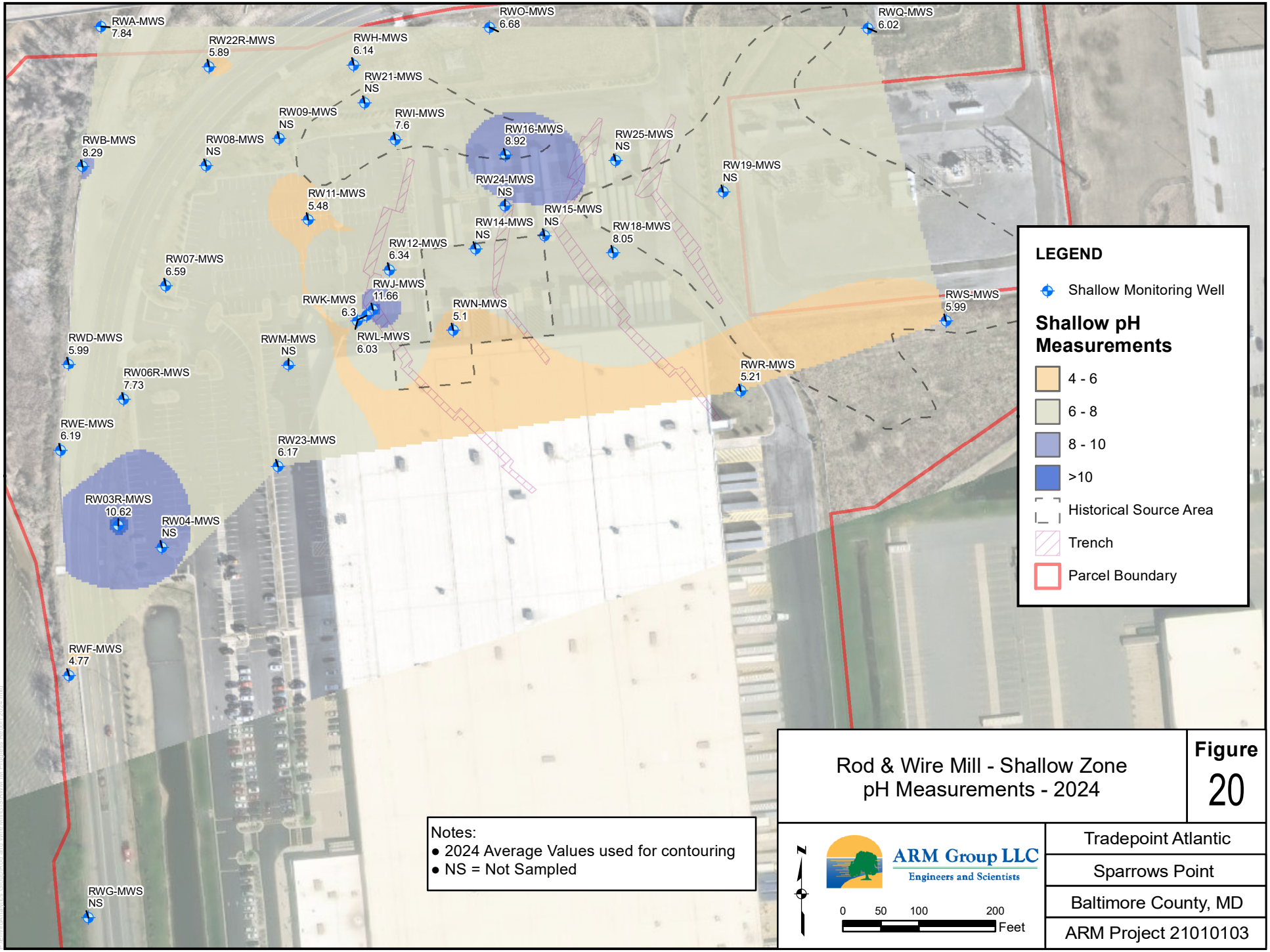
Rod and Wire Mill
Tradepoint Atlantic

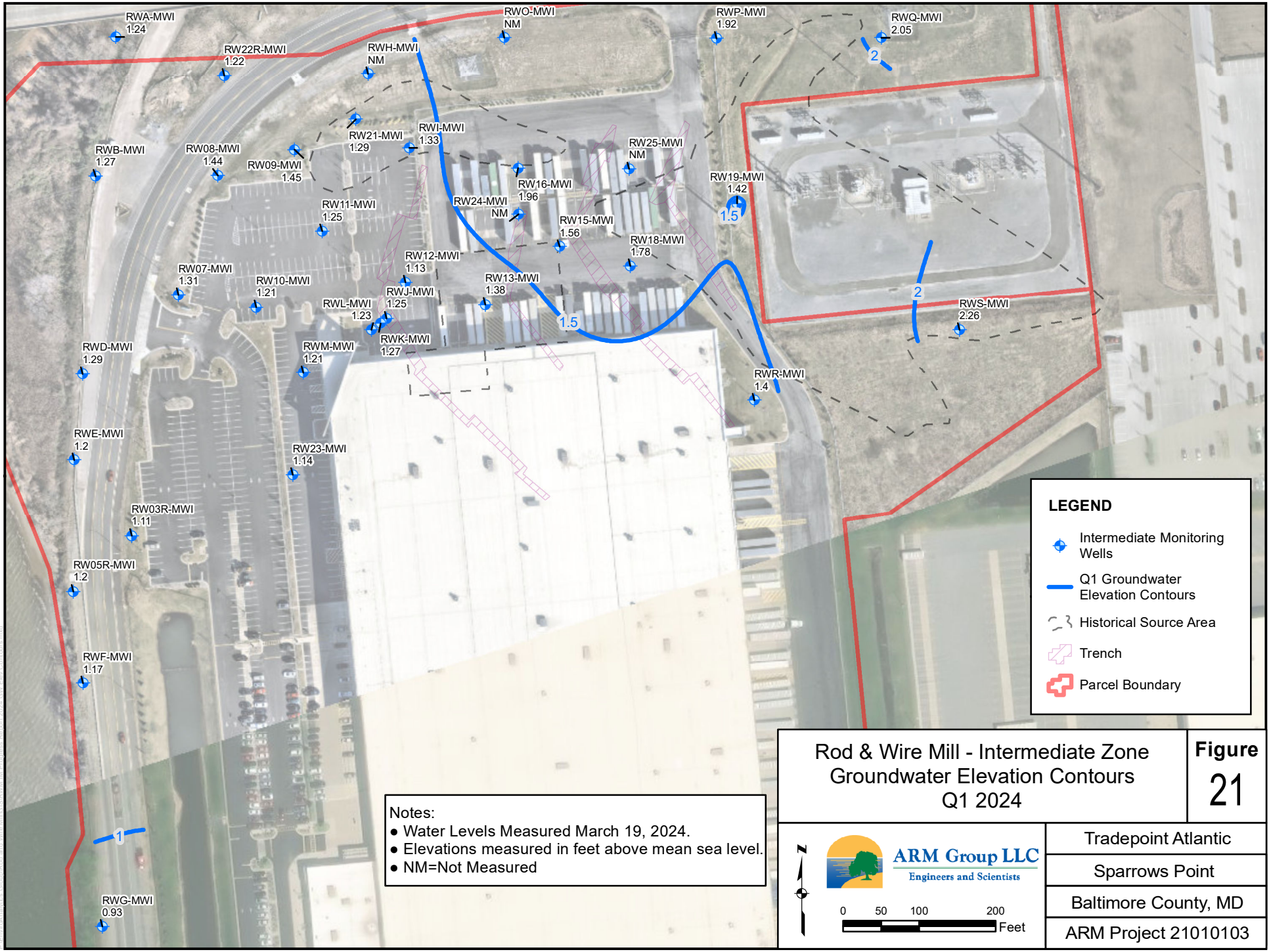
Sparrows Point, Maryland

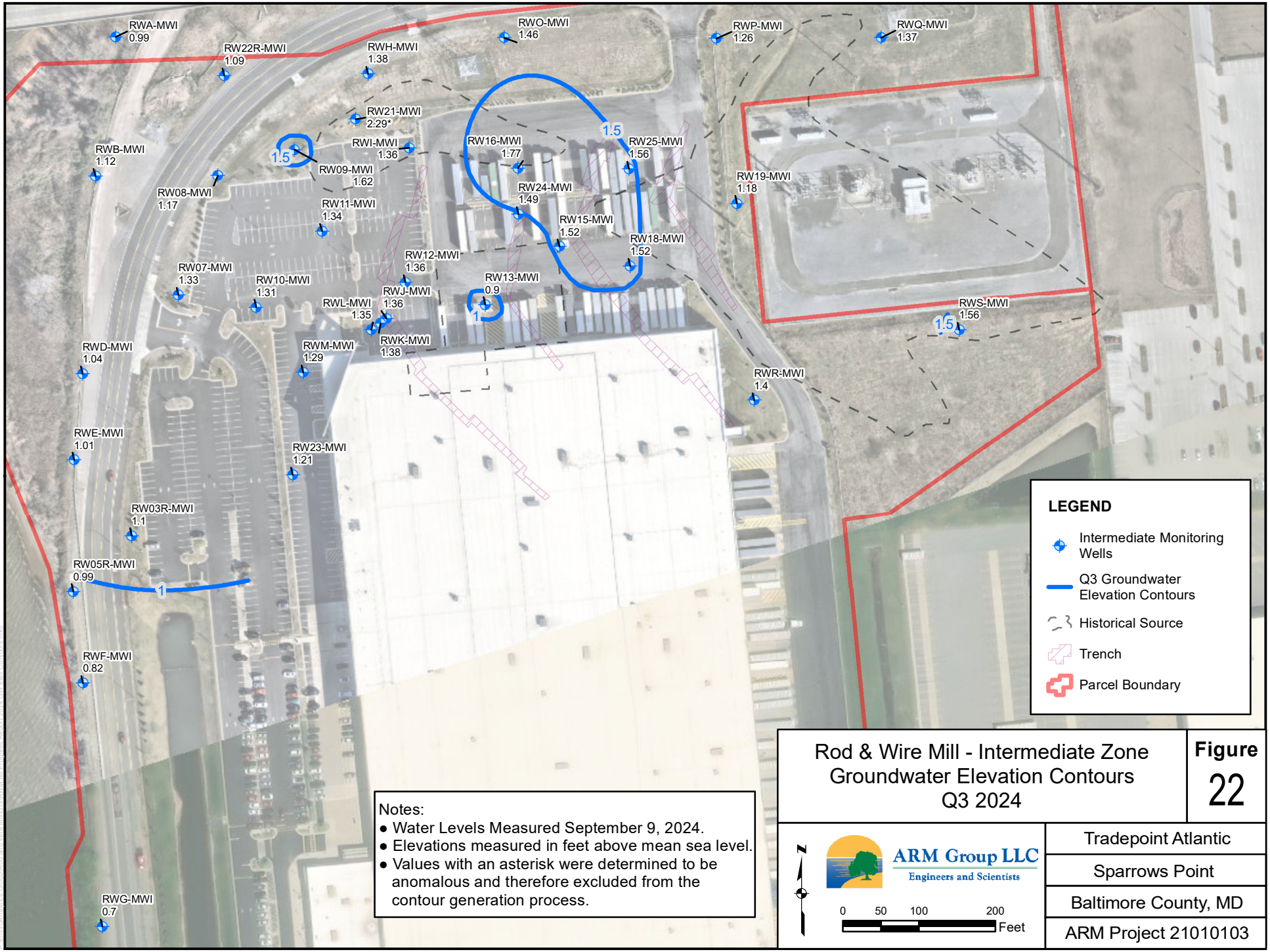
# Shallow Upgradient Cadmium Concentrations

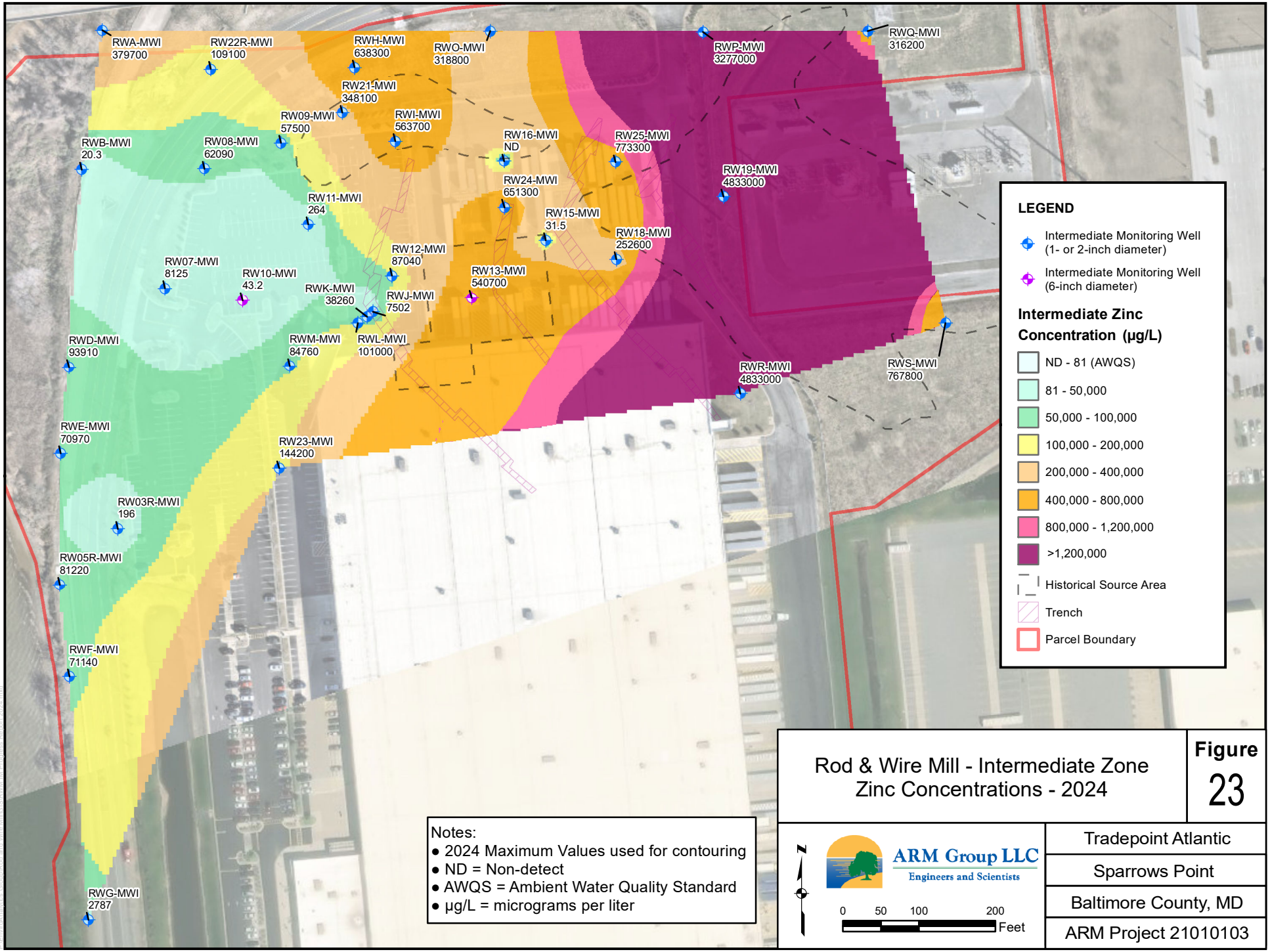
January 2025

**Figure 19**


RWA-MWS 7.84
RW22R-MWS 5.89
RWH-MWS 6.14
RWO-MWS 6.68
RWQ-MWS 6.02
RW21-MWS NS
RW09-MWS NS
RWI-MWS 7.6
RW16-MWS 8.92
RW25-MWS NS
RWB-MWS 8.29
RW08-MWS NS
RW19-MWS NS
RW24-MWS NS
RW11-MWS 5.48
RW15-MWS NS
RW14-MWS NS
RW18-MWS 8.05
RW12-MWS 6.34
RW07-MWS 6.59
RWJ-MWS 11.66
RWK-MWS 6.3
RWN-MWS 5.1
RWS-MWS 5.99
RWD-MWS 5.99
RWM-MWS NS
RWL-MWS 6.03
RW06R-MWS 7.73
RWR-MWS 5.21
RWE-MWS 6.19
RW23-MWS 6.17
RW03R-MWS 10.62
RW04-MWS NS
RWF-MWS 4.77
RWG-MWS NS
LEGEND
Shallow Monitoring Well
Shallow pH Measurements
4 - 6
6 - 8
8 - 10
>10
Historical Source Area
Trench
Parcel Boundary
Notes:
• 2024 Average Values used for contouring
• NS = Not Sampled
Rod & Wire Mill - Shallow Zone
pH Measurements - 2024
Figure
20
ARM Group LLC
Engineers and Scientists
0 50 100 200
Feet
Tradepoint Atlantic
Sparrows Point
Baltimore County, MD
ARM Project 21010103


RWA-MWI 1.24
RW22R-MWI 1.22
RWH-MWI NM
RWO-MWI NM
RWP-MWI 1.92
RWQ-MWI 2.05
RW21-MWI 1.29
RWI-MWI 1.33
RW25-MWI NM
RWB-MWI 1.27
RW08-MWI 1.44
RW09-MWI 1.45
RW16-MWI 1.96
RW19-MWI 1.42
RW24-MWI NM
RW11-MWI 1.25
RW15-MWI 1.56
RW18-MWI 1.78
RW12-MWI 1.13
RW07-MWI 1.31
RW10-MWI 1.21
RW13-MWI 1.38
RWJ-MWI 1.25
RWL-MWI 1.23
RWS-MWI 2.26
RWK-MWI 1.27
RWM-MWI 1.21
RWD-MWI 1.29
RWR-MWI 1.4
RWE-MWI 1.2
RW23-MWI 1.14
RW03R-MWI 1.11
RW05R-MWI 1.2
RWF-MWI 1.17
RWG-MWI 0.93
1
1.5
2
LEGEND
Intermediate Monitoring Wells
Q1 Groundwater Elevation Contours
Historical Source Area
Trench
Parcel Boundary
Notes:
• Water Levels Measured March 19, 2024.
• Elevations measured in feet above mean sea level.
• NM=Not Measured
Rod & Wire Mill - Intermediate Zone Groundwater Elevation Contours Q1 2024
Figure 21
ARM Group LLC
Engineers and Scientists
0 50 100 200 Feet
Tradepoint Atlantic
Sparrows Point
Baltimore County, MD
ARM Project 21010103

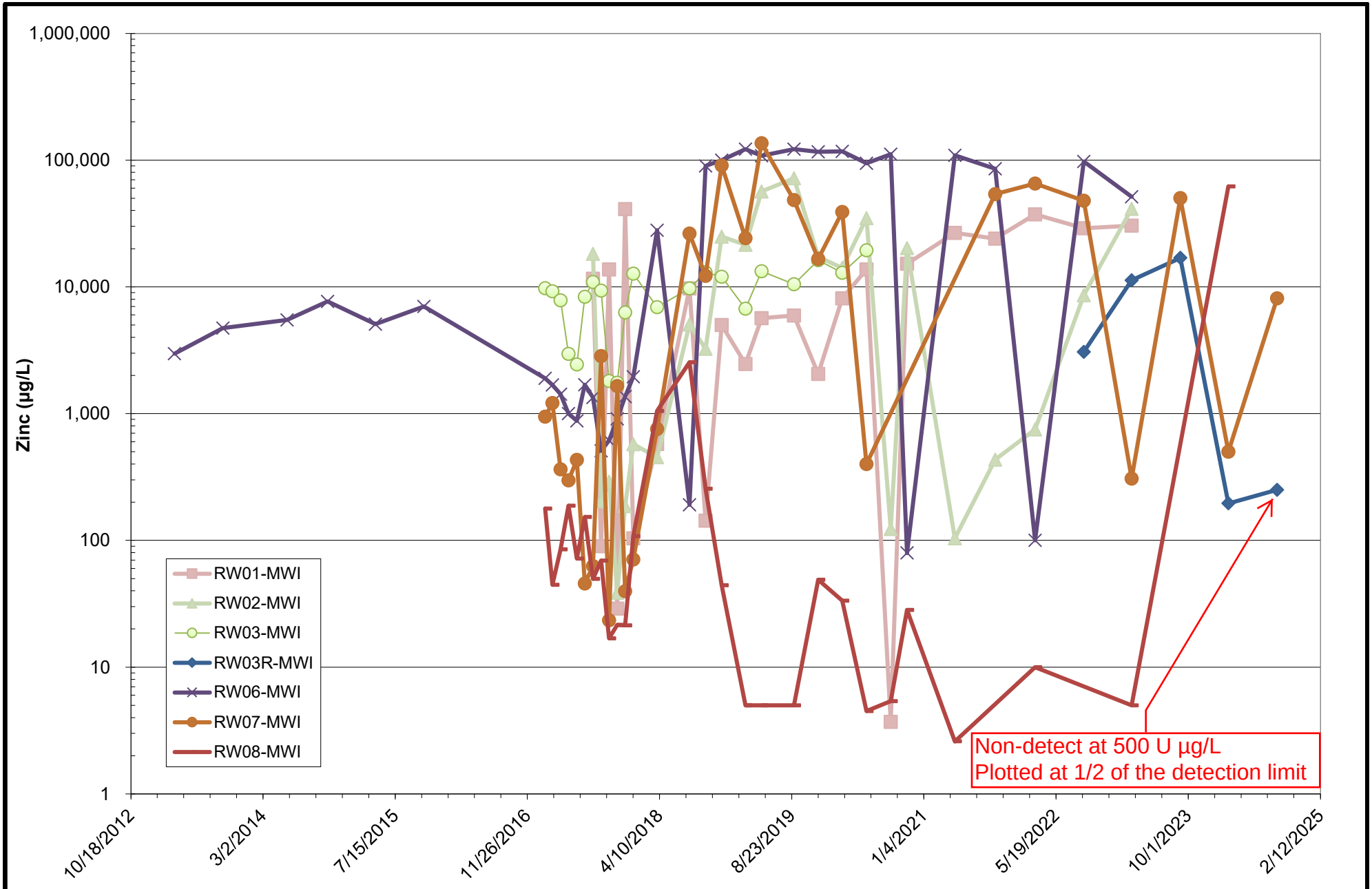

RWA-MWI 0.99
RW22R-MWI 1.09
RWH-MWI 1.38
RWO-MWI 1.46
RWP-MWI 1.26
RWQ-MWI 1.37
RW21-MWI 2.29*
RWB-MWI 1.12
RWI-MWI 1.36
RW16-MWI 1.77
RW25-MWI 1.56
RW09-MWI 1.62
RW08-MWI 1.17
RW24-MWI 1.49
RW19-MWI 1.18
RW11-MWI 1.34
RW15-MWI 1.52
RW18-MWI 1.52
RW12-MWI 1.36
RW07-MWI 1.33
RW10-MWI 1.31
RW13-MWI 0.9
RWJ-MWI 1.36
RWL-MWI 1.35
RWS-MWI 1.56
RWK-MWI 1.38
RWM-MWI 1.29
RWD-MWI 1.04
RWR-MWI 1.4
RWE-MWI 1.01
RW23-MWI 1.21
RW03R-MWI 1.1
RW05R-MWI 0.99
RWF-MWI 0.82
RWG-MWI 0.7
1.5
1
LEGEND
Intermediate Monitoring Wells
Q3 Groundwater Elevation Contours
Historical Source
Trench
Parcel Boundary
Notes:
• Water Levels Measured September 9, 2024.
• Elevations measured in feet above mean sea level.
• Values with an asterisk were determined to be anomalous and therefore excluded from the contour generation process.
Rod & Wire Mill - Intermediate Zone Groundwater Elevation Contours Q3 2024
Figure 22
ARM Group LLC
Engineers and Scientists
0 50 100 200
Feet
Tradepoint Atlantic
Sparrows Point
Baltimore County, MD
ARM Project 21010103




# Rod & Wire Mill - Intermediate Zone Zinc Concentrations - 2024

**Figure 23**

Tradepoint Atlantic
Sparrows Point
Baltimore County, MD
ARM Project 21010103




ARM Group LLC
Engineers and Scientists

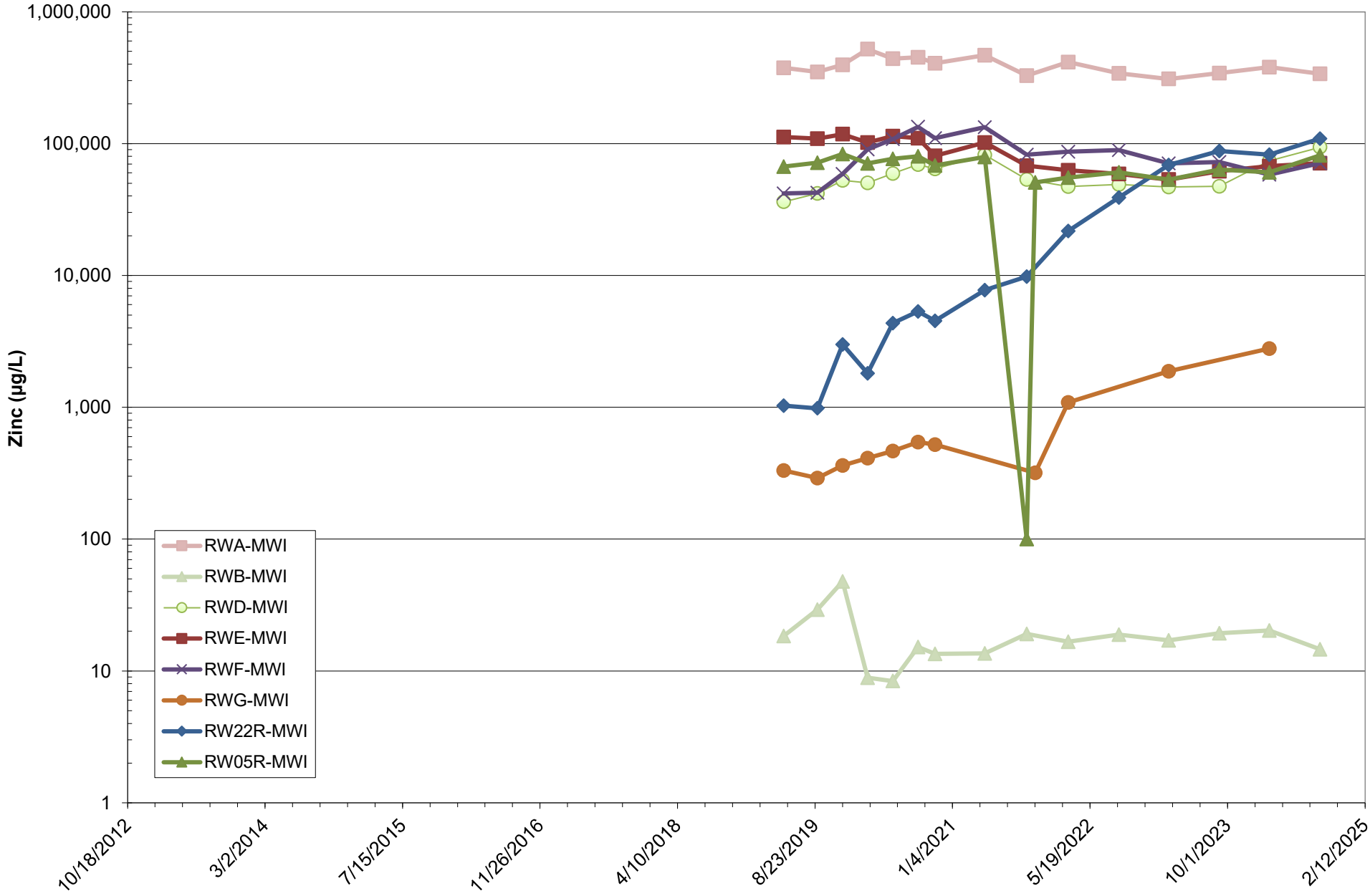
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# Intermediate Downgradient Perimeter Zinc Concentrations (Original Wells)

January 2025

**Figure 24**




ARM Group LLC
Engineers and Scientists

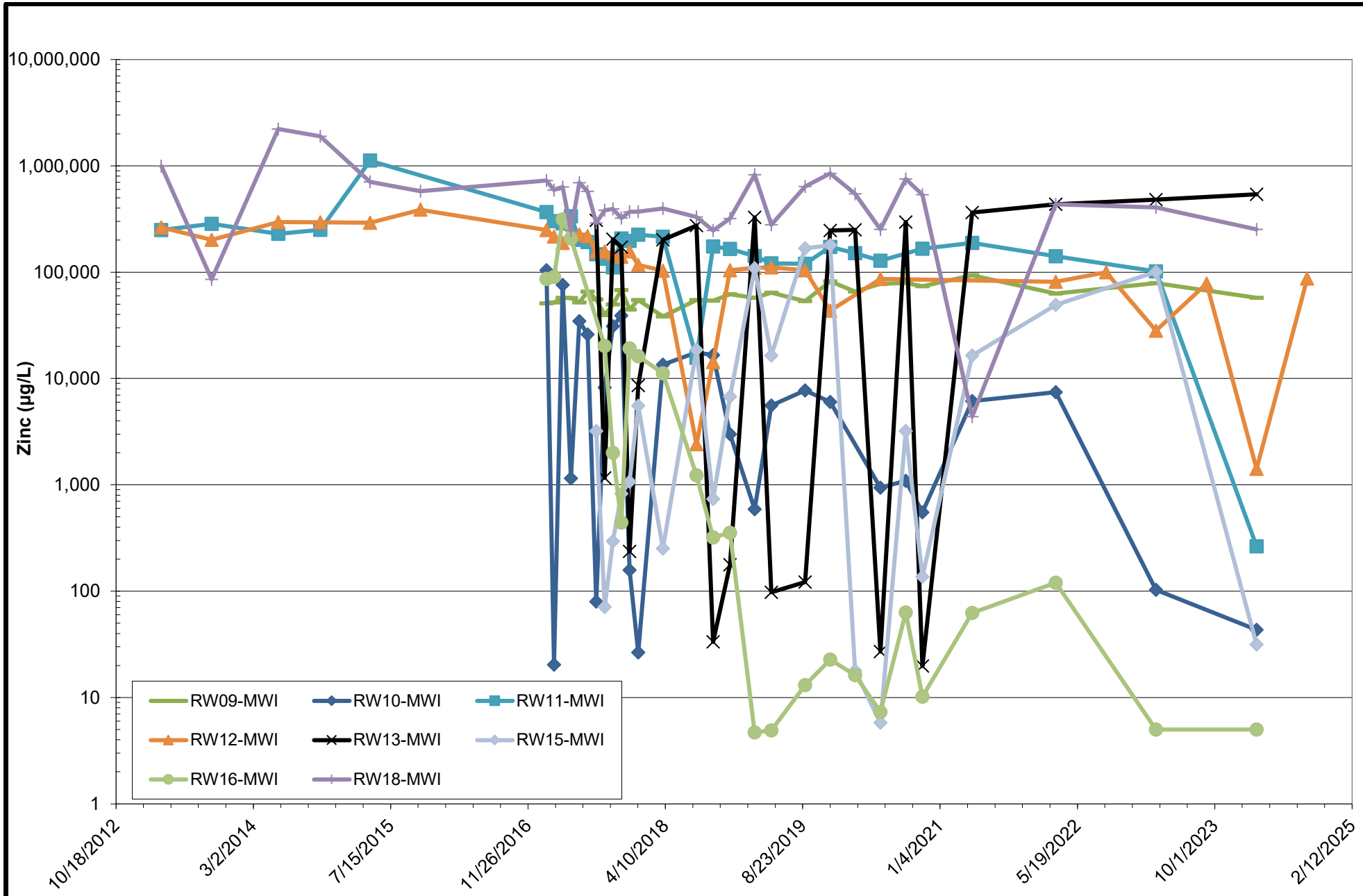
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# Intermediate Downgradient Perimeter Zinc Concentrations (Supplemental Wells)

January 2025

**Figure 25**




ARM Group LLC
Engineers and Scientists

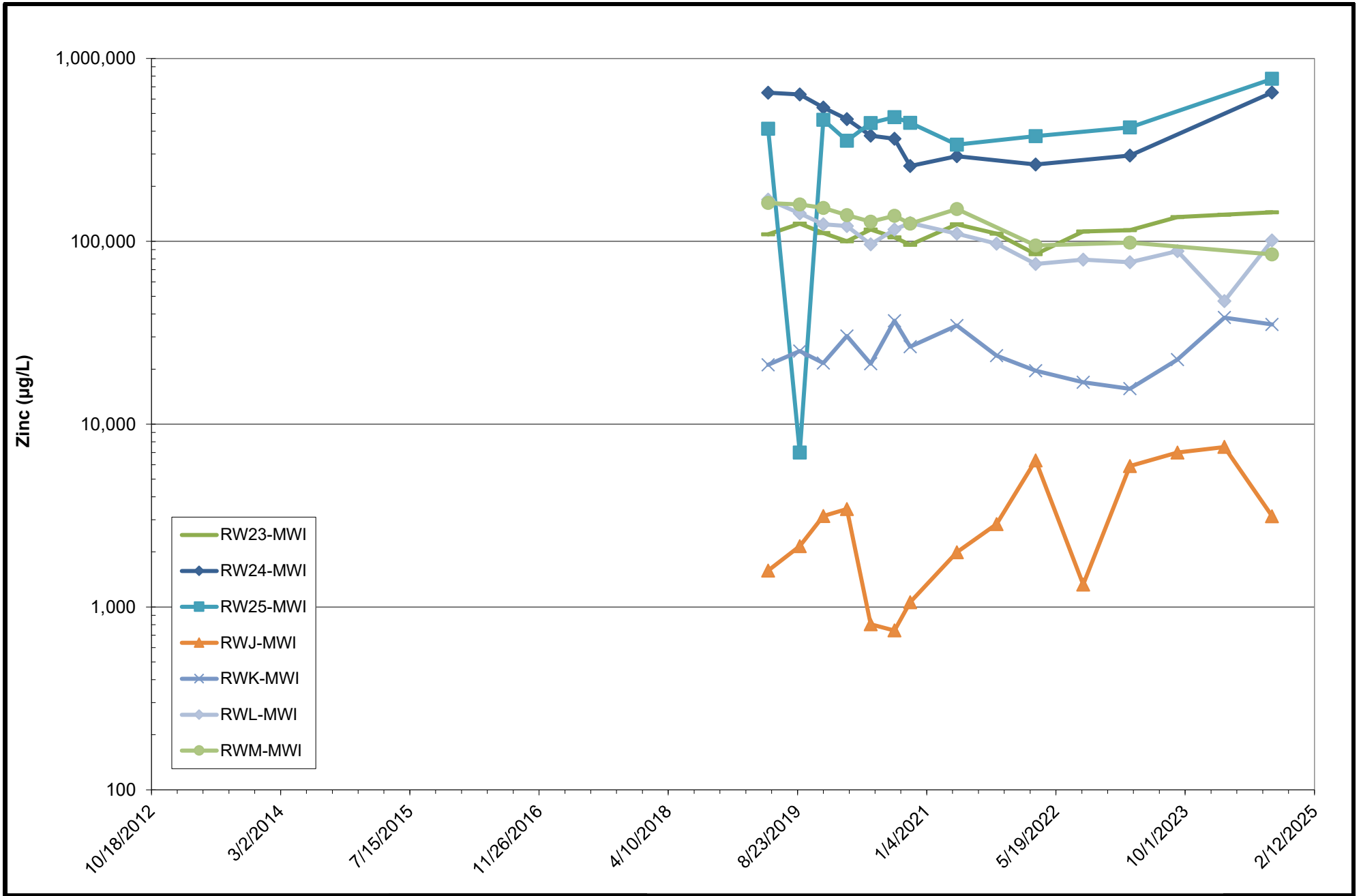
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# Intermediate Interior Zinc Concentrations (Original Wells)

January 2025

**Figure 26**




ARM Group LLC
Engineers and Scientists

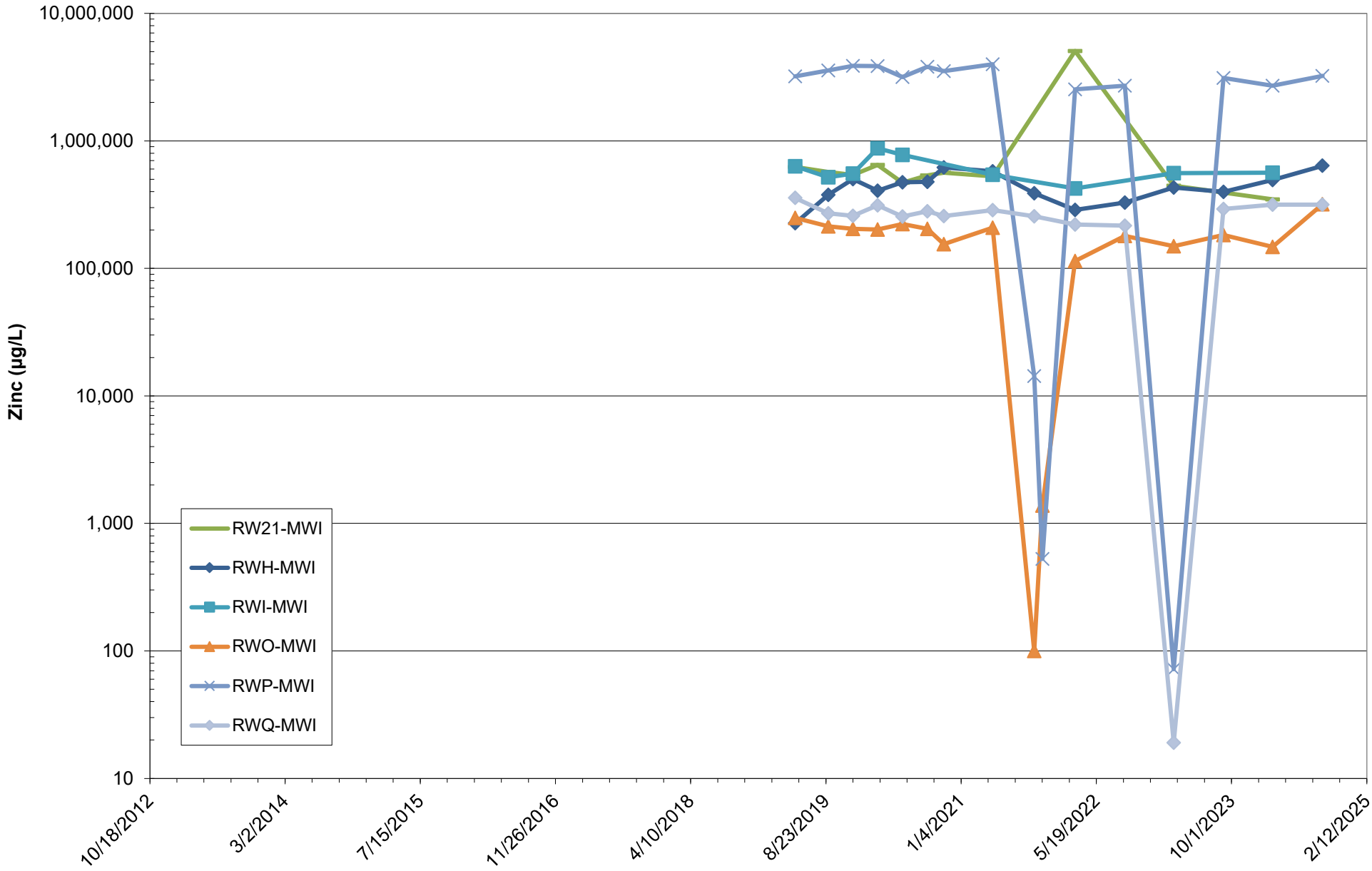
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# Intermediate Interior Zinc Concentrations (Supplemental Wells)

January 2025

**Figure 27**




ARM Group LLC
Engineers and Scientists

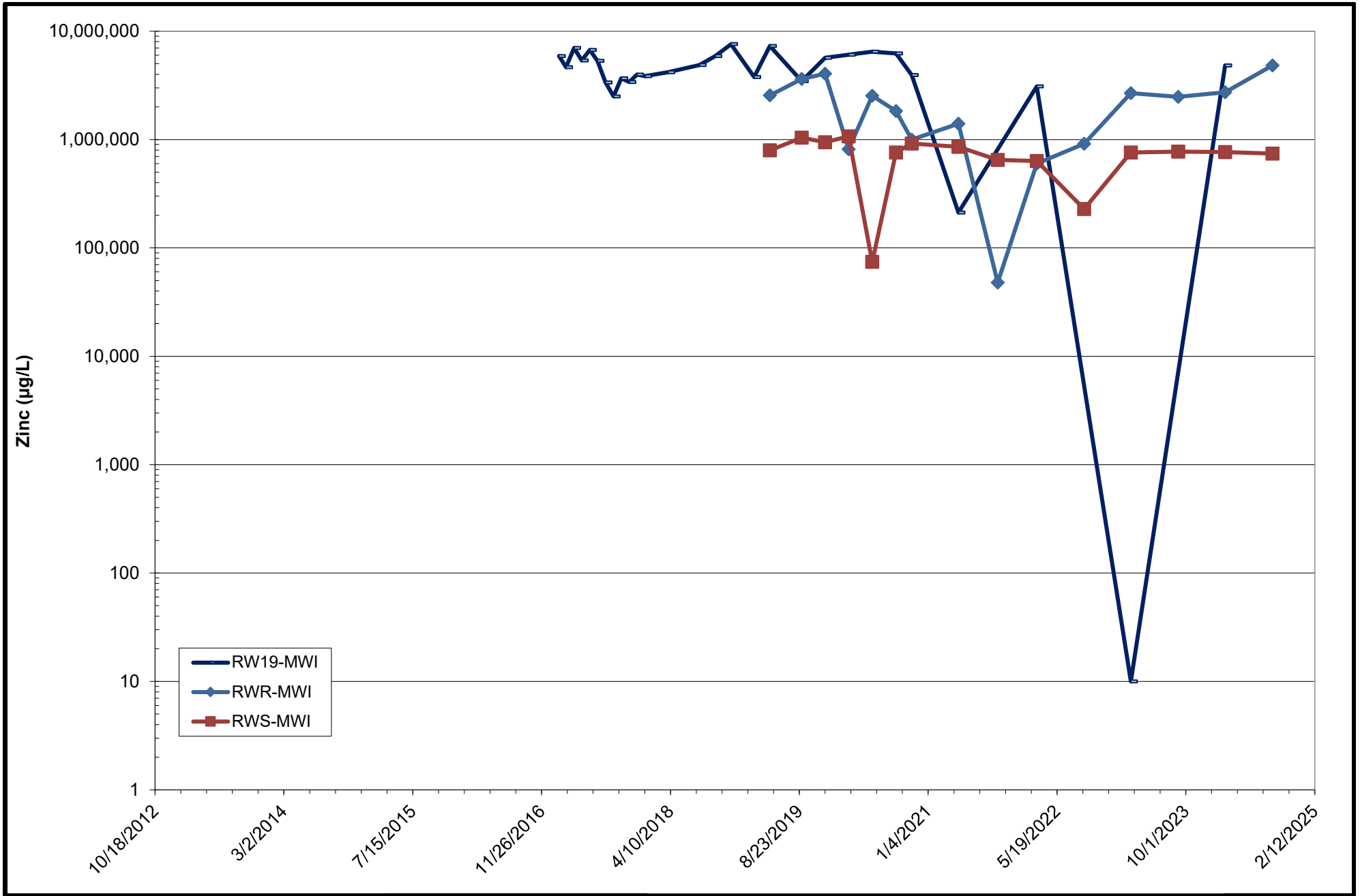
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# Intermediate Delineation Wells Zinc Concentrations

January 2025

**Figure 28**




ARM Group LLC
Engineers and Scientists

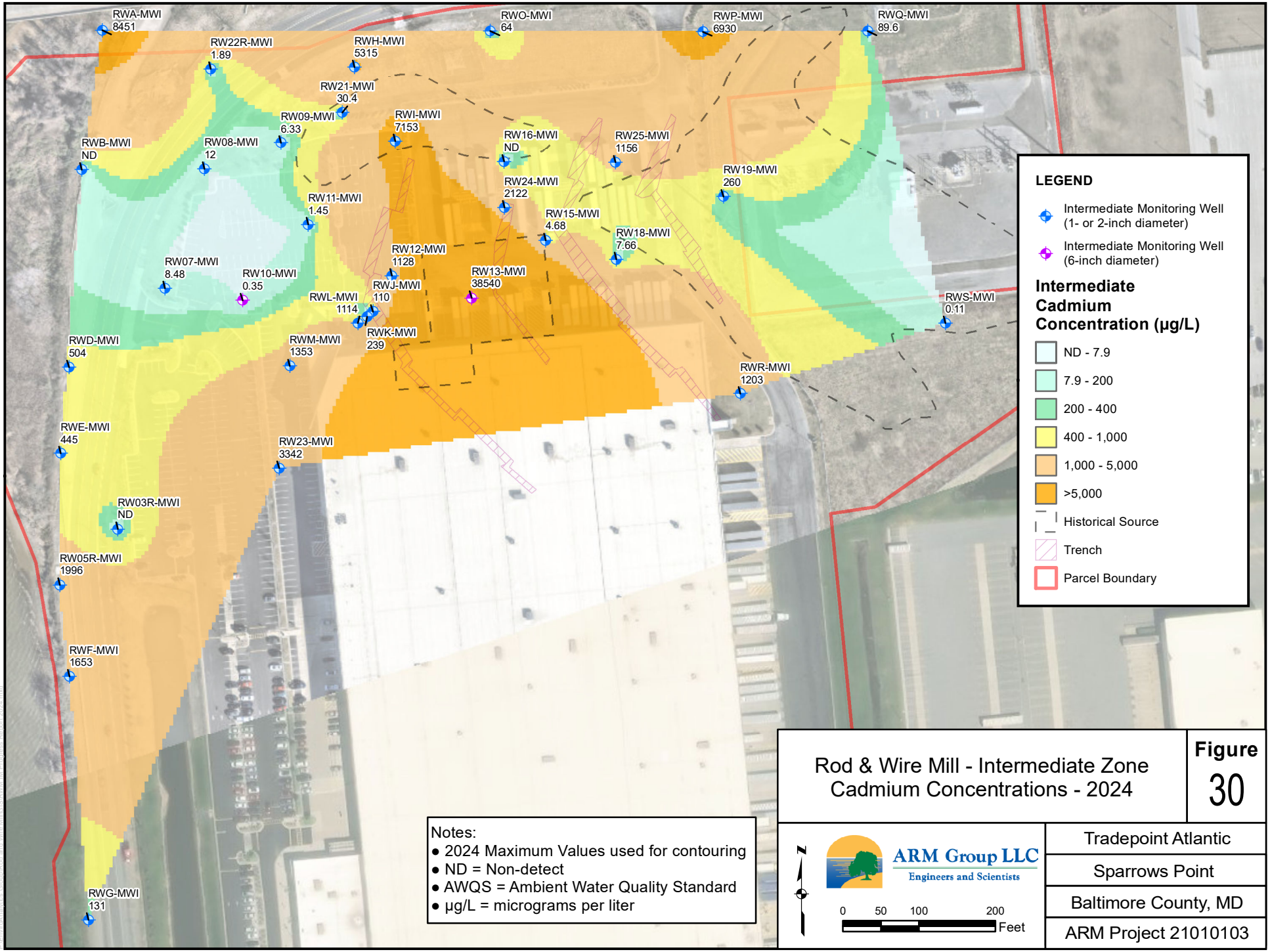
Rod and Wire Mill
Tradepoint Atlantic

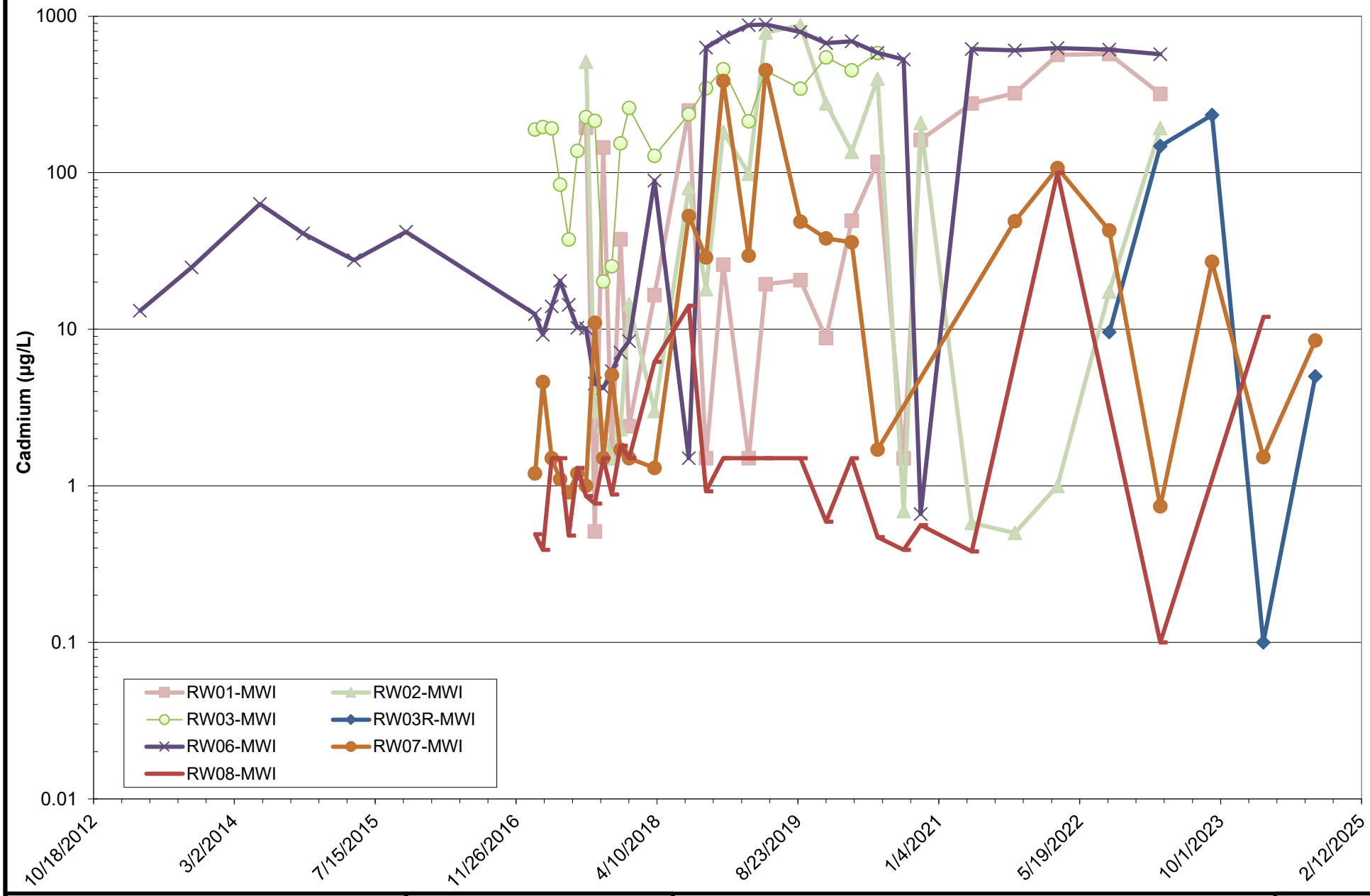
Sparrows Point, Maryland

# Intermediate Upgradient Zinc Concentrations

January 2025

**Figure 29**


RWA-MWI 8451
RW22R-MWI 1.89
RWH-MWI 5315
RWO-MWI 64
RWP-MWI 6930
RWQ-MWI 89.6
RW21-MWI 30.4
RW09-MWI 6.33
RWI-MWI 7153
RWB-MWI ND
RW08-MWI 12
RW16-MWI ND
RW25-MWI 1156
RW19-MWI 260
RW24-MWI 2122
RW11-MWI 1.45
RW15-MWI 4.68
RW18-MWI 7.66
RW12-MWI 1128
RW07-MWI 8.48
RW10-MWI 0.35
RW13-MWI 38540
RWJ-MWI 110
RWL-MWI 1114
RWS-MWI 0.11
RWK-MWI 239
RWD-MWI 504
RWM-MWI 1353
RWR-MWI 1203
RWE-MWI 445
RW23-MWI 3342
RW03R-MWI ND
RW05R-MWI 1996
RWF-MWI 1653
RWG-MWI 131
LEGEND
Intermediate Monitoring Well (1- or 2-inch diameter)
Intermediate Monitoring Well (6-inch diameter)
Intermediate Cadmium Concentration (µg/L)
ND - 7.9
7.9 - 200
200 - 400
400 - 1,000
1,000 - 5,000
>5,000
Historical Source
Trench
Parcel Boundary
Notes:
• 2024 Maximum Values used for contouring
• ND = Non-detect
• AWQS = Ambient Water Quality Standard
• µg/L = micrograms per liter
Rod & Wire Mill - Intermediate Zone Cadmium Concentrations - 2024
Figure 30
ARM Group LLC
Engineers and Scientists
0 50 100 200
Feet
Tradepoint Atlantic
Sparrows Point
Baltimore County, MD
ARM Project 21010103




ARM Group LLC
Engineers and Scientists

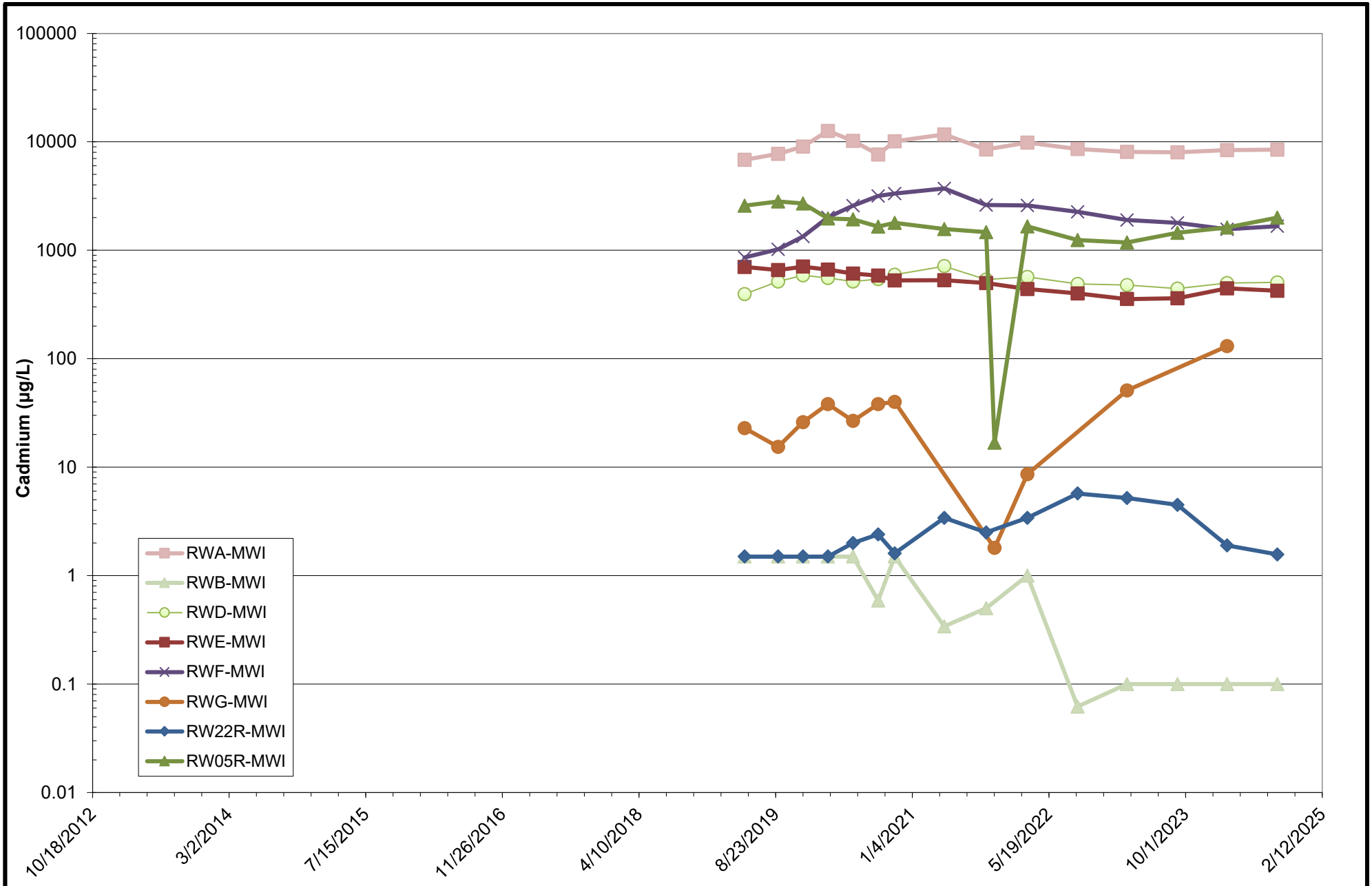
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# Intermediate Downgradient Perimeter Cadmium Concentrations (Orginal Wells)

January 2025

**Figure 31**




ARM Group LLC
Engineers and Scientists

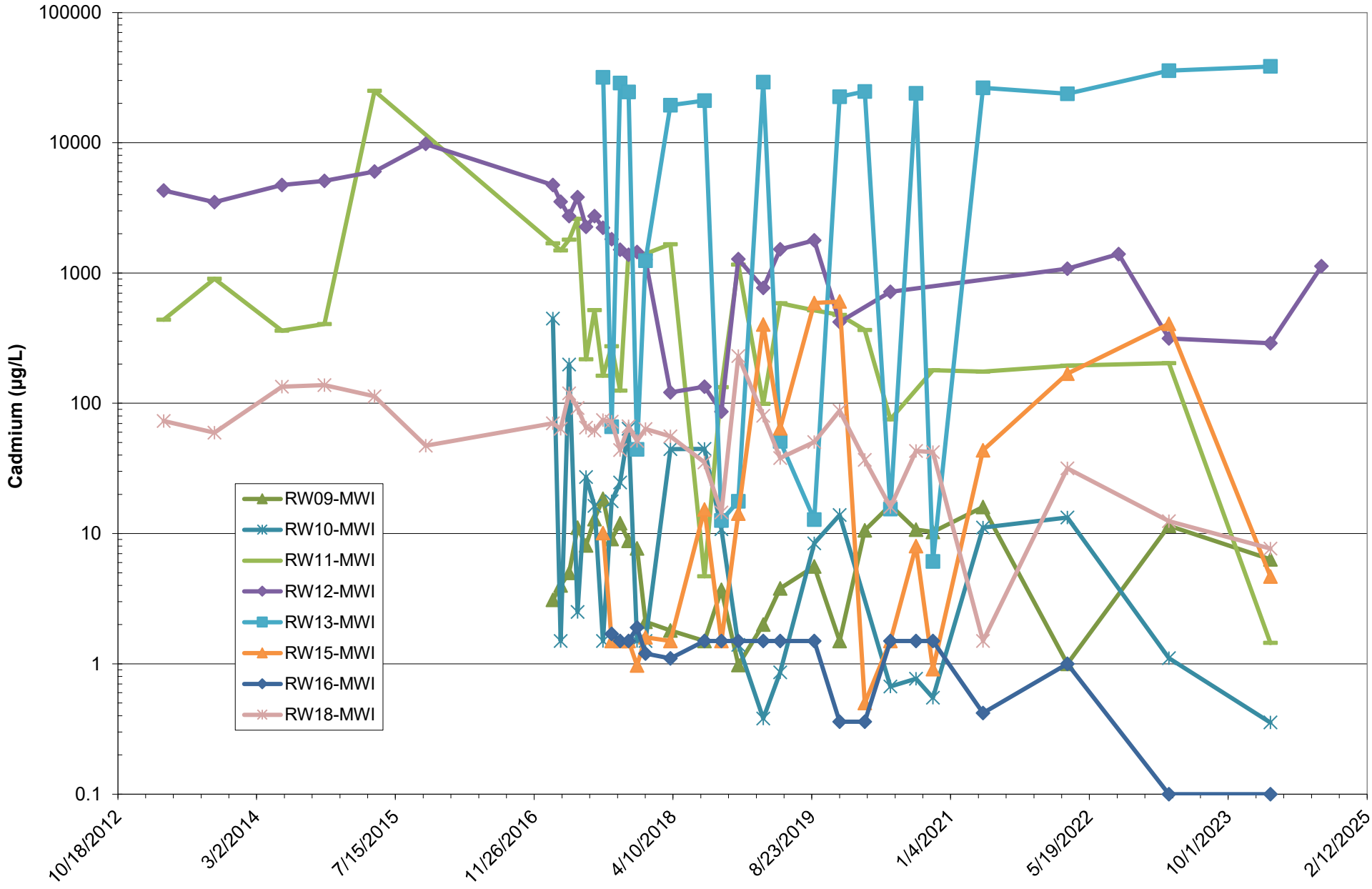
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# Intermediate Downgradient Perimeter Cadmium Concentrations (Supplemental Wells)

January 2025

**Figure 32**




ARM Group LLC
Engineers and Scientists

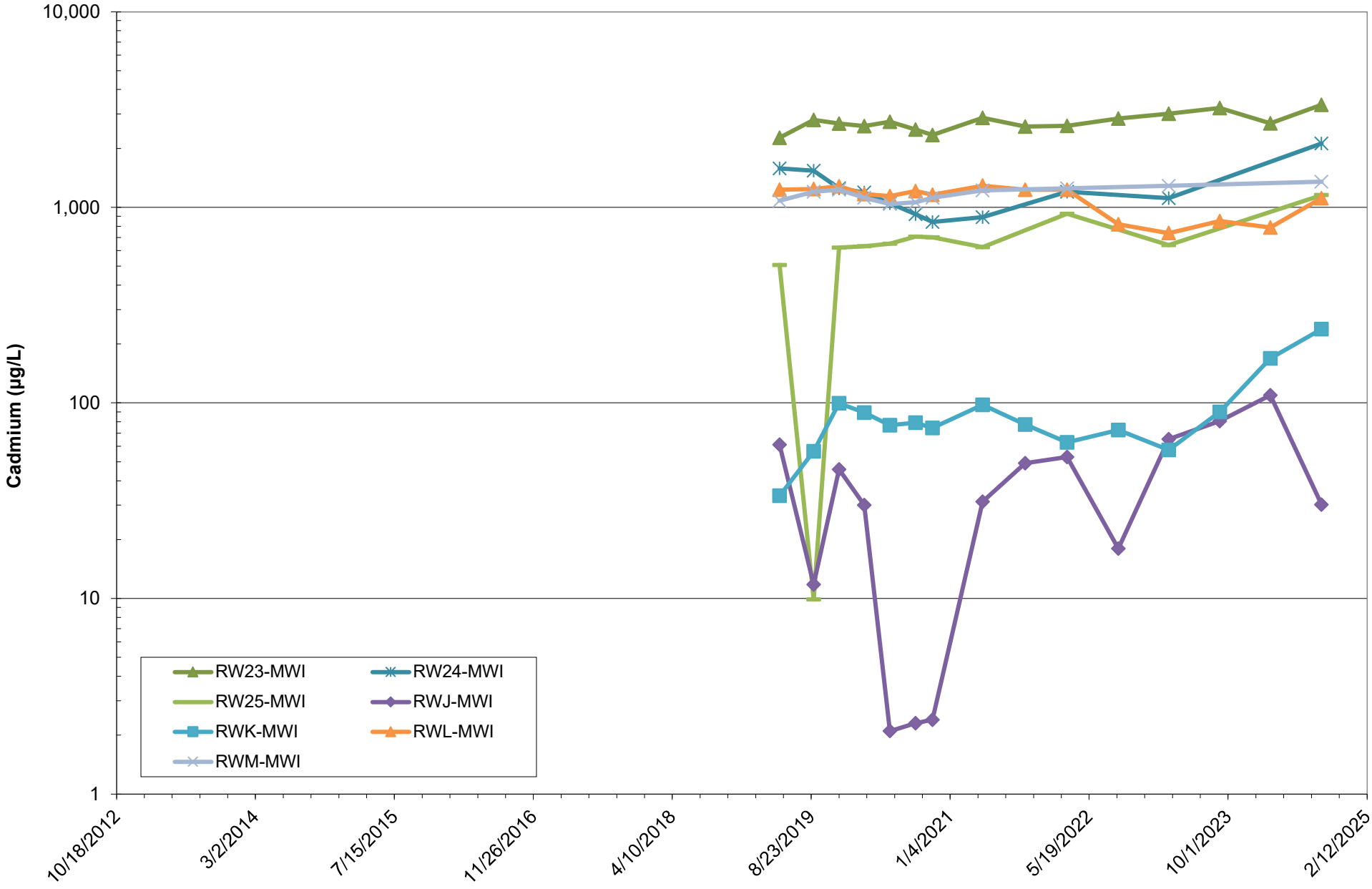
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# Intermediate Interior Cadmium Concentrations (Original Wells)

January 2025

**Figure 33**




ARM Group LLC
Engineers and Scientists

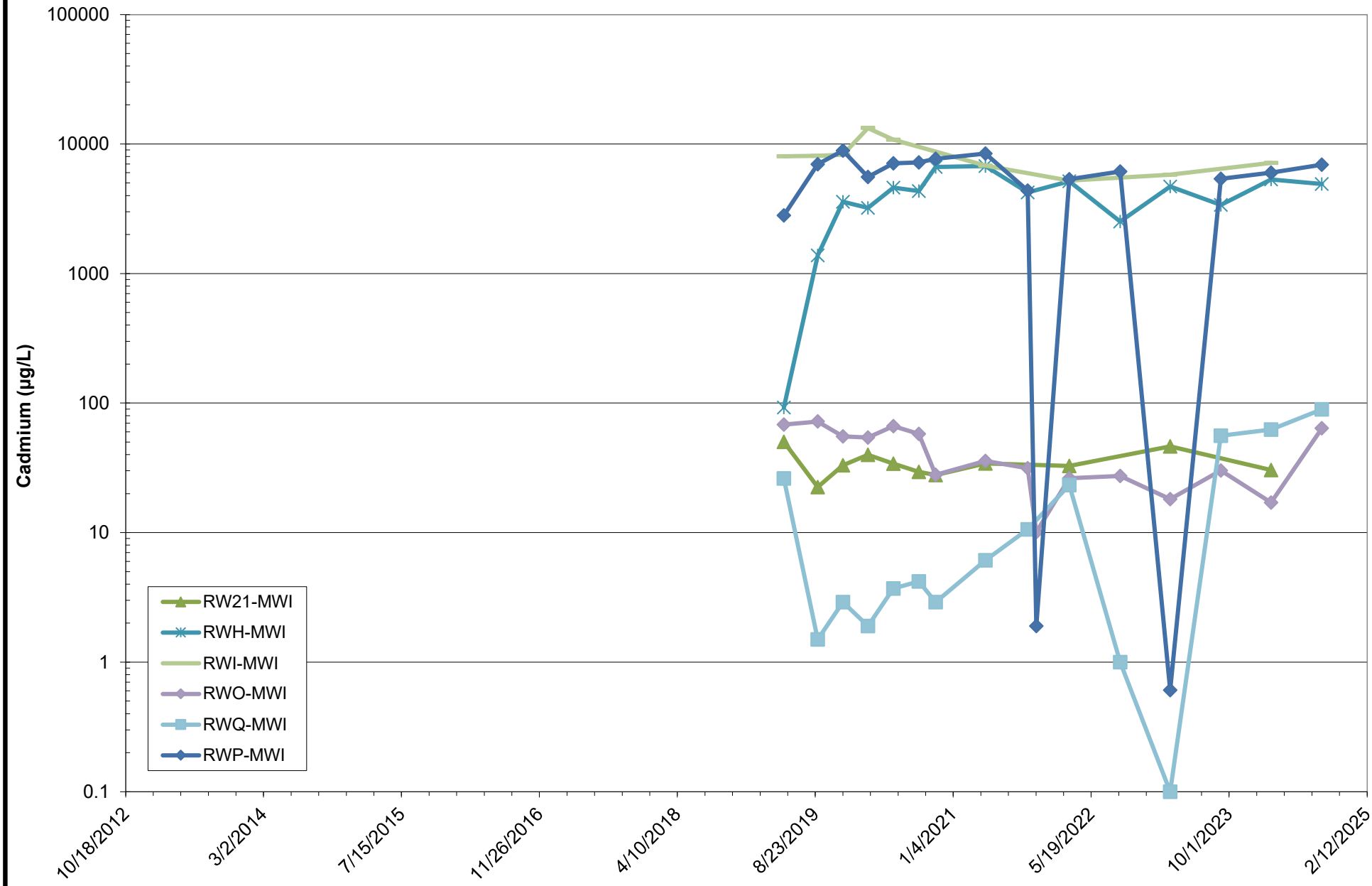
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# Intermediate Interior Cadmium Concentrations (Supplemental Wells)

January 2025

**Figure 34**




ARM Group LLC
Engineers and Scientists

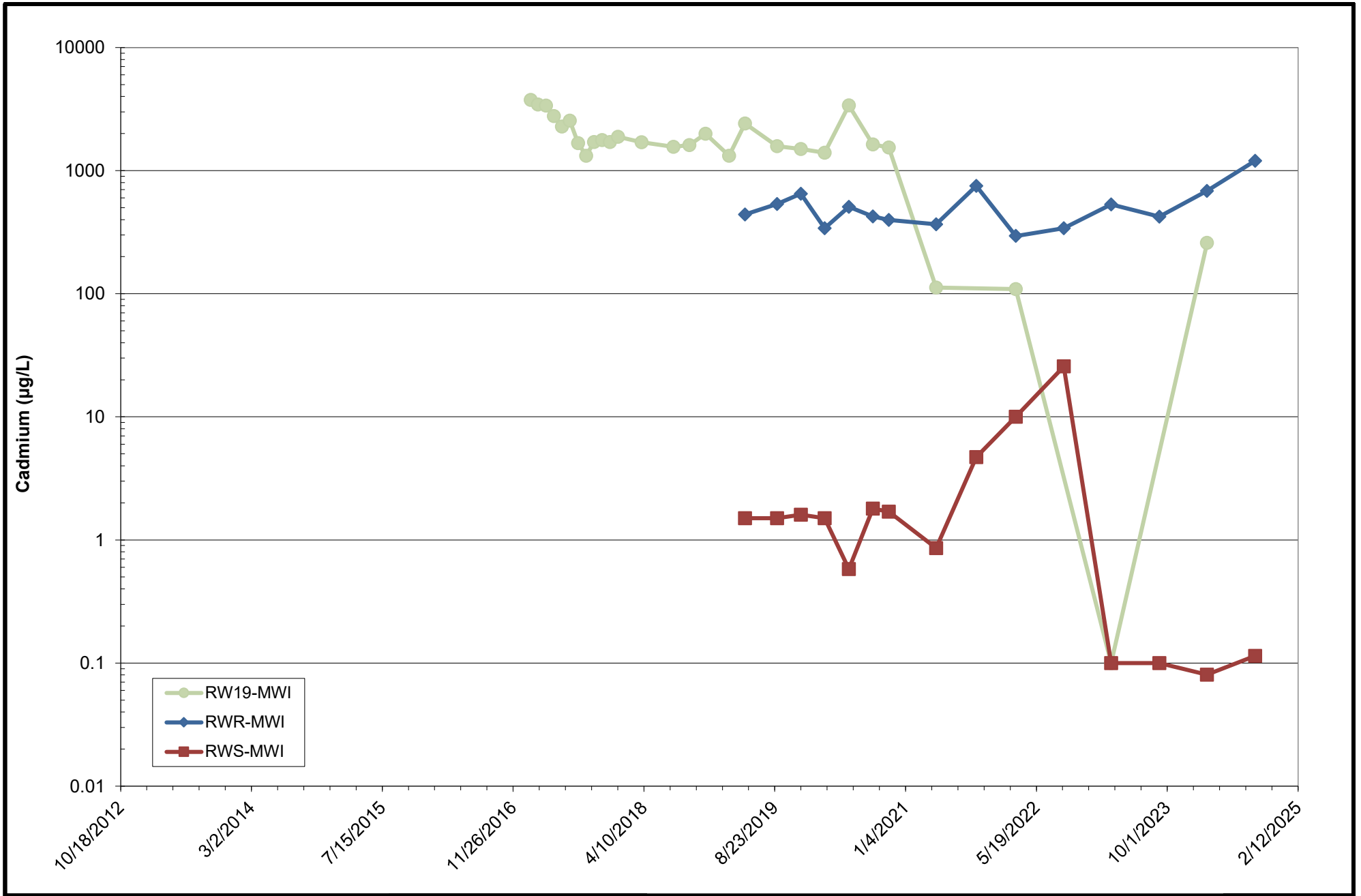
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# Intermediate Delineation Wells Cadmium Concentrations

January 2025

**Figure 35**




ARM Group LLC
Engineers and Scientists

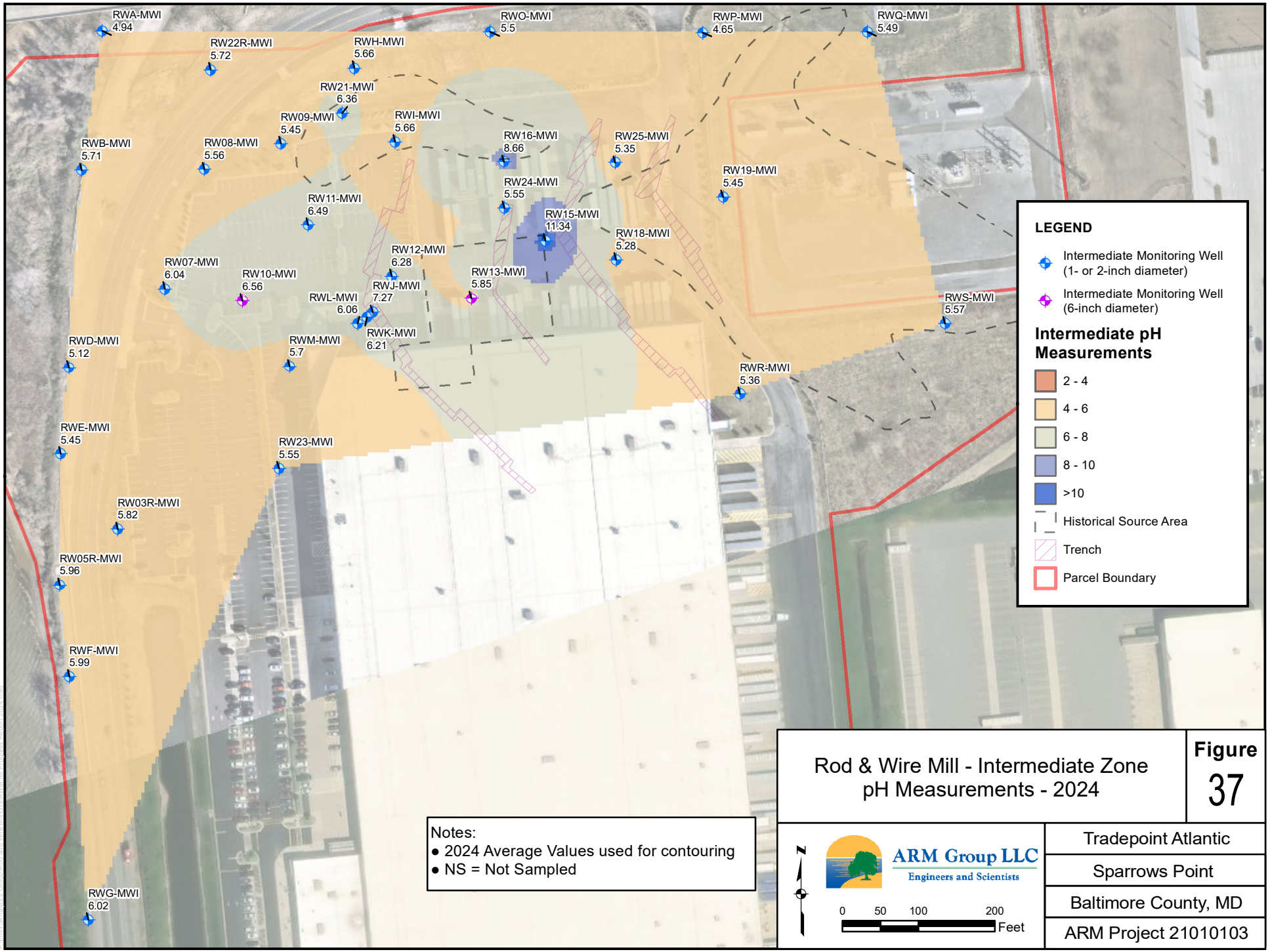
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# Intermediate Upgradient Cadmium Concentrations

January 2025

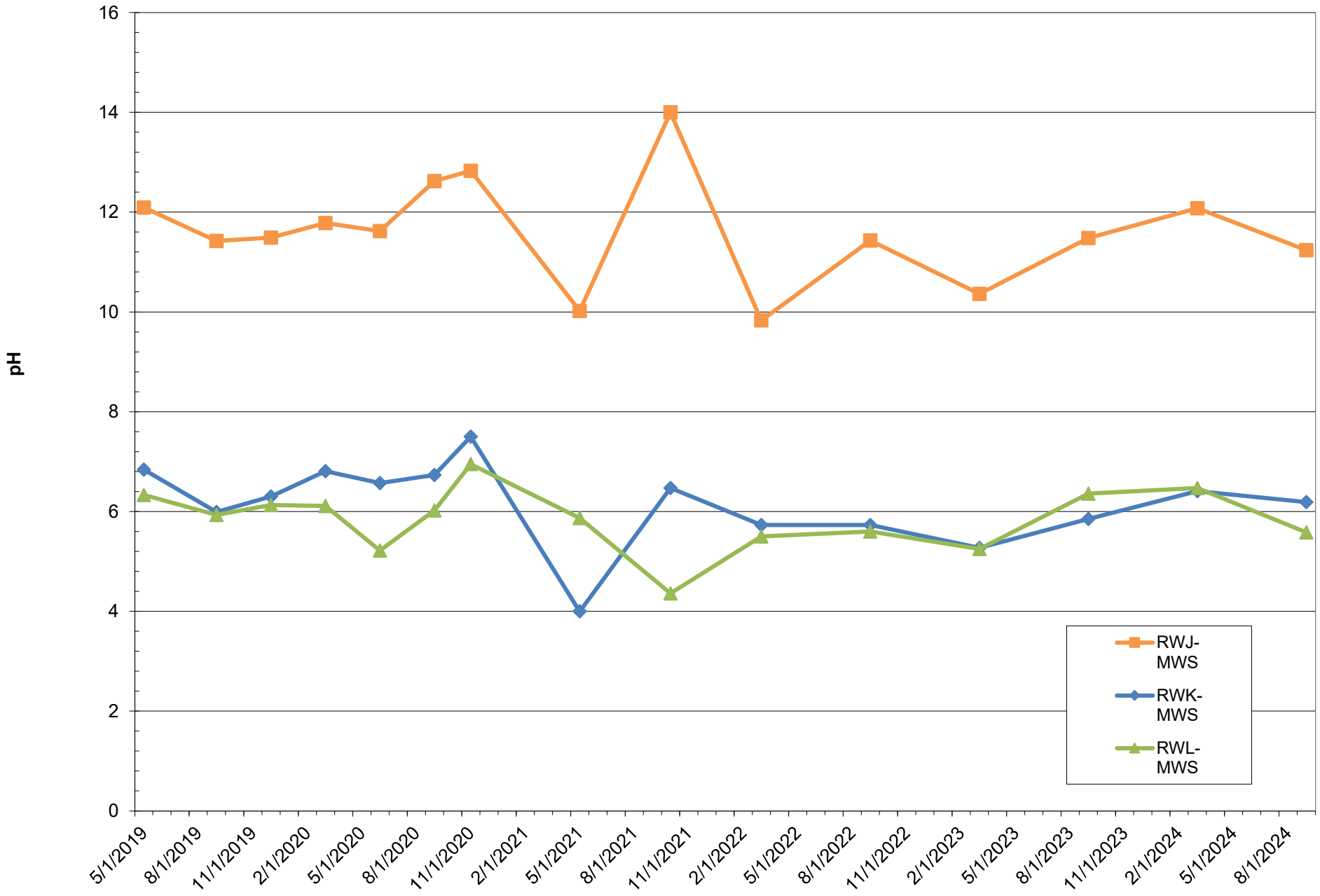
**Figure 36**




# Rod & Wire Mill - Intermediate Zone pH Measurements - 2024

**Figure 37**

Tradepoint Atlantic
Sparrows Point
Baltimore County, MD
ARM Project 21010103




ARM Group LLC
Engineers and Scientists

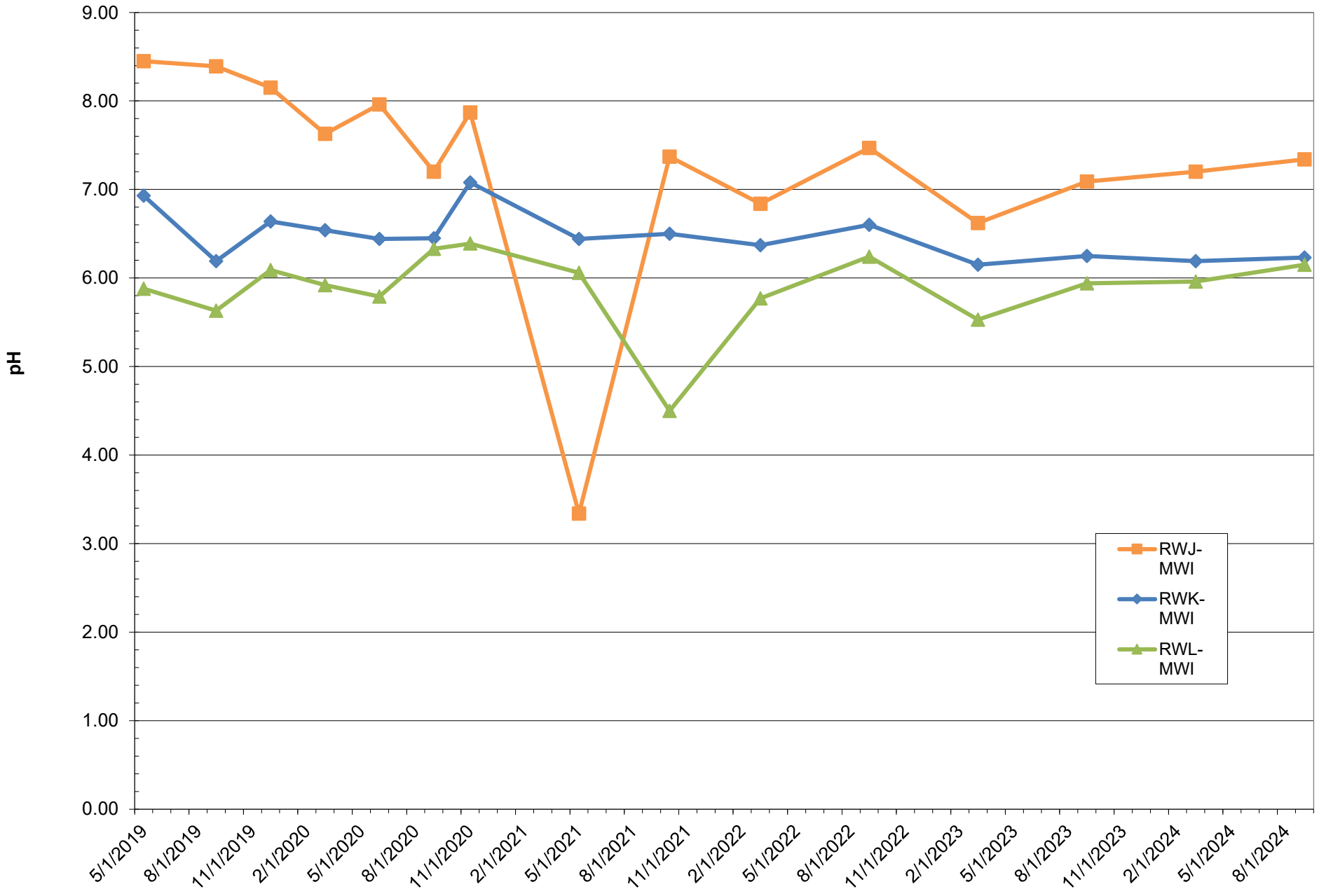
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

RWJ-MWS, RWK-MWS, RWL-MWS
pH Measurements

January 2025

**Figure 38**




ARM Group LLC
Engineers and Scientists

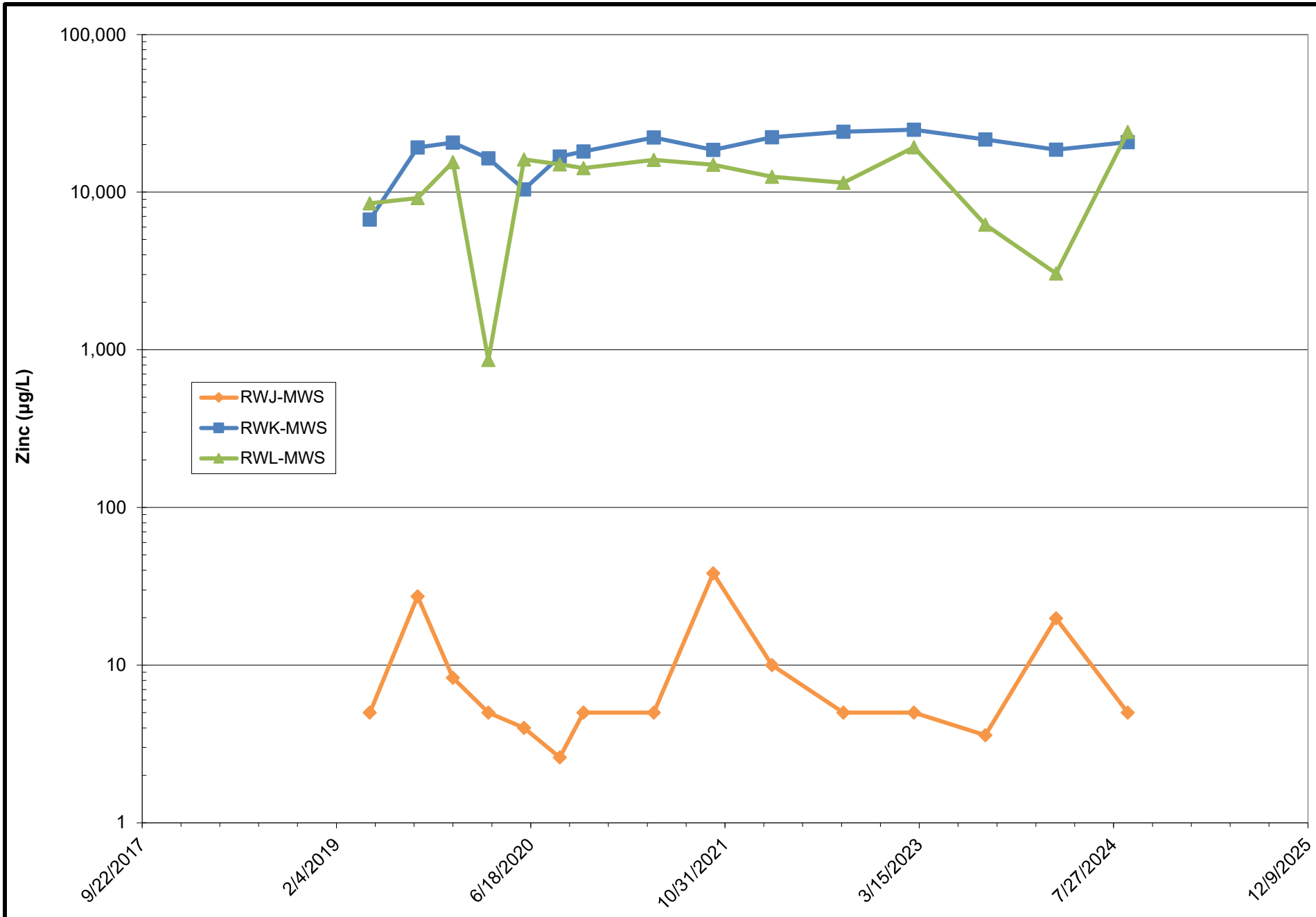
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RWJ-MWI, RWK-MWI, and RWL-MWI pH Measurements

January 2025

**Figure 39**




ARM Group LLC
Engineers and Scientists

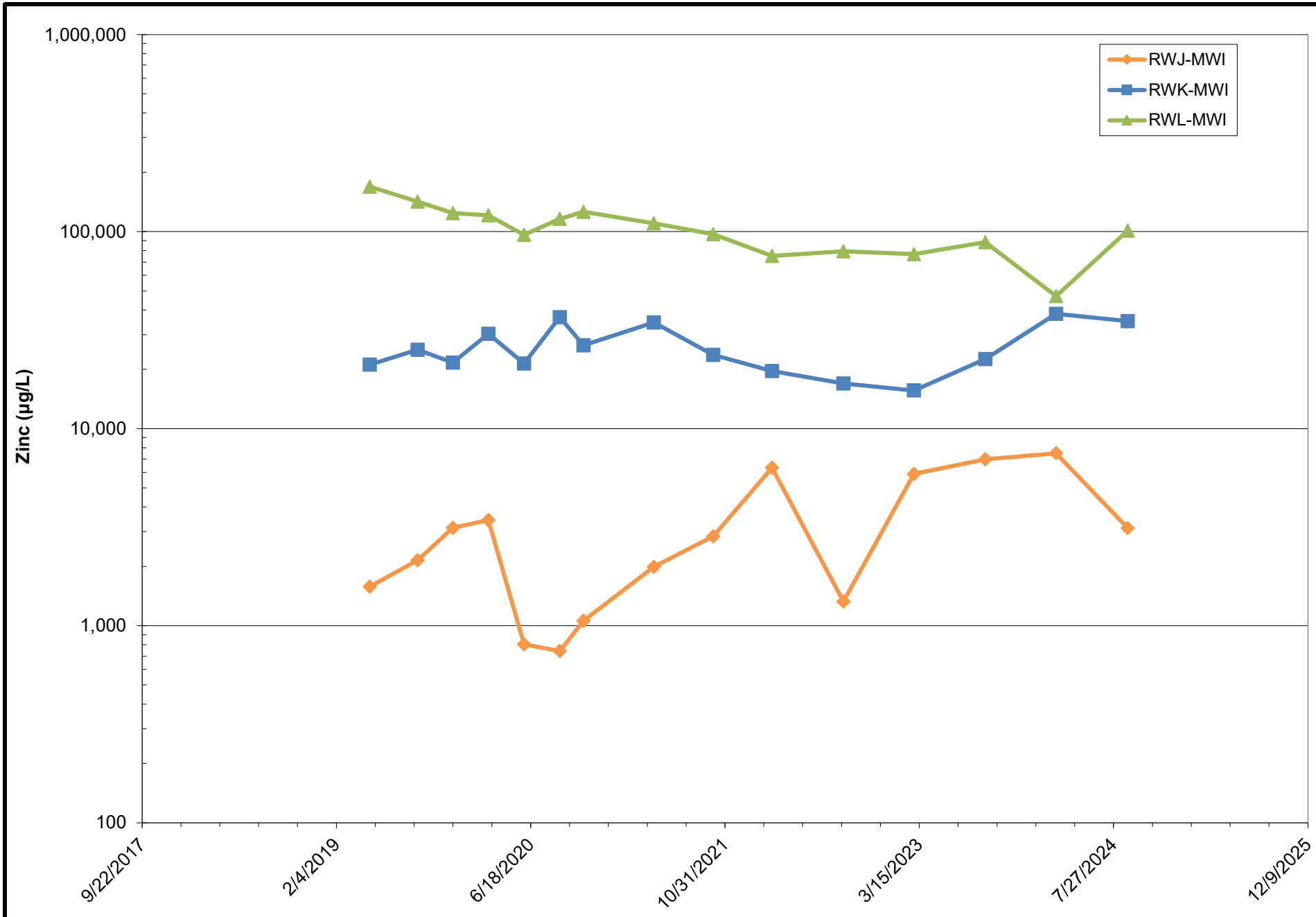
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RWJ-MWS, RWK-MWS, and RWL-MWS Zinc Concentrations

January 2025

**Figure 40**




ARM Group LLC
Engineers and Scientists

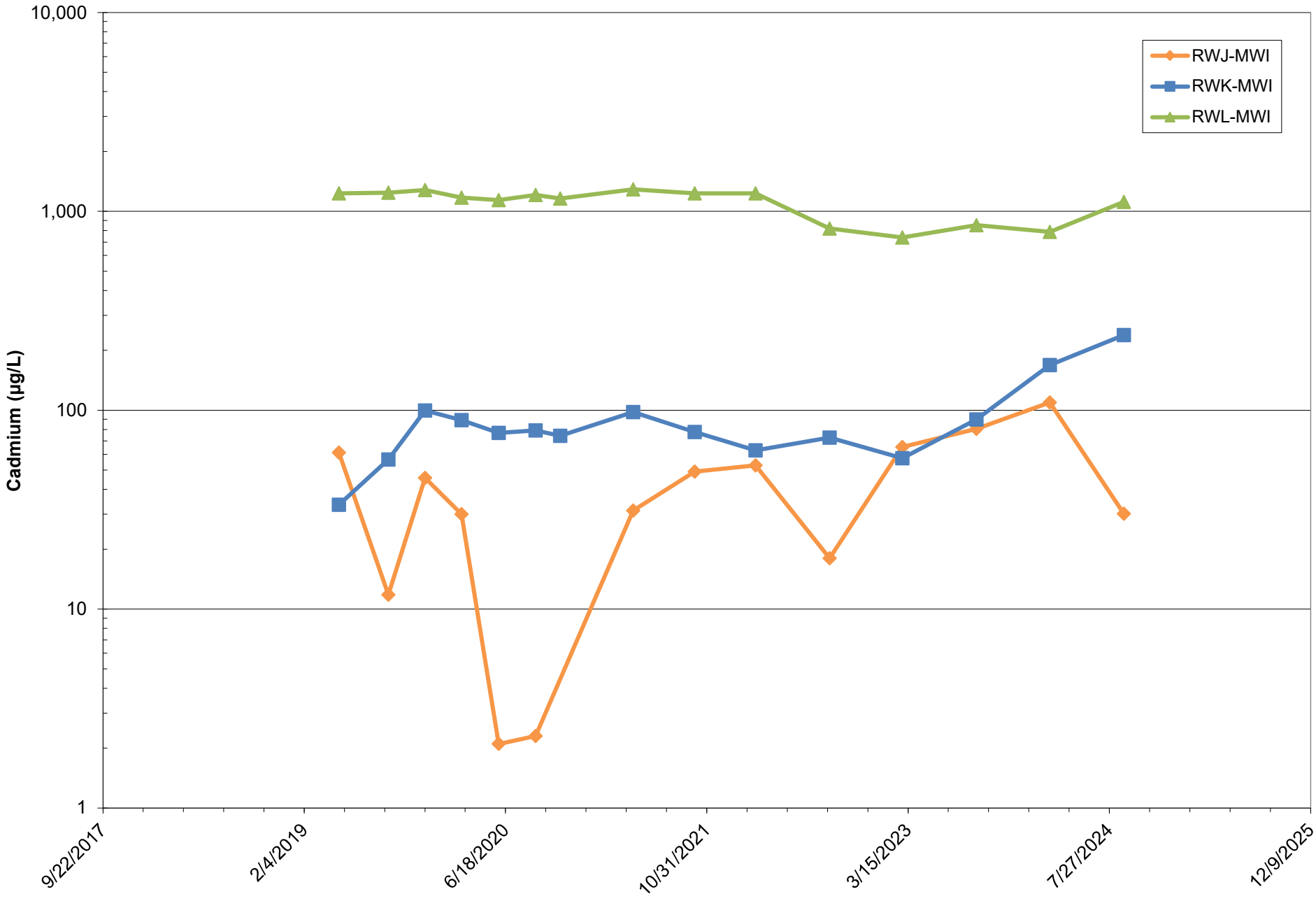
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RWJ-MWI, RWK-MWI, and RWL-MWI Zinc Concentrations

January 2025

**Figure 41**




ARM Group LLC
Engineers and Scientists

Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RWJ-MWI, RWK-MWI, and RWL-MWI Cadmium Concentrations

January 2025

**Figure 42**

# TABLES

**TABLE 1**
**Monitoring Well Construction Summary**
**Rod and Wire Mill Interim Measure Progress Report**

| Well Name | Monitoring Area | Installation Date | Abandonment Date | Northing | Easting | Surface Completion | TOC Elevation (ft AMSL) | Ground Surface Elevation (ft AMSL) | Total Well Depth (feet) | Screen Length (feet) | Well Diameter (inch) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| RW01-MWI | Intermediate | 8/1/2017 | 4/25/2023 | 571513.6572 | 1455952.772 | Flush Mount | 9.78 | 10.21 | 41 | 10 | 2 |
| RW01-MWS | Shallow | 7/28/2017 | 4/25/2023 | 571518.9458 | 1455952.268 | Flush Mount | 9.71 | 10.18 | 20 | 10 | 2 |
| RW02-MWI | Intermediate | 7/31/2017 | 4/25/2023 | 571665.1462 | 1455934.83 | Flush Mount | 9.86 | 10.12 | 36.5 | 10 | 2 |
| RW02-MWS | Shallow | 7/27/2017 | 4/25/2023 | 571670.4206 | 1455934.956 | Flush Mount | 10.01 | 10.18 | 18 | 10 | 2 |
| RW03-MWI | Intermediate | 12/9/2016 | Destroyed | 571819.168 | 1455955.53 | | 13.35 | 10.15 | 40 | 10 | 2 |
| RW03-MWS | Shallow | 12/9/2016 | Destroyed | 571824.033 | 1455955.781 | | 13.92 | 10.08 | 20 | 10 | 2 |
| RW03R-MWI | Shallow | 5/3/2022 | | 571809.753 | 1455953.368 | Stick-up Steel Casing | 13.8 | 11.63 | 20 | 8 | 2 |
| RW03R-MWS | Intermediate | 5/3/2022 | | 571805.64 | 1455953.193 | Stick-up Steel Casing | 13.78 | 11.52 | 40 | 10 | 2 |
| RW04-MWS | Shallow | 8/11/2000 | | 571781.312 | 1456010.849 | Flush Mount | 8.89 | 9.2 | 15 | unknown | 2 |
| RW05-MWS | Shallow | 7/11/2017 | Destroyed | 571709.0224 | 1455888.533 | Flush Mount | 9.73 | 10.08 | 17 | 10 | 2 |
| RW05R-MWI | Intermediate | 4/23/2019 | | 571732.443 | 1455877.003 | Stick-up Steel Casing | 12.95 | 10.56 | 40 | 10 | 1 |
| RW06R-MWD | Deep | 5/1/2018 | | 571962.528 | 1455966.189 | Flush mount | 11.84 | 12.07 | 62 | 10 | 2 |
| RW06R-MWS | Shallow | 4/30/2018 | | 571966.8512 | 1455965.706 | Flush mount | 11.44 | 11.95 | 10 | 5 | 2 |
| RW06-MWI | Intermediate | 4/30/1986 | 4/25/2023 | 571975.244 | 1455960.618 | Flush mount | 11.32 | 11.78 | 30 | | 2 |
| RW07-MWI | Intermediate | 12/14/2016 | | 572120.736 | 1456014.511 | Flush mount | 12.87 | 13.16 | 40 | 10 | 2 |
| RW07-MWS | Shallow | 12/14/2016 | | 572124.671 | 1456015.618 | Flush mount | 13.01 | 13.31 | 20 | 10 | 2 |
| RW08-MWI | Intermediate | 12/13/2016 | | 572277.419 | 1456066.32 | Flush mount | 12.27 | 12.71 | 40 | 10 | 2 |
| RW08-MWS | Shallow | 12/13/2016 | | 572281.232 | 1456068.357 | Flush mount | 12.32 | 12.47 | 20 | 10 | 2 |
| RW09-MWI | Intermediate | 12/15/2016 | | 572311.301 | 1456166.668 | Flush mount | 12.75 | 12.95 | 40 | 10 | 2 |
| RW09-MWS | Shallow | 12/16/2016 | | 572317.199 | 1456164.575 | flush mount | 12.81 | 13.07 | 20 | 10 | 2 |
| RW10-MWI | Intermediate | 12/22/2016 | | 572105.166 | 1456116.254 | Vault | 13.44 | NM | 40 | 10 | 6 |
| RW11-MWI | Intermediate | 8/30/2001 | | 572204.529 | 1456202.556 | Flush mount | 12.34 | 12.64 | 30 | unknown | 2 |
| RW11-MWS | Shallow | 12/19/2016 | | 572210.58 | 1456202.673 | Flush mount | 12.16 | 12.63 | 20 | 10 | 2 |
| RW12-MWI | Intermediate | 9/12/1985 | | 572137.284 | 1456311.813 | Flush mount | 13.43 | 13.6 | 30 | unknown | 2 |
| RW12-MWS | Shallow | 8/28/2001 | | 572145.256 | 1456308.732 | Flush mount | 13.15 | 13.5 | 14 | unknown | 2 |
| RW13-MWI | Intermediate | 7/21/2017 | | 572108.388 | 1456416.357 | Vault | 13.69 | 14.51 | 38 | 10 | 6 |
| RW14-MWS | Shallow | 7/27/2017 | | 572172.661 | 1456421.302 | Flush mount | 12.64 | 13.13 | 20.5 | 10 | 2 |
| RW15-MWI | Intermediate | 7/24/2017 | | 572183.9168 | 1456513.584 | Flush mount | 13.33 | 13.58 | 36.5 | 10 | 2 |
| RW15-MWS | Shallow | 7/21/2017 | | 572189.6508 | 1456512.039 | Flush mount | 13.22 | 13.52 | 18.3 | 10 | 2 |
| RW16-MWI | Intermediate | 8/22/2017 | | 572286.93 | 1456459.18 | Flush mount | 12.18 | 12.38 | 40 | 10 | 2 |
| RW16-MWS | Shallow | 8/22/2017 | | 572294.99 | 1456460.62 | Flush mount | 12.02 | 12.24 | 20 | 10 | 2 |
| RW18-MWI | Intermediate | 9/12/1985 | | 572158.807 | 1456606.197 | Flush mount | 13.8 | 14.04 | 30 | unknown | 2 |
| RW18-MWS | Shallow | 9/13/1985 | | 572167.7271 | 1456601.817 | Flush mount | 13.68 | 13.92 | 10 | unknown | 2 |
| RW19-MWI | Intermediate | 12/19/2016 | | 572240.998 | 1456746.128 | Flush mount | 12.64 | NM | 40 | 10 | 2 |
| RW19-MWS | Shallow | 12/20/2016 | | 572247.126 | 1456745.983 | Flush mount | 12.97 | NM | 20 | 10 | 2 |
| RW21-MWI | Intermediate | 4/9/2019 | | 572350.7734 | 1456246.875 | Flush mount | 14.46 | 14.63 | 40 | 10 | 1 |
| RW21-MWP | Perched | 1/28/2020 | | 572363.832 | 1456276.034 | Flush mount | 13.52 | 13.87 | 14 | 10 | 2 |
| RW21-MWS | Shallow | 8/25/2017 | | 572363.8291 | 1456276.018 | Flush mount | 13.51 | 13.91 | 28 | 5 | 2 |
| RW22R-MWI | Intermediate | 4/11/2019 | | 572408.1789 | 1456074.575 | Stick-up Steel Casing | 16.63 | 14.02 | 40 | 10 | 1 |
| RW22R-MWS | Shallow | 4/10/2019 | | 572411.5743 | 1456072.492 | Stick-up Steel Casing | 16.56 | 14.02 | 20 | 10 | 1 |

**TABLE 1**
**Monitoring Well Construction Summary**
**Rod and Wire Mill Interim Measure Progress Report**

| Well Name | Monitoring Area | Installation Date | Abandonment Date | Northing | Easting | Surface Completion | TOC Elevation (ft AMSL) | Ground Surface Elevation (ft AMSL) | Total Well Depth (feet) | Screen Length (feet) | Well Diameter (inch) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| RW23-MWI | Intermediate | 4/3/2019 | | 571885.073 | 1456164.16 | Flush Mount | 14.36 | 14.6 | 40 | 10 | 1 |
| RW23-MWS | Shallow | 4/4/2019 | | 571887.2879 | 1456162.566 | Flush Mount | 14.24 | 14.5 | 20 | 10 | 1 |
| RW24-MWI | Intermediate | 4/12/2019 | | 572226.4847 | 1456459.746 | Flush Mount | 12.57 | 12.74 | 40 | 10 | 1 |
| RW24-MWS | Shallow | 4/12/2019 | | 572228.5369 | 1456459.897 | Flush Mount | 12.55 | 12.78 | 20 | 10 | 1 |
| RW25-MWI | Intermediate | 4/15/2019 | | 572285.8111 | 1456604.805 | Flush Mount | 12.08 | 12.28 | 40 | 10 | 1 |
| RW25-MWS | Shallow | 4/12/2019 | | 572287.9682 | 1456604.755 | Flush Mount | 11.94 | 12.16 | 20 | 10 | 1 |
| RWA-MWI | Intermediate | 4/10/2019 | | 572458.8731 | 1455932.71 | Stick-up Steel Casing | 10.2 | 7.52 | 20.3 | 5 | 1 |
| RWA-MWS | Shallow | 4/10/2019 | | 572463.9889 | 1455931.14 | Stick-up Steel Casing | 10.59 | 7.74 | 14 | 10 | 1 |
| RWB-MWI | Intermediate | 4/15/2019 | | 572276.3787 | 1455905.79 | Stick-up Steel Casing | 19.73 | 17.57 | 40 | 10 | 1 |
| RWB-MWS | Shallow | 4/16/2019 | | 572280.0647 | 1455906.999 | Stick-up Steel Casing | 20.17 | 17.66 | 20.5 | 10 | 1 |
| RWD-MWI | Intermediate | 4/22/2019 | | 572017.6 | 1455888.923 | Stick-up Steel Casing | 14.87 | 12.72 | 40 | 10 | 1 |
| RWD-MWS | Shallow | 4/22/2019 | | 572021.3034 | 1455888.645 | Stick-up Steel Casing | 14.93 | 12.68 | 19.5 | 10 | 1 |
| RWE-MWI | Intermediate | 4/23/2019 | | 571904.5202 | 1455877.954 | Stick-up Steel Casing | 13.92 | 11.43 | 40 | 10 | 1 |
| RWE-MWS | Shallow | 4/22/2019 | | 571908.5576 | 1455878.188 | Stick-up Steel Casing | 13.96 | 11.57 | 20 | 10 | 1 |
| RWF-MWI | Intermediate | 4/24/2019 | | 571612.1556 | 1455889.581 | Stick-up Steel Casing | 12.31 | 10.3 | 40 | 10 | 1 |
| RWF-MWS | Shallow | 4/24/2019 | | 571613.4919 | 1455888.933 | Stick-up Steel Casing | 12.74 | 10.24 | 20 | 10 | 1 |
| RWG-MWI | Intermediate | 4/25/2019 | | 571293.311 | 1455914.675 | Flush Mount | 9.45 | 9.62 | 40 | 10 | 1 |
| RWG-MWS | Shallow | 4/24/2019 | | 571296.366 | 1455914.217 | Flush mount | 9.64 | 9.55 | 20 | 10 | 1 |
| RWH-MWI | Intermediate | 4/9/2019 | | 572410.3075 | 1456262.809 | Flush Mount | 12.03 | 12.4 | 33.5 | 10 | 1 |
| RWH-MWS | Shallow | 4/8/2019 | | 572413.9151 | 1456261.997 | Flush Mount | 11.83 | 12.29 | 20 | 10 | 1 |
| RWI-MWI | Intermediate | 4/8/2019 | | 572313.561 | 1456316.524 | Flush Mount | 12.95 | 13.23 | 40 | 10 | 1 |
| RWI-MWS | Shallow | 4/8/2019 | | 572315.7998 | 1456316.335 | Flush Mount | 12.89 | 13.23 | 20 | 10 | 1 |
| RWJ-MWI | Intermediate | 4/29/2019 | | 572090.2068 | 1456286.997 | Flush Mount | 14.1 | 14.4 | 40 | 10 | 1 |
| RWJ-MWS | Shallow | 4/29/2019 | | 572092.2156 | 1456287.233 | Flush Mount | 13.81 | 14.31 | 20.5 | 10 | 1 |
| RWK-MWI | Intermediate | 4/2/2019 | | 572083.3646 | 1456279.397 | Flush Mount | 14.22 | 14.54 | 40 | 10 | 1 |
| RWK-MWS | Shallow | 4/1/2019 | | 572085.0241 | 1456279.042 | Flush Mount | 14.24 | 14.5 | 20 | 10 | 1 |
| RWL-MWI | Intermediate | 4/2/2019 | | 572075.2173 | 1456267.262 | Flush Mount | 14.36 | 14.6 | 40 | 10 | 1 |
| RWL-MWS | Shallow | 4/2/2019 | | 572078.1957 | 1456266.559 | Flush Mount | 14.26 | 14.55 | 20 | 10 | 1 |
| RWM-MWI | Intermediate | 4/4/2019 | | 572018.7755 | 1456178.189 | Flush Mount | 14.92 | 15.2 | 40 | 10 | 1 |
| RWM-MWS | Shallow | 4/4/2019 | | 572019.8634 | 1456176.579 | Flush Mount | 14.97 | 15.21 | 20 | 10 | 1 |
| RWN-MWS | Shallow | 4/11/2019 | | 572065.843 | 1456392.375 | Flush Mount | 14.84 | 15.16 | 25 | 10 | 1 |
| RWO-MWI | Intermediate | 4/29/2019 | | 572457.7694 | 1456441.038 | Flush Mount | 11.67 | 11.99 | 40 | 10 | 1 |
| RWO-MWS | Shallow | 4/29/2019 | | 572462.5312 | 1456439.69 | Flush Mount | 11.59 | 11.93 | 20 | 10 | 1 |
| RWP-MWI | Intermediate | 4/17/2019 | | 572456.879 | 1456719.178 | Stick-up Steel Casing | 14.32 | 11.62 | 40 | 10 | 1 |
| RWQ-MWI | Intermediate | 4/18/2019 | | 572457.955 | 1456935.254 | Stick-up Steel Casing | 17.07 | 14.87 | 40 | 10 | 1 |
| RWQ-MWS | Shallow | 4/17/2019 | | 572461.929 | 1456935.291 | Stick-up Steel Casing | 17.11 | 14.64 | 20 | 10 | 1 |
| RWR-MWI | Intermediate | 4/25/2019 | | 571982.59 | 1456768.613 | Flush Mount | 13.7 | 14.04 | 40 | 10 | 1 |
| RWR-MWS | Shallow | 4/25/2019 | | 571986.165 | 1456769.115 | Flush Mount | 13.68 | 14.07 | 20 | 10 | 1 |
| RWS-MWI | Intermediate | 4/18/2019 | | 572075.052 | 1457037.284 | Stick-up Steel Casing | 17.6 | 15.06 | 45 | 10 | 1 |
| RWS-MWS | Shallow | 4/18/2019 | | 572077.763 | 1457037.433 | Stick-up Steel Casing | 17.6 | 15.25 | 20 | 10 | 1 |

NM = not mearsured
TOC = top of casing
AMSL = above mean sea level

**TABLE 2**
**Shallow Zone Sampling Frequency**
**Rod and Wire Mill Interim Measure Progress Report**

| Well Name | Monitoring Area | Sample Frequency | Sampling Rationale |
|---|---|---|---|
| RWA-MWS | Downgradient Perimeter | Semi-Annually | Monitor for changes in perimeter concentrations |
| RWB-MWS | Downgradient Perimeter | Semi-Annually | Monitor for changes in perimeter concentrations |
| RWD-MWS | Downgradient Perimeter | Semi-Annually | Monitor for changes in perimeter concentrations |
| RWE-MWS | Downgradient Perimeter | Semi-Annually | Monitor for changes in perimeter concentrations |
| RWF-MWS | Downgradient Perimeter | Semi-Annually | Monitor for changes in perimeter concentrations |
| RWG-MWS | Downgradient Perimeter | Not Sampled | Outside the area of concern (south) and do not expect to see any changes |
| RWH-MWS | Delineation | Semi-Annually | Monitor northern perimeter concentrations |
| RWI-MWS | Delineation | Annually | Monitor the northwest pond |
| RWJ-MWS | Interior | Semi-Annually | Compare to the intermediate well to assess potential vertical migration |
| RWK-MWS | Interior | Semi-Annually | Compare to the intermediate well to assess potential vertical migration |
| RWL-MWS | Interior | Semi-Annually | Compare to the intermediate well to assess potential vertical migration |
| RWM-MWS | Interior | Not Sampled | Not monitoring the perimeter |
| RWN-MWS | Interior | Annually | Monitor effect on former sludge storage area and any southern direction impacts before the operational building |
| RWO-MWS | Delineation | Semi-Annually | Monitor northern perimeter concentrations |
| RWQ-MWS | Delineation | Semi-Annually | Monitor northern perimeter concentrations |
| RWR-MWS | Upgradient | Semi-Annually | Monitor eastern perimeter concentrations |
| RWS-MWS | Upgradient | Semi-Annually | Monitor eastern perimeter concentrations |
| RW01-MWS | Downgradient Perimeter | Semi-Annually | Monitor for changes in perimeter concentrations; Abandoned, will be reinstalled |
| RW02-MWS | Downgradient Perimeter | Semi-Annually | Monitor for changes in perimeter concentrations; Abandoned |
| RW03R-MWS | Downgradient Perimeter | Semi-Annually | Monitor for changes in perimeter concentrations |
| RW04-MWS | Downgradient Perimeter | Not Sampled | In close proximity to RW03-MWS; not needed to monitor the perimeter |
| RW05-MWS | Downgradient Perimeter | Semi-Annually | Monitor for changes in perimeter concentrations; Destroyed, will be reinstalled |
| RW06R-MWS | Downgradient Perimeter | Annually | In close proximity to RWD and RWE-MWS; not needed to monitor the perimeter |
| RW07-MWS | Downgradient Perimeter | Annually | In close proximity to RWB; not needed to monitor the perimeter |
| RW08-MWS | Downgradient Perimeter | Not Sampled | Not monitoring the perimeter |
| RW09-MWS | Interior | Not Sampled | Not monitoring the perimeter |
| RW11-MWS | Interior | Annually | Provide spatial coverage in central area |
| RW12-MWS | Interior | Semi-Annually | Compare to the intermediate well to assess potential vertical migration |
| RW14-MWS | Interior | Not Sampled | Redundant with other wells monitoring central area |
| RW15-MWS | Interior | Not Sampled | Redundant with other wells monitoring central area |
| RW16-MWS | Interior | Annually | Within the area of the northwest disposal pond; provide spatial coverage in central area |
| RW18-MWS | Interior | Annually | Monitor any southern direction impacts before the operational building; provide spatial coverage in central area |
| RW19-MWS | Upgradient | Not Sampled | Do not expect to see changes in conditions |
| RW21-MWP | Delineation | Not Sampled | Installed for NAPL monitoring |
| RW21-MWS | Delineation | Not Sampled | Redundant with other monitoring wells in the central area |
| RW22R-MWS | Downgradient Perimeter | Semi-Annually | Monitor downgradient of northwest pond area; monitor northern perimeter concentrations |
| RW23-MWS | Interior | Semi-Annually | Monitor southern perimeter and immediately downgradient of operational building concentrations |
| RW24-MWS | Interior | Not Sampled | Redundant with other monitoring wells in the central area |
| RW25-MWS | Interior | Not Sampled | Redundant with other monitoring wells in the central area |

Abandoned or Destroyed

**TABLE 3**
**Intermediate Zone Sampling Frequency**
**Rod and Wire Mill Interim Measure Progress Report**

| Well Name | Monitoring Area | Sample Frequency | Sampling Rationale |
|---|---|---|---|
| RWA-MWI | Downgradient Perimeter | Semi-Annually | Monitor for changes in perimeter concentrations |
| RWB-MWI | Downgradient Perimeter | Semi-Annually | Monitor for changes in perimeter concentrations |
| RWD-MWI | Downgradient Perimeter | Semi-Annually | Monitor for changes in perimeter concentrations |
| RWE-MWI | Downgradient Perimeter | Semi-Annually | Monitor for changes in perimeter concentrations |
| RWF-MWI | Downgradient Perimeter | Semi-Annually | Monitor for changes in perimeter concentrations |
| RWG-MWI | Downgradient Perimeter | Annually | Monitor for changes in perimeter concentrations |
| RWH-MWI | Delineation | Semi-Annually | Monitor northern perimeter conditions |
| RWI-MWI | Delineation | Annually | Do not expect to see rapid changing conditions due to passive condition and slow migration of groundwater |
| RWJ-MWI | Interior | Semi-Annually | Near field wells to monitor trench effectiveness; inside final treatment trench |
| RWK-MWI | Interior | Semi-Annually | Near field wells to monitor trench effectiveness; immediate well downgradient after final treatment trench |
| RWL-MWI | Interior | Semi-Annually | Near field wells to monitor trench effectiveness; delineation of final treatment trench |
| RWM-MWI | Interior | Annually | Trench effectiveness is already being monitored closer to the area of concern |
| RWO-MWI | Delineation | Semi-Annually | Monitor northern perimeter conditions |
| RWP-MWI | Delineation | Semi-Annually | Monitor northern perimeter conditions |
| RWQ-MWI | Delineation | Semi-Annually | Monitor northern perimeter conditions |
| RWR-MWI | Upgradient | Semi-Annually | Monitor eastern perimeter conditions; monitor concentrations proximal to the operational building |
| RWS-MWI | Upgradient | Semi-Annually | Monitor eastern perimeter conditions |
| RW01-MWI | Downgradient Perimeter | Semi-Annually | Monitor for changes in perimeter concentrations; Abandoned, will be reinstalled |
| RW02-MWI | Downgradient Perimeter | Semi-Annually | Monitor for changes in perimeter concentrations; Abandoned |
| RW03R-MWI | Downgradient Perimeter | Semi-Annually | Monitor for changes in perimeter concentrations |
| RW05R-MWI | Downgradient Perimeter | Semi-Annually | Monitor for changes in perimeter concentrations |
| RW06-MWI | Downgradient Perimeter | Semi-Annually | Monitor for changes in perimeter concentrations; Abandoned |
| RW06R-MWD | Downgradient Perimeter | Annually | Monitor any vertical movement of groundwater into deep hydrogeologic zone |
| RW07-MWI | Downgradient Perimeter | Semi-Annually | Monitor western perimeter |
| RW08-MWI | Downgradient Perimeter | Annually | Do not expect to see rapid changing conditions due to passive condition and slow migration of groundwater |
| RW09-MWI | Interior | Annually | Do not expect to see rapid changing conditions due to passive condition and slow migration of groundwater |
| RW10-MWI | Interior | Annually | Do not expect to see rapid changing conditions due to passive condition and slow migration of groundwater |
| RW11-MWI | Interior | Annually | Do not expect to see rapid changing conditions due to passive condition and slow migration of groundwater |
| RW12-MWI | Interior | Semi-Annually | Near field wells to monitor trench effectiveness; well immediate upgradient to final treatment trench |
| RW13-MWI | Interior | Annually | Do not expect to see rapid changing conditions due to passive condition and slow migration of groundwater |
| RW15-MWI | Interior | Annually | Do not expect to see rapid changing conditions due to passive condition and slow migration of groundwater |
| RW16-MWI | Interior | Annually | Do not expect to see rapid changing conditions due to passive condition and slow migration of groundwater |
| RW18-MWI | Interior | Annually | Do not expect to see rapid changing conditions due to passive condition and slow migration of groundwater |
| RW19-MWI | Upgradient | Annually | Do not expect to see changing conditions because it is upgradient of all treatment trenches |
| RW21-MWI | Delineation | Annually | Do not expect to see rapid changing conditions due to passive condition and slow migration of groundwater |
| RW22R-MWI | Downgradient Perimeter | Semi-Annually | Monitor downgradient of northwest pond area; monitor northern perimeter concentrations |
| RW23-MWI | Interior | Semi-Annually | Monitor the concentrations along the southern perimeter and immediately downgradient of operational building |
| RW24-MWI | Interior | Annually | Do not expect to see rapid changing conditions due to passive condition and slow migration of groundwater |
| RW25-MWI | Interior | Annually | Do not expect to see rapid changing conditions due to passive condition and slow migration of groundwater |

Abandoned or Destroyed

**TABLE 4**
**Shallow Zinc Concentrations**
**Rod and Wire Mill Interim Measure Progress Report**

| Sampling Dates | Units | RW01-MWS | RW02-MWS | RW03-MWS | RW03R-MWS | RW04-MWS | RW05-MWS | RW06R-MWS | RW07-MWS | RW08-MWS | RW09-MWS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2024 Sampling Frequency | | Semiannually | Semiannually | NA | Semiannually | Not Sampled | Semiannually | Annually | Annually | Not Sampled | Not Sampled |
| 5/1/2015 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | **2,330** | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 11/1/2015 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *NS* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 2/10/2017-2/14/2017 | µg/L | *DNE* | *DNE* | **6,200** | *DNE* | *NS* | *DNE* | *DNE* | **81.6** | **1,080** | **14,500** |
| 3/28/2017-3/29/2017 | µg/L | *DNE* | *DNE* | **6,510** | *DNE* | *NS* | *DNE* | *DNE* | **74.8** | **8,710** | **12,400** |
| 4/25/2017-4/27/2017 | µg/L | *DNE* | *DNE* | **4,860** | *DNE* | *NS* | *DNE* | *DNE* | **86.4** | **9,520** | **12,900** |
| 5/22/2017-5/24/2017 | µg/L | *DNE* | *DNE* | **5,380** | *DNE* | *NS* | *DNE* | *DNE* | **102** | **2,680** | **11,900** |
| 6/5/2017-6/8/2017 | µg/L | *DNE* | *DNE* | **5,500** | *DNE* | **58.2** | *DNE* | *DNE* | **107** | **1,870** | **13,000** |
| 7/10/2017-7/12/2017 | µg/L | *DNE* | *DNE* | **8,460** | *DNE* | **179** | *DNE* | *DNE* | **114** | **968** | **11,500** |
| 8/7/2017-8/10/2017 | µg/L | **12,200** | **6,290** | **7,730** | *DNE* | **74.7** | **550** | *DNE* | **127** | **3,190** | **9,700** |
| 9/1/2017-9/8/2017 | µg/L | **5,730** | **3,220** | **16,300** | *DNE* | **163** | **184** | *DNE* | **165** | **4,460** | **8,750** |
| 10/2/2017-10/6/2017 | µg/L | **7,730** | **5,490** | **32,100** | *DNE* | **137** | **1,410** | *DNE* | **144** | **1,950** | **8,310 ML** |
| 11/3/2017-11/13/2017 | µg/L | **25,200** | **1,460** | **14,100** | *DNE* | **123** | **503** | *DNE* | **227** | **1,600** | **9,290** |
| 12/4/2017-12/8/2017 | µg/L | **7,300** | **79.3** | **46,400** | *DNE* | **279** | **5,440** | *DNE* | **216** | **1,770** | **8,550** |
| 1/2/2018-1/9/2018 | µg/L | **35,200** | **2,210** | **31,500** | *DNE* | **384** | **35.7** | *DNE* | **276** | **2,600** | **9,310** |
| 4/8/2018-4/13/2018 | µg/L | **52,000** | **5,320** | **44,000** | *DNE* | **300** | **75.3** | *DNE* | **204** | **13,200** | **8,980** |
| 7/30/2018-8/3/2018 | µg/L | **24,100** | **5,470** | **25,600** | *DNE* | **7.9 J** | **32.6** | **22** | **248** | **6,640** | **10,700** |
| 10/1/2018-10/5/2018 | µg/L | **37,000** | **5,930** | **14,900** | *DNE* | **168** | **21.7** | **3.7 J** | **223** | **13,300** | **10,800** |
| 12/10/2018-12/14/2018* | µg/L | **13,700** | **27,400** | **23,300** | *DNE* | **23.5** | *10 U* | *10 U* | **176** | **931** | **9,200** |
| 3/12/2019-3/19/2019* | µg/L | **16,500** | **13,100** | **9,570** | *DNE* | **33.6** | *10 U* | *10 U* | **142** | **14,600** | **11,300** |
| 5/3/2019-6/7/2019* | µg/L | **16,300** | **21,900** | **18,700** | *DNE* | *10 U* | *10 U* | **20.7** | **137** | **11,300** | **14,100** |
| 9/10/2019-9/23/2019* | µg/L | **16,300** | **27,400** | **19,200** | *DNE* | **313** | *8.3 B* | *4.1 B* | **148** | **1,350** | **19,600** |
| 12/3/2019-12/11/2019 | µg/L | **10,400** | **594** | **19,200** | *DNE* | **604** | **41.6** | **4.3 J** | **168** | **1,250** | **20,600** |
| 3/11/2020-3/23/2020* | µg/L | **9,810** | **269** | **16,800** | *DNE* | **37.8** | **5.4 J** | **4.1 J** | **124** | **10,300** | **20,700** |
| 6/8/2020-6/30/2020* | µg/L | **6,200** | **1,940** | **18,800** | *DNE* | **79.4** | **8.6 J** | **19.4** | **220** | **12,000** | **26,700** |
| 9/9/2020-9/29/2020* | µg/L | **7,050** | **1,280** | *NS* | *DNE* | **75.4** | **5.9 J** | **8 J** | *NS* | **2,330** | **39,900** |
| 11/5/2020-11/19/2020* | µg/L | **4,140** | **9,950** | *NS* | *DNE* | **54.6** | **9.8 J** | *10 U* | *NS* | **1,600** | **45,200** |
| 5/26/2021-6/18/2021* | µg/L | **3,620** | **472** | *NS* | *DNE* | *NS* | **7.0 J** | *10 U* | *NS* | *NS* | *NS* |
| 10/4/2021-10/18/2021* | µg/L | **5,660** | **3.1 J** | *NS* | *DNE* | *NS* | **17.8 J** | *NS* | *NS* | *NS* | *NS* |
| 11/29/2021-11/30/2021* | µg/L | *NS* | *NS* | *NS* | *DNE* | *NS* | *NS* | *NS* | **298** | *NS* | *NS* |
| 2/23/2022-3/28/2022* | µg/L | **11,300** | **36,300** | *Destroyed* | *DNE* | *NS* | **56.7** | *20 U* | **406** | *NS* | *NS* |
| 9/9/2022-9/15/2022* | µg/L | **6,406** | **7,503** | *Destroyed* | **102** | *NS* | **14.7** | *NS* | *NS* | *NS* | *NS* |
| 3/10/2023-4/10/2023* | µg/L | **10,390** | **18,640** | *Destroyed* | **658** | *NS* | **14.5** | *10 U* | **96.1** | *NS* | *NS* |
| 9/08/2023-9/21/2023* | µg/L | *Abandoned* | *Abandoned* | *Destroyed* | **82.8** | *NS* | *Destroyed* | *NS* | *NS* | *NS* | *NS* |
| 3/19/2024-4/11/2024* | µg/L | *Abandoned* | *Abandoned* | *Destroyed* | **25.8** | *NS* | *Destroyed* | **3.55 J** | **149** | *NS* | *NS* |
| 9/10/2024-9/19/2024* | µg/L | *Abandoned* | *Abandoned* | *Destroyed* | *500 U* | *NS* | *Destroyed* | *NS* | *NS* | *NS* | *NS* |
| 2/20/2025*, ** | µg/L | *Abandoned* | *Abandoned* | *Destroyed* | *NS* | *NS* | *Destroyed* | *NS* | *NS* | *NS* | *NS* |

**Bold indicates detection above the reporting limit**
NS = Not Sampled
DNE = Did/Does Not Exist
*Indicates concentrations are for dissolved metals. All other events show total metals.
**Resample to confirm 2024 results

**TABLE 4**
**Shallow Zinc Concentrations**
**Rod and Wire Mill Interim Measure Progress Report**

| Sampling Dates | Units | RW11-MWS | RW12-MWS | RW14-MWS | RW15-MWS | RW16-MWS | RW18-MWS | RW19-MWS | RW21-MWS | RW22R-MWS | RW23-MWS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2024 Sampling Frequency | | Annually | Semiannually | Not Sampled | Not Sampled | Annually | Annually | Not Sampled | Not Sampled | Semiannually | Semiannually |
| 5/1/2015 | µg/L | *DNE* | **4,290** | *DNE* | *DNE* | *DNE* | **6,470** | *DNE* | *DNE* | *DNE* | *DNE* |
| 11/1/2015 | µg/L | *DNE* | **925** | *DNE* | *DNE* | *DNE* | **912** | *DNE* | *DNE* | *DNE* | *DNE* |
| 2/10/2017-2/14/2017 | µg/L | **8,790** | *NS* | *DNE* | *DNE* | *DNE* | *NS* | **10,100** | *DNE* | *DNE* | *DNE* |
| 3/28/2017-3/29/2017 | µg/L | **10,500** | *NS* | *DNE* | *DNE* | *DNE* | *NS* | **7,100** | *DNE* | *DNE* | *DNE* |
| 4/25/2017-4/27/2017 | µg/L | **13,100** | *NS* | *DNE* | *DNE* | *DNE* | *NS* | **6,260** | *DNE* | *DNE* | *DNE* |
| 5/22/2017-5/24/2017 | µg/L | **12,500** | *NS* | *DNE* | *DNE* | *DNE* | *NS* | **4,860** | *DNE* | *DNE* | *DNE* |
| 6/5/2017-6/8/2017 | µg/L | **13,500** | **11,400** | *DNE* | *DNE* | *DNE* | **25,500** | **3,720** | *DNE* | *DNE* | *DNE* |
| 7/10/2017-7/12/2017 | µg/L | **10,900** | **9,090** | *DNE* | *DNE* | *DNE* | **13,300** | **3,700** | *DNE* | *DNE* | *DNE* |
| 8/7/2017-8/10/2017 | µg/L | **10,800** | **5,090** | **42,000** | **276** | *NS* | **964** | **3,360** | *DNE* | *DNE* | *DNE* |
| 9/1/2017-9/8/2017 | µg/L | **10,600** | **3,980** | **43,500** | **1,080** | **25.6** | **6,160** | **2,990** | *DNE* | *DNE* | *DNE* |
| 10/2/2017-10/6/2017 | µg/L | **9,270** | **3,790** | **28,900** | **900** | **26.2** | **14,500** | **18,700** | *DNE* | *DNE* | *DNE* |
| 11/3/2017-11/13/2017 | µg/L | **18,300** | **235,000** | **28,100** | **8,800** | **48.6** | **10,700** | **2,730** | *DNE* | *DNE* | *DNE* |
| 12/4/2017-12/8/2017 | µg/L | **24,000** | **2,980** | **49,200** | **7,630** | **27.7** | **23,400** | **3,380** | *DNE* | *DNE* | *DNE* |
| 1/2/2018-1/9/2018 | µg/L | **27,700** | **10,100** | **61,800** | **5,150** | **31.2** | **11,600** | **10,200** | *DNE* | *DNE* | *DNE* |
| 4/8/2018-4/13/2018 | µg/L | **37,100** | **10,600** | **62,100** | **5,940** | **25** | **25,900** | **7,060** | *DNE* | *DNE* | *DNE* |
| 7/30/2018-8/3/2018 | µg/L | **109,000** | **2,900** | **64,100** | **1,320** | **35.9** | **439** | **10,100** | *DNE* | *DNE* | *DNE* |
| 10/1/2018-10/5/2018 | µg/L | **29,500** | **1,140** | **80,100** | **2,950** | **30.0** | **44.9** | **10,500** | *DNE* | *DNE* | *DNE* |
| 12/10/2018-12/14/2018* | µg/L | **28,900** | **8,570** | **79,200** | **4,380** | **5.5 J** | **12.7** | **3,390** | *DNE* | *DNE* | *DNE* |
| 3/12/2019-3/19/2019* | µg/L | **13,500** | **4,640** | **65,700** | **499** | **7 J** | **30** | **4,680** | *DNE* | *DNE* | *DNE* |
| 5/3/2019-6/7/2019* | µg/L | **38,900** | **1,550** | **69,600** | **684** | **106** | **16.9** | **3,180** | **282,000** | **58,100** | **22.4** |
| 9/10/2019-9/23/2019* | µg/L | **44,000** | **5,390** | **70,500** | **134** | *10.0 U* | *4.3 B* | **2,260** | **330,000** | **188,000** | **20.6** |
| 12/3/2019-12/11/2019 | µg/L | **37,500** | **763** | **77,500** | **378** | **22.7** | **15.2** | **2,640** | **368,000** | **112,000** | **38.6** |
| 3/11/2020-3/23/2020* | µg/L | **28,900** | *NS* | **70,800** | **105** | *10 U* | **4.2 J** | **5,300** | **301,000** | **213,000** | **5 J** |
| 6/8/2020-6/30/2020* | µg/L | **37,200** | **4,660** | **71,900** | **2.7 J** | *10 U* | **4.2 J** | **2,710** | **268,000** | **217,000** | **2.7 J** |
| 9/9/2020-9/29/2020* | µg/L | **46,600** | *NS* | **56,600** | **9.4 J** | **22.3** | **22.7** | **22,600** | **298,000** | **253,000** | **6.4 J** |
| 11/5/2020-11/19/2020* | µg/L | **55,200** | *NS* | **50,200** | **3.3 J** | **3.7 J** | **3.3 J** | **6,190** | **325,000** | **145,000** | **5.9 J** |
| 5/26/2021-6/18/2021* | µg/L | **61,000** | *NS* | *NS* | *NS* | **3.0 J** | **20.1** | *NS* | *NS* | **169,000** | **2.8 J** |
| 10/4/2021-10/18/2021* | µg/L | *NS* | **4,960** | *NS* | *NS* | *NS* | *NS* | *NS* | *NS* | **137,000** | **6.5 J** |
| 11/29/2021-11/30/2021* | µg/L | *NS* | *NS* | *NS* | *NS* | *NS* | *NS* | *NS* | *NS* | *NS* | *NS* |
| 2/23/2022-3/28/2022* | µg/L | **13,500** | **12,400** | *NS* | *NS* | *20 U* | *200 U* | *NS* | *NS* | **113,000** | *20 U* |
| 9/9/2022-9/15/2022* | µg/L | *NS* | **21,800** | *NS* | *NS* | *NS* | *NS* | *NS* | *NS* | **197,000** | *10 U* |
| 3/10/2023-4/10/2023* | µg/L | **58,030** | **20,890** | *NS* | *NS* | **10.4** | **12.6** | *NS* | *NS* | **138,800** | **3.47 J** |
| 9/08/2023-9/21/2023* | µg/L | *NS* | **19,360** | *NS* | *NS* | *NS* | *NS* | *NS* | *NS* | **154,200** | **4.05 J** |
| 3/19/2024-4/11/2024* | µg/L | **254** | **6,243** | *NS* | *NS* | *10 U* | **20.0** | *NS* | *NS* | **88,690** | **5.74 J** |
| 9/10/2024-9/19/2024* | µg/L | *NS* | **5,627** | *NS* | *NS* | *NS* | *NS* | *NS* | *NS* | **196,900** | **539** |
| 2/20/2025*, ** | µg/L | *NS* | *NS* | *NS* | *NS* | *NS* | *NS* | *NS* | *NS* | *NS* | *10 U* |

**Bold indicates detection above the reporting limit**
NS = Not Sampled
DNE = Did/Does Not Exist
*Indicates concentrations are for dissolved metals. All other events show total metals.
**Resample to confirm 2024 results

**TABLE 4**
**Shallow Zinc Concentrations**
**Rod and Wire Mill Interim Measure Progress Report**

| Sampling Dates | Units | RW24-MWS | RW25-MWS | RWA-MWS | RWB-MWS | RWD-MWS | RWE-MWS | RWF-MWS | RWG-MWS | RWH-MWS | RWI-MWS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2024 Sampling Frequency | | Not Sampled | Not Sampled | Semiannually | Semiannually | Semiannually | Semiannually | Semiannually | Not Sampled | Semiannually | Annually |
| 5/1/2015 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 11/1/2015 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 2/10/2017-2/14/2017 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 3/28/2017-3/29/2017 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 4/25/2017-4/27/2017 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 5/22/2017-5/24/2017 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 6/5/2017-6/8/2017 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 7/10/2017-7/12/2017 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 8/7/2017-8/10/2017 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 9/1/2017-9/8/2017 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 10/2/2017-10/6/2017 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 11/3/2017-11/13/2017 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 12/4/2017-12/8/2017 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 1/2/2018-1/9/2018 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 4/8/2018-4/13/2018 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 7/30/2018-8/3/2018 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 10/1/2018-10/5/2018 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 12/10/2018-12/14/2018* | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 3/12/2019-3/19/2019* | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 5/3/2019-6/7/2019* | µg/L | **5 J** | **70,500** | **516** | **7.4 J** | **4.7 J** | **468** | **39,100** | *10 U* | **367** | **25,800** |
| 9/10/2019-9/23/2019* | µg/L | **8.2 J** | **437,000** | **1,720** | **5.5 J** | **9.1 J** | **422** | **34,300** | *10.0 U* | **60,600** | **26,200** |
| 12/3/2019-12/11/2019 | µg/L | **6.7 J** | **11,900** | **49.7** | **38.7** | **5.4 J** | **261** | **35,000** | **194** | **2,600** | **32,400** |
| 3/11/2020-3/23/2020* | µg/L | **3.5 J** | **2,570** | **9.7 J** | **6.1 J** | **3.6 J** | **303** | **33,900** | **2.9 J** | **19,300** | **1,510** |
| 6/8/2020-6/30/2020* | µg/L | **3.4 J** | **5,720** | **21.5** | *10 U* | *10 U* | **1,360** | **31,200** | **9.8 J** | **48.9** | **211** |
| 9/9/2020-9/29/2020* | µg/L | **16.4** | **2,780** | **182** | **5.8 J** | **4.2 J** | **22,100** | **44,400** | *10 U* | **5,330** | *NS* |
| 11/5/2020-11/19/2020* | µg/L | *10 U* | **9,930** | **52.1** | **11.9** | **3 J** | **156** | **39,000** | *10 U* | **1,310** | *NS* |
| 5/26/2021-6/18/2021* | µg/L | *NS* | *NS* | **6.1 J** | *10 U* | *10 U* | **21,900** | **32,800** | *NS* | **3,400** | *NS* |
| 10/4/2021-10/18/2021* | µg/L | *NS* | *NS* | **7.6 J** | **12.4 J** | **10 J** | **1,630** | **25,200** | *NS* | **6,670** | *NS* |
| 11/29/2021-11/30/2021* | µg/L | *NS* | *NS* | *NS* | *NS* | *NS* | *NS* | *NS* | *NS* | *NS* | **2.0 J** |
| 2/23/2022-3/28/2022* | µg/L | *NS* | *NS* | **46.8** | *20 U* | *20 U* | **174** | **33,600** | *NS* | **3,270** | **24,300** |
| 9/9/2022-9/15/2022* | µg/L | *NS* | *NS* | **628** | **5.07 J** | **38.2** | **8,214** | **24,250** | *NS* | **2,468** | *NS* |
| 3/10/2023-4/10/2023* | µg/L | *NS* | *NS* | **284** | *0.2 U* | *10 U* | **4,432** | **20,160** | *NS* | **5,340** | **17,540** |
| 9/08/2023-9/21/2023* | µg/L | *NS* | *NS* | **319** | **3.55 J** | *10 U* | **7,079** | **29,160** | *NS* | **17,390** | *NS* |
| 3/19/2024-4/11/2024* | µg/L | *NS* | *NS* | **152** | **17.0** | *10 U* | **13,660** | **22,400** | *NS* | **8,314** | **82.6** |
| 9/10/2024-9/19/2024* | µg/L | *NS* | *NS* | **184** | *10 U* | *10 U* | **12,150** | **19,130** | *NS* | **153,900** | *NS* |
| 2/20/2025*, ** | µg/L | *NS* | *NS* | *NS* | *NS* | *NS* | *NS* | *NS* | *NS* | **9,659** | *NS* |

**Bold indicates detection above the reporting limit**
NS = Not Sampled
DNE = Did/Does Not Exist
*Indicates concentrations are for dissolved metals. All other events show total metals.
**Resample to confirm 2024 results

**TABLE 4**
**Shallow Zinc Concentrations**
**Rod and Wire Mill Interim Measure Progress Report**

| Sampling Dates | Units | RWJ-MWS | RWK-MWS | RWL-MWS | RWM-MWS | RWN-MWS | RWO-MWS | RWQ-MWS | RWR-MWS | RWS-MWS |
|---|---|---|---|---|---|---|---|---|---|---|
| 2024 Sampling Frequency | | Semiannually | Semiannually | Semiannually | Not Sampled | Annually | Semiannually | Semiannually | Semiannually | Semiannually |
| 5/1/2015 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 11/1/2015 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 2/10/2017-2/14/2017 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 3/28/2017-3/29/2017 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 4/25/2017-4/27/2017 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 5/22/2017-5/24/2017 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 6/5/2017-6/8/2017 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 7/10/2017-7/12/2017 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 8/7/2017-8/10/2017 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 9/1/2017-9/8/2017 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 10/2/2017-10/6/2017 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 11/3/2017-11/13/2017 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 12/4/2017-12/8/2017 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 1/2/2018-1/9/2018 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 4/8/2018-4/13/2018 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 7/30/2018-8/3/2018 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 10/1/2018-10/5/2018 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 12/10/2018-12/14/2018* | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 3/12/2019-3/19/2019* | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 5/3/2019-6/7/2019* | µg/L | *10 U* | **6,710** | **8,480** | **6 J** | **978,000** | **2,660** | **146** | **213,000** | **10,100** |
| 9/10/2019-9/23/2019* | µg/L | **27** | **19,200** | **9,180** | **4.0 J** | **964,000** | **6,790** | **147** | **245,000** | **1,980** |
| 12/3/2019-12/11/2019 | µg/L | **8.3 J** | **20,600** | **15,500** | **11.6** | **943,000** | **3,720** | **182** | **320,000** | **2,970** |
| 3/11/2020-3/23/2020* | µg/L | *10 U* | **16,400** | **861** | **4.8 J** | **1,170,000** | **6,220** | **194** | **344,000** | **19,100** |
| 6/8/2020-6/30/2020* | µg/L | **4 J** | **10,400** | **16,100** | **21.8** | **884,000** | **11,100** | **149** | **327,000** | **954,000** |
| 9/9/2020-9/29/2020* | µg/L | **2.6 J** | **16,800** | **15,000** | **7.8 J** | **1,140,000** | **5,030** | **162** | **326,000** | **60,300** |
| 11/5/2020-11/19/2020* | µg/L | *10 U* | **18,100** | **14,200** | **10.6** | **709,000** | **2,750** | **152** | **293,000** | **7,260** |
| 5/26/2021-6/18/2021* | µg/L | *10 U* | **22,200** | **16,000** | *NS* | **745,000** | **1,130** | **158** | **269,000** | **116,000** |
| 10/4/2021-10/18/2021* | µg/L | **38.2** | **18,500** | **14,900** | *NS* | *NS* | **694** | **166** | **298,000** | **36,700** |
| 11/29/2021-11/30/2021* | µg/L | *NS* | *NS* | *NS* | *NS* | *NS* | *NS* | *NS* | *NS* | *NS* |
| 2/23/2022-3/28/2022* | µg/L | *20 U* | **22,300** | **12,500** | *NS* | **548,000** | **397** | **239** | **267,000** | **97,500** |
| 9/9/2022-9/15/2022* | µg/L | *10 U* | **24,170** | **11,470** | *NS* | *NS* | **49.3** | **134** | **205,000** | **22,290** |
| 3/10/2023-4/10/2023* | µg/L | *10 U* | **24,920** | **19,240** | *NS* | **546,700** | *10 U* | **94.5** | **233,900** | **158,800** |
| 9/08/2023-9/21/2023* | µg/L | **3.54 J** | **21,550** | **6,219** | *NS* | *NS* | *10 U* | **117** | **243,900** | **62,160** |
| 3/19/2024-4/11/2024* | µg/L | **19.8** | **18,610** | **3,047** | *NS* | **662,200** | *10 U* | **154** | **280,800** | **167,200** |
| 9/10/2024-9/19/2024* | µg/L | *10 U* | **20,750** | **24,050** | *NS* | *NS* | *500 U* | **212** | **455,600** | **166,800** |
| 2/20/2025*, ** | µg/L | *NS* | *NS* | *NS* | *NS* | *NS* | *NS* | *NS* | *NS* | *NS* |

**Bold indicates detection above the reporting limit**
NS = Not Sampled
DNE = Did/Does Not Exist
*Indicates concentrations are for dissolved metals. All other events show total metals.
**Resample to confirm 2024 results

**TABLE 5**
**Shallow Cadmium Concentrations**
**Rod and Wire Mill Interim Measure Progress Report**

| Sampling Dates | Units | RW01-MWS | RW02-MWS | RW03-MWS | RW03R-MWS | RW04-MWS | RW05-MWS | RW06R-MWS | RW07-MWS | RW08-MWS | RW09-MWS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2024 Sampling Frequency | | Semiannually | Semiannually | NA | Semiannually | Not Sampled | Semiannually | Annually | Annually | Not Sampled | Not Sampled |
| 5/1/2015 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | **2.8** | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 11/1/2015 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *NS* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 2/10/2017-2/14/2017 | µg/L | *DNE* | *DNE* | **7.9** | *DNE* | *NS* | *DNE* | *DNE* | **1.8 J** | **3.8** | **22.3** |
| 3/28/2017-3/29/2017 | µg/L | *DNE* | *DNE* | **4.7** | *DNE* | *NS* | *DNE* | *DNE* | **1.7 J** | **11** | **17.5** |
| 4/25/2017-4/27/2017 | µg/L | *DNE* | *DNE* | **3.2** | *DNE* | *NS* | *DNE* | *DNE* | **1.4 J** | **7.8** | **16.6** |
| 5/22/2017-5/24/2017 | µg/L | *DNE* | *DNE* | **3.9** | *DNE* | *NS* | *DNE* | *DNE* | **1.9 J** | **3.2** | **14.9** |
| 6/5/2017-6/8/2017 | µg/L | *DNE* | *DNE* | **4** | *DNE* | **0.7 J** | *DNE* | *DNE* | **2.3 J** | **1.7 J** | **13.9** |
| 7/10/2017-7/12/2017 | µg/L | *DNE* | *DNE* | **4.6** | *DNE* | **1.2 J** | *DNE* | *DNE* | **2.8 J** | **0.74 J** | **13.4** |
| 8/7/2017-8/10/2017 | µg/L | **1.6 J** | **12** | **5.1** | *DNE* | *3 U* | **4.9** | *DNE* | **3.1** | **2.7 J** | **12.5** |
| 9/1/2017-9/8/2017 | µg/L | **1.2 J** | **11.8** | **8.4** | *DNE* | **0.71 J** | **0.37 J** | *DNE* | **3.6** | **2.5 J** | **12.3** |
| 10/2/2017-10/6/2017 | µg/L | **1.7 J** | **9.1** | **11** | *DNE* | *3 U* | **1.2 J** | *DNE* | **3.2** | **0.96 J** | **10.6** |
| 11/3/2017-11/13/2017 | µg/L | **21.7** | **7.7** | **8.5** | *DNE* | **1.1 J** | *3 U* | *DNE* | **5.8** | *3 U* | **10.5** |
| 12/4/2017-12/8/2017 | µg/L | **98** | *3 U* | **11.4** | *DNE* | **1.1 J** | **8.4** | *DNE* | **6** | *3 U* | **9.2** |
| 1/2/2018-1/9/2018 | µg/L | **23.9** | **13.1** | **9.9** | *DNE* | *3 U* | *3 U* | *DNE* | **4.8** | *3 U* | **9.9** |
| 4/8/2018-4/13/2018 | µg/L | **7.6** | **16.7** | **11.8** | *DNE* | *3 U* | *3 U* | *DNE* | **4.6** | **2.2 J** | **9.8** |
| 7/30/2018-8/3/2018 | µg/L | **1.6 J** | **5.2** | **10.8** | *DNE* | *3 U* | *3 U* | *3 U* | **4.8** | *3 U* | **13.1** |
| 10/1/2018-10/5/2018 | µg/L | **0.97 J** | **3.4** | **8.7** | *DNE* | *3 U* | *3 U* | *3 U* | **4.7** | *3 U* | **22.3** |
| 12/10/2018-12/14/2018* | µg/L | **1.8 J** | **9** | **24** | *DNE* | *3 U* | *3 U* | **0.56 J** | **4.1** | *3 U* | **9.3** |
| 3/12/2019-3/19/2019* | µg/L | **2.3 J** | **3.8** | **7.7** | *DNE* | *3 U* | *3 U* | *3 U* | **2.7 J** | **2 J** | **10.2** |
| 5/3/2019-6/7/2019* | µg/L | **4.7** | **1.7 J** | **17.9** | *DNE* | *3 U* | *3 U* | *3 U* | **2.9 J** | **0.86 J** | **12** |
| 9/10/2019-9/23/2019* | µg/L | **4.3** | **1.1 J** | **16.3** | *DNE* | **0.55 J** | *3.0 U* | *3.0 U* | **3.4** | **0.39 J** | **16.7** |
| 12/3/2019-12/11/2019 | µg/L | *3.9 B* | *0.55 B* | **18.8** | *DNE* | **1.8 J** | *3.0 U* | *3.0 U* | **3.0 J** | *3.0 U* | **14.3** |
| 3/11/2020-3/23/2020* | µg/L | **4.4** | **0.97 J** | **18.8** | *DNE* | **1.7 J** | **0.52 J** | *3 U* | **2.5 J** | **2.7 J** | **16.9** |
| 6/8/2020-6/30/2020* | µg/L | **1.6 J** | **0.61 J** | **14.5** | *DNE* | **0.99 J** | **0.53 J** | **0.98 J** | **4.5** | **0.67 J** | **15.2** |
| 9/9/2020-9/29/2020* | µg/L | **1.3 J** | **0.43 J** | *NS* | *DNE* | **0.62 J** | *3 U* | **0.69 J** | *NS* | *3 U* | **17** |
| 11/5/2020-11/19/2020* | µg/L | **1.1 J** | **0.58 J** | *NS* | *DNE* | **0.38 J** | *3 U* | **0.9 J** | *NS* | **0.37 J** | **16** |
| 5/26/2021-6/18/2021* | µg/L | **0.40 J** | *3 U* | *NS* | *DNE* | *NS* | *3 U* | *3 U* | *NS* | *NS* | *NS* |
| 10/4/2021-10/18/2021* | µg/L | *1 U* | *1 U* | *NS* | *DNE* | *NS* | *1 U* | *NS* | *NS* | *NS* | *NS* |
| 11/29/2021-11/30/2021* | µg/L | *NS* | *NS* | *NS* | *DNE* | *NS* | *NS* | *NS* | **1.7** | *NS* | *NS* |
| 2/23/2022-3/28/2022* | µg/L | *2 U* | *2 U* | *Destroyed* | *DNE* | *NS* | *2 U* | *2 U* | **16.6** | *NS* | *NS* |
| 9/9/2022-9/15/2022* | µg/L | **0.55** | **0.13 J** | *Destroyed* | *0.2 U* | *NS* | **0.12 J** | *NS* | *NS* | *NS* | *NS* |
| 3/10/2023-4/10/2023* | µg/L | **0.54** | *0.2 U* | *Destroyed* | **0.18 J** | *NS* | **0.19 J** | *0.2 U* | **2.54** | *NS* | *NS* |
| 9/08/2023-9/21/2023* | µg/L | *Abandoned* | *Abandoned* | *Destroyed* | **0.14 J** | *NS* | *Destroyed* | *NS* | *NS* | *NS* | *NS* |
| 3/19/2024-4/11/2024* | µg/L | *Abandoned* | *Abandoned* | *Destroyed* | **0.06 J** | *NS* | *Destroyed* | *0.2 U* | **4.38** | *NS* | *NS* |
| 9/10/2024-9/19/2024* | µg/L | *Abandoned* | *Abandoned* | *Destroyed* | *10 U* | *NS* | *Destroyed* | *NS* | *NS* | *NS* | *NS* |
| 2/20/2025*, ** | µg/L | *Abandoned* | *Abandoned* | *Destroyed* | *NS* | *NS* | *Destroyed* | *NS* | *NS* | *NS* | *NS* |

**Bold indicates detection above the reporting limit**
NS = Not Sampled
DNE = Did Not Exist
*Indicates concentrations are for dissolved metals. All other events show total metals.
**Resample to confirm 2024 results

**TABLE 5**
**Shallow Cadmium Concentrations**
**Rod and Wire Mill Interim Measure Progress Report**

| Sampling Dates | Units | RW11-MWS | RW12-MWS | RW14-MWS | RW15-MWS | RW16-MWS | RW18-MWS | RW19-MWS | RW21-MWS | RW22R-MWS | RW23-MWS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2024 Sampling Frequency | | Annually | Semiannually | Not Sampled | Not Sampled | Annually | Annually | Not Sampled | Not Sampled | Semiannually | Semiannually |
| 5/1/2015 | µg/L | *DNE* | **4.4** | *DNE* | *DNE* | *DNE* | **168** | *DNE* | *DNE* | *DNE* | *DNE* |
| 11/1/2015 | µg/L | *DNE* | **3.2** | *DNE* | *DNE* | *DNE* | **31.3** | *DNE* | *DNE* | *DNE* | *DNE* |
| 2/10/2017-2/14/2017 | µg/L | **0.78 J** | *NS* | *DNE* | *DNE* | *DNE* | *NS* | **14.8** | *DNE* | *DNE* | *DNE* |
| 3/28/2017-3/29/2017 | µg/L | **1.8 J** | *NS* | *DNE* | *DNE* | *DNE* | *NS* | **6.9** | *DNE* | *DNE* | *DNE* |
| 4/25/2017-4/27/2017 | µg/L | **5.3** | *NS* | *DNE* | *DNE* | *DNE* | *NS* | **8.5** | *DNE* | *DNE* | *DNE* |
| 5/22/2017-5/24/2017 | µg/L | **1.8 J** | *NS* | *DNE* | *DNE* | *DNE* | *NS* | **3.6** | *DNE* | *DNE* | *DNE* |
| 6/5/2017-6/8/2017 | µg/L | **0.94 J** | **29.7** | *DNE* | *DNE* | *DNE* | **356** | **2.4 J** | *DNE* | *DNE* | *DNE* |
| 7/10/2017-7/12/2017 | µg/L | **0.84 J** | **12.6** | *DNE* | *DNE* | *DNE* | **240** | **9.7** | *DNE* | *DNE* | *DNE* |
| 8/7/2017-8/10/2017 | µg/L | **1.3 J** | **7** | **1,780** | **12.2** | *NS* | **34.9** | **7.2** | *DNE* | *DNE* | *DNE* |
| 9/1/2017-9/8/2017 | µg/L | **0.81 J** | **5.1** | **1,700** | **29.9** | *3 U* | **156** | **2.6 J** | *DNE* | *DNE* | *DNE* |
| 10/2/2017-10/6/2017 | µg/L | *3 U* | **11.3** | **1,750** | **25.3** | *3 U* | **306** | **5.2** | *DNE* | *DNE* | *DNE* |
| 11/3/2017-11/13/2017 | µg/L | **2.1 J** | **193** | **2,390** | **63** | *3 U* | **208** | **4.4** | *DNE* | *DNE* | *DNE* |
| 12/4/2017-12/8/2017 | µg/L | **2.9 J** | **4.2** | **2,820** | **55** | *3 U* | **410** | **4.6** | *DNE* | *DNE* | *DNE* |
| 1/2/2018-1/9/2018 | µg/L | **2.2 J** | **11.7** | **2,800** | **40.7** | *3 U* | **218** | **4.8** | *DNE* | *DNE* | *DNE* |
| 4/8/2018-4/13/2018 | µg/L | **4.1** | **11** | **3,220** | **41.2** | *3 U* | **448** | **6.6** | *DNE* | *DNE* | *DNE* |
| 7/30/2018-8/3/2018 | µg/L | **66.3** | **5.2** | **3,630** | **38.5** | *3 U* | **7.1** | **1.2 J** | *DNE* | *DNE* | *DNE* |
| 10/1/2018-10/5/2018 | µg/L | **1.2 J** | **2.3 J** | **3,840** | **78.1** | *3 U* | **1.2 J** | **3.6** | *DNE* | *DNE* | *DNE* |
| 12/10/2018-12/14/2018* | µg/L | **0.81 J** | **15.3** | **3,730** | **94.4** | *3 U* | **1.5 J** | *3 U* | *DNE* | *DNE* | *DNE* |
| 3/12/2019-3/19/2019* | µg/L | **2.2 J** | **6.6** | **2,960** | **15.4** | *3 U* | *3 U* | *3 U* | *DNE* | *DNE* | *DNE* |
| 5/3/2019-6/7/2019* | µg/L | *1.1 B* | **2.1 J** | **3,000** | **19.1** | *3 U* | *3 U* | *3 U* | **483** | **157** | *3 U* |
| 9/10/2019-9/23/2019* | µg/L | *3.0 U* | **3.2** | **3,450** | **7.4** | *3.0 U* | *3.0 U* | *3.0 U* | **354** | **105** | **0.88 J** |
| 12/3/2019-12/11/2019 | µg/L | **1.9 J** | **2.5 J** | **3,990** | **8.5** | **0.36 J** | **1.9 J** | **1.2 J** | **433** | **70.4** | **1.3 J** |
| 3/11/2020-3/23/2020* | µg/L | **2 J** | *NS* | **3,020** | **4.3** | *3 U* | *3 U* | **0.66 J** | **378** | **62.9** | **0.52 J** |
| 6/8/2020-6/30/2020* | µg/L | **2.5 J** | **5.2** | **3,590** | *3 U* | *3 U* | *3 U* | **0.77 J** | **322** | **51.4** | *3 U* |
| 9/9/2020-9/29/2020* | µg/L | **2.2 J** | *NS* | **3,240** | **0.51 J** | *3 U* | *3 U* | **4.3** | **294** | **52.1** | *3 U* |
| 11/5/2020-11/19/2020* | µg/L | **2 J** | *NS* | **3,020** | *3 U* | *3 U* | *3 U* | **1.3 J** | **367** | **30.7** | *3 U* |
| 5/26/2021-6/18/2021* | µg/L | **3.4** | *NS* | *NS* | *NS* | *3 U* | *3 U* | *NS* | *NS* | **78.5** | *3 U* |
| 10/4/2021-10/18/2021* | µg/L | *NS* | *1 U* | *NS* | *NS* | *NS* | *NS* | *NS* | *NS* | **117** | *1 U* |
| 11/29/2021-11/30/2021* | µg/L | *NS* | *NS* | *NS* | *NS* | *NS* | *NS* | *NS* | *NS* | *NS* | *NS* |
| 2/23/2022-3/28/2022* | µg/L | *2 U* | *2 U* | *NS* | *NS* | *2 U* | *2 U* | *NS* | *NS* | **29.4** | *2 U* |
| 9/9/2022-9/15/2022* | µg/L | *NS* | **3.05** | *NS* | *NS* | *NS* | *NS* | *NS* | *NS* | **56.9** | **0.14** |
| 3/10/2023-4/10/2023* | µg/L | **3.84** | **11.0** | *NS* | *NS* | *0.2 U* | *0.2 U* | *NS* | *NS* | **22.0** | **0.097 J** |
| 9/08/2023-9/21/2023* | µg/L | *NS* | **8.66** | *NS* | *NS* | *NS* | *NS* | *NS* | *NS* | **24.1** | **0.12 J** |
| 3/19/2024-4/11/2024* | µg/L | **0.09 J** | **5.97** | *NS* | *NS* | **0.07 J** | **0.38** | *NS* | *NS* | **28.1** | *0.2 U* |
| 9/10/2024-9/19/2024* | µg/L | *NS* | **2.80** | *NS* | *NS* | *NS* | *NS* | *NS* | *NS* | **26.7** | **8.46** |
| 2/20/2025*, ** | µg/L | *NS* | *NS* | *NS* | *NS* | *NS* | *NS* | *NS* | *NS* | *NS* | **0.0766 J** |

**Bold indicates detection above the reporting limit**
NS = Not Sampled
DNE = Did Not Exist
*Indicates concentrations are for dissolved metals. All other events show total metals.
**Resample to confirm 2024 results

**TABLE 5**
**Shallow Cadmium Concentrations**
**Rod and Wire Mill Interim Measure Progress Report**

| Sampling Dates | Units | RW24-MWS | RW25-MWS | RWA-MWS | RWB-MWS | RWD-MWS | RWE-MWS | RWF-MWS | RWG-MWS | RWH-MWS | RWI-MWS |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2024 Sampling Frequency | | Not Sampled | Not Sampled | Semiannually | Semiannually | Semiannually | Semiannually | Semiannually | Not Sampled | Semiannually | Annually |
| 5/1/2015 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 11/1/2015 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 2/10/2017-2/14/2017 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 3/28/2017-3/29/2017 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 4/25/2017-4/27/2017 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 5/22/2017-5/24/2017 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 6/5/2017-6/8/2017 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 7/10/2017-7/12/2017 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 8/7/2017-8/10/2017 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 9/1/2017-9/8/2017 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 10/2/2017-10/6/2017 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 11/3/2017-11/13/2017 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 12/4/2017-12/8/2017 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 1/2/2018-1/9/2018 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 4/8/2018-4/13/2018 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 7/30/2018-8/3/2018 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 10/1/2018-10/5/2018 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 12/10/2018-12/14/2018* | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 3/12/2019-3/19/2019* | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 5/3/2019-6/7/2019* | µg/L | *3 U* | **491** | **2.3 J** | *3 U* | *3 U* | **0.57 J** | **4.2** | *3 U* | **20** | **714** |
| 9/10/2019-9/23/2019* | µg/L | *3.0 U* | **599** | **24** | *3.0 U* | *3.0 U* | **0.64 J** | **6.1** | *3.0 U* | **856** | **840** |
| 12/3/2019-12/11/2019 | µg/L | **0.43 J** | **9.9** | **4.4** | *3.0 U* | *3.0 U* | **2.0 J** | **7.3** | *3.0 U* | **19.9** | **1,080** |
| 3/11/2020-3/23/2020* | µg/L | *3 U* | **2.7 J** | **0.6 J** | *3 U* | *3 U* | **0.91 J** | **7.7** | *3 U* | **163** | **125** |
| 6/8/2020-6/30/2020* | µg/L | *3 U* | **4.6** | **0.88 J** | *3 U* | **0.46 J** | **1.4 J** | **5.7** | **0.63 J** | **0.97 J** | **17.5** |
| 9/9/2020-9/29/2020* | µg/L | *3 U* | **7.0** | **2.9 J** | *3 U* | **0.46 J** | **8.7** | **6.0** | *3 U* | **22.4** | *NS* |
| 11/5/2020-11/19/2020* | µg/L | *3 U* | **8.6** | **1.5 J** | *3 U* | *3 U* | **0.44 J** | **4.6** | *3 U* | **7.0** | *NS* |
| 5/26/2021-6/18/2021* | µg/L | *NS* | *NS* | **0.48 J** | *3 U* | *3 U* | **10.9** | **4.0** | *NS* | **9.9** | *NS* |
| 10/4/2021-10/18/2021* | µg/L | *NS* | *NS* | *1 U* | *1 U* | *1 U* | **0.55 J** | **3.4** | *NS* | **6.8** | *NS* |
| 11/29/2021-11/30/2021* | µg/L | *NS* | *NS* | *NS* | *NS* | *NS* | *NS* | *NS* | *NS* | *NS* | **0.76 J** |
| 2/23/2022-3/28/2022* | µg/L | *NS* | *NS* | *2 U* | *2 U* | *2 U* | *2 U* | **4.9** | *NS* | **7.0** | **1,010** |
| 9/9/2022-9/15/2022* | µg/L | *NS* | *NS* | **3.94** | *0.2 U* | **0.81** | **3.58** | **2.55** | *NS* | **26.3** | *NS* |
| 3/10/2023-4/10/2023* | µg/L | *NS* | *NS* | **5.86** | *0.2 U* | *0.2 U* | **2.85** | **2.17** | *NS* | **5.37** | **596** |
| 9/08/2023-9/21/2023* | µg/L | *NS* | *NS* | **4.39** | *0.2 U* | *0.2 U* | **2.06** | **1.51** | *NS* | **173** | *NS* |
| 3/19/2024-4/11/2024* | µg/L | *NS* | *NS* | **1.78** | **0.41** | *0.2 U* | **5.26** | **1.02** | *NS* | **11.5** | **8.83** |
| 9/10/2024-9/19/2024* | µg/L | *NS* | *NS* | **2.19** | *0.2 U* | *0.2 U* | **3.18** | **0.68** | *NS* | **2,316** | *NS* |
| 2/20/2025*, ** | µg/L | *NS* | *NS* | *NS* | *NS* | *NS* | *NS* | *NS* | *NS* | **189** | *NS* |

**Bold indicates detection above the reporting limit**
NS = Not Sampled
DNE = Did Not Exist
*Indicates concentrations are for dissolved metals. All other events show total metals.
**Resample to confirm 2024 results

**TABLE 5**
**Shallow Cadmium Concentrations**
**Rod and Wire Mill Interim Measure Progress Report**

| Sampling Dates | Units | RWJ-MWS | RWK-MWS | RWL-MWS | RWM-MWS | RWN-MWS | RWO-MWS | RWQ-MWS | RWR-MWS | RWS-MWS |
|---|---|---|---|---|---|---|---|---|---|---|
| 2024 Sampling Frequency | | Semiannually | Semiannually | Semiannually | Not Sampled | Annually | Semiannually | Semiannually | Semiannually | Semiannually |
| 5/1/2015 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 11/1/2015 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 2/10/2017-2/14/2017 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 3/28/2017-3/29/2017 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 4/25/2017-4/27/2017 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 5/22/2017-5/24/2017 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 6/5/2017-6/8/2017 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 7/10/2017-7/12/2017 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 8/7/2017-8/10/2017 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 9/1/2017-9/8/2017 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 10/2/2017-10/6/2017 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 11/3/2017-11/13/2017 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 12/4/2017-12/8/2017 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 1/2/2018-1/9/2018 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 4/8/2018-4/13/2018 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 7/30/2018-8/3/2018 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 10/1/2018-10/5/2018 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 12/10/2018-12/14/2018* | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 3/12/2019-3/19/2019* | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 5/3/2019-6/7/2019* | µg/L | *3 U* | *3 U* | *3 U* | *3 U* | **13,000** | **1.4 J** | **2.6 J** | **50** | *3 U* |
| 9/10/2019-9/23/2019* | µg/L | *3.0 U* | *3.0 U* | *3.0 U* | *3.0 U* | **11,100** | **1.3 J** | **2.6 J** | **41** | *3.0 U* |
| 12/3/2019-12/11/2019 | µg/L | *3.0 U* | *3.0 U* | *3.0 U* | **0.36 J** | **11,200** | **7.6** | **4.4** | **42.3** | *3.0 U* |
| 3/11/2020-3/23/2020* | µg/L | *3 U* | *3 U* | **0.85 J** | *3 U* | **9,420** | **0.65 J** | **3.1** | **38.8** | *3 U* |
| 6/8/2020-6/30/2020* | µg/L | *3 U* | *3 U* | **0.52 J** | *3 U* | **6,810** | **0.46 J** | **2.9 J** | **35.5** | **1.9 J** |
| 9/9/2020-9/29/2020* | µg/L | *3 U* | **0.51 J** | **0.59 J** | *3 U* | **7,350** | **4.1** | **3.3** | **34.3** | **0.42 J** |
| 11/5/2020-11/19/2020* | µg/L | *3 U* | **0.37 J** | *3 U* | *3 U* | **6,260** | **0.53 J** | **3.2** | **33.8** | **0.39 J** |
| 5/26/2021-6/18/2021* | µg/L | *3 U* | *3 U* | *3 U* | *NS* | **4,850** | **0.85 J** | **3.4** | **35.1** | *3 U* |
| 10/4/2021-10/18/2021* | µg/L | **0.22 J** | *1 U* | **0.37 J** | *NS* | *NS* | *1 U* | **3.1** | **39.3** | *10 U* |
| 11/29/2021-11/30/2021* | µg/L | *NS* | *NS* | *NS* | *NS* | *NS* | *NS* | *NS* | *NS* | *NS* |
| 2/23/2022-3/28/2022* | µg/L | *2 U* | *2 U* | *2 U* | *NS* | **2,260** | *2 U* | **3.3** | **28.8** | *2 U* |
| 9/9/2022-9/15/2022* | µg/L | *0.2 U* | *0.2 U* | **0.14** | *NS* | *NS* | **0.075** | **2.69** | **23.5** | **0.23** |
| 3/10/2023-4/10/2023* | µg/L | *0.2 U* | *0.2 U* | **0.072 J** | *NS* | **2,517** | *0.2 U* | **10.5** | **19.3** | **0.68** |
| 9/08/2023-9/21/2023* | µg/L | *0.2 U* | **0.11 J** | *0.2 U* | *NS* | *NS* | *0.2 U* | **2.04** | **20.3** | **0.17** |
| 3/19/2024-4/11/2024* | µg/L | *0.2 U* | **0.28** | **4.63** | *NS* | **2,350** | *0.2 U* | **2.62** | **15.3** | **1.03** |
| 9/10/2024-9/19/2024* | µg/L | *0.2 U* | **0.31** | **1.45** | *NS* | *NS* | *10 U* | **3.01** | **36.2** | **1.43** |
| 2/20/2025*, ** | µg/L | *NS* | *NS* | *NS* | *NS* | *NS* | *NS* | *NS* | *NS* | *NS* |

**Bold indicates detection above the reporting limit**
NS = Not Sampled
DNE = Did Not Exist
*Indicates concentrations are for dissolved metals. All other events show total metals.
**Resample to confirm 2024 results

**TABLE 6**
**2024 Shallow Field Parameter Data**
**Rod and Wire Mill Interim Measure Progress Report**

| | | RW03R-MWS | | RW06R-MWS | | RW07-MWS | | RW11-MWS | | RW12-MWS | | RW16-MWS | | RW18-MWS | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Parameters** | **Units** | **Mar-24** | **Sep-24** | **Mar-24** | **Sep-24** | **Mar-24** | **Sep-24** | **Mar-24** | **Sep-24** | **Mar-24** | **Sep-24** | **Mar-24** | **Sep-24** | **Mar-24** | **Sep-24** |
| pH | s.u. | 10.54 | 10.69 | 7.73 | *NS* | 6.59 | *NS* | 5.48 | *NS* | 6.4 | 6.27 | 8.92 | *NS* | 8.05 | *NS* |
| Specific Conductance | ms/cm | 1.41 | 1.68 | 1.62 | *NS* | 3.24 | *NS* | 3.52 | *NS* | 5.64 | 3.4 | 1.18 | *NS* | 0.449 | *NS* |
| Dissolved Oxygen | mg/L | 1.43 | 4.35 | 7.14 | *NS* | 4.65 | *NS* | 1.3 | *NS* | 0.29 | 0.18 | 1.87 | *NS* | 0.35 | *NS* |
| ORP | mV | 4 | -301 | 172 | *NS* | 329 | *NS* | 59 | *NS* | -29 | -56 | -56 | *NS* | -189 | *NS* |
| Turbidity | NTU | 3.91 | 1.72 | 12.7 | *NS* | 4.14 | *NS* | 46.5 | *NS* | 4.51 | 7.5 | 4.04 | *NS* | Overrange | *NS* |
| Depth To Water | ft | 12.0 | 12.15 | 7.3 | *8.46* | 9.77 | *11.07* | 10.01 | *9.19* | 9.95 | 10.21 | 8.4 | *9.1* | 8.75 | *9.24* |

| | | RW22R-MWS | | RW23-MWS | | | RWA-MWS | | RWB-MWS | | RWD-MWS | | RWE-MWS | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Parameters** | **Units** | **Mar-24** | **Sep-24** | **Mar-24** | **Sep-24** | **Feb-25** | **Mar-24** | **Sep-24** | **Mar-24** | **Sep-24** | **Mar-24** | **Sep-24** | **Mar-24** | **Sep-24** |
| pH | s.u. | 6.11 | 5.66 | 6.28 | 6.05 | 5.49 | 7.73 | 7.95 | 9.15 | 7.42 | 6.01 | 5.97 | 6.11 | 6.26 |
| Specific Conductance | ms/cm | 2.12 | 2.9 | 0.619 | 0.492 | 0.357 | 2.02 | 1.73 | 0.901 | 1.33 | 1.77 | 1.74 | 2.95 | 1.64 |
| Dissolved Oxygen | mg/L | 2.17 | 0 | 0.53 | 0.13 | 0 | 0.41 | 0 | 1.96 | 0.06 | 0.55 | 0 | 0.68 | 0.16 |
| ORP | mV | -57 | 44 | 128 | 111 | 57 | -181 | -222 | -62 | -243 | -48 | -120 | -30 | -132 |
| Turbidity | NTU | 0.49 | 7.01 | 2.6 | 4.8 | 5.9 | 3.15 | 0 | 3.95 | 3.28 | 4.51 | 0.5 | 11.5 | 7.3 |
| Depth To Water | ft | NA | 15.45 | 9.75 | 9.64 | 9.55 | 9.17 | 9.15 | NA | 18.85 | NA | 13.56 | 13.1 | 12.7 |

| | | RWF-MWS | | RWG-MWS | | RWH-MWS | | | RWI-MWS | | RWJ-MWS | | RWK-MWS | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Parameters** | **Units** | **Mar-24** | **Sep-24** | **Mar-24** | **Sep-24** | **Mar-24** | **Sep-24** | **Feb-25** | **Mar-24** | **Sep-24** | **Mar-24** | **Sep-24** | **Mar-24** | **Sep-24** |
| pH | s.u. | 4.67 | 4.87 | NS | *NS* | 6.39 | 5.88 | 5.22 | 7.6 | *NS* | 12.08 | 11.24 | 6.41 | 6.19 |
| Specific Conductance | ms/cm | 4.98 | 3.49 | NS | *NS* | 1.16 | 1.66 | 1.03 | 3.3 | *NS* | 5.33 | 2.64 | 1.97 | 1.4 |
| Dissolved Oxygen | mg/L | 0.28 | 0.13 | NS | *NS* | 0.52 | 0 | 0 | 0.91 | *NS* | 1.95 | 0 | 0.51 | 1.42 |
| ORP | mV | 189 | 140 | NS | *NS* | -68 | -51 | -82 | 179 | *NS* | -166 | -205 | -25 | 1 |
| Turbidity | NTU | 4.39 | 4.9 | NS | *NS* | 4.55 | 4.44 | 5.0 | 3.33 | *NS* | 2.94 | 0 | 3.87 | 0.72 |
| Depth To Water | ft | NA | 11.89 | NA | *8.17* | 9.42 | 10.43 | 10.45 | 7.2 | *9.89* | 10.08 | 10.94 | 11.79 | 11.18 |

| | | RWL-MWS | | RWN-MWS | | RWO-MWS | | RWQ-MWS | | RWR-MWS | | RWS-MWS | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **RWG-MWS** | **Units** | **Mar-24** | **Sep-24** | **Mar-24** | **Sep-24** | **Mar-24** | **Sep-24** | **Mar-24** | **Sep-24** | **Mar-24** | **Sep-24** | **Mar-24** | **Sep-24** |
| pH | s.u. | 6.47 | 5.58 | 5.1 | *NS* | 6.94 | 6.41 | 5.93 | 6.11 | 5.06 | 5.36 | 6.1 | 5.87 |
| Specific Conductance | ms/cm | 3.3 | 1.1 | 3.02 | *NS* | 1.56 | 1.37 | 0.719 | 0.6 | 2.58 | 2.33 | 1.96 | 1.83 |
| Dissolved Oxygen | mg/L | 0.31 | 0.09 | 0.58 | *NS* | 0.37 | 0 | 0.4 | 0.5 | 0.74 | 0 | 0.3 | 0 |
| ORP | mV | 7 | 66 | 57 | *NS* | -265 | -215 | 71 | 33 | 75 | 71 | -73 | -43 |
| Turbidity | NTU | 4.58 | 4.52 | 4.19 | *NS* | 4.42 | 3.5 | 42.9 | 4.05 | 3.8 | 12.9 | 6.96 | 3.37 |
| Depth To Water | ft | 9.0 | 11.15 | NA | *11.91* | NA | 10.3 | NA | 12.3 | NA | 10.45 | 10.8 | 11 |

NS = Not Sampled

**TABLE 7**
**Intermediate Zinc Concentrations**
**Rod and Wire Mill Interim Measure Progress Report**

| Sampling Dates | Units | RW01-MWI | RW02-MWI | RW03-MWI | RW03R-MWI | RW05-MWI | RW05R-MWI | RW06-MWI | RW07-MWI | RW08-MWI | RW09-MWI | RW10-MWI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2024 Sampling Frequency | | Semiannually | Semiannually | NA | Semiannually | NA | Semiannually | Semiannually | Semiannually | Annually | Annually | Annually |
| 4/1/2013 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | **136** | *DNE* | **2,970** | *DNE* | *DNE* | *DNE* | *DNE* |
| 10/1/2013 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | **247** | *DNE* | **4,720** | *DNE* | *DNE* | *DNE* | *DNE* |
| 6/1/2014 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | **2,180** | *DNE* | **5,480** | *DNE* | *DNE* | *DNE* | *DNE* |
| 11/1/2014 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | **592** | *DNE* | **7,660** | *DNE* | *DNE* | *DNE* | *DNE* |
| 5/1/2015 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | **1,300** | *DNE* | **5,090** | *DNE* | *DNE* | *DNE* | *DNE* |
| 11/1/2015 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *NS* | *DNE* | **7,000** | *DNE* | *DNE* | *DNE* | *DNE* |
| 2/10/2017-2/16/2017 | µg/L | *DNE* | *DNE* | **9,740** | *DNE* | *NS* | *DNE* | **1,900** | **944** | **178** | **51,000** | **104,000** |
| 3/27/2017-3/30/2017 | µg/L | *DNE* | *DNE* | **9,240** | *DNE* | *NS* | *DNE* | **1,680** | **1,210** | **44.6** | **51,900** | **20.4** |
| 4/25/2017-4/28/2017 | µg/L | *DNE* | *DNE* | **7,830** | *DNE* | *NS* | *DNE* | **1,420** | **364** | **85** | **57,500** | **75,800** |
| 5/22/2017-5/24/2017 | µg/L | *DNE* | *DNE* | **2,960** | *DNE* | *NS* | *DNE* | **999** | **298** | **188** | **57,200** | **1,150** |
| 6/5/2017-6/9/2017 | µg/L | *DNE* | *DNE* | **2,440** | *DNE* | **374** | *DNE* | **876** | **432** | **71.9** | **51,900** | **34,600** |
| 7/10/2017-7/13/2017 | µg/L | *DNE* | *DNE* | **8,330** | *DNE* | **1,730** | *DNE* | **1,690** | **45.7** | **153** | **65,600** | **25,900** |
| 8/7/2017-8/10/2017 | µg/L | **11,600** | **18,200** | **10,900** | *DNE* | **1,730** | *DNE* | **1,340** | **62.7** | **49.8** | **55,500** | **79.7** |
| 9/1/2017-9/8/2017 | µg/L | **90** | **203** | **9,340** | *DNE* | **328** | *DNE* | **508** | **2,840** | **69.4** | **39,400** | **8,220** |
| 10/2/2017-10/9/2017 | µg/L | **13,700** | **290** | **1,810** | *DNE* | **349** | *DNE* | **615** | **23.4** | **16.9** | **49,700** | **31,000** |
| 11/3/2017-11/13/2017 | µg/L | **29** | **38.6** | **1,750** | *DNE* | **502** | *DNE* | **909** | **1,650** | **21.5** | **67,900** | **39,000** |
| 12/4/2017-12/8/2017 | µg/L | **41,000** | **186** | **6,270** | *DNE* | **205** | *DNE* | **1,360** | **39.8** | **21.4** | **44,500** | **158** |
| 1/2/2018-1/9/2018 | µg/L | **104** | **573** | **12,700** | *DNE* | **173** | *DNE* | **1,950** | **70.6** | **108** | **54,700** | **26.5** |
| 4/8/2018-4/13/2018 | µg/L | **576** | **452** | **6,920** | *DNE* | **402** | *DNE* | **27,900** | **756** | **1,050** | **38,400** | **13,500** |
| 7/30/2018-8/3/2018 | µg/L | **9,710** | **5,030** | **9,710** | *DNE* | **282** | *DNE* | **191** | **26,300** | **2,540** | **54,700** | **17,600** |
| 10/1/2018-10/5/2018 | µg/L | **143** | **3,240** | **13,000** | *DNE* | **110** | *DNE* | **90,100** | **12,200** | **256** | **53,800** | **16,600** |
| 12/10/2018-12/14/2018* | µg/L | **3,880** | **25,300** | **14,900** | *DNE* | **177** | *DNE* | **99,600** | **86,000** | **11** | **66,600** | **2,520** |
| 3/12/2019-3/19/2019* | µg/L | **2,460** | **21,500** | **6,720** | *DNE* | **7.5 J** | *DNE* | **122,000** | **24,200** | *10 U* | **57,500** | **591** |
| 5/3/2019-6/7/2019* | µg/L | **5,670** | **56,600** | **13,300** | *DNE* | *Abandoned* | **66,800** | **108,000** | **136,000** | *10 U* | **64,200** | **5,560** |
| 9/10/2019-9/23/2019* | µg/L | **5,940** | **72,000** | **10,500** | *DNE* | *Abandoned* | **71,700** | **122,000** | **48,300** | *11.2 B* | **53,300** | **7,730** |
| 12/3/2019-12/11/2019 | µg/L | **2,060** | **17,200** | **16,200** | *DNE* | *Abandoned* | **83,400** | **116,000** | **16,600** | **48.9** | **82,000** | **6,020** |
| 3/11/2020-3/23/2020* | µg/L | **8,120** | **14,100** | **12,900** | *DNE* | *Abandoned* | **70,700** | **117,000** | **39,000** | **33.4** | **65,600** | *NS* |
| 6/8/2020-6/30/2020* | µg/L | **13,700** | **34,900** | **19,400** | *DNE* | *Abandoned* | **76,600** | **94,400** | **400** | **4.5 J** | **77,800** | **940** |
| 9/9/2020-9/29/2020* | µg/L | **3.7 J** | **123** | *Destroyed* | *DNE* | *Abandoned* | **80,000** | **111,000** | *NS* | **5.4 J** | **79,100** | **1,090** |
| 11/5/2020-11/19/2020* | µg/L | **15,200** | **20,200** | *Destroyed* | *DNE* | *Abandoned* | **68,200** | **79.7** | *NS* | **28.3** | **73,700** | **550** |
| 5/26/2021-6/18/2021* | µg/L | **26,600** | **104** | *Destroyed* | *DNE* | *Abandoned* | **79,000** | **109,000** | *NS* | **2.6 J** | **93,600** | **6,130** |
| 10/4/2021-10/18/2021* | µg/L | **24,000** | **433** | *Destroyed* | *DNE* | *Abandoned* | *200 U* | **85,500** | **53,900** | *NS* | *NS* | *NS* |
| 11/29/2021-11/30/2021* | µg/L | *NS* | *NS* | *Destroyed* | *DNE* | *Abandoned* | **50,700** | *NS* | *NS* | *NS* | *NS* | *NS* |
| 2/23/2022-3/28/2022* | µg/L | **37,300** | **751** | *Destroyed* | *DNE* | *Abandoned* | **55,200** | *200 U* | **65,300** | *20 U* | **63,000** | **7,440** |
| 9/9/2022-9/15/2022* | µg/L | **29,010** | **8,598** | *Destroyed* | **3,063** | *Abandoned* | **60,560** | **97,570** | **47,770** | *NS* | *NS* | *NS* |
| 3/10/2023-4/10/2023* | µg/L | **30,440** | **41,190** | *Destroyed* | **11,250** | *Abandoned* | **53,290** | **51,260** | **307** | *10 U* | **78,950** | **103** |
| 9/08/2023-9/21/2023* | µg/L | *Abandoned* | *Abandoned* | *Destroyed* | **16,920** | *Abandoned* | **63,410** | *NS* | **50,180** | *NS* | *NS* | *NS* |
| 3/19/2024-4/11/2024* | µg/L | Abandoned | *Abandoned* | Destroyed | **196** | *Abandoned* | **60,490** | *NS* | **500** | **62,090** | **57,500** | **43.2** |
| 9/10/2024-9/19/2024* | µg/L | Abandoned | *Abandoned* | Destroyed | *500 U* | *Abandoned* | **81,220** | *NS* | **8,125** | *NS* | *NS* | *NS* |

**Bold indicates detection above the reporting limit**
NS = Not Sampled
DNE = Did Not Exist

*Indicates concentrations are for dissolved metals. All other events show total metals.

**TABLE 7**
**Intermediate Zinc Concentrations**
**Rod and Wire Mill Interim Measure Progress Report**

| Sampling Dates | Units | RW11-MWI | RW12-MWI | RW13-MWI | RW15-MWI | RW16-MWI | RW18-MWI | RW19-MWI | RW21-MWI | RW22-MWI | RW22R-MWI |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2024 Sampling Frequency | | Annually | Semiannually | Annually | Annually | Annually | Annually | Annually | Annually | NA | Semiannually |
| 4/1/2013 | µg/L | **249,000** | **263,000** | *DNE* | *DNE* | *DNE* | **996,000** | *DNE* | *DNE* | *NS* | *DNE* |
| 10/1/2013 | µg/L | **284,000** | **201,000** | *DNE* | *DNE* | *DNE* | **85,400** | *DNE* | *DNE* | *NS* | *DNE* |
| 6/1/2014 | µg/L | **229,000** | **296,000** | *DNE* | *DNE* | *DNE* | **2,220,000** | *DNE* | *DNE* | *NS* | *DNE* |
| 11/1/2014 | µg/L | **250,000** | **295,000** | *DNE* | *DNE* | *DNE* | **1,890,000** | *DNE* | *DNE* | *NS* | *DNE* |
| 5/1/2015 | µg/L | **1,120,000** | **291,000** | *DNE* | *DNE* | *DNE* | **708,000** | *DNE* | *DNE* | *NS* | *DNE* |
| 11/1/2015 | µg/L | *NS* | **387,000** | *DNE* | *DNE* | *DNE* | **576,000** | *DNE* | *DNE* | *NS* | *DNE* |
| 2/10/2017-2/16/2017 | µg/L | **368,000** | **249,000** | *DNE* | *DNE* | *DNE* | **728,000** | **5,900,000** | *DNE* | *NS* | *DNE* |
| 3/27/2017-3/30/2017 | µg/L | **301,000** | **216,000** | *DNE* | *DNE* | *DNE* | **592,000** | **4,650,000** | *DNE* | *NS* | *DNE* |
| 4/25/2017-4/28/2017 | µg/L | **288,000** | **188,000** | *DNE* | *DNE* | *DNE* | **633,000** | **7,010,000** | *DNE* | *NS* | *DNE* |
| 5/22/2017-5/24/2017 | µg/L | **336,000** | **232,000** | *DNE* | *DNE* | *DNE* | **246,000** | **5,370,000** | *DNE* | *NS* | *DNE* |
| 6/5/2017-6/9/2017 | µg/L | **201,000** | **226,000** | *DNE* | *DNE* | *DNE* | **694,000** | **6,720,000** | *DNE* | **303** | *DNE* |
| 7/10/2017-7/13/2017 | µg/L | **192,000** | **219,000** | *DNE* | *DNE* | *DNE* | **575,000** | **5,330,000** | *DNE* | **103** | *DNE* |
| 8/7/2017-8/10/2017 | µg/L | **147,000** | **156,000** | **308,000** | **3,210** | *DNE* | **290,000** | **3,360,000** | *DNE* | *NS* | *DNE* |
| 9/1/2017-9/8/2017 | µg/L | **134,000** | **156,000** | **1,160** | **71.1** | **20,200** | **382,000** | **2,500,000** | *DNE* | **43,000** | *DNE* |
| 10/2/2017-10/9/2017 | µg/L | **111,000** | **150,000** | **204,000** | **295** | **2,000** | **393,000** | **3,670,000** | *DNE* | **16,100** | *DNE* |
| 11/3/2017-11/13/2017 | µg/L | **207,000** | **140,000** | **172,000** | **825** | **441** | **323,000** | **3,400,000** | *DNE* | **3,700** | *DNE* |
| 12/4/2017-12/8/2017 | µg/L | **197,000** | **157,000** | **237** | **1,070** | **19,200** | **369,000** | **3,970,000** | *DNE* | **19,500** | *DNE* |
| 1/2/2018-1/9/2018 | µg/L | **225,000** | **117,000** | **8,600** | **5,540** | **16,200** | **370,000** | **3,840,000** | *DNE* | **27,200** | *DNE* |
| 4/8/2018-4/13/2018 | µg/L | **215,000** | **103,000** | **201,000** | **252** | **11,200** | **396,000** | **4,190,000** | *DNE* | **44,700** | *DNE* |
| 7/30/2018-8/3/2018 | µg/L | **15,700** | **2,410** | **274,000** | **18,600** | **1,230** | **330,000** | **4,880,000** | *DNE* | **73,300** | *DNE* |
| 10/1/2018-10/5/2018 | µg/L | **174,000** | **14,300** | **33.4** | **736** | **320** | **247,000** | **5,880,000** | *DNE* | **47,100** | *DNE* |
| 12/10/2018-12/14/2018* | µg/L | **176,000** | **109,000** | **116** | **6,540** | **6 J** | **318,000** | **7,580,000** | *DNE* | **68,100** | *DNE* |
| 3/12/2019-3/19/2019* | µg/L | **142,000** | **110,000** | **328,000** | **109,000** | **4.7 J** | **822,000** | **3,770,000** | *DNE* | **81,100** | *DNE* |
| 5/3/2019-6/7/2019* | µg/L | **121,000** | **111,000** | **97.7** | **16,400** | **4.9 J** | **279,000** | **7,280,000** | **624,000** | *NS* | **1,030** |
| 9/10/2019-9/23/2019* | µg/L | **120,000** | **104,000** | **122** | **168,000** | **13.1** | **640,000** | **3,460,000** | **570,000** | *NS* | **983** |
| 12/3/2019-12/11/2019 | µg/L | **173,000** | **43,500** | **246,000** | **179,000** | **22.7** | **849,000** | **5,690,000** | **539,000** | *NS* | **3,000** |
| 3/11/2020-3/23/2020* | µg/L | **151,000** | *NS* | **250,000** | **17.9** | **16.2** | **545,000** | **6,050,000** | **648,000** | *Abandoned* | **1,810** |
| 6/8/2020-6/30/2020* | µg/L | **128,000** | **86,400** | **27** | **5.8 J** | **7.3 J** | **252,000** | **6,450,000** | **470,000** | *Abandoned* | **4,350** |
| 9/9/2020-9/29/2020* | µg/L | *NS* | *NS* | **296,000** | **3,210** | **63.1** | **753,000** | **6,220,000** | **536,000** | *Abandoned* | **5,340** |
| 11/5/2020-11/19/2020* | µg/L | **166,000** | *NS* | **19.8** | **137** | **10.2** | **534,000** | **3,930,000** | **562,000** | *Abandoned* | **4,520** |
| 5/26/2021-6/18/2021* | µg/L | **188,000** | *NS* | **363,000** | **16,400** | **62.4** | **4,380** | **212,000** | **527,000** | *Abandoned* | **7,730** |
| 10/4/2021-10/18/2021* | µg/L | *NS* | *NS* | *NS* | *NS* | *NS* | *NS* | *NS* | *NS* | *Abandoned* | **9,800** |
| 11/29/2021-11/30/2021* | µg/L | *NS* | *NS* | *NS* | *NS* | *NS* | *NS* | *NS* | *NS* | *Abandoned* | *NS* |
| 2/23/2022-3/28/2022* | µg/L | **141,000** | **81,000** | **435,000** | **49,300** | **120** | **434,000** | **3,090,000** | **5,070,000** | *Abandoned* | **21,700** |
| 9/9/2022-9/15/2022* | µg/L | *NS* | **99,550** | *NS* | *NS* | *NS* | *NS* | *NS* | *NS* | *Abandoned* | **38,920** |
| 3/10/2023-4/10/2023* | µg/L | **101,800** | **28,220** | **479,900** | **100,800** | *10 U* | **406,100** | **9.94** | **445,600** | *Abandoned* | **68,800** |
| 9/08/2023-9/21/2023* | µg/L | *NS* | **78,100** | *NS* | *NS* | *NS* | *NS* | *NS* | *NS* | *Abandoned* | **87,920** |
| 3/19/2024-4/11/2024* | µg/L | **264** | **1,418** | **540,700** | **31.5** | *10 U* | **252,600** | **4,833,000** | **348,100** | *Abandoned* | **82,310** |
| 9/10/2024-9/19/2024* | µg/L | *NS* | **87,040** | *NS* | *NS* | *NS* | *NS* | *NS* | *NS* | *Abandoned* | **109,100** |

**Bold indicates detection above the reporting limit**
NS = Not Sampled
DNE = Did Not Exist

*Indicates concentrations are for dissolved metals. All other events show total metals.

**TABLE 7**
**Intermediate Zinc Concentrations**
**Rod and Wire Mill Interim Measure Progress Report**

| Sampling Dates | Units | RW23-MWI | RW24-MWI | RW25-MWI | RWA-MWI | RWB-MWI | RWD-MWI | RWE-MWI | RWF-MWI | RWG-MWI | RWH-MWI |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2024 Sampling Frequency | | Semiannually | Annually | Annually | Semiannually | Semiannually | Semiannually | Semiannually | Semiannually | Annually | Semiannually |
| 4/1/2013 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 10/1/2013 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 6/1/2014 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 11/1/2014 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 5/1/2015 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 11/1/2015 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 2/10/2017-2/16/2017 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 3/27/2017-3/30/2017 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 4/25/2017-4/28/2017 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 5/22/2017-5/24/2017 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 6/5/2017-6/9/2017 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 7/10/2017-7/13/2017 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 8/7/2017-8/10/2017 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 9/1/2017-9/8/2017 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 10/2/2017-10/9/2017 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 11/3/2017-11/13/2017 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 12/4/2017-12/8/2017 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 1/2/2018-1/9/2018 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 4/8/2018-4/13/2018 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 7/30/2018-8/3/2018 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 10/1/2018-10/5/2018 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 12/10/2018-12/14/2018* | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 3/12/2019-3/19/2019* | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 5/3/2019-6/7/2019* | µg/L | **109,000** | **650,000** | **413,000** | **375,000** | **18** | **36,200** | **112,000** | **41,900** | **332** | **226,000** |
| 9/10/2019-9/23/2019* | µg/L | **125,000** | **635,000** | **7,000** | **349,000** | **29.2** | **41,900** | **109,000** | **42,300** | **291** | **378,000** |
| 12/3/2019-12/11/2019 | µg/L | **111,000** | **538,000** | **462,000** | **396,000** | **47.8** | **52,600** | **118,000** | **58,800** | **362** | **502,000** |
| 3/11/2020-3/23/2020* | µg/L | **100,000** | **466,000** | **355,000** | **521,000** | **8.9 J** | **50,400** | **102,000** | **90,400** | **411** | **406,000** |
| 6/8/2020-6/30/2020* | µg/L | **116,000** | **378,000** | **443,000** | **441,000** | **8.4 J** | **59,300** | **114,000** | **108,000** | **465** | **474,000** |
| 9/9/2020-9/29/2020* | µg/L | **105,000** | **364,000** | **477,000** | **452,000** | **15.2** | **69,300** | **110,000** | **134,000** | **545** | **477,000** |
| 11/5/2020-11/19/2020* | µg/L | **95,600** | **258,000** | **445,000** | **406,000** | **13.5** | **64,200** | **80,800** | **110,000** | **522** | **618,000** |
| 5/26/2021-6/18/2021* | µg/L | **124,000** | **292,000** | **338,000** | **468,000** | **13.6** | **81,900** | **102,000** | **133,000** | *NS* | **578,000** |
| 10/4/2021-10/18/2021* | µg/L | **110,000** | *NS* | *NS* | **328,000** | **19.1 J** | **53,400** | **68,000** | **82,500** | *NS* | **388,000** |
| 11/29/2021-11/30/2021* | µg/L | *NS* | *NS* | *NS* | *NS* | *NS* | *NS* | *NS* | *NS* | **319** | *NS* |
| 2/23/2022-3/28/2022* | µg/L | **85,000** | **263,000** | **376,000** | **415,000** | **16.7** | **47,200** | **62,700** | **86,800** | **1,090** | **287,000** |
| 9/9/2022-9/15/2022* | µg/L | **1,113,200** | *NS* | *NS* | **340,500** | **18.9** | **49,020** | **58,890** | **89,070** | *NS* | **328,000** |
| 3/10/2023-4/10/2023* | µg/L | **114,900** | **294,700** | **419,800** | **309,600** | **17.1** | **46,840** | **53,380** | **70,650** | **1,872** | **430,500** |
| 9/08/2023-9/21/2023* | µg/L | **135,500** | *NS* | *NS* | **341,900** | **19.3** | **47,480** | **61,680** | **72,380** | *NS* | **397,700** |
| 3/19/2024-4/11/2024* | µg/L | **139,800** | *NS* | *NS* | **379,700** | **20.3** | **73,990** | **67,550** | **58,150** | **2,787** | **494,000** |
| 9/10/2024-9/19/2024* | µg/L | **144,200** | **651,300** | **773,300** | **337,700** | **14.6** | **93,910** | **70,970** | **71,140** | *NS* | **638,300** |

**Bold indicates detection above the reporting limit**
NS = Not Sampled
DNE = Did Not Exist

*Indicates concentrations are for dissolved metals. All other events show total metals.

**TABLE 7**
**Intermediate Zinc Concentrations**
**Rod and Wire Mill Interim Measure Progress Report**

| Sampling Dates | Units | RWI-MWI | RWJ-MWI | RWK-MWI | RWL-MWI | RWM-MWI | RWO-MWI | RWP-MWI | RWQ-MWI | RWR-MWI | RWS-MWI |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2024 Sampling Frequency | | Annually | Semiannually | Semiannually | Semiannually | Annually | Semiannually | Semiannually | Semiannually | Semiannually | Semiannually |
| 4/1/2013 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 10/1/2013 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 6/1/2014 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 11/1/2014 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 5/1/2015 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 11/1/2015 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 2/10/2017-2/16/2017 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 3/27/2017-3/30/2017 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 4/25/2017-4/28/2017 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 5/22/2017-5/24/2017 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 6/5/2017-6/9/2017 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 7/10/2017-7/13/2017 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 8/7/2017-8/10/2017 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 9/1/2017-9/8/2017 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 10/2/2017-10/9/2017 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 11/3/2017-11/13/2017 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 12/4/2017-12/8/2017 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 1/2/2018-1/9/2018 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 4/8/2018-4/13/2018 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 7/30/2018-8/3/2018 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 10/1/2018-10/5/2018 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 12/10/2018-12/14/2018* | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 3/12/2019-3/19/2019* | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 5/3/2019-6/7/2019* | µg/L | **632,000** | **1,580** | **21,100** | **169,000** | **162,000** | **249,000** | **3,210,000** | **357,000** | **2,560,000** | **797,000** |
| 9/10/2019-9/23/2019* | µg/L | **519,000** | **2,150** | **25,100** | **142,000** | **159,000** | **214,000** | **3,570,000** | **270,000** | **3,620,000** | **1,040,000** |
| 12/3/2019-12/11/2019 | µg/L | **554,000** | **3,140** | **21,600** | **124,000** | **152,000** | **204,000** | **3,880,000** | **258,000** | **4,050,000** | **946,000** |
| 3/11/2020-3/23/2020* | µg/L | **875,000** | **3,430** | **30,300** | **121,000** | **139,000** | **202,000** | **3,860,000** | **312,000** | **814,000** | **1,070,000** |
| 6/8/2020-6/30/2020* | µg/L | **775,000** | **805** | **21,400** | **96,300** | **128,000** | **223,000** | **3,160,000** | **255,000** | **2,530,000** | **74,300** |
| 9/9/2020-9/29/2020* | µg/L | *NS* | **744** | **36,800** | **116,000** | **138,000** | **204,000** | **3,810,000** | **280,000** | **1,830,000** | **760,000** |
| 11/5/2020-11/19/2020* | µg/L | *NS* | **1,060** | **26,500** | **126,000** | **125,000** | **155,000** | **3,520,000** | **257,000** | **996,000** | **919,000** |
| 5/26/2021-6/18/2021* | µg/L | **542,000** | **1,990** | **34,600** | **110,000** | **150,000** | **208,000** | **3,990,000** | **286,000** | **1,400,000** | **858,000** |
| 10/4/2021-10/18/2021* | µg/L | *NS* | **2,840** | **23,700** | **97,000** | *NS* | *200 U* | **14,300** | **256,000** | **48,000** | **649,000** |
| 11/29/2021-11/30/2021* | µg/L | *NS* | *NS* | *NS* | *NS* | *NS* | **1,380** | **526** | *NS* | *NS* | *NS* |
| 2/23/2022-3/28/2022* | µg/L | **424,000** | **6,330** | **19,600** | **75,200** | **94,900** | **114,000** | **2,530,000** | **221,000** | **599,000** | **633,000** |
| 9/9/2022-9/15/2022* | µg/L | *NS* | **1,325** | **16,940** | **79,440** | *NS* | **180,000** | **2,709,000** | **216,500** | **912,000** | **228,900** |
| 3/10/2023-4/10/2023* | µg/L | **557,800** | **5,894** | **15,630** | **76,850** | **98,340** | **149,200** | **72.0** | **19.1** | **2,677,000** | **759,700** |
| 9/08/2023-9/21/2023* | µg/L | *NS* | **6,992** | **22,520** | **88,270** | *NS* | **182,300** | **3,118,000** | **292,800** | **2,476,000** | **773,700** |
| 3/19/2024-4/11/2024* | µg/L | **563,700** | **7,502** | **38,260** | **47,080** | *NS* | **147,600** | **2,706,000** | **316,200** | **2,730,000** | **767,800** |
| 9/10/2024-9/19/2024* | µg/L | *NS* | **3,130** | **35,070** | **101,000** | **84,760** | **318,800** | **3,227,000** | **315,500** | **4,833,000** | **742,600** |

**Bold indicates detection above the reporting limit**
NS = Not Sampled
DNE = Did Not Exist

*Indicates concentrations are for dissolved metals. All other events show total metals.

**TABLE 8**
**Intermediate Cadmium Concentrations**
**Rod and Wire Mill Interim Measure Progress Report**

| Sampling Dates | Units | RW01-MWI | RW02-MWI | RW03-MWI | RW03R-MWI | RW05-MWI | RW05R-MWI | RW06-MWI | RW07-MWI | RW08-MWI | RW09-MWI | RW10-MWI |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2024 Sampling Frequency | | Semiannually | Semiannually | NA | Semiannually | NA | Semiannually | Semiannually | Semiannually | Annually | Annually | Annually |
| 4/1/2013 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | **0.75** | *DNE* | **13.1** | *DNE* | *DNE* | *DNE* | *DNE* |
| 10/1/2013 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | **1.2** | *DNE* | **24.8** | *DNE* | *DNE* | *DNE* | *DNE* |
| 6/1/2014 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | **4.1** | *DNE* | **63.2** | *DNE* | *DNE* | *DNE* | *DNE* |
| 11/1/2014 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | **1.8** | *DNE* | **40.9** | *DNE* | *DNE* | *DNE* | *DNE* |
| 5/1/2015 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | **13.3** | *DNE* | **27.6** | *DNE* | *DNE* | *DNE* | *DNE* |
| 11/1/2015 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *NS* | *DNE* | **41.9** | *DNE* | *DNE* | *DNE* | *DNE* |
| 2/10/2017-2/16/2017 | µg/L | *DNE* | *DNE* | **189** | *DNE* | *NS* | *DNE* | **12.5** | **1.2 J** | **0.49 J** | **3.1** | **446** |
| 3/27/2017-3/30/2017 | µg/L | *DNE* | *DNE* | **196** | *DNE* | *NS* | *DNE* | **9.2** | **4.6** | **0.39 J** | **4** | *3 U* |
| 4/25/2017-4/28/2017 | µg/L | *DNE* | *DNE* | **192** | *DNE* | *NS* | *DNE* | **14** | *3 U* | *3 U* | **5** | **198** |
| 5/22/2017-5/24/2017 | µg/L | *DNE* | *DNE* | **84** | *DNE* | *NS* | *DNE* | **20.4** | **1.1 J** | **1.5 J** | **11.1** | **2.5 J** |
| 6/5/2017-6/9/2017 | µg/L | *DNE* | *DNE* | **37.4** | *DNE* | **1.9 J** | *DNE* | **14.3** | **0.91 J** | **0.48 J** | **8.1** | **27.2** |
| 7/10/2017-7/13/2017 | µg/L | *DNE* | *DNE* | **138** | *DNE* | **17.5** | *DNE* | **10.2** | **1.2 J** | **1.3 J** | **12.9** | **16.3** |
| 8/7/2017-8/10/2017 | µg/L | **194** | **511** | **227** | *DNE* | **19.3** | *DNE* | **10.1** | **1 J** | **0.86 J** | **18.5** | *3 U* |
| 9/1/2017-9/8/2017 | µg/L | **0.51 J** | **3 J** | **214** | *DNE* | **3.7** | *DNE* | **4.5** | **11** | **0.77 J** | **9.1** | **17.7** |
| 10/2/2017-10/9/2017 | µg/L | **145** | **2.4 J** | **20.2** | *DNE* | **4.2** | *DNE* | **4.2** | *3 U* | *3 U* | **12** | **24.6** |
| 11/3/2017-11/13/2017 | µg/L | *3 U* | *3 U* | **25.2** | *DNE* | **4.9** | *DNE* | **5.4** | **5.1** | **0.88 J** | **8.8** | **63.7** |
| 12/4/2017-12/8/2017 | µg/L | **37.5** | **2.3 J** | **154** | *DNE* | **2.7 J** | *DNE* | **7.1** | **1.7 J** | **1.8 J** | **7.7** | *3 U* |
| 1/2/2018-1/9/2018 | µg/L | **2.4 J** | **14.5** | **259** | *DNE* | **2.2 J** | *DNE* | **8.4** | *3 U* | *3 U* | **2.1 J** | *3 U* |
| 4/8/2018-4/13/2018 | µg/L | **16.5** | **3** | **128** | *DNE* | **2.6 J** | *DNE* | **89.2** | **1.3 J** | **6.2** | **1.8 J** | **44.4** |
| 7/30/2018-8/3/2018 | µg/L | **250** | **79.9** | **236** | *DNE* | **1.3 J** | *DNE* | *3 U* | **52.9** | **14.1** | *3 U* | **44.7** |
| 10/1/2018-10/5/2018 | µg/L | *3 U* | **18** | **346** | *DNE* | *3 U* | *DNE* | **629** | **28.7** | **0.92 J** | **3.7** | **10.8** |
| 12/10/2018-12/14/2018* | µg/L | **9.3** | **191** | **342** | *DNE* | **0.76 J** | *DNE* | **752** | **344** | *3 U* | **0.96 J** | *3 U* |
| 3/12/2019-3/19/2019* | µg/L | *3 U* | **98.3** | **213** | *DNE* | *3 U* | *DNE* | **876** | **29.5** | *3 U* | **2 J** | **0.38 J** |
| 5/3/2019-6/7/2019* | µg/L | **19.4** | **785** | **449** | *DNE* | *Abandoned* | **2,570** | **885** | **453** | *3 U* | **3.8** | **0.86 J** |
| 9/10/2019-9/23/2019* | µg/L | **20.6** | **873** | **344** | *DNE* | *Abandoned* | **2,820** | **793** | **48.7** | *3.0 U* | **5.6** | **8.4** |
| 12/3/2019-12/11/2019 | µg/L | **8.8** | **277** | **546** | *DNE* | *Abandoned* | **2,700** | **673** | **38.1** | **0.59 J** | *4.2 B* | **13.9** |
| 3/11/2020-3/23/2020* | µg/L | **49.3** | **136** | **451** | *DNE* | *Abandoned* | **1,960** | **690** | **36** | *3 U* | **10.6** | *NS* |
| 6/8/2020-6/30/2020* | µg/L | **117** | **398** | **581** | *DNE* | *Abandoned* | **1,930** | **582** | **1.7 J** | **0.47 J** | **16.5** | **0.67 J** |
| 9/9/2020-9/29/2020* | µg/L | *3 U* | **0.69 J** | *Destroyed* | *DNE* | *Abandoned* | **1,650** | **530** | *NS* | **0.39 J** | **10.7** | **0.77 J** |
| 11/5/2020-11/19/2020* | µg/L | **162** | **208** | *Destroyed* | *DNE* | *Abandoned* | **1,790** | **0.66 J** | *NS* | **0.56 J** | **10.3** | **0.55 J** |
| 5/26/2021-6/18/2021* | µg/L | **277** | **0.58 J** | *Destroyed* | *DNE* | *Abandoned* | **1,570** | **616** | *NS* | **0.38 J** | **16** | **11.1** |
| 10/4/2021-10/18/2021* | µg/L | **322** | *1 U* | *Destroyed* | *DNE* | *Abandoned* | **1,470** | **604** | **49.1** | *NS* | *NS* | *NS* |
| 11/29/2021-11/30/2021* | µg/L | *NS* | *NS* | *Destroyed* | *DNE* | *Abandoned* | **16.8** | *NS* | *NS* | *NS* | *NS* | *NS* |
| 2/23/2022-3/28/2022* | µg/L | **565** | *2 U* | *Destroyed* | *DNE* | *Abandoned* | **1,660** | **626** | **107** | *200 U* | *2 U* | **13.3** |
| 9/9/2022-9/15/2022* | µg/L | **574** | **17.4** | *Destroyed* | **9.60** | *Abandoned* | **1,243** | **611** | **42.7** | *NS* | *NS* | *NS* |
| 3/10/2023-4/10/2023* | µg/L | **318** | **193** | *Destroyed* | **148** | *Abandoned* | **1,178** | **571** | **0.74** | *0.2 U* | **11.5** | **1.11** |
| 9/08/2023-9/21/2023* | µg/L | *Abandoned* | *Abandoned* | *Destroyed* | **234** | *Abandoned* | **1,451** | *NS* | **26.9** | *NS* | *NS* | *NS* |
| 3/19/2024-4/11/2024* | µg/L | *Abandoned* | *Abandoned* | *Destroyed* | *0.2 U* | *Abandoned* | **1,622** | *NS* | **1.52** | **12.0** | **6.33** | **0.35** |
| 9/10/2024-9/19/2024* | µg/L | *Abandoned* | *Abandoned* | *Destroyed* | *10 U* | *Abandoned* | **1,996** | *NS* | **8.48** | *NS* | *NS* | *NS* |

**Bold indicates detection above the reporting limit**
NS = Not Sampled
DNE = Did Not Exist

*Indicates concentrations are for dissolved metals. All other events show total metals.

**TABLE 8**
**Intermediate Cadmium Concentrations**
**Rod and Wire Mill Interim Measure Progress Report**

| Sampling Dates | Units | RW11-MWI | RW12-MWI | RW13-MWI | RW15-MWI | RW16-MWI | RW18-MWI | RW19-MWI | RW21-MWI | RW22-MWI | RW22R-MWI |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2024 Sampling Frequency | | Annually | Semiannually | Annually | Annually | Annually | Annually | Annually | Annually | NA | Semiannually |
| 4/1/2013 | µg/L | **438** | **4,300** | *DNE* | *DNE* | *DNE* | **73.1** | *DNE* | *DNE* | *NS* | *DNE* |
| 10/1/2013 | µg/L | **903** | **3,500** | *DNE* | *DNE* | *DNE* | **59.4** | *DNE* | *DNE* | *NS* | *DNE* |
| 6/1/2014 | µg/L | **361** | **4,740** | *DNE* | *DNE* | *DNE* | **134** | *DNE* | *DNE* | *NS* | *DNE* |
| 11/1/2014 | µg/L | **405** | **5,090** | *DNE* | *DNE* | *DNE* | **138** | *DNE* | *DNE* | *NS* | *DNE* |
| 5/1/2015 | µg/L | **25,000** | **6,000** | *DNE* | *DNE* | *DNE* | **113** | *DNE* | *DNE* | *NS* | *DNE* |
| 11/1/2015 | µg/L | *NS* | **9,780** | *DNE* | *DNE* | *DNE* | **47.2** | *DNE* | *DNE* | *NS* | *DNE* |
| 2/10/2017-2/16/2017 | µg/L | **1,690** | **4,740** | *DNE* | *DNE* | *DNE* | **70.3** | **3,760** | *DNE* | *NS* | *DNE* |
| 3/27/2017-3/30/2017 | µg/L | **1,490** | **3,530** | *DNE* | *DNE* | *DNE* | **63.8** | **3,450** | *DNE* | *NS* | *DNE* |
| 4/25/2017-4/28/2017 | µg/L | **1,800** | **2,730** | *DNE* | *DNE* | *DNE* | **119** | **3,380** | *DNE* | *NS* | *DNE* |
| 5/22/2017-5/24/2017 | µg/L | **2,600** | **3,820** | *DNE* | *DNE* | *DNE* | **92** | **2,770** | *DNE* | *NS* | *DNE* |
| 6/5/2017-6/9/2017 | µg/L | **218** | **2,260** | *DNE* | *DNE* | *DNE* | **65.1** | **2,280** | *DNE* | **0.35 J** | *DNE* |
| 7/10/2017-7/13/2017 | µg/L | **518** | **2,730** | *DNE* | *DNE* | *DNE* | **61.7** | **2,550** | *DNE* | *3 U* | *DNE* |
| 8/7/2017-8/10/2017 | µg/L | **163** | **2,220** | **31,800** | **10.1** | *DNE* | **74.4** | **1,670** | *DNE* | *NS* | *DNE* |
| 9/1/2017-9/8/2017 | µg/L | **274** | **1,820** | **66** | *3 U* | **1.7 J** | **72.2** | **1,320** | *DNE* | **2.3 J** | *DNE* |
| 10/2/2017-10/9/2017 | µg/L | **125** | **1,510** | **28,700** | *3 U* | *3 U* | **43.7** | **1,710** | *DNE* | *3 U* | *DNE* |
| 11/3/2017-11/13/2017 | µg/L | **1,460** | **1,380** | **24,500** | *3 U* | *3 U* | **66.6** | **1,770** | *DNE* | **3.8** | *DNE* |
| 12/4/2017-12/8/2017 | µg/L | **1,380** | **1,450** | **44.2** | **0.97 J** | **1.9 J** | **51.5** | **1,710** | *DNE* | **15.2** | *DNE* |
| 1/2/2018-1/9/2018 | µg/L | **1,400** | **1,270** | **1,240** | **1.6 J** | **1.2 J** | **63.5** | **1,880** | *DNE* | **4.1** | *DNE* |
| 4/8/2018-4/13/2018 | µg/L | **1,660** | **121** | **19,400** | *3 U* | **1.1 J** | **55.8** | **1,700** | *DNE* | *3 U* | *DNE* |
| 7/30/2018-8/3/2018 | µg/L | **4.7** | **134** | **21,000** | **15.3** | *3 U* | **35.1** | **1,560** | *DNE* | *3 U* | *DNE* |
| 10/1/2018-10/5/2018 | µg/L | **133** | **86.3** | **12.6** | *3 U* | *3 U* | **14.5** | **1,610** | *DNE* | *3 U* | *DNE* |
| 12/10/2018-12/14/2018* | µg/L | **1,160** | **1,220** | **3.2** | **12.9** | *3 U* | **44.7** | **1,900** | *DNE* | *3 U* | *DNE* |
| 3/12/2019-3/19/2019* | µg/L | **98.9** | **768** | **29,200** | **402** | *3 U* | **80.3** | **1,320** | *DNE* | *3 U* | *DNE* |
| 5/3/2019-6/7/2019* | µg/L | **586** | **1,520** | **51.1** | **64.2** | *3 U* | **38.0** | **2,420** | **50.2** | *NS* | *3 U* |
| 9/10/2019-9/23/2019* | µg/L | **517** | **1,780** | **12.8** | **589** | *3.0 U* | **50.4** | **1,580** | **23** | *NS* | *3.0 U* |
| 12/3/2019-12/11/2019 | µg/L | **476** | **420** | **22,500** | **605** | **0.36 J** | **87.6** | **1,500** | **33.1** | *NS* | *3.0 U* |
| 3/11/2020-3/23/2020* | µg/L | **365** | *NS* | **24,700** | **0.5 J** | **0.36 J** | **36.8** | **1,400** | **39.8** | *Abandoned* | *3 U* |
| 6/8/2020-6/30/2020* | µg/L | **75.1** | **716** | **15.4** | *3 U* | *3 U* | **16** | **3,390** | **34** | *Abandoned* | **2 J** |
| 9/9/2020-9/29/2020* | µg/L | *NS* | *NS* | **23,900** | **8** | *3 U* | **43.1** | **1,630** | **29.4** | *Abandoned* | **2.4 J** |
| 11/5/2020-11/19/2020* | µg/L | **179** | *NS* | **6.1** | **0.91 J** | *3 U* | **42.1** | **1,540** | **27.8** | *Abandoned* | **1.6 J** |
| 5/26/2021-6/18/2021* | µg/L | **175** | *NS* | **26,400** | **43.6** | **0.42 J** | *3 U* | **112** | **34.2** | *Abandoned* | **3.4** |
| 10/4/2021-10/18/2021* | µg/L | *NS* | *NS* | *NS* | *NS* | *NS* | *NS* | *NS* | *NS* | *Abandoned* | **2.5 J** |
| 11/29/2021-11/30/2021* | µg/L | *NS* | *NS* | *NS* | *NS* | *NS* | *NS* | *NS* | *NS* | *Abandoned* | *NS* |
| 2/23/2022-3/28/2022* | µg/L | **194** | **1,080** | **23,700** | **169** | *2 U* | **31.7** | **109** | **32.7** | *Abandoned* | **3.4** |
| 9/9/2022-9/15/2022* | µg/L | *NS* | **1,396** | *NS* | *NS* | *NS* | *NS* | *NS* | *NS* | *Abandoned* | **5.72** |
| 3/10/2023-4/10/2023* | µg/L | **203** | **315** | **35,700** | **408** | *0.2 U* | **12.5** | *0.2 U* | **46.3** | *Abandoned* | **5.19** |
| 9/08/2023-9/21/2023* | µg/L | *NS* | *NS* | *NS* | *NS* | *NS* | *NS* | *NS* | *NS* | *Abandoned* | **4.49** |
| 3/19/2024-4/11/2024* | µg/L | **1.45** | **289** | **38,540** | **4.68** | *0.2 U* | **7.66** | **260** | **30.4** | *Abandoned* | **1.89** |
| 9/10/2024-9/19/2024* | µg/L | *NS* | **1,128** | *NS* | *NS* | *NS* | *NS* | *NS* | *NS* | *Abandoned* | **1.56** |

**Bold indicates detection above the reporting limit**
NS = Not Sampled
DNE = Did Not Exist

*Indicates concentrations are for dissolved metals. All other events show total metals.

**TABLE 8**
**Intermediate Cadmium Concentrations**
**Rod and Wire Mill Interim Measure Progress Report**

| Sampling Dates | Units | RW23-MWI | RW24-MWI | RW25-MWI | RWA-MWI | RWB-MWI | RWD-MWI | RWE-MWI | RWF-MWI | RWG-MWI | RWH-MWI |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2024 Sampling Frequency | | Semiannually | Annually | Annually | Semiannually | Semiannually | Semiannually | Semiannually | Semiannually | Annually | Semiannually |
| 4/1/2013 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 10/1/2013 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 6/1/2014 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 11/1/2014 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 5/1/2015 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 11/1/2015 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 2/10/2017-2/16/2017 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 3/27/2017-3/30/2017 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 4/25/2017-4/28/2017 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 5/22/2017-5/24/2017 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 6/5/2017-6/9/2017 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 7/10/2017-7/13/2017 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 8/7/2017-8/10/2017 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 9/1/2017-9/8/2017 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 10/2/2017-10/9/2017 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 11/3/2017-11/13/2017 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 12/4/2017-12/8/2017 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 1/2/2018-1/9/2018 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 4/8/2018-4/13/2018 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 7/30/2018-8/3/2018 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 10/1/2018-10/5/2018 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 12/10/2018-12/14/2018* | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 3/12/2019-3/19/2019* | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 5/3/2019-6/7/2019* | µg/L | **2,270** | **1,580** | **507** | **6,830** | *3 U* | **395** | **700** | **859** | **23** | **92** |
| 9/10/2019-9/23/2019* | µg/L | **2,800** | **1,540** | **9.9** | **7,740** | *3.0 U* | **514** | **656** | **1,020** | **15.4** | **1,380** |
| 12/3/2019-12/11/2019 | µg/L | **2,680** | **1,250** | **622** | **9,020** | *3.0 U* | **586** | **707** | **1,340** | **26.0** | **3,580** |
| 3/11/2020-3/23/2020* | µg/L | **2,600** | **1,190** | **633** | **12,600** | *3 U* | **555** | **664** | **2,010** | **38.2** | **3,210** |
| 6/8/2020-6/30/2020* | µg/L | **2,740** | **1,050** | **652** | **10,200** | *3 U* | **515** | **609** | **2,580** | **26.7** | **4,610** |
| 9/9/2020-9/29/2020* | µg/L | **2,500** | **922** | **708** | **7,630** | **0.59 J** | **541** | **584** | **3,170** | **38.2** | **4,330** |
| 11/5/2020-11/19/2020* | µg/L | **2,340** | **842** | **703** | **10,100** | *3 U* | **596** | **527** | **3,330** | **40.0** | **6,650** |
| 5/26/2021-6/18/2021* | µg/L | **2,870** | **890** | **626** | **11,700** | **0.34 J** | **713** | **530** | **3,710** | *NS* | **6,760** |
| 10/4/2021-10/18/2021* | µg/L | **2,590** | *NS* | *NS* | **8,510** | *1 U* | **536** | **497** | **2,610** | *NS* | **4,220** |
| 11/29/2021-11/30/2021* | µg/L | *NS* | *NS* | *NS* | *NS* | *NS* | *NS* | *NS* | *NS* | **1.8** | *NS* |
| 2/23/2022-3/28/2022* | µg/L | **2,610** | **1,200** | **926** | **9,840** | *2 U* | **567** | **438** | **2,590** | **8.6** | **5,150** |
| 9/9/2022-9/15/2022* | µg/L | **2,844** | *NS* | *NS* | **8,587** | **0.062 J** | **488** | **399** | **2,263** | *NS* | **2,520** |
| 3/10/2023-4/10/2023* | µg/L | **3,005** | **1,113** | **640** | **8,051** | *0.2 U* | **477** | **355** | **1,903** | **51.0** | **4,700** |
| 9/08/2023-9/21/2023* | µg/L | **3,222** | *NS* | *NS* | **7,977** | *0.2 U* | **442** | **360** | **1,787** | *NS* | **3,385** |
| 3/19/2024-4/11/2024* | µg/L | **2,687** | *NS* | *NS* | **8,386** | *0.2 U* | **497** | **445** | **1,558** | **131** | **5,315** |
| 9/10/2024-9/19/2024* | µg/L | **3,342** | **2,122** | **1,156** | **8,451** | *0.2 U* | **504** | **424** | **1,653** | *NS* | **4,904** |

**Bold indicates detection above the reporting limit**
NS = Not Sampled
DNE = Did Not Exist

*Indicates concentrations are for dissolved metals. All other events show total metals.

**TABLE 8**
**Intermediate Cadmium Concentrations**
**Rod and Wire Mill Interim Measure Progress Report**

| Sampling Dates | Units | RWI-MWI | RWJ-MWI | RWK-MWI | RWL-MWI | RWM-MWI | RWO-MWI | RWP-MWI | RWQ-MWI | RWR-MWI | RWS-MWI |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2024 Sampling Frequency | | Annually | Semiannually | Semiannually | Semiannually | Annually | Semiannually | Semiannually | Semiannually | Semiannually | Semiannually |
| 4/1/2013 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 10/1/2013 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 6/1/2014 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 11/1/2014 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 5/1/2015 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 11/1/2015 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 2/10/2017-2/16/2017 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 3/27/2017-3/30/2017 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 4/25/2017-4/28/2017 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 5/22/2017-5/24/2017 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 6/5/2017-6/9/2017 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 7/10/2017-7/13/2017 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 8/7/2017-8/10/2017 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 9/1/2017-9/8/2017 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 10/2/2017-10/9/2017 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 11/3/2017-11/13/2017 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 12/4/2017-12/8/2017 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 1/2/2018-1/9/2018 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 4/8/2018-4/13/2018 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 7/30/2018-8/3/2018 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 10/1/2018-10/5/2018 | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 12/10/2018-12/14/2018* | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 3/12/2019-3/19/2019* | µg/L | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* | *DNE* |
| 5/3/2019-6/7/2019* | µg/L | **8,050** | **61.2** | **33.5** | **1,230** | **1,080** | **68** | **2,810** | **26.2** | **440** | *3 U* |
| 9/10/2019-9/23/2019* | µg/L | **8,120** | **11.8** | **56.5** | **1,240** | **1,200** | **72.1** | **6,990** | *3.0 U* | **535** | *3.0 U* |
| 12/3/2019-12/11/2019 | µg/L | **8,270** | **45.7** | **99.5** | **1,280** | **1,230** | **55.4** | **8,910** | **2.9 J** | **650** | **1.6 J** |
| 3/11/2020-3/23/2020* | µg/L | **13,300** | **30.0** | **89.1** | **1,170** | **1,120** | **54.3** | **5,560** | **1.9 J** | **340** | *3 U* |
| 6/8/2020-6/30/2020* | µg/L | **10,800** | **2.1 J** | **76.9** | **1,140** | **1,040** | **66.2** | **7,090** | **3.7** | **508** | **0.58 J** |
| 9/9/2020-9/29/2020* | µg/L | *NS* | **2.3 J** | **79.1** | **1,210** | **1,060** | **57.8** | **7,220** | **4.2** | **425** | **1.8 J** |
| 11/5/2020-11/19/2020* | µg/L | *NS* | **2.4 J** | **74.4** | **1,160** | **1,120** | **27.9** | **7,700** | **2.9 J** | **398** | **1.7 J** |
| 5/26/2021-6/18/2021* | µg/L | **6,810** | **31.3** | **97.8** | **1,290** | **1,220** | **35.8** | **8,430** | **6.1** | **367** | **0.86 J** |
| 10/4/2021-10/18/2021* | µg/L | *NS* | **49.1** | **77.6** | **1,230** | *NS* | **31.4** | **4,370** | **10.6** | **753** | **4.7 J** |
| 11/29/2021-11/30/2021* | µg/L | *NS* | *NS* | *NS* | *NS* | *NS* | **10.1** | **2.0** | *NS* | *NS* | *NS* |
| 2/23/2022-3/28/2022* | µg/L | **5,230** | **52.8** | **62.8** | **1,230** | **1,250** | **26.3** | **5,340** | **23.3** | **295** | *20 U* |
| 9/9/2022-9/15/2022* | µg/L | *NS* | **18.0** | **72.7** | **819** | *NS* | **27.3** | **6,136** | *2 U* | **340** | **25.7** |
| 3/10/2023-4/10/2023* | µg/L | **5,797** | **65.3** | **57.4** | **739** | **1,286** | **18.1** | **0.6083** | *0.2 U* | **531** | *0.2 U* |
| 9/08/2023-9/21/2023* | µg/L | *NS* | **80.6** | **89.9** | **851** | *NS* | **30.1** | **5,384** | **55.9** | **422** | *0.2 U* |
| 3/19/2024-4/11/2024* | µg/L | **7,153** | **110** | **169** | **788** | *NS* | **17.1** | **6,017** | **62.4** | **685** | **0.081** |
| 9/10/2024-9/19/2024* | µg/L | *NS* | **30.2** | **239** | **1,114** | **1,353** | **64.0** | **6,930** | **89.6** | **1,203** | **0.11 J** |

**Bold indicates detection above the reporting limit**
NS = Not Sampled
DNE = Did Not Exist

*Indicates concentrations are for dissolved metals. All other events show total metals.

**TABLE 9**
**2024 Intermediate and Deep Field Parameter Data**
**Rod and Wire Mill Interim Measure Progress Report**

| | | RW03R-MWI | | RW05R-MWI | | RW06R-MWD | | RW07-MWI | | RW08-MWI | | RW09-MWI | | RW10-MWI | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Parameters** | **Units** | **Mar-24** | **Sep-24** | **Mar-24** | **Sep-24** | **Mar-24** | **Sep-24** | **Mar-24** | **Sep-24** | **Mar-24** | **Sep-24** | **Mar-24** | **Sep-24** | **Mar-24** | **Sep-24** |
| pH | s.u. | 5.58 | 6.05 | 5.78 | 6.13 | 7.06 | *NS* | 6.15 | 5.93 | 5.56 | *NS* | 5.45 | *NS* | 6.56 | *NS* |
| Specific Conductance | ms/cm | 5.8 | 5.25 | 3.17 | 2.79 | 0.409 | *NS* | 3.5 | 3.13 | 3.18 | *NS* | 2.95 | *NS* | 1.27 | *NS* |
| Dissolved Oxygen | mg/L | 0.45 | 0 | 0.42 | 0.09 | 6.69 | *NS* | 1.74 | 0 | 0.82 | *NS* | 0.9 | *NS* | 2.2 | *NS* |
| ORP | mV | -16 | -14 | -32 | -66 | 163 | *NS* | 176 | 107 | -47 | *NS* | 5 | *NS* | 57 | *NS* |
| Turbidity | NTU | 4.88 | 3 | 12.2 | 0 | 2.6 | *NS* | 4.97 | 2.07 | 4.94 | *NS* | 1.83 | *NS* | 14.2 | *NS* |
| Depth To Water | ft | 12.55 | 12.7 | NA | 12 | NA | *NS* | 11.22 | 11.45 | NA | *11.15* | 11.38 | *11.04* | 11.4 | *12.17* |

| | | RW11-MWI | | RW12-MWI | | RW13-MWI | | RW15-MWI | | RW16-MWI | | RW18-MWI | | RW19-MWI | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Parameters** | **Units** | **Mar-24** | **Sep-24** | **Mar-24** | **Sep-24** | **Mar-24** | **Sep-24** | **Mar-24** | **Sep-24** | **Mar-24** | **Sep-24** | **Mar-24** | **Sep-24** | **Mar-24** | **Sep-24** |
| pH | s.u. | 6.49 | *NS* | 6.62 | 5.94 | 5.85 | *NS* | 11.34 | *NS* | 8.66 | *NS* | 5.28 | *NS* | 5.45 | *NS* |
| Specific Conductance | ms/cm | 0.692 | *NS* | 3.7 | 2.82 | 3.97 | *NS* | 2.48 | *NS* | 1.47 | *NS* | 3.1 | *NS* | 9.78 | *NS* |
| Dissolved Oxygen | mg/L | 7.19 | *NS* | 3.96 | 0.24 | 0.44 | *NS* | 0.3 | *NS* | 0.78 | *NS* | 1.16 | *NS* | 0.31 | *NS* |
| ORP | mV | 109 | *NS* | 72 | -12 | -80 | *NS* | -150 | *NS* | -112 | *NS* | 9 | *NS* | 6 | *NS* |
| Turbidity | NTU | 0.7 | *NS* | 1.41 | 3.96 | 11.1 | *NS* | 1.27 | *NS* | 2.6 | *NS* | 7.58 | *NS* | 22.5 | *NS* |
| Depth To Water | ft | 10.25 | *10.98* | NA | 11.95 | 12.04 | *12.78* | 11.8 | *11.8* | NA | *10.41* | NA | *12.2* | 10.45 | *11.28* |

| | | RW21-MWI | | RW22R-MWI | | RW23-MWI | | RW24-MWI | | RW25-MWI | | RWA-MWI | | RWB-MWI | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Parameters** | **Units** | **Mar-24** | **Sep-24** | **Mar-24** | **Sep-24** | **Mar-24** | **Sep-24** | **Mar-24** | **Sep-24** | **Mar-24** | **Sep-24** | **Mar-24** | **Sep-24** | **Mar-24** | **Sep-24** |
| pH | s.u. | 6.36 | *NS* | 5.64 | 5.8 | 5.51 | 5.58 | *NS* | 5.55 | *NS* | 5.35 | 4.81 | 5.06 | 5.56 | 5.85 |
| Specific Conductance | ms/cm | 4.66 | *NS* | 6.3 | 6.19 | 2.47 | 2.71 | *NS* | 3.43 | *NS* | 1.81 | 3.05 | 2.85 | 1.19 | 1.03 |
| Dissolved Oxygen | mg/L | 0.76 | *NS* | 8.06 | 0 | 0.6 | 0.18 | *NS* | 0.01 | *NS* | 0 | 0.33 | 0.58 | 1.2 | 0.04 |
| ORP | mV | -6 | *NS* | -53 | -53 | 14 | 38 | *NS* | 27 | *NS* | 89 | 153 | 130 | -27 | -75 |
| Turbidity | NTU | 2.6 | *NS* | 3.61 | 3.67 | 11 | 4.27 | *NS* | 3.27 | *NS* | 0.23 | 54.8 | 17.2 | 11.5 | 9.7 |
| Depth To Water | ft | NA | *12.15* | NA | 15.45 | 12.7 | 13.15 | *NS* | 11.08 | *NS* | 10.52 | 11.1 | 9.65 | NA | 18.58 |

| | | RWD-MWI | | RWE-MWI | | RWF-MWI | | RWG-MWI | | RWH-MWI | | RWI-MWI | | RWJ-MWI | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **RWG-MWS** | **Units** | **Mar-24** | **Sep-24** | **Mar-24** | **Sep-24** | **Mar-24** | **Sep-24** | **Mar-24** | **Sep-24** | **Mar-24** | **Sep-24** | **Mar-24** | **Sep-24** | **Mar-24** | **Sep-24** |
| pH | s.u. | 5.06 | 5.17 | 5.3 | 5.6 | 5.92 | 6.06 | 6.02 | *NS* | 5.79 | 5.52 | 5.66 | *NS* | 7.2 | 7.34 |
| Specific Conductance | ms/cm | 2.73 | 3.01 | 3.44 | 3.45 | 5.46 | 4.68 | 8.06 | *NS* | 3.9 | 3.31 | 4.13 | *NS* | 2.49 | 2.37 |
| Dissolved Oxygen | mg/L | 0.44 | 0 | 0.55 | 0 | 0.29 | 0 | 0.37 | *NS* | 0.44 | 0 | 0.39 | *NS* | 0.45 | 0.03 |
| ORP | mV | 83 | 15 | 35 | -50 | -55 | -59 | -74 | *NS* | -28 | -13 | -62 | *NS* | -144 | -175 |
| Turbidity | NTU | 3.29 | 0 | 39.5 | 1.1 | 0.45 | 0 | 56.8 | *NS* | 3.96 | 4.3 | 7.28 | *NS* | 3.32 | 4.08 |
| Depth To Water | ft | 13.92 | 13.83 | 13.03 | 12.9 | NA | 11.45 | NA | *8.75* | 10.49 | 10.65 | NA | *11.46* | 13.52 | 12.7 |

**TABLE 9**
**2024 Intermediate and Deep Field Parameter Data**
**Rod and Wire Mill Interim Measure Progress Report**

| | | RWK-MWI | | RWL-MWI | | RWM-MWI | | RWO-MWI | | RWP-MWI | | RWQ-MWI | | RWR-MWI | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **RWG-MWS** | **Units** | **Mar-24** | **Sep-24** | **Mar-24** | **Sep-24** | **Mar-24** | **Sep-24** | **Mar-24** | **Sep-24** | **Mar-24** | **Sep-24** | **Mar-24** | **Sep-24** | **Mar-24** | **Sep-24** |
| pH | s.u. | 6.19 | 6.23 | 5.96 | 6.15 | *NS* | 5.7 | 5.74 | 5.26 | 4.63 | 4.67 | 5.43 | 5.55 | 5.2 | 5.52 |
| Specific Conductance | ms/cm | 2.15 | 2.41 | 3.02 | 2.64 | *NS* | 1.99 | 3.07 | 2.89 | 8.51 | 8.11 | 3.66 | 3.64 | 7.06 | 6.67 |
| Dissolved Oxygen | mg/L | 0.49 | 0 | 0.31 | 0 | *NS* | 0.01 | 0.64 | 1.96 | 0.53 | 0.01 | 0.63 | 0.45 | 0.55 | 0 |
| ORP | mV | -13 | -25 | -17 | -35 | *NS* | 24 | -59 | 31.0 | 187 | 194 | -4 | 13 | 60 | 58 |
| Turbidity | NTU | 2.27 | 0 | 1.34 | 2.64 | *NS* | 5 | 3.68 | 1.22 | 10.9 | 4.9 | 4.6 | 1.28 | 20 | 3.96 |
| Depth To Water | ft | 13.8 | 12.87 | 11.18 | 13.05 | *NS* | 13.64 | NA | 10.15 | 11.42 | 12.95 | NA | 15.58 | NA | 12.19 |

| | | RWS-MWI | |
|---|---|---|---|
| **RWG-MWS** | **Units** | **Mar-24** | **Sep-24** |
| pH | s.u. | 5.61 | 5.52 |
| Specific Conductance | ms/cm | 6.65 | 7.16 |
| Dissolved Oxygen | mg/L | 0.28 | 0 |
| ORP | mV | -32 | -16 |
| Turbidity | NTU | 4.63 | 3.57 |
| Depth To Water | ft | 15.5 | 15.88 |

Access to wells RW24-MWI, RW25-MWI, and RWM-MWI were blocked during the Spring 2024 sampling event. They were sampled during the Fall 2024 sampling event to fulfill the annual sampling quota.
NS = Not Sampled

**TABLE 10**
**Statistically Significant Trends**
**Rod and Wire Mill Interim Measure Progress Report**

| Zone | Monitoring Area | Well ID | Parameter Name | Statistical Trend |
|---|---|---|---|---|
| Shallow | Upgradient | RW19-MWS | Cadmium | Downward |
| | | RWR-MWS | Cadmium | Downward |
| | | RWS-MWS | Cadmium | Downward |
| | | | Zinc | Upward |
| | Delineation | RW21-MWS | Cadmium | Downward |
| | | RWI-MWS | Zinc | Downward |
| | | RWO-MWS | Cadmium | Downward |
| | | | Zinc | Downward |
| | Interior | RW09-MWS | Zinc | Upward |
| | | RW11-MWS | Zinc | Upward |
| | | RW12-MWS | Cadmium | Downward |
| | | RW14-MWS | Cadmium | Upward |
| | | | Zinc | Upward |
| | | RW15-MWS | Cadmium | Downward |
| | | | Zinc | Downward |
| | | RW16-MWS | Cadmium | Downward |
| | | | Zinc | Downward |
| | | RW18-MWS | Cadmium | Downward |
| | | | Zinc | Downward |
| | | RW23-MWS | Cadmium | Downward |
| | | RWN-MWS | Cadmium | Downward |
| | | | Zinc | Downward |
| | Focused | RWJ-MWS | Cadmium | Downward |
| | | RWK-MWS | Cadmium | Downward |
| | | | Zinc | Upward |
| | | RWL-MWS | Cadmium | Downward |
| | Downgradient Perimeter | RW06R-MWS | Cadmium | Downward |
| | | RW07-MWS | Zinc | Upward |
| | | RW08-MWS | Cadmium | Downward |
| | | RW22R-MWS | Cadmium | Downward |
| | | RWB-MWS | Cadmium | Downward |
| | | | Zinc | Downward |
| | | RWD-MWS | Cadmium | Downward |
| | | RWE-MWS | Cadmium | Upward |
| | | | Zinc | Upward |
| | | RWF-MWS | Cadmium | Downward |
| | | | Zinc | Downward |

**TABLE 10**
**Statistically Significant Trends**
**Rod and Wire Mill Interim Measure Progress Report**

| Zone | Monitoring Area | Well ID | Parameter Name | Statistical Trend |
|---|---|---|---|---|
| Intermediate | Upgradient | RW19-MWI | Cadmium | Downward |
| | | RWS-MWI | Zinc | Downward |
| | Delineation | RW21-MWI | Zinc | Downward |
| | | RWH-MWI | Cadmium | Upward |
| | | RWO-MWI | Cadmium | Downward |
| | | | Zinc | Downward |
| | Interior | RW09-MWI | Zinc | Upward |
| | | RW10-MWI | Cadmium | Downward |
| | | | Zinc | Downward |
| | | RW11-MWI | Cadmium | Downward |
| | | | Zinc | Downward |
| | | RW12-MWI | Cadmium | Downward |
| | | | Zinc | Downward |
| | | RW16-MWI | Cadmium | Downward |
| | | | Zinc | Downward |
| | | RW18-MWI | Cadmium | Downward |
| | | RW23-MWI | Cadmium | Upward |
| | | RW24-MWI | Zinc | Downward |
| | | RW25-MWI | Cadmium | Upward |
| | | RWM-MWI | Zinc | Downward |
| | | | Cadmium | Upward |
| | Focused | RWJ-MWI | Zinc | Upward |
| | | RWL-MWI | Cadmium | Downward |
| | | | Zinc | Downward |
| | Downgradient Perimeter | RW05R-MWI | Cadmium | Downward |
| | | RW07-MWI | Cadmium | Upward |
| | | | Zinc | Upward |
| | | RW08-MWI | Zinc | Downward |
| | | RW22R-MWI | Cadmium | Upward |
| | | | Zinc | Upward |
| | | RWA-MWI | Cadmium | Upward |
| | | RWB-MWI | Cadmium | Downward |
| | | RWE-MWI | Cadmium | Downward |
| | | | Zinc | Downward |
| | | RWG-MWI | Cadmium | Upward |
| | | | Zinc | Upward |

*Note: Cadmium and zinc in all wells underwent trend testing. If the result of the testing was that no upward or downward trend was identified for a parameter at a particular well, it was not included in this table.*

# TABLE 11
## Average Historical Shallow Zone Concentrations
## Rod and Wire Mill Interim Measure Progress Report

| Shallow Zone Cadmium Concentration (µg/L) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Well Group** | **Well** | **2015** | **2017** | **2018** | **2019** | **2020** | **2021** | **2022** | **2023** | **2024** | **% Change from Earliest Yearly Average** |
| Upgradient | RW19-MWS | NA | 6.4 | 3.4 | 1.4 | 1.8 | NS | NS | NS | NS | NA |
| Interior | RW09-MWS | NA | 14.0 | 13.0 | 13.3 | 16.3 | NS | NS | NS | NS | NA |
| | RW11-MWS | NA | 1.8 | 15.0 | 1.8 | 2.2 | 3.4 | 1.0 | 3.8 | 0.088 | -95% |
| | RW12-MWS | 3.8 | 37.6 | 9.3 | 3.6 | 5.2 | 0.5 | 3.0 | 9.8 | 4.39 | 15% |
| | RW14-MWS | NA | 2,088 | 3,440 | 3,350 | 3,218 | NS | NS | NS | NS | NA |
| | RW15-MWS | NA | 37.1 | 59.1 | 12.6 | 2.0 | NS | NS | NS | NS | NA |
| | RW16-MWS | NA | 1.5 | 1.5 | 1.2 | 1.5 | 1.5 | 1.0 | 0.1 | 0.066 | -96% |
| | RW18-MWS | 100 | 244 | 137 | 1.6 | 1.5 | 1.5 | 1.0 | 0.1 | 0.38 | -100% |
| Downgradient Perimeter | RW01-MWS | NA | 24.8 | 7.2 | 3.2 | 2.1 | 0.4 | 0.6 | 0.5 | NS | NA |
| | RW02-MWS | NA | 8.4 | 9.4 | 2.0 | 0.6 | 2.0 | 0.1 | 0.1 | NS | NA |
| | RW03R-MWS | NA | 6.6 | 12.9 | 15.2 | 16.7 | NS | 0.1 | 0.2 | 0.062 | -99% |
| | RW04-MWS | 2.8 | 1.1 | 1.5 | 1.3 | 0.9 | NS | NS | NS | NS | NA |
| | RW05-MWS | NA | 3.3 | 1.5 | 1.5 | 0.5 | 1.0 | 0.1 | 0.0 | NS | NA |
| | RW06R-MWS | NA | NA | 1.2 | 1.5 | 1.0 | 1.5 | 1.0 | 0.1 | 0.1 | -91% |
| | RW07-MWS | NA | 3.1 | 4.6 | 3.0 | 3.5 | 1.7 | 16.6 | 2.5 | 4.38 | 43% |
| | RW08-MWS | NA | 3.4 | 1.4 | 1.2 | 1.3 | NS | NS | NS | NS | NA |

| Shallow Zone Zinc Concentration (µg/L) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Well Group** | **Well** | **2015** | **2017** | **2018** | **2019** | **2020** | **2021** | **2022** | **2023** | **2024** | **% Change from Earliest Yearly Average** |
| Upgradient | RW19-MWS | NA | 6,082 | 8,226 | 3,190 | 9,200 | NS | NS | NS | NS | NA |
| Interior | RW09-MWS | NA | 10,982 | 9,856 | 16,400 | 33,125 | NS | NS | NS | NS | NA |
| | RW11-MWS | NA | 12,933 | 46,100 | 33,475 | 41,975 | 61,000 | 13,500 | 58,030 | 254 | -98% |
| | RW12-MWS | 2,608 | 38,761 | 6,516 | 3,086 | 4,660 | 4,960 | 17,100 | 20,125 | 5,935 | 128% |
| | RW14-MWS | NA | 38,340 | 69,380 | 70,825 | 62,375 | NS | NS | NS | NS | NA |
| | RW15-MWS | NA | 3,737 | 4,002 | 424 | 30 | NS | NS | NS | NS | NA |
| | RW16-MWS | NA | 32 | 26.6 | 35.2 | 9.0 | 3.0 | 10.0 | 10.4 | 5.0 | -84% |
| | RW18-MWS | 3,691 | 13,503 | 7,648 | 17.3 | 8.6 | 20.1 | 100.0 | 12.6 | 20.0 | -99% |
| Downgradient Perimeter | RW01-MWS | NA | 11,632 | 32,460 | 14,875 | 6,800 | 4,640 | 8,853 | 10,390 | NS | NA |
| | RW02-MWS | NA | 3,308 | 9,146 | 15,749 | 3,360 | 238 | 21,902 | 18,640 | NS | NA |
| | RW03R-MWS | NA | 13,958 | 27,920 | 16,668 | 17,800 | NS | 102 | 370 | 25.8 | -100% |
| | RW04-MWS | 2,330 | 145 | 180 | 239 | 62 | NS | NS | NS | NS | NA |
| | RW05-MWS | NA | 1,617 | 34.3 | 14.2 | 7.4 | 12.4 | 35.7 | 14.5 | NS | NA |
| | RW06R-MWS | NA | NA | 9.9 | 8.8 | 9.1 | 5.0 | 10.0 | 5.0 | 3.55 | -64% |
| | RW07-MWS | NA | 131 | 230 | 149 | 172 | 298 | 406.0 | 96.1 | 149 | 14% |
| | RW08-MWS | NA | 3,436 | 7,320 | 7,125 | 6,558 | NS | NS | NS | NS | NA |

Positive % change
Negative % change
non-detect (1/2 Reporting Limit)
NA = Not Applicable
NS = Not Sampled
Notes:
1. If a well was sampled twice in a year, then the average concentration is included in the above table.
2. If a well was sampled twice in a year, and one result is detected and one result is non-detect, then the detected result is included in the above table.
3. If a well was sampled only once and the result was non-detect, then 1/2 of the reporting limit is included in the above table.
Combined data shown for RW06-MWS/RW06R-MWS and RW03-MWS/RW03R-MWS

# TABLE 12
## Average Historical Intermediate Zone Concentrations
## Rod and Wire Mill Interim Measure Progress Report

| Average Cadmium Concentration (µg/L) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Well Group** | **Well** | **2015** | **2017** | **2018** | **2019** | **2020** | **2021** | **2022** | **2023** | **2024** | **% Change from Earliest Yearly Average** |
| Upgradient | RW19-MWI | NA | 2,397 | 1,748 | 1,705 | 1,990 | 112 | 109 | 0.1 | 260 | -89% |
| Interior | RW09-MWI | NA | 9.1 | 2.0 | 3.2 | 12.0 | 16.0 | 1 | 11.5 | 6.33 | -31% |
| | RW10-MWI | NA | 72.8 | 20.6 | 5.9 | 0.7 | 11.1 | 13 | 1.1 | 0.35 | -100% |
| | RW11-MWI | 25,000 | 1,065 | 872 | 419 | 206 | 175 | 194 | 203 | 1.45 | -100% |
| | RW12-MWI | 7,890 | 2,563 | 578 | 1,122 | 716 | NS | 1,238 | 315 | 709 | -91% |
| | RW13-MWI | 44,500 | 17,022 | 8,334 | 12,941 | 12,155 | 26,400 | 23,700 | 35,700 | 38,540 | -13% |
| | RW15-MWI | NA | 3.1 | 6.8 | 415 | 2.7 | 43.6 | 169 | 408 | 4.68 | 50% |
| | RW16-MWI | NA | 1.8 | 1.2 | 0.4 | 0.4 | 0.42 | 1 | 0.1 | 0.1 | -94% |
| | RW18-MWI | 80.1 | 70.9 | 79.8 | 64.1 | 34.5 | 1.5 | 32 | 12 | 7.66 | -90% |
| Downgradient Perimeter | RW01-MWI | NA | 75.7 | 59.2 | 12.6 | 82.5 | 299.5 | 570 | 318 | NS | NA |
| | RW02-MWI | NA | 104 | 59.5 | 508 | 186 | 0.6 | 17.4 | 193 | NS | NA |
| | RW03R-MWI | NA | 134 | 285 | 388 | 516 | NS | 9.6 | 191 | 2.5 | -98% |
| | RW06-MWI | 34.8 | 10.2 | 292 | 807 | 451 | 610 | 618 | 571 | NS | NA |
| | RW07-MWI | NA | 2.8 | 93.9 | 142 | 18.9 | 49.1 | 74.9 | 13.8 | 5.0 | 79% |
| | RW08-MWI | NA | 1.0 | 4.8 | 1.3 | 0.7 | 0.38 | 100 | 0.1 | 12.0 | 1051% |

| Average Zinc Concentration (µg/L) | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Well Group** | **Well** | **2015** | **2017** | **2018** | **2019** | **2020** | **2021** | **2022** | **2023** | **2024** | **% Change from Earliest Yearly Average** |
| Upgradient | RW19-MWI | NA | 4,716,364 | 5,278,000 | 5,050,000 | 5,662,500 | 212,000 | 3,090,000 | 10 | 4,833,000 | 2% |
| Interior | RW09-MWI | NA | 53,827 | 52,740 | 64,250 | 74,050 | 93,600 | 63,000 | 78,950 | 57,500 | 7% |
| | RW10-MWI | NA | 29,084 | 10,143 | 4,975 | 860 | 6,130 | 7,440 | 103 | 43.2 | -100% |
| | RW11-MWI | 1,120,000 | 225,636 | 158,940 | 139,000 | 148,333 | 188,000 | 141,000 | 101,800 | 264 | -100% |
| | RW12-MWI | 339,000 | 189,909 | 68,142 | 92,125 | 86,400 | NS | 90,275 | 53,160 | 44,229 | -87% |
| | RW13-MWI | 658,000 | 137,079 | 96,762 | 143,555 | 136,512 | 363,000 | 435,000 | 479,900 | 540,700 | -18% |
| | RW15-MWI | NA | 1,094 | 6,374 | 118,100 | 843 | 16,400 | 49,300 | 100,800 | 31.5 | -97% |
| | RW16-MWI | NA | 10,460 | 5,861 | 11.4 | 29.8 | 62.4 | 120 | 5 | 5 | -100% |
| | RW18-MWI | 642,000 | 475,000 | 332,400 | 647,500 | 521,000 | 4,380 | 434,000 | 406,100 | 252,600 | -61% |
| Downgradient Perimeter | RW01-MWI | NA | 13,284 | 3,107 | 4,033 | 9,256 | 25,300 | 33,155 | 30,440 | NS | NA |
| | RW02-MWI | NA | 3,784 | 6,839 | 41,825 | 17,331 | 269 | 4,675 | 41,190 | NS | NA |
| | RW03R-MWI | NA | 6,419 | 10,866 | 11,680 | 16,150 | NS | 3,063 | 14,085 | 196 | -97% |
| | RW06-MWI | 6,045 | 1,209 | 43,988 | 117,000 | 80,620 | 97,250 | 48,835 | 51,260 | NS | NA |
| | RW07-MWI | NA | 719 | 25,985 | 56,275 | 19,700 | 53,900 | 65,300 | 25,244 | 4,313 | 500% |
| | RW08-MWI | NA | 81.8 | 800 | 16.0 | 17.9 | 2.6 | 10 | 5 | 62,090* | NA |

Positive % change
Negative % change
non-detect (1/2 Reporting Limit)
NA = Not Applicable
NS = Not Sampled
Notes:
1. If a well was sampled twice in a year, then the average concentration is included in the above table.
2. If a well was sampled twice in a year, and one result is detected and one result is non-detect, then the detected result is included in the above table.
3. If a well was sampled only once and the result was non-detect, then 1/2 of the reporting limit is included in the above table.
Combined data shown for RW03-MWI/RW03R-MWI
* RW08-MWI Spring 2024 sample is suspected to be anomalous. Therefore, Percent Change has not been calculated for this year.
The RW13-MWI concentrations for 2015 are actually results for a sample from RW-057-PZ, a PDI piezometer existing in November 2015 at a location within a few feet of the current location of RW13-MWI.

# APPENDIX A

# RWM Lab Report Index

| Sample ID | Sample Date | Event Date | Lab Job ID |
|---|---|---|---|
| RWB-MWS | 3/19/2024 | 3/1/2024 | L2414945 |
| RWB-MWI | 3/19/2024 | 3/1/2024 | |
| RWE-MWS | 3/19/2024 | 3/1/2024 | L2415158 |
| RWE-MWI | 3/19/2024 | 3/1/2024 | |
| RWD-MWS | 3/19/2024 | 3/1/2024 | |
| RWD-MWI | 3/19/2024 | 3/1/2024 | |
| RWQ-MWS | 3/19/2024 | 3/1/2024 | |
| RWQ-MWI | 3/19/2024 | 3/1/2024 | |
| RW03R-MWS | 3/20/2024 | 3/1/2024 | |
| RW03R-MWI | 3/20/2024 | 3/1/2024 | |
| RW12-MWS | 3/20/2024 | 3/1/2024 | L2415529 |
| RW12-MWI | 3/20/2024 | 3/1/2024 | |
| RWA-MWS | 3/20/2024 | 3/1/2024 | |
| RWA-MWI | 3/20/2024 | 3/1/2024 | |
| RWS-MWS | 3/20/2024 | 3/1/2024 | |
| RWS-MWI | 3/20/2024 | 3/1/2024 | |
| RWJ-MWS | 3/21/2024 | 3/1/2024 | L2415551 |
| RWJ-MWI | 3/21/2024 | 3/1/2024 | |
| RWK-MWS | 3/21/2024 | 3/1/2024 | |
| RWK-MWI | 3/21/2024 | 3/1/2024 | |
| RW16-MWS | 3/25/2024 | 3/1/2024 | L2416133 |
| RW16-MWI | 3/25/2024 | 3/1/2024 | |
| RWN-MWS | 3/25/2024 | 3/1/2024 | |
| RW13-MWI | 3/25/2024 | 3/1/2024 | |
| RW15-MWI | 3/25/2024 | 3/1/2024 | |
| RW18-MWS | 3/25/2024 | 3/1/2024 | |
| RW18-MWI | 3/29/2024 | 3/1/2024 | L2417351 |
| RWR-MWS | 3/29/2024 | 3/1/2024 | |
| RWR-MWI | 3/29/2024 | 3/1/2024 | |
| RW09-MWI | 3/29/2024 | 3/1/2024 | |
| RWH-MWS | 3/29/2024 | 3/1/2024 | |
| RWH-MWI | 3/29/2024 | 3/1/2024 | |
| RW06R-MWS | 4/1/2024 | 3/1/2024 | L2417909 |
| RW06R-MWD | 4/1/2024 | 3/1/2024 | |
| RW23-MWS | 4/1/2024 | 3/1/2024 | |
| RW23-MWI | 4/1/2024 | 3/1/2024 | |
| RW11-MWS | 4/2/2024 | 3/1/2024 | |
| RW11-MWI | 4/2/2024 | 3/1/2024 | |
| RWI-MWS | 4/4/2024 | 3/1/2024 | L2418553 |
| RWI-MWI | 4/4/2024 | 3/1/2024 | |
| RWL-MWS | 4/4/2024 | 3/1/2024 | |
| RWL-MWI | 4/4/2024 | 3/1/2024 | |
| RW10-MWI | 4/4/2024 | 3/1/2024 | |
| RW19-MWI | 4/4/2024 | 3/1/2024 | |
| RWP-MWI | 4/4/2024 | 3/1/2024 | |
| RW21-MWI | 4/5/2024 | 3/1/2024 | L2418751 |
| RWO-MWS | 4/5/2024 | 3/1/2024 | |
| RWO-MWI | 4/5/2024 | 3/1/2024 | |

| Sample ID | Sample Date | Event Date | Lab Job ID |
|---|---|---|---|
| RW07-MWS | 4/8/2024 | 3/1/2024 | L2419292 |
| RW07-MWI | 4/8/2024 | 3/1/2024 | |
| RW22R-MWS | 4/9/2024 | 3/1/2024 | |
| RW22R-MWI | 4/9/2024 | 3/1/2024 | |
| RWF-MWS | 4/9/2024 | 3/1/2024 | |
| RWF-MWI | 4/9/2024 | 3/1/2024 | |
| RW05R-MWI | 4/9/2024 | 3/1/2024 | |
| RWG-MWI | 4/9/2024 | 3/1/2024 | |
| RW08-MWI | 4/11/2024 | 3/1/2024 | L2420048 |
| RWB-MWS | 9/10/2024 | 9/1/2024 | L2451814 |
| RWB-MWI | 9/10/2024 | 9/1/2024 | |
| RWD-MWS | 9/10/2024 | 9/1/2024 | |
| RWD-MWI | 9/10/2024 | 9/1/2024 | |
| RWE-MWS | 9/10/2024 | 9/1/2024 | |
| RWE-MWI | 9/10/2024 | 9/1/2024 | |
| RWF-MWS | 9/11/2024 | 9/1/2024 | L2452147 |
| RWF-MWI | 9/11/2024 | 9/1/2024 | |
| RW05R-MWI | 9/11/2024 | 9/1/2024 | |
| RWA-MWS | 9/11/2024 | 9/1/2024 | |
| RWA-MWI | 9/11/2024 | 9/1/2024 | |
| RW22R-MWS | 9/11/2024 | 9/1/2024 | |
| RW22R-MWI | 9/12/2024 | 9/1/2024 | L2452536 |
| RW07-MWI | 9/12/2024 | 9/1/2024 | |
| RWJ-MWS | 9/12/2024 | 9/1/2024 | |
| RWJ-MWI | 9/12/2024 | 9/1/2024 | |
| RWK-MWS | 9/12/2024 | 9/1/2024 | |
| RWK-MWI | 9/12/2024 | 9/1/2024 | |
| RWL-MWS | 9/12/2024 | 9/1/2024 | |
| RW12-MWS | 9/16/2024 | 9/1/2024 | L2453048 |
| RW12-MWI | 9/16/2024 | 9/1/2024 | |
| RW23-MWS | 9/16/2024 | 9/1/2024 | |
| RW23-MWI | 9/16/2024 | 9/1/2024 | |
| RWM-MWI | 9/16/2024 | 9/1/2024 | |
| RWL-MWI | 9/16/2024 | 9/1/2024 | |
| RW24-MWI | 9/17/2024 | 9/1/2024 | L2453352 |
| RW25-MWI | 9/17/2024 | 9/1/2024 | |
| RWR-MWS | 9/17/2024 | 9/1/2024 | |
| RWR-MWI | 9/17/2024 | 9/1/2024 | |
| RW03R-MWS | 9/17/2024 | 9/1/2024 | |
| RW03R-MWI | 9/17/2024 | 9/1/2024 | |
| RWS-MWS | 9/18/2024 | 9/1/2024 | L2453633 |
| RWS-MWI | 9/18/2024 | 9/1/2024 | |
| RWQ-MWS | 9/18/2024 | 9/1/2024 | |
| RWQ-MWI | 9/18/2024 | 9/1/2024 | |
| RWP-MWI | 9/18/2024 | 9/1/2024 | |
| RWH-MWS | 9/19/2024 | 9/1/2024 | L2454033 |
| RWH-MWI | 9/19/2024 | 9/1/2024 | |
| RWO-MWS | 9/19/2024 | 9/1/2024 | |
| RWO-MWI | 9/19/2024 | 9/1/2024 | |
| RWH-MWS | 2/20/2025 | Resample | L2509486 |
| RW23-MWI | 2/20/2025 | Resample | |

# ANALYTICAL REPORT

| | |
|---|---|
| Lab Number: | L2414945 |
| Client: | Tradepoint Atlantic<br>1600 Sparrows Point Boulevard<br>Baltimore, MD 21219 |
| ATTN: | Robert Tworkowski |
| Phone: | (443) 649-5073 |
| Project Name: | RWM-Q1 |
| Project Number: | 21010103 |
| Report Date: | 04/03/24 |

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Certifications & Approvals: MA (M-MA086), NH NELAP (2064), CT (PH-0826), IL (200077), IN (C-MA-03), KY (KY98045), ME (MA00086), MD (348), NJ (MA935), NY (11148), NC (25700/666), OH (CL108), OR (MA-1316), PA (68-03671), RI (LAO00065), TX (T104704476), VT (VT-0935), VA (460195), USDA (Permit #525-23-122-91930).

Eight Walkup Drive, Westborough, MA 01581-1019
508-898-9220 (Fax) 508-898-9193 800-624-9220 - www.alphalab.com

**Project Name:** RWM-Q1
**Project Number:** 21010103

**Lab Number:** L2414945
**Report Date:** 04/03/24

| Alpha Sample ID | Client ID | Matrix | Sample Location | Collection Date/Time | Receive Date |
|---|---|---|---|---|---|
| L2414945-01 | RWB-MWS | WATER | Not Specified | 03/19/24 12:45 | 03/19/24 |
| L2414945-02 | RWB-MWI | WATER | Not Specified | 03/19/24 13:25 | 03/19/24 |

| | | | |
|---|---|---|---|
| **Project Name:** | RWM-Q1 | **Lab Number:** | L2414945 |
| **Project Number:** | 21010103 | **Report Date:** | 04/03/24 |

## Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet NELAP requirements for all NELAP accredited parameters unless otherwise noted in the following narrative. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. Tentatively Identified Compounds (TICs), if requested, are reported for compounds identified to be present and are not part of the method/program Target Compound List, even if only a subset of the TCL are being reported. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively.

When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances, the specific failure is not narrated but noted in the associated QC Outlier Summary Report, located directly after the Case Narrative. QC information is also incorporated in the Data Usability Assessment table (Format 11) of our Data Merger tool, where it can be reviewed in conjunction with the sample result, associated regulatory criteria and any associated data usability implications.

Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

HOLD POLICY - For samples submitted on hold, Alpha's policy is to hold samples (with the exception of Air canisters) free of charge for 21 calendar days from the date the project is completed. After 21 calendar days, we will dispose of all samples submitted including those put on hold unless you have contacted your Alpha Project Manager and made arrangements for Alpha to continue to hold the samples. Air canisters will be disposed after 3 business days from the date the project is completed.

Please contact Project Management at 800-624-9220 with any questions.

**Project Name:** RWM-Q1 **Lab Number:** L2414945
**Project Number:** 21010103 **Report Date:** 04/03/24

**Case Narrative (continued)**

Report Submission

April 03, 2024: This final report includes the results of all requested analyses.

March 26, 2024: This is a preliminary report.

All non-detect (ND) or estimated concentrations (J-qualified) have been quantitated to the limit noted in the MDL column.

The analysis of Sulfide was subcontracted. A copy of the laboratory report is included as an addendum. Please note: This data is only available in PDF format and is not available on Data Merger.

Sample Receipt

L2414945-02: The Client ID was specified by the client.

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature: Tiffani Morrissey - Tiffani Morrissey

Title: Technical Director/Representative Date: 04/03/24

# METALS

**Project Name:** RWM-Q1 **Lab Number:** L2414945

**Project Number:** 21010103 **Report Date:** 04/03/24

## SAMPLE RESULTS

Lab ID: L2414945-01 Date Collected: 03/19/24 12:45

Client ID: RWB-MWS Date Received: 03/19/24

Sample Location: Not Specified Field Prep: Refer to COC

Sample Depth:

Matrix: Water

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dissolved Metals - Mansfield Lab** | | | | | | | | | | | |
| Cadmium, Dissolved | 0.4092 | | ug/l | 0.2000 | 0.0599 | 1 | 03/25/24 16:23 | 03/26/24 11:30 | EPA 3005A | 1,6020B | EJF |
| Zinc, Dissolved | 17.04 | | ug/l | 10.00 | 3.410 | 1 | 03/25/24 16:23 | 03/26/24 11:30 | EPA 3005A | 1,6020B | EJF |

**Project Name:** RWM-Q1 **Lab Number:** L2414945

**Project Number:** 21010103 **Report Date:** 04/03/24

## SAMPLE RESULTS

Lab ID: L2414945-02 Date Collected: 03/19/24 13:25

Client ID: RWB-MWI Date Received: 03/19/24

Sample Location: Not Specified Field Prep: Refer to COC

Sample Depth:

Matrix: Water

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dissolved Metals - Mansfield Lab** | | | | | | | | | | | |
| Cadmium, Dissolved | ND | | ug/l | 0.2000 | 0.0599 | 1 | 03/25/24 16:23 | 03/26/24 11:34 | EPA 3005A | 1,6020B | EJF |
| Zinc, Dissolved | 20.29 | | ug/l | 10.00 | 3.410 | 1 | 03/25/24 16:23 | 03/26/24 11:34 | EPA 3005A | 1,6020B | EJF |

**Project Name:** RWM-Q1 **Lab Number:** L2414945

**Project Number:** 21010103 **Report Date:** 04/03/24

# Method Blank Analysis
# Batch Quality Control

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|
| Dissolved Metals - Mansfield Lab for sample(s): 01-02 Batch: WG1900504-1 | | | | | | | | | | |
| Cadmium, Dissolved | ND | | ug/l | 0.2000 | 0.0599 | 1 | 03/25/24 16:23 | 03/26/24 11:07 | 1,6020B | EJF |
| Zinc, Dissolved | ND | | ug/l | 10.00 | 3.410 | 1 | 03/25/24 16:23 | 03/26/24 11:07 | 1,6020B | EJF |

**Prep Information**

Digestion Method: EPA 3005A

# Lab Control Sample Analysis

## Batch Quality Control

**Project Name:** RWM-Q1

**Project Number:** 21010103

**Lab Number:** L2414945

**Report Date:** 04/03/24

| Parameter | LCS %Recovery | Qual | LCSD %Recovery | Qual | %Recovery Limits | RPD | Qual | RPD Limits |
|---|---|---|---|---|---|---|---|---|
| Dissolved Metals - Mansfield Lab Associated sample(s): 01-02 Batch: WG1900504-2 | | | | | | | | |
| Cadmium, Dissolved | 95 | | - | | 80-120 | - | | |
| Zinc, Dissolved | 97 | | - | | 80-120 | - | | |

# Matrix Spike Analysis
## Batch Quality Control

**Project Name:** RWM-Q1
**Project Number:** 21010103

**Lab Number:** L2414945
**Report Date:** 04/03/24

| Parameter | Native Sample | MS Added | MS Found | MS %Recovery | Qual | MSD Found | MSD %Recovery | Qual | Recovery Limits | RPD | Qual | RPD Limits |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Dissolved Metals - Mansfield Lab Associated sample(s): 01-02 QC Batch ID: WG1900504-3 QC Sample: L2414945-01 Client ID: RWB-MWS | | | | | | | | | | | | |
| Cadmium, Dissolved | 0.4092 | 53 | 52.63 | 98 | | - | - | | 75-125 | - | | 20 |
| Zinc, Dissolved | 17.04 | 500 | 521.3 | 101 | | - | - | | 75-125 | - | | 20 |

# Lab Duplicate Analysis

***Batch Quality Control***

**Project Name:** RWM-Q1

**Project Number:** 21010103

***Lab Number:*** L2414945

***Report Date:*** 04/03/24

| Parameter | Native Sample | Duplicate Sample | Units | RPD | Qual | RPD Limits |
|---|---|---|---|---|---|---|
| Dissolved Metals - Mansfield Lab Associated sample(s): 01-02 QC Batch ID: WG1900504-4 QC Sample: L2414945-01 Client ID: RWB-MWS | | | | | | |
| Cadmium, Dissolved | 0.4092 | 0.3787 | ug/l | 8 | | 20 |
| Zinc, Dissolved | 17.04 | 17.73 | ug/l | 4 | | 20 |

**Project Name:** RWM-Q1
**Project Number:** 21010103

**Lab Number:** L2414945
**Report Date:** 04/03/24

## Sample Receipt and Container Information

Were project specific reporting limits specified? YES

### Cooler Information

| Cooler | Custody Seal |
|---|---|
| A | Absent |

### Container Information

| Container ID | Container Type | Cooler | Initial pH | Final pH | Temp deg C | Pres | Seal | Frozen Date/Time | Analysis(*) |
|---|---|---|---|---|---|---|---|---|---|
| L2414945-01A | Plastic 250ml Zn Acetate/NaOH preserved | A | >9 | >9 | 4.8 | Y | Absent | | SUB-SULFIDE() |
| L2414945-01B | Plastic 250ml HNO3 preserved | A | <2 | <2 | 4.8 | Y | Absent | | ZN-6020S-PPB(180),CD-6020S-PPB(180) |
| L2414945-02A | Plastic 250ml Zn Acetate/NaOH preserved | A | >9 | >9 | 4.8 | Y | Absent | | SUB-SULFIDE() |
| L2414945-02B | Plastic 250ml HNO3 preserved | A | <2 | <2 | 4.8 | Y | Absent | | ZN-6020S-PPB(180),CD-6020S-PPB(180) |



*Values in parentheses indicate holding time in days

| | | | |
|---|---|---|---|
| **Project Name:** | RWM-Q1 | **Lab Number:** | L2414945 |
| **Project Number:** | 21010103 | **Report Date:** | 04/03/24 |

## GLOSSARY

***Acronyms***

| | |
|---|---|
| DL | - Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the limit of quantitation (LOQ). The DL includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.) |
| EDL | - Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME). |
| EMPC | - Estimated Maximum Possible Concentration: The concentration that results from the signal present at the retention time of an analyte when the ions meet all of the identification criteria except the ion abundance ratio criteria. An EMPC is a worst-case estimate of the concentration. |
| EPA | - Environmental Protection Agency. |
| LCS | - Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes. |
| LCSD | - Laboratory Control Sample Duplicate: Refer to LCS. |
| LFB | - Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes. |
| LOD | - Limit of Detection: This value represents the level to which a target analyte can reliably be detected for a specific analyte in a specific matrix by a specific method. The LOD includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.) |
| LOQ | - Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)<br><br>Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.) |
| MDL | - Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. |
| MS | - Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available. For Method 332.0, the spike recovery is calculated using the native concentration, including estimated values. |
| MSD | - Matrix Spike Sample Duplicate: Refer to MS. |
| NA | - Not Applicable. |
| NC | - Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit. |
| NDPA/DPA | - N-Nitrosodiphenylamine/Diphenylamine. |
| NI | - Not Ignitable. |
| NP | - Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil. |
| NR | - No Results: Term is utilized when 'No Target Compounds Requested' is reported for the analysis of Volatile or Semivolatile Organic TIC only requests. |
| RL | - Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable. |
| RPD | - Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report. |
| SRM | - Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples. |
| STLP | - Semi-dynamic Tank Leaching Procedure per EPA Method 1315. |
| TEF | - Toxic Equivalency Factors: The values assigned to each dioxin and furan to evaluate their toxicity relative to 2,3,7,8-TCDD. |
| TEQ | - Toxic Equivalent: The measure of a sample's toxicity derived by multiplying each dioxin and furan by its corresponding TEF and then summing the resulting values. |
| TIC | - Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations. |

*Report Format: DU Report with 'J' Qualifiers*

| | | | |
|---|---|---|---|
| **Project Name:** | RWM-Q1 | **Lab Number:** | L2414945 |
| **Project Number:** | 21010103 | **Report Date:** | 04/03/24 |

***Footnotes***

1 - The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

***Terms***

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Chlordane: The target compound Chlordane (CAS No. 57-74-9) is reported for GC ECD analyses. Per EPA,this compound "refers to a mixture of chlordane isomers, other chlorinated hydrocarbons and numerous other components." (Reference: USEPA Toxicological Review of Chlordane, In Support of Summary Information on the Integrated Risk Information System (IRIS), December 1997.)

Difference: With respect to Total Oxidizable Precursor (TOP) Assay analysis, the difference is defined as the Post-Treatment value minus the Pre-Treatment value.

Final pH: As it pertains to Sample Receipt & Container Information section of the report, Final pH reflects pH of container determined after adjustment at the laboratory, if applicable. If no adjustment required, value reflects Initial pH.

Frozen Date/Time: With respect to Volatile Organics in soil, Frozen Date/Time reflects the date/time at which associated Reagent Water-preserved vials were initially frozen. Note: If frozen date/time is beyond 48 hours from sample collection, value will be reflected in 'bold'.

Gasoline Range Organics (GRO): Gasoline Range Organics (GRO) results include all chromatographic peaks eluting from Methyl tert butyl ether through Naphthalene, with the exception of GRO analysis in support of State of Ohio programs, which includes all chromatographic peaks eluting from Hexane through Dodecane.

Initial pH: As it pertains to Sample Receipt & Container Information section of the report, Initial pH reflects pH of container determined upon receipt, if applicable.

PAH Total: With respect to Alkylated PAH analyses, the 'PAHs, Total' result is defined as the summation of results for all or a subset of the following compounds: Naphthalene, C1-C4 Naphthalenes, 2-Methylnaphthalene, 1-Methylnaphthalene, Biphenyl, Acenaphthylene, Acenaphthene, Fluorene, C1-C3 Fluorenes, Phenanthrene, C1-C4 Phenanthrenes/Anthracenes, Anthracene, Fluoranthene, Pyrene, C1-C4 Fluoranthenes/Pyrenes, Benz(a)anthracene, Chrysene, C1-C4 Chrysenes, Benzo(b)fluoranthene, Benzo(j)+(k)fluoranthene, Benzo(e)pyrene, Benzo(a)pyrene, Perylene, Indeno(1,2,3-cd)pyrene, Dibenz(ah)+(ac)anthracene, Benzo(g,h,i)perylene. If a 'Total' result is requested, the results of its individual components will also be reported.

PFAS Total: With respect to PFAS analyses, the 'PFAS, Total (5)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA and PFOS. In addition, the 'PFAS, Total (6)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA, PFDA and PFOS. For MassDEP DW compliance analysis only, the 'PFAS, Total (6)' result is defined as the summation of results at or above the RL. Note: If a 'Total' result is requested, the results of its individual components will also be reported.

Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

***Data Qualifiers***

**A** - Spectra identified as "Aldol Condensates" are byproducts of the extraction/concentration procedures when acetone is introduced in the process.

**B** - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).

**C** - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.

**D** - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.

**E** - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.

**F** - The ratio of quantifier ion response to qualifier ion response falls outside of the laboratory criteria. Results are considered to be an estimated maximum concentration.

**G** - The concentration may be biased high due to matrix interferences (i.e, co-elution) with non-target compound(s). The result should be considered estimated.

**H** - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.

**I** - The lower value for the two columns has been reported due to obvious interference.

**J** - Estimated value. The Target analyte concentration is below the quantitation limit (RL), but above the Method Detection Limit (MDL) or Estimated Detection Limit (EDL) for SPME-related analyses. This represents an estimated concentration for Tentatively

*Report Format: DU Report with 'J' Qualifiers*

| | | | |
|---|---|---|---|
| **Project Name:** | RWM-Q1 | **Lab Number:** | L2414945 |
| **Project Number:** | 21010103 | **Report Date:** | 04/03/24 |

***Data Qualifiers***

Identified Compounds (TICs). For calculated parameters, this represents that one or more values used in the calculation were estimated.

**M** - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.

**ND** - Not detected at the method detection limit (MDL) for the sample, or estimated detection limit (EDL) for SPME-related analyses.

**NJ** - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where the identification is based on a mass spectral library search.

**P** - The RPD between the results for the two columns exceeds the method-specified criteria.

**Q** - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)

**R** - Analytical results are from sample re-analysis.

**RE** - Analytical results are from sample re-extraction.

**S** - Analytical results are from modified screening analysis.

**V** - The surrogate associated with this target analyte has a recovery outside the QC acceptance limits. (Applicable to MassDEP DW Compliance samples only.)

**Z** - The batch matrix spike and/or duplicate associated with this target analyte has a recovery/RPD outside the QC acceptance limits. (Applicable to MassDEP DW Compliance samples only.)

| | | | |
|---|---|---|---|
| **Project Name:** | RWM-Q1 | **Lab Number:** | L2414945 |
| **Project Number:** | 21010103 | **Report Date:** | 04/03/24 |

## REFERENCES

1 Test Methods for Evaluating Solid Waste: Physical/Chemical Methods. EPA SW-846. Third Edition. Updates I - VI, 2018.

## LIMITATION OF LIABILITIES

Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Analytical shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Alpha Analytical.

We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.

# Certification Information

**The following analytes are not included in our Primary NELAP Scope of Accreditation:**

**Westborough Facility**
**EPA 624.1:** m/p-xylene, o-xylene, Naphthalene
**EPA 625.1:** alpha-Terpineol
**EPA 8260D:** NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene, Azobenzene; SCM: Iodomethane (methyl iodide), 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.
**EPA 8270E:** NPW: Dimethylnaphthalene,1,4-Diphenylhydrazine, alpha-Terpineol; SCM: Dimethylnaphthalene,1,4-Diphenylhydrazine.
**SM4500**: NPW: Amenable Cyanide; SCM: Total Phosphorus, TKN, NO2, NO3.

**Mansfield Facility**
**SM 2540D:** TSS.
**EPA TO-15:** Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene, 3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene.
**Biological Tissue Matrix:** EPA 3050B

**The following analytes are included in our Massachusetts DEP Scope of Accreditation**

**Westborough Facility:**

***Drinking Water***
**EPA 300.0**: Chloride, Nitrate-N, Fluoride, Sulfate; **EPA 353.2**: Nitrate-N, Nitrite-N; **SM4500NO3-F**: Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE, EPA 180.1, SM2130B, SM4500Cl-D, SM2320B, SM2540C, SM4500H-B, SM4500NO2-B**
**EPA 524.2:** THMs and VOCs; **EPA 504.1:** EDB, DBCP.
**Microbiology**: **SM9215B; SM9223-P/A, SM9223B-Colilert-QT,SM9222D**.

***Non-Potable Water***
**SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2320B, SM4500CL-E, SM4500F-BC, SM4500NH3-BH:** Ammonia-N and Kjeldahl-N, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **EPA 351.1, SM4500NO3-F, EPA 353.2**: Nitrate-N**, SM4500P-E, SM4500P-B, E, SM4500SO4-E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, EPA 420.1, SM4500-CN-CE, SM2540D, EPA 300: Chloride, Sulfate, Nitrate.**
**EPA 624.1**: Volatile Halocarbons & Aromatics,
**EPA 608.3**: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs
**EPA 625.1**: SVOC (Acid/Base/Neutral Extractables).
**Microbiology**: **SM9223B-Colilert-QT; Enterolert-QT, SM9221E, EPA 1600, EPA 1603, SM9222D.**

**Mansfield Facility:**

***Drinking Water***
**EPA 200.7:** Al, Ba, Cd, Cr, Cu, Fe, Mn, Ni, Na, Ag, Ca, Zn. **EPA 200.8:** Al, Sb, As, Ba, Be, Cd, Cr, Cu, Pb, Mn, Ni, Se, Ag, TL, Zn. **EPA 245.1** Hg.
**EPA 522, EPA 537.1.**

***Non-Potable Water***
**EPA 200.7:** Al, Sb, As, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, K, Se, Ag, Na, Sr, TL, Ti, V, Zn.
**EPA 200.8:** Al, Sb**,** As, Be, Cd, Cr, Cu, Fe, Pb, Mn, Ni, K, Se, Ag, Na, TL, Zn.
**EPA 245.1** Hg.
**SM2340B**

For a complete listing of analytes and methods, please contact your Alpha Project Manager.

# CHAIN OF CUSTODY

PAGE 1 OF 1

Date Rec'd in Lab: 03/20/24

ALPHA Job #: L2414945

ALPHA ANALYTICAL
WESTBORO, MA TEL: 508-898-9220 FAX: 508-898-9193
MANSFIELD, MA TEL: 508-822-9300 FAX: 508-822-3288

**Client Information**

Client: TPA

Address:

Phone:

Fax:

Email:

☐ These samples have been previously analyzed by Alpha

**Project Information**

Project Name: RWM-Q1

Project Location:

Project #: 210103

Project Manager: Bob T.

ALPHA Quote #:

**Turn-Around Time**

☑ Standard ☐ RUSH (only confirmed if pre-approved)

Date Due: Time:

**Report Information - Data Deliverables**

☐ FAX ☐ EMAIL

☐ ADEx ☐ Add'l Deliverables

**Billing Information**

☐ Same as Client info PO #:

**Regulatory Requirements/Report Limits**

| State /Fed Program | Criteria |
|---|---|
| | |

Other Project Specific Requirements/Comments/Detection Limits:

| ALPHA Lab ID (Lab Use Only) | Sample ID | Collection Date | Collection Time | Sample Matrix | Sampler's Initials | ANALYSIS: Diss. Zn & Cd | ANALYSIS: Sulfide | SAMPLE HANDLING: Filtration Done | SAMPLE HANDLING: Not needed | SAMPLE HANDLING: Lab to do | Preservation: Lab to do | Sample Specific Comments | TOTAL # BOTTLES |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 14945-01 | RWB-MW5 | 3/19/24 | 1245 | GW | TB | X | X | | | | | | 2 |
| | | " | 1325 | " | " | X | X | | | | | | 2 |

3/20/24 0010

| Container Type | P | P | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Preservative | C | B | | | | | | | | | | | |

| Relinquished By: | Date/Time | Received By: | Date/Time |
|---|---|---|---|
| TB | 3/19/24 1325 | | |
| | 3-19-24 1824 | | 3-19-24 1320 |
| | 3/19/24 1615 | | 3/19/24 19:05 |
| | 3/19/24 | NK | 3/19 22:00 |
| | | | NK 3/20 0:10 |

Please print clearly, legibly and completely. Samples can not be logged in and turnaround time clock will not start until any ambiguities are resolved. All samples submitted are subject to Alpha's Terms and Conditions. See reverse side.

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*Pace Analytical Services, LLC-Fairfield*

# ANALYTICAL RESULTS

## REDUCED DELIVERABLES FORMAT

Work Order Number: 24C1492

Pace - Alpha Analytical Laboratories

Project: L2414945



Sudip Pradhan
Laboratory Director

**All Results meet the requirements of the National Environmental Laboratory Accreditation Conference and/or State specific certifications as applicable.**

**Report Date:** Apr 01, 2024

1275 Bloomfield Ave., Bldg. 6, Fairfield, New Jersey 07004
(t) 973.227.0422 (f) 973.227.2813 (w) www.pacelabs.com

**NELAC** National Environmental Laboratory Accreditation Conference
NJDEP #07010 / NYDOH #11634 / PADEP #68-02903

sections 1 2 3 4 5 6 7 8 9

# CONTENTS

1. Sample Summary . . . 3
2. Chain of Custody . . . 4
3. Methodology Summary . . . 6
4. Abbreviations and Qualifiers . . . 7
5. Data of Known Quality . . . 8
6. Conformance/Non-Conformance Summary . . . 9
7. Positive Results Summary . . . 10
8. All Results Summary . . . 11
9. General Chemistry . . . 12
    9.1. General Chemistry Results . . . 13

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*Pace Analytical Services, LLC-Fairfield*

# Sample Summary

**Work Order:** 24C1492

**Client:** Pace - Alpha Analytical Laboratories

**Project:** L2414945

| Sample ID | Laboratory ID | Matrix | Date Sampled | Date Received |
|---|---|---|---|---|
| RWB-MWS | 24C1492-01 | Water | 03/19/2024 12:45 | 03/22/2024 08:05 |
| RWB-MWI | 24C1492-02 | Water | 03/19/2024 13:25 | 03/22/2024 08:05 |

**Pace**
Pace Analytical Services-Fairfield
www.pacelabs.com

# Subcontract Chain of Custody

APL/ Pace Fairfield
1275 Bloomfield Ave.
Bldg. 6
Fairfield, NJ 07004

24C1492
Pace - Alpha Analytical Laboratories
L2414945

**Alpha Job Number**
L2414945

## Client Information

Client: Alpha Analytical Labs
Address: Eight Walkup Drive
Westborough, MA 01581-1019

Phone: 508.844.4115
Email: Mitchell.Ostrowski@pacelabs.com

## Project Information

Project Location: MD
Project Manager: Mitchell Ostrowski

### Turnaround & Deliverables Information

Due Date:
Deliverables:

## uirements/Report Limits

State/Federal Program:
Regulatory Criteria:

## Project Specific Requirements and/or Report Requirements

Reference following Alpha Job Number on final report/deliverables: L2414945

Report to include Method Blank, LCS/LCSD:

Additional Comments: Invoices to: invoices@pacelabs.coupahost.com Reports to: west.subreports@pacelabs.com

| Lab ID | Client ID | Collection Date/Time | Sample Matrix | Analysis | Batch QC |
|---|---|---|---|---|---|
| 01 | RWB-MW5 | 03-19-24 12:45 | WATER | Sulfide | |
| 02 | RWB-MWI | 03-19-24 13:25 | WATER | Sulfide | |

1.2°C

| | Relinquished By: | Date/Time: | Received By: | Date/Time: |
|---|---|---|---|---|
| | C. Edwards | 3/21/24 | | 3/21 17:30 |
| | | 3/21 23:00 | | 3/21/24 23:00 |
| | | 3/21/24 | Paul Hubbard AL | 3/22/24 0630 |
| Form No: AL_subcoc | Paul Hubbard AL | 3/24/24 0805 | | 3/24/24 805 |



Serial_No:04032413:54

DC#_Title: ENV-FRM-FAIR-007 v01_Sample Condition Upon Receipt Form
Effective Date: 7/26/2023

24C1492

## Sample Condition Upon Receipt Form (SCUR)

Pace ANALYTICAL SERVICES

Affix Sample Label Here

Date and Initials of person:
Examining contents: nf
Label:
Deliver to location:
pH: 7.0

Thermometer Used: 71TR03 Date: 3/22/24 Time: 805 Initials: nf

State of Origin:

Cooler #1 Temp.°C 1.1 (Visual) 1.0.1 (Correction Factor) 1.2 (Actual) ☐ Samples on ice, cooling process has begun

Courier: ☐ Fed Ex ☐ UPS ☐ USPS ☐ Client ☐ Commercial ☒ Pace ☐ Other

Shipping Method: ☐ First Overnight ☐ Priority Overnight ☐ Standard Overnight ☐ Ground
☐ Other

Tracking #

Custody Seal on Cooler/Box Present: ☐ Yes ☒ No Seals intact: ☐ Yes ☒ No Ice: (Wet) Blue Melted None

Packing Material: ☐ Bubble Wrap ☐ Bubble Bags ☒ None ☐ Other

Samples were collected by Pace employee ☐ Yes ☒ No ☐ N/A

| | | Comments: |
|---|---|---|
| Chain of Custody Present | ☑Yes ☐ No ☐ N/A | |
| Chain of Custody Filled Out | ☑Yes ☐ No ☐ N/A | |
| Relinquished Signature on COC | ☑Yes ☐ No ☐ N/A | |
| Sampler Name and Signature on COC | ☑Yes ☐ No ☐ N/A | |
| Samples Arrived within Hold Time | ☑Yes ☐ No ☐ N/A | |
| Rush TAT requested on COC | ☐Yes ☑ No ☐ N/A | |
| Sufficient Volume | ☑Yes ☐ No ☐ N/A | |
| Correct Containers Used | ☑Yes ☐ No ☐ N/A | |
| Containers Intact | ☑Yes ☐ No ☐ N/A | |
| Sample Labels match COC (sample IDs & date/time of collection) | ☑Yes ☐ No ☐ N/A | |
| All containers needing acid/base preservation have been checked. | ☑Yes ☐ No ☐ N/A | Preservation Information: Preservative: NaOH & Zinc Acetate * Lot #/Trace #: 2306680 & 24011416 Date: 3/22/24 Time: 1057 Initials: nf |
| All Containers needing preservation are found to be in compliance with EPA recommendation: Exceptions: Vials, Microbiology, O&G, Metals | ☑Yes ☐ No ☐ N/A | |
| Headspace in VOA Vials? ( >6mm): | ☐Yes ☐ No ☑N/A | |
| Trip Blank Present: | ☐Yes ☐ No ☑N/A | |

**Additional Login Comments:**

Lot # 232221 * For Sample -02

**Client notification/ Resolution**

Person Contacted: Date/Time:

Comments/Resolution:

Pace Analytical Services, LLC-Fairfield
Methodology Summary

## Extractable Petroleum Hydrocarbons:

### *Gas Chromatography/Flame Ionization Detector*

New Jersey Department of Environmental Protection Site Remediation Program Extractable Petroleum Hydrocarbons Methodology (Version 3.0).
USEPA SW-846 Test Methods for Evaluating Solid Waste Physical/Chemical Methods Update III, Method 8015D or NJDEP Office of Quality Assurance Quantitation of Semi-Volatile Petroleum Products in Water, Soil and Sediment OQA-QAM-025, Revision 6.

## Metals:

### *Inductively-Coupled Plasma Atomic Emission Spectrometry or Inductively-Coupled Plasma Mass Spectroscopy*

**Wastewater and Groundwater Samples:** USEPA Methods for the Analysis of Water and Wastes, Method 200.7, Method 200.8.
**Soil Samples:** USEPA Methods for Evaluating Solid Waste Physical/Chemical Methods Update III, Method 6010D.

## Mercury:

### *Cold Vapor Atomic Absorption Spectrometry*

**Wastewater and Groundwater Samples:** USEPA Methods for the Analysis of Water and Wastes, Method 245.1.
**Soil Samples**: USEPA SW-846 Test Methods for Evaluating Solid Waste Physical/Chemical Methods Update III, Method 7471B.

## Volatile Organic Compounds:

### *Purge and Trap Gas Chromatography/Mass Spectroscopy*

**Drinking Water Samples:** USEPA Methods for the Determination of Organic Compounds in Drinking Water, Method 524.2.
**Wastewater Samples:** USEPA Methods for the Analysis of Water and Wastes, Method 624.1.
**Soil and Groundwater Samples:** USEPA SW-846 Test Methods for Evaluating Solid Waste Physical/Chemical Methods Update VI, Method 8260D.

## Semi-Volatile Organic Compounds:

### *Gas Chromatography/Mass Spectroscopy*

**Wastewater Samples:** USEPA Methods for the Analysis of Water and Wastes, Method 625.1.
**Soil and Groundwater Samples:** USEPA SW-846 Test Methods for Evaluating Solid Waste Physical/Chemical Methods Update VI, Method 8270E.

## PFAS Compounds:

### *Liquid Chromatography/Tandem Mass Spectroscopy*

**Drinking Water Samples:** USEPA Methods for the Determination of Selected Perfluorinated Alkyl Acids in Drinking Water by Solid Phase Extraction and Liquid Chromatography/Tandem Mass Spectrometry (LC/MS/MS), Method 537 (v1.1).

## Pesticides:

### *Gas Chromatography/Electron Capture Detector*

**Wastewater Samples:** USEPA Methods for the Analysis of Water and Wastes, Method 608.3.
**Soil and Groundwater Samples:** USEPA SW-846 Test Methods for Evaluating Solid Waste Physical/Chemical Methods Update III, Method 8081B.

## Polychlorinated Biphenyls (PCBs):

### *Gas Chromatography/Electron Capture Detector*

**Wastewater Samples:** USEPA Methods for the Analysis of Water and Wastes, Method 608.3.
**Soil and Groundwater Samples:** USEPA SW-846 Test Methods for Evaluating Solid Waste Physical/Chemical Methods Update III, Method 8082A.

## General Chemistry Methods:

### *Various general chemistry methods are taken from* "Standard Methods for the Examination of Water and Wastewater, 22nd Edition", .

Specific method citations can be found on the Analytical Results Summary page of this report listed under 'Method'.

** A complete list of Pace Fairfield's certified Methods are on the Standards And Docs page of the Results Retrieval System

Pace Analytical Services, LLC-Fairfield
Data Reporting Abbreviations and Qualifiers



**Method Detection Limit (MDL):**

The MDL is defined as the minimum measured concentration of a substance that can be reported with 99% confidence that the measured concentration is distinguishable from method blank results. The value is calculated following the guidelines defined in:

"Definition and Procedure for the Determination of the Method Detection Limit, Revision 2"
EPA 821-R-16-006, published December 2016.

**Reporting Limit (RL):**

The RL is the Concentration of the lowest calibration standard that was included in the initial calibration of the instrument. On analytical reports this value is corrected for percent moisture and any concentration or dilution factors.

**Concentration (Conc.) / Result:**

If the compound is detected, the measured concentration is reported. If this column is "ND", or contains a 'less than' (<) symbol, the compound was not detected.

**Tentatively Identified Compound (TIC):**

A TIC is a non-targeted compound, not included in the calibration, identified by a mass spectral library search OR requested to be identified and reported by the client.

**Abbreviations:**

| | |
|---|---|
| **ND** | Non-Detect |
| **TNTC** | Too Numerous To Count |

**Qualifers:**

| | |
|---|---|
| **U** | Compound not detected |

## DATA OF KNOWN QUALITY CONFORMANCE/NON-CONFORMANCE SUMMARY QUESTIONNAIRE

**Laboratory Name:** Pace Analytical Services, LLC-Fairfield **Client:** Pace - Alpha Analytical Laboratories

**Project Location:** L2414945 **Project Number:** 24C1492

**Laboratory Sample ID(s):** 01-02 **Sampling Date(s):** March 19,2024

**List DKQP Methods Used:** SM 4500-S-D-11

| | | |
|---|---|---|
| 1 | For each analytical method referenced in this laboratory report package, were all specified QA/QC performance criteria followed, including the requirement to explain any criteria falling outside of acceptable guidelines, as specified in the NJDEP Data of Known Quality performance standards? | ☑ Yes ☐ No |
| 1A | Were the method specified handling, preservation, and holding time requirements met? | ☑ Yes ☐ No |
| 1B | EPH Method: Was the EPH method conducted without significant modifications (see Section 11.3 of respective DKQ methods) | ☐ Yes ☐ No ☑ N/A |
| 2 | Were all samples received by the laboratory in a condition consistent with that described on the associated chain-of-custody document(s)? | ☑ Yes ☐ No |
| 3 | Were samples received at an appropriate temperature (4±2° C)? | ☐ Yes ☑ No ☐ N/A |
| 4 | Were all QA/QC performance criteria specified in the NJDEP DKQP standards achieved? | ☑ Yes ☐ No |
| 5 | Were reporting limits specified or referenced on the chain-of-custody or communicated to the laboratory prior to sample receipt?<br>Were these reporting limits met? | ☑ Yes ☐ No<br>☑ Yes ☐ No ☐ N/A |
| 6 | For each analytical method referenced in this laboratory report package, were results reported for all constituents identified in the method-specific analyte lists presented in the DKQP documents and/or site-specific QAPP? | ☑ Yes ☐ No |
| 7 | Are project-specific matrix spikes and/or laboratory duplicates included in this data set? | ☐ Yes ☑ No |

**Notes: For all questions to which the response was "No° (with the exception of question #7), additional information should be provided in an attached narrative. If the answer to question #1, #1A, or #1B is "No", the data package does not meet the requirements for Data of Known Quality.°**

**A-5**

Pace Analytical Services, LLC-Fairfield

## QUALITY CONTROL
## Conformance/Non-Conformance Summary



**ANALYSIS: Sulfide [SM 4500-S-D-11]**

COMMENTS:
All samples met QC criteria.

Reviewed By: _____ (IK) 4/1/2024
Sudip Pradhan - Laboratory Director — Date

*For any questions about your Quality Control, please call us at 973-227-0422*

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*Pace Analytical Services, LLC-Fairfield*

# Positive Results Only Summary

**24C1492-01 (Water)** Sample Name: **RWB-MWS**

**SM 4500-S-D-11 - General Chemistry**

| Analyte | Result | Qual | MDL | RL | Units | Dilution | Analyzed |
|---|---|---|---|---|---|---|---|
| Sulfide | 0.0260 | | 0.00500 | 0.0100 | mg/L | 1 | 3/25/24 11:00 |

**24C1492-02 (Water)** Sample Name: **RWB-MWI**

**SM 4500-S-D-11 - General Chemistry**

| Analyte | Result | Qual | MDL | RL | Units | Dilution | Analyzed |
|---|---|---|---|---|---|---|---|
| Sulfide | 0.0260 | | 0.00500 | 0.0100 | mg/L | 1 | 3/25/24 11:00 |

**ND** - Indicates compound analyzed for but not detected
**J** - Indicates estimated value
**B** - Indicates compound found in associated blank
**E** - Concentration exceeds highest calibration standard

**D** - Indicates result is based on a dilution
**H** - Indicates a Hold Time violation
**P** - Greater than 25% diff. between 2 GC columns.
**MDL** - Minimum detection limit, **RL** - Reporting limit
**D1** - Sample was Decanted (Dissolved)

PEOPLE ADVANCING SCIENCE

*Pace Analytical Services, LLC-Fairfield*

# All Results Summary

**Client:** Pace - Alpha Analytical Laboratories
**Project:** L2414945
**Work Order:** 24C1492
**Date to Lab:** 3/22/2024 8:05:00AM

**24C1492-01 (Water)** Sample Name: **RWB-MWS** Collected: **3/19/2024 12:45:00PM**

**SM 4500-S-D-11 - General Chemistry**

| Analyte | Result | Qual | MDL | RL | Units | Dilution | Analyzed |
|---|---|---|---|---|---|---|---|
| Sulfide | 0.0260 | | 0.00500 | 0.0100 | mg/L | 1 | 3/25/24 11:00 |

**24C1492-02 (Water)** Sample Name: **RWB-MWI** Collected: **3/19/2024 1:25:00PM**

**SM 4500-S-D-11 - General Chemistry**

| Analyte | Result | Qual | MDL | RL | Units | Dilution | Analyzed |
|---|---|---|---|---|---|---|---|
| Sulfide | 0.0260 | | 0.00500 | 0.0100 | mg/L | 1 | 3/25/24 11:00 |

**ND, U** - Indicates compound analyzed for but not detected
**J** - Indicates estimated value
**B** - Indicates compound found in associated blank
**E** - Concentration exceeds highest calibration standard
**D** - Indicates result is based on a dilution
**H** - Indicates a Hold Time violation
**P** - Greater than 25% diff. between 2 GC columns.
**MDL** - Minimum detection limit, **RL** - Reporting limit
**D1** - Sample was Decanted (Dissolved)

PEOPLE ADVANCING SCIENCE

*Pace Analytical Services, LLC-Fairfield*

# GENERAL CHEMISTRY



Pace - Alpha Analytical Laboratories

Work Order: 24C1492

Project: L2414945

# ANALYSIS DATA SHEET

## General Chemistry

**Client:** Pace - Alpha Analytical Laboratories
**Project:** L2414945
**Work Order:** 24C1492

### General Chemistry

**24C1492-01 (Water) - RWB-MWS**

| Analyte | Units | Conc. | RL | DF | Qual | Analyzed | Method |
|---|---|---|---|---|---|---|---|
| Sulfide | mg/L | 0.0260 | 0.0100 | 1 | | 03/25/24 11:00 | SM 4500-S-D-11 |

**24C1492-02 (Water) - RWB-MWI**

| Analyte | Units | Conc. | RL | DF | Qual | Analyzed | Method |
|---|---|---|---|---|---|---|---|
| Sulfide | mg/L | 0.0260 | 0.0100 | 1 | | 03/25/24 11:00 | SM 4500-S-D-11 |



**ND** - Indicates compound analyzed for but not detected
**J** - Indicates estimated value
**B** - Indicates compound found in associated blank
**E** - Concentration exceeds highest calibration standard
**D** - Indicates result is based on a dilution
**H** - Indicates a Hold Time violation
**P** - Greater than 25% diff. between 2 GC columns.
**MDL** - Minimum detection limit, **RL** - Reporting limit

F-I

## Pace Analytical Services, LLC-Fairfield

### General Chemistry - Quality Control

| Sulfide | | Result | Reporting Limit | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit |
|---|---|---|---|---|---|---|---|---|---|---|
| **Batch BBC1691** | | | Prepared & Analyzed: 3/25/2024 | | | | | | | |
| BBC1691-BLK1 | | ND | 0.0100 | mg/L | | | | | | |
| BBC1691-BS1 | | 0.371 | 0.0100 | mg/L | 0.400 | | 92.8 | 80-120 | | |
| BBC1691-DUP1 | **Source: 24C1374-01** | 0.0360 | 0.0100 | mg/L | | 0.0240 | | | 40.00* | 20 |
| BBC1691-MS1 | **Source: 24C1374-01** | 0.436 | 0.0100 | mg/L | 0.400 | 0.0240 | 103 | 70-130 | | |
| BBC1691-MSD1 | **Source: 24C1374-01** | 0.390 | 0.0100 | mg/L | 0.400 | 0.0240 | 91.5 | 70-130 | 11.10 | 20 |

**ND** - Indicates compound analyzed for but not detected
**J** - Indicates estimated value
**B** - Indicates compound found in associated blank
**E** - Concentration exceeds highest calibration standard
**D** - Indicates result is based on a dilution
**H** - Indicates a Hold Time violation
**P** - Greater than 25% diff. between 2 GC columns.
**MDL** - Minimum detection limit, **RL** - Reporting limit

F-III

# ANALYTICAL REPORT

| | |
|---|---|
| Lab Number: | L2415158 |
| Client: | Tradepoint Atlantic<br>1600 Sparrows Point Boulevard<br>Baltimore, MD 21219 |
| ATTN: | Robert Tworkowski |
| Phone: | (443) 649-5073 |
| Project Name: | RWM-Q1 |
| Project Number: | 21010103 |
| Report Date: | 04/03/24 |

The original project report/data package is held by Alpha Analytical. This report/data package is paginated and should be reproduced only in its entirety. Alpha Analytical holds no responsibility for results and/or data that are not consistent with the original.

Certifications & Approvals: MA (M-MA086), NH NELAP (2064), CT (PH-0826), IL (200077), IN (C-MA-03), KY (KY98045), ME (MA00086), MD (348), NJ (MA935), NY (11148), NC (25700/666), OH (CL108), OR (MA-1316), PA (68-03671), RI (LAO00065), TX (T104704476), VT (VT-0935), VA (460195), USDA (Permit #525-23-122-91930).

Eight Walkup Drive, Westborough, MA 01581-1019
508-898-9220 (Fax) 508-898-9193 800-624-9220 - www.alphalab.com

**Project Name:** RWM-Q1
**Project Number:** 21010103

**Lab Number:** L2415158
**Report Date:** 04/03/24

| Alpha Sample ID | Client ID | Matrix | Sample Location | Collection Date/Time | Receive Date |
|---|---|---|---|---|---|
| L2415158-01 | RWE-MWS | WATER | Not Specified | 03/19/24 14:10 | 03/20/24 |
| L2415158-02 | RWE-MWI | WATER | Not Specified | 03/19/24 14:45 | 03/20/24 |
| L2415158-03 | RWD-MWS | WATER | Not Specified | 03/19/24 15:20 | 03/20/24 |
| L2415158-04 | RWD-MWI | WATER | Not Specified | 03/19/24 15:50 | 03/20/24 |
| L2415158-05 | RWQ-MWS | WATER | Not Specified | 03/19/24 16:55 | 03/20/24 |
| L2415158-06 | RWQ-MWI | WATER | Not Specified | 03/19/24 17:35 | 03/20/24 |
| L2415158-07 | RW03R-MWS | WATER | Not Specified | 03/20/24 09:15 | 03/20/24 |
| L2415158-08 | RW03R-MWI | WATER | Not Specified | 03/20/24 09:50 | 03/20/24 |

| | | | |
|---|---|---|---|
| **Project Name:** | RWM-Q1 | **Lab Number:** | L2415158 |
| **Project Number:** | 21010103 | **Report Date:** | 04/03/24 |

## Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet NELAP requirements for all NELAP accredited parameters unless otherwise noted in the following narrative. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. Tentatively Identified Compounds (TICs), if requested, are reported for compounds identified to be present and are not part of the method/program Target Compound List, even if only a subset of the TCL are being reported. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively.

When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances, the specific failure is not narrated but noted in the associated QC Outlier Summary Report, located directly after the Case Narrative. QC information is also incorporated in the Data Usability Assessment table (Format 11) of our Data Merger tool, where it can be reviewed in conjunction with the sample result, associated regulatory criteria and any associated data usability implications.

Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

HOLD POLICY - For samples submitted on hold, Alpha's policy is to hold samples (with the exception of Air canisters) free of charge for 21 calendar days from the date the project is completed. After 21 calendar days, we will dispose of all samples submitted including those put on hold unless you have contacted your Alpha Project Manager and made arrangements for Alpha to continue to hold the samples. Air canisters will be disposed after 3 business days from the date the project is completed.

Please contact Project Management at 800-624-9220 with any questions.

| | | | |
|---|---|---|---|
| **Project Name:** | RWM-Q1 | **Lab Number:** | L2415158 |
| **Project Number:** | 21010103 | **Report Date:** | 04/03/24 |

**Case Narrative (continued)**

Report Submission

April 03, 2024: This final report includes the results of all requested analyses.

March 27, 2024: This is a preliminary report.

All non-detect (ND) or estimated concentrations (J-qualified) have been quantitated to the limit noted in the MDL column.

The analysis of Sulfide was subcontracted. A copy of the laboratory report is included as an addendum. Please note: This data is only available in PDF format and is not available on Data Merger.

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature: Tiffani Morrissey - Tiffani Morrissey

Title: Technical Director/Representative Date: 04/03/24

# METALS

**Project Name:** RWM-Q1 **Lab Number:** L2415158

**Project Number:** 21010103 **Report Date:** 04/03/24

## SAMPLE RESULTS

Lab ID: L2415158-01 Date Collected: 03/19/24 14:10

Client ID: RWE-MWS Date Received: 03/20/24

Sample Location: Not Specified Field Prep: Refer to COC

Sample Depth:

Matrix: Water

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dissolved Metals - Mansfield Lab** | | | | | | | | | | | |
| Cadmium, Dissolved | 5.255 | | ug/l | 0.2000 | 0.0599 | 1 | 03/25/24 16:23 | 03/26/24 12:27 | EPA 3005A | 1,6020B | EJF |
| Zinc, Dissolved | 13660 | | ug/l | 100.0 | 34.10 | 10 | 03/25/24 16:23 | 03/26/24 13:41 | EPA 3005A | 1,6020B | EJF |

**Project Name:** RWM-Q1 **Lab Number:** L2415158

**Project Number:** 21010103 **Report Date:** 04/03/24

## SAMPLE RESULTS

Lab ID: L2415158-02 Date Collected: 03/19/24 14:45

Client ID: RWE-MWI Date Received: 03/20/24

Sample Location: Not Specified Field Prep: Refer to COC

Sample Depth:

Matrix: Water

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dissolved Metals - Mansfield Lab** | | | | | | | | | | | |
| Cadmium, Dissolved | 444.8 | | ug/l | 2.000 | 0.5990 | 10 | 03/25/24 16:23 | 03/26/24 13:45 | EPA 3005A | 1,6020B | EJF |
| Zinc, Dissolved | 67550 | | ug/l | 100.0 | 34.10 | 10 | 03/25/24 16:23 | 03/26/24 13:45 | EPA 3005A | 1,6020B | EJF |

**Project Name:** RWM-Q1 **Lab Number:** L2415158

**Project Number:** 21010103 **Report Date:** 04/03/24

## SAMPLE RESULTS

Lab ID: L2415158-03 Date Collected: 03/19/24 15:20

Client ID: RWD-MWS Date Received: 03/20/24

Sample Location: Not Specified Field Prep: Refer to COC

Sample Depth:

Matrix: Water

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dissolved Metals - Mansfield Lab** | | | | | | | | | | | |
| Cadmium, Dissolved | ND | | ug/l | 0.2000 | 0.0599 | 1 | 03/25/24 16:23 | 03/26/24 12:52 | EPA 3005A | 1,6020B | EJF |
| Zinc, Dissolved | ND | | ug/l | 10.00 | 3.410 | 1 | 03/25/24 16:23 | 03/26/24 12:52 | EPA 3005A | 1,6020B | EJF |

**Project Name:** RWM-Q1 **Lab Number:** L2415158

**Project Number:** 21010103 **Report Date:** 04/03/24

## SAMPLE RESULTS

Lab ID: L2415158-04 Date Collected: 03/19/24 15:50

Client ID: RWD-MWI Date Received: 03/20/24

Sample Location: Not Specified Field Prep: Refer to COC

Sample Depth:

Matrix: Water

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dissolved Metals - Mansfield Lab** | | | | | | | | | | | |
| Cadmium, Dissolved | 497.4 | | ug/l | 2.000 | 0.5990 | 10 | 03/25/24 16:23 | 03/26/24 13:50 | EPA 3005A | 1,6020B | EJF |
| Zinc, Dissolved | 73990 | | ug/l | 100.0 | 34.10 | 10 | 03/25/24 16:23 | 03/26/24 13:50 | EPA 3005A | 1,6020B | EJF |

**Project Name:** RWM-Q1 **Lab Number:** L2415158

**Project Number:** 21010103 **Report Date:** 04/03/24

## SAMPLE RESULTS

Lab ID: L2415158-05 Date Collected: 03/19/24 16:55

Client ID: RWQ-MWS Date Received: 03/20/24

Sample Location: Not Specified Field Prep: Refer to COC

Sample Depth:

Matrix: Water

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dissolved Metals - Mansfield Lab** | | | | | | | | | | | |
| Cadmium, Dissolved | 2.623 | | ug/l | 0.2000 | 0.0599 | 1 | 03/25/24 16:23 | 03/26/24 13:00 | EPA 3005A | 1,6020B | EJF |
| Zinc, Dissolved | 153.7 | | ug/l | 10.00 | 3.410 | 1 | 03/25/24 16:23 | 03/26/24 13:00 | EPA 3005A | 1,6020B | EJF |

**Project Name:** RWM-Q1 **Lab Number:** L2415158

**Project Number:** 21010103 **Report Date:** 04/03/24

## SAMPLE RESULTS

Lab ID: L2415158-06 Date Collected: 03/19/24 17:35

Client ID: RWQ-MWI Date Received: 03/20/24

Sample Location: Not Specified Field Prep: Refer to COC

Sample Depth:

Matrix: Water

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dissolved Metals - Mansfield Lab** | | | | | | | | | | | |
| Cadmium, Dissolved | 62.38 | | ug/l | 2.000 | 0.5990 | 10 | 03/25/24 16:23 | 03/26/24 13:07 | EPA 3005A | 1,6020B | EJF |
| Zinc, Dissolved | 316200 | | ug/l | 1000. | 341.0 | 100 | 03/25/24 16:23 | 03/26/24 13:54 | EPA 3005A | 1,6020B | EJF |

**Project Name:** RWM-Q1 **Lab Number:** L2415158

**Project Number:** 21010103 **Report Date:** 04/03/24

## SAMPLE RESULTS

Lab ID: L2415158-07 Date Collected: 03/20/24 09:15

Client ID: RW03R-MWS Date Received: 03/20/24

Sample Location: Not Specified Field Prep: Refer to COC

Sample Depth:

Matrix: Water

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dissolved Metals - Mansfield Lab** | | | | | | | | | | | |
| Cadmium, Dissolved | 0.0618 | J | ug/l | 0.2000 | 0.0599 | 1 | 03/25/24 16:23 | 03/26/24 13:11 | EPA 3005A | 1,6020B | EJF |
| Zinc, Dissolved | 25.78 | | ug/l | 10.00 | 3.410 | 1 | 03/25/24 16:23 | 03/26/24 13:11 | EPA 3005A | 1,6020B | EJF |

**Project Name:** RWM-Q1 **Lab Number:** L2415158

**Project Number:** 21010103 **Report Date:** 04/03/24

## SAMPLE RESULTS

Lab ID: L2415158-08 Date Collected: 03/20/24 09:50

Client ID: RW03R-MWI Date Received: 03/20/24

Sample Location: Not Specified Field Prep: Refer to COC

Sample Depth:

Matrix: Water

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dissolved Metals - Mansfield Lab** | | | | | | | | | | | |
| Cadmium, Dissolved | ND | | ug/l | 0.2000 | 0.0599 | 1 | 03/25/24 16:23 | 03/26/24 13:16 | EPA 3005A | 1,6020B | EJF |
| Zinc, Dissolved | 196.1 | | ug/l | 10.00 | 3.410 | 1 | 03/25/24 16:23 | 03/26/24 13:16 | EPA 3005A | 1,6020B | EJF |

**Project Name:** RWM-Q1 **Lab Number:** L2415158

**Project Number:** 21010103 **Report Date:** 04/03/24

# Method Blank Analysis
# Batch Quality Control

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|
| Dissolved Metals - Mansfield Lab for sample(s): 01-08 Batch: WG1900504-1 | | | | | | | | | | |
| Cadmium, Dissolved | ND | | ug/l | 0.2000 | 0.0599 | 1 | 03/25/24 16:23 | 03/26/24 11:07 | 1,6020B | EJF |
| Zinc, Dissolved | ND | | ug/l | 10.00 | 3.410 | 1 | 03/25/24 16:23 | 03/26/24 11:07 | 1,6020B | EJF |

**Prep Information**

Digestion Method: EPA 3005A

# Lab Control Sample Analysis

## Batch Quality Control

**Project Name:** RWM-Q1

**Project Number:** 21010103

**Lab Number:** L2415158

**Report Date:** 04/03/24

| Parameter | LCS %Recovery | Qual | LCSD %Recovery | Qual | %Recovery Limits | RPD | Qual | RPD Limits |
|---|---|---|---|---|---|---|---|---|
| Dissolved Metals - Mansfield Lab Associated sample(s): 01-08 Batch: WG1900504-2 | | | | | | | | |
| Cadmium, Dissolved | 95 | | - | | 80-120 | - | | |
| Zinc, Dissolved | 97 | | - | | 80-120 | - | | |

# Matrix Spike Analysis
## Batch Quality Control

**Project Name:** RWM-Q1
**Project Number:** 21010103

**Lab Number:** L2415158
**Report Date:** 04/03/24

| Parameter | Native Sample | MS Added | MS Found | MS %Recovery | Qual | MSD Found | MSD %Recovery | Qual | Recovery Limits | RPD | Qual | RPD Limits |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Dissolved Metals - Mansfield Lab Associated sample(s): 01-08 QC Batch ID: WG1900504-3 QC Sample: L2414945-01 Client ID: MS Sample | | | | | | | | | | | | |
| Cadmium, Dissolved | 0.4092 | 53 | 52.63 | 98 | | - | - | | 75-125 | - | | 20 |
| Zinc, Dissolved | 17.04 | 500 | 521.3 | 101 | | - | - | | 75-125 | - | | 20 |

# Lab Duplicate Analysis

***Batch Quality Control***

**Project Name:** RWM-Q1

**Project Number:** 21010103

***Lab Number:*** L2415158

***Report Date:*** 04/03/24

| Parameter | Native Sample | Duplicate Sample | Units | RPD | Qual | RPD Limits |
|---|---|---|---|---|---|---|
| Dissolved Metals - Mansfield Lab Associated sample(s): 01-08 QC Batch ID: WG1900504-4 QC Sample: L2414945-01 Client ID: DUP Sample | | | | | | |
| Cadmium, Dissolved | 0.4092 | 0.3787 | ug/l | 8 | | 20 |
| Zinc, Dissolved | 17.04 | 17.73 | ug/l | 4 | | 20 |

**Project Name:** RWM-Q1
**Project Number:** 21010103

**Lab Number:** L2415158
**Report Date:** 04/03/24

## Sample Receipt and Container Information

Were project specific reporting limits specified? YES

### Cooler Information

| Cooler | Custody Seal |
|---|---|
| A | Absent |

### Container Information

| Container ID | Container Type | Cooler | Initial pH | Final pH | Temp deg C | Pres | Seal | Frozen Date/Time | Analysis(*) |
|---|---|---|---|---|---|---|---|---|---|
| L2415158-01A | Plastic 250ml HNO3 preserved | A | <2 | <2 | 3.0 | Y | Absent | | ZN-6020S-PPB(180),CD-6020S-PPB(180) |
| L2415158-02A | Plastic 250ml HNO3 preserved | A | <2 | <2 | 3.0 | Y | Absent | | ZN-6020S-PPB(180),CD-6020S-PPB(180) |
| L2415158-03A | Plastic 250ml HNO3 preserved | A | <2 | <2 | 3.0 | Y | Absent | | ZN-6020S-PPB(180),CD-6020S-PPB(180) |
| L2415158-04A | Plastic 250ml HNO3 preserved | A | <2 | <2 | 3.0 | Y | Absent | | ZN-6020S-PPB(180),CD-6020S-PPB(180) |
| L2415158-05A | Plastic 250ml HNO3 preserved | A | <2 | <2 | 3.0 | Y | Absent | | ZN-6020S-PPB(180),CD-6020S-PPB(180) |
| L2415158-05B | Plastic 250ml Zn Acetate/NaOH preserved | A | >9 | >9 | 3.0 | Y | Absent | | SUB-SULFIDE() |
| L2415158-06A | Plastic 250ml HNO3 preserved | A | <2 | <2 | 3.0 | Y | Absent | | ZN-6020S-PPB(180),CD-6020S-PPB(180) |
| L2415158-06B | Plastic 250ml Zn Acetate/NaOH preserved | A | 7 | >9 | 3.0 | N | Absent | | SUB-SULFIDE() |
| L2415158-07A | Plastic 250ml HNO3 preserved | A | <2 | <2 | 3.0 | Y | Absent | | ZN-6020S-PPB(180),CD-6020S-PPB(180) |
| L2415158-08A | Plastic 250ml HNO3 preserved | A | <2 | <2 | 3.0 | Y | Absent | | ZN-6020S-PPB(180),CD-6020S-PPB(180) |



*Values in parentheses indicate holding time in days

| | | | |
|---|---|---|---|
| **Project Name:** | RWM-Q1 | **Lab Number:** | L2415158 |
| **Project Number:** | 21010103 | **Report Date:** | 04/03/24 |

## GLOSSARY

***Acronyms***

| | |
|---|---|
| DL | - Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the limit of quantitation (LOQ). The DL includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.) |
| EDL | - Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME). |
| EMPC | - Estimated Maximum Possible Concentration: The concentration that results from the signal present at the retention time of an analyte when the ions meet all of the identification criteria except the ion abundance ratio criteria. An EMPC is a worst-case estimate of the concentration. |
| EPA | - Environmental Protection Agency. |
| LCS | - Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes. |
| LCSD | - Laboratory Control Sample Duplicate: Refer to LCS. |
| LFB | - Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes. |
| LOD | - Limit of Detection: This value represents the level to which a target analyte can reliably be detected for a specific analyte in a specific matrix by a specific method. The LOD includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.) |
| LOQ | - Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)<br><br>Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.) |
| MDL | - Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. |
| MS | - Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available. For Method 332.0, the spike recovery is calculated using the native concentration, including estimated values. |
| MSD | - Matrix Spike Sample Duplicate: Refer to MS. |
| NA | - Not Applicable. |
| NC | - Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit. |
| NDPA/DPA | - N-Nitrosodiphenylamine/Diphenylamine. |
| NI | - Not Ignitable. |
| NP | - Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil. |
| NR | - No Results: Term is utilized when 'No Target Compounds Requested' is reported for the analysis of Volatile or Semivolatile Organic TIC only requests. |
| RL | - Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable. |
| RPD | - Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report. |
| SRM | - Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples. |
| STLP | - Semi-dynamic Tank Leaching Procedure per EPA Method 1315. |
| TEF | - Toxic Equivalency Factors: The values assigned to each dioxin and furan to evaluate their toxicity relative to 2,3,7,8-TCDD. |
| TEQ | - Toxic Equivalent: The measure of a sample's toxicity derived by multiplying each dioxin and furan by its corresponding TEF and then summing the resulting values. |
| TIC | - Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations. |

*Report Format: DU Report with 'J' Qualifiers*

| | | | |
|---|---|---|---|
| **Project Name:** | RWM-Q1 | **Lab Number:** | L2415158 |
| **Project Number:** | 21010103 | **Report Date:** | 04/03/24 |

***Footnotes***

1 - The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

***Terms***

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Chlordane: The target compound Chlordane (CAS No. 57-74-9) is reported for GC ECD analyses. Per EPA,this compound "refers to a mixture of chlordane isomers, other chlorinated hydrocarbons and numerous other components." (Reference: USEPA Toxicological Review of Chlordane, In Support of Summary Information on the Integrated Risk Information System (IRIS), December 1997.)

Difference: With respect to Total Oxidizable Precursor (TOP) Assay analysis, the difference is defined as the Post-Treatment value minus the Pre-Treatment value.

Final pH: As it pertains to Sample Receipt & Container Information section of the report, Final pH reflects pH of container determined after adjustment at the laboratory, if applicable. If no adjustment required, value reflects Initial pH.

Frozen Date/Time: With respect to Volatile Organics in soil, Frozen Date/Time reflects the date/time at which associated Reagent Water-preserved vials were initially frozen. Note: If frozen date/time is beyond 48 hours from sample collection, value will be reflected in 'bold'.

Gasoline Range Organics (GRO): Gasoline Range Organics (GRO) results include all chromatographic peaks eluting from Methyl tert butyl ether through Naphthalene, with the exception of GRO analysis in support of State of Ohio programs, which includes all chromatographic peaks eluting from Hexane through Dodecane.

Initial pH: As it pertains to Sample Receipt & Container Information section of the report, Initial pH reflects pH of container determined upon receipt, if applicable.

PAH Total: With respect to Alkylated PAH analyses, the 'PAHs, Total' result is defined as the summation of results for all or a subset of the following compounds: Naphthalene, C1-C4 Naphthalenes, 2-Methylnaphthalene, 1-Methylnaphthalene, Biphenyl, Acenaphthylene, Acenaphthene, Fluorene, C1-C3 Fluorenes, Phenanthrene, C1-C4 Phenanthrenes/Anthracenes, Anthracene, Fluoranthene, Pyrene, C1-C4 Fluoranthenes/Pyrenes, Benz(a)anthracene, Chrysene, C1-C4 Chrysenes, Benzo(b)fluoranthene, Benzo(j)+(k)fluoranthene, Benzo(e)pyrene, Benzo(a)pyrene, Perylene, Indeno(1,2,3-cd)pyrene, Dibenz(ah)+(ac)anthracene, Benzo(g,h,i)perylene. If a 'Total' result is requested, the results of its individual components will also be reported.

PFAS Total: With respect to PFAS analyses, the 'PFAS, Total (5)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA and PFOS. In addition, the 'PFAS, Total (6)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA, PFDA and PFOS. For MassDEP DW compliance analysis only, the 'PFAS, Total (6)' result is defined as the summation of results at or above the RL. Note: If a 'Total' result is requested, the results of its individual components will also be reported.

Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

***Data Qualifiers***

**A** - Spectra identified as "Aldol Condensates" are byproducts of the extraction/concentration procedures when acetone is introduced in the process.

**B** - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).

**C** - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.

**D** - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.

**E** - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.

**F** - The ratio of quantifier ion response to qualifier ion response falls outside of the laboratory criteria. Results are considered to be an estimated maximum concentration.

**G** - The concentration may be biased high due to matrix interferences (i.e, co-elution) with non-target compound(s). The result should be considered estimated.

**H** - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.

**I** - The lower value for the two columns has been reported due to obvious interference.

**J** - Estimated value. The Target analyte concentration is below the quantitation limit (RL), but above the Method Detection Limit (MDL) or Estimated Detection Limit (EDL) for SPME-related analyses. This represents an estimated concentration for Tentatively

*Report Format: DU Report with 'J' Qualifiers*

| | | | |
|---|---|---|---|
| **Project Name:** | RWM-Q1 | **Lab Number:** | L2415158 |
| **Project Number:** | 21010103 | **Report Date:** | 04/03/24 |

***Data Qualifiers***

Identified Compounds (TICs). For calculated parameters, this represents that one or more values used in the calculation were estimated.

**M** - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.

**ND** - Not detected at the method detection limit (MDL) for the sample, or estimated detection limit (EDL) for SPME-related analyses.

**NJ** - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where the identification is based on a mass spectral library search.

**P** - The RPD between the results for the two columns exceeds the method-specified criteria.

**Q** - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)

**R** - Analytical results are from sample re-analysis.

**RE** - Analytical results are from sample re-extraction.

**S** - Analytical results are from modified screening analysis.

**V** - The surrogate associated with this target analyte has a recovery outside the QC acceptance limits. (Applicable to MassDEP DW Compliance samples only.)

**Z** - The batch matrix spike and/or duplicate associated with this target analyte has a recovery/RPD outside the QC acceptance limits. (Applicable to MassDEP DW Compliance samples only.)

| | | | |
|---|---|---|---|
| **Project Name:** | RWM-Q1 | **Lab Number:** | L2415158 |
| **Project Number:** | 21010103 | **Report Date:** | 04/03/24 |

## REFERENCES

1 Test Methods for Evaluating Solid Waste: Physical/Chemical Methods. EPA SW-846. Third Edition. Updates I - VI, 2018.

## LIMITATION OF LIABILITIES

Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Analytical shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Alpha Analytical.

We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.

# Certification Information

**The following analytes are not included in our Primary NELAP Scope of Accreditation:**

**Westborough Facility**
**EPA 624.1:** m/p-xylene, o-xylene, Naphthalene
**EPA 625.1:** alpha-Terpineol
**EPA 8260D:** NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene, Azobenzene; SCM: Iodomethane (methyl iodide), 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.
**EPA 8270E:** NPW: Dimethylnaphthalene,1,4-Diphenylhydrazine, alpha-Terpineol; SCM: Dimethylnaphthalene,1,4-Diphenylhydrazine.
**SM4500**: NPW: Amenable Cyanide; SCM: Total Phosphorus, TKN, NO2, NO3.

**Mansfield Facility**
**SM 2540D:** TSS.
**EPA TO-15:** Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene, 3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene.
**Biological Tissue Matrix:** EPA 3050B

**The following analytes are included in our Massachusetts DEP Scope of Accreditation**

**Westborough Facility:**

***Drinking Water***
**EPA 300.0**: Chloride, Nitrate-N, Fluoride, Sulfate; **EPA 353.2**: Nitrate-N, Nitrite-N; **SM4500NO3-F**: Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE, EPA 180.1, SM2130B, SM4500Cl-D, SM2320B, SM2540C, SM4500H-B, SM4500NO2-B**
**EPA 524.2:** THMs and VOCs; **EPA 504.1:** EDB, DBCP.
**Microbiology**: **SM9215B; SM9223-P/A, SM9223B-Colilert-QT,SM9222D**.

***Non-Potable Water***
**SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2320B, SM4500CL-E, SM4500F-BC, SM4500NH3-BH:** Ammonia-N and Kjeldahl-N, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **EPA 351.1, SM4500NO3-F, EPA 353.2**: Nitrate-N**, SM4500P-E, SM4500P-B, E, SM4500SO4-E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, EPA 420.1, SM4500-CN-CE, SM2540D, EPA 300: Chloride, Sulfate, Nitrate.**
**EPA 624.1**: Volatile Halocarbons & Aromatics,
**EPA 608.3**: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs
**EPA 625.1**: SVOC (Acid/Base/Neutral Extractables).
**Microbiology**: **SM9223B-Colilert-QT; Enterolert-QT, SM9221E, EPA 1600, EPA 1603, SM9222D.**

**Mansfield Facility:**

***Drinking Water***
**EPA 200.7:** Al, Ba, Cd, Cr, Cu, Fe, Mn, Ni, Na, Ag, Ca, Zn. **EPA 200.8:** Al, Sb, As, Ba, Be, Cd, Cr, Cu, Pb, Mn, Ni, Se, Ag, TL, Zn. **EPA 245.1** Hg.
**EPA 522, EPA 537.1.**

***Non-Potable Water***
**EPA 200.7:** Al, Sb, As, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, K, Se, Ag, Na, Sr, TL, Ti, V, Zn.
**EPA 200.8:** Al, Sb**,** As, Be, Cd, Cr, Cu, Fe, Pb, Mn, Ni, K, Se, Ag, Na, TL, Zn.
**EPA 245.1** Hg.
**SM2340B**

For a complete listing of analytes and methods, please contact your Alpha Project Manager.

# CHAIN OF CUSTODY

PAGE 1 OF 1

ALPHA ANALYTICAL
WESTBORO, MA TEL. 508-898-9220 FAX: 508-898-9193
MANSFIELD, MA TEL. 508-822-9300 FAX: 508-822-3288

Date Rec'd in Lab: 3/21/24

ALPHA Job #: L2415158

**Client Information**
Client: TPA
Address:
Phone:
Fax:
Email:
☐ These samples have been previously analyzed by Alpha

**Project Information**
Project Name: RWM-Q1
Project Location:
Project #: 2010103
Project Manager: BOB T
ALPHA Quote #:

**Turn-Around Time**
☑ Standard ☐ RUSH (only confirmed if pre-approved!)
Date Due: Time:

**Report Information - Data Deliverables**
☐ FAX ☐ EMAIL
☐ ADEx ☐ Add'l Deliverables

**Billing Information**
☐ Same as Client info PO #:

**Regulatory Requirements/Report Limits**
State /Fed Program | Criteria

Other Project Specific Requirements/Comments/Detection Limits:

ANALYSIS: 1,4-Dioxane by 8270D SIM-de

SAMPLE HANDLING
Filtration
☒ Done
☐ Not needed
☐ Lab to do
Preservation
☐ Lab to do
(Please specify below)

| ALPHA Lab ID (Lab Use Only) | Sample ID | Collection Date | Collection Time | Sample Matrix | Sampler's Initials | Sample Specific Comments | TOTAL # BOTTLES |
|---|---|---|---|---|---|---|---|
| 5158 -01 | RWE-MWS | 3/19/24 | 1410 | GW | TP | | 1 |
| -02 | RWE-MWI | | 1445 | | | | 1 |
| -03 | RWD-MWS | | 1520 | | | | 1 |
| -04 | RWD-MWI | | 1550 | | | | 1 |
| -05 | RWQ-MWS | | 1655 | | | | 2 |
| -06 | RWQ-MWI | | 1735 | | | | 2 |
| -07 | RWQ3R-MWS | 3/20/24 | 0915 | | | | 1 |
| -08 | RWQ3R-MWI | 3/20/24 | 0950 | | | | 1 |

Container Type P P
Preservative C C

3/21/24 0230
3/21/24 0230

| Relinquished By: | Date/Time | Received By: | Date/Time |
|---|---|---|---|
| | 3/20/24 1400 | | 3/20/24 1355 |
| | 3/20/24 1800 | | 3/20/24 1800 |
| Anthony Green | 3/21/24 0020 | Anthony Green | 3/21/24 0020 |

MAR 20 2024 2114

Please print clearly, legibly and completely. Samples can not be logged in and turnaround time clock will not start until any ambiguities are resolved. All samples submitted are subject to Alpha's Terms and Conditions. See reverse side.

FORM NO: 01-01 (rev. 14-OCT-07)

PEOPLE ADVANCING SCIENCE

*Pace Analytical Services, LLC-Fairfield*

# ANALYTICAL RESULTS

## REDUCED DELIVERABLES FORMAT

Work Order Number: 24C1494

Pace - Alpha Analytical Laboratories

Project: L2415158



Sudip Pradhan
Laboratory Director

**All Results meet the requirements of the National Environmental Laboratory Accreditation Conference and/or State specific certifications as applicable.**

**Report Date:** Apr 01, 2024

1275 Bloomfield Ave., Bldg. 6, Fairfield, New Jersey 07004
(t) 973.227.0422 (f) 973.227.2813 (w) www.pacelabs.com

**NELAC** National Environmental Laboratory Accreditation Conference
NJDEP #07010 / NYDOH #11634 / PADEP #68-02903

sections 1 2 3 4 5 6 7 8 9

# CONTENTS

1. Sample Summary . . . 3
2. Chain of Custody . . . 4
3. Methodology Summary . . . 6
4. Abbreviations and Qualifiers . . . 7
5. Data of Known Quality . . . 8
6. Conformance/Non-Conformance Summary . . . 9
7. Positive Results Summary . . . 10
8. All Results Summary . . . 11
9. General Chemistry . . . 12
    9.1. General Chemistry Results . . . 13

PEOPLE ADVANCING SCIENCE

*Pace Analytical Services, LLC-Fairfield*

# Sample Summary

**Work Order:** 24C1494

**Client:** Pace - Alpha Analytical Laboratories

**Project:** L2415158

| Sample ID | Laboratory ID | Matrix | Date Sampled | Date Received |
|---|---|---|---|---|
| RWQ-MWS | 24C1494-01 | Water | 03/19/2024 16:55 | 03/22/2024 08:05 |
| RWQ-MWI | 24C1494-02 | Water | 03/19/2024 17:35 | 03/22/2024 08:05 |

**Pace**
Pace Analytical Services-Fairfield
www.pacelabs.com

# Subcontract Chain of Custody

APL/ Pace Fairfield
1275 Bloomfield Ave.
Bldg. 6
Fairfield, NJ 07004

24C1494

Pace - Alpha Analytical Laboratories
L2415158

**Alpha Job Number**
L2415158

| Client Information | Project Information | irements/Report Limits |
|---|---|---|
| Client: Alpha Analytical Labs<br>Address: Eight Walkup Drive<br>Westborough, MA 01581-1019<br>1494<br>Phone: 508.844.4115<br>Email: Mitchell.Ostrowski@pacelabs.com | Project Location: MD<br>Project Manager: Mitchell Ostrowski<br>**Turnaround & Deliverables Information**<br>Due Date:<br>Deliverables: | State/Federal Program:<br>Regulatory Criteria: |

**Project Specific Requirements and/or Report Requirements**

Reference following Alpha Job Number on final report/deliverables: L2415158

Report to include Method Blank, LCS/LCSD:

Additional Comments: Invoices to: invoices@pacelabs.coupahost.com Reports to: west.subreports@pacelabs.com

| Lab ID | Client ID | Collection Date/Time | Sample Matrix | Analysis | Batch QC |
|---|---|---|---|---|---|
| 01 | RWQ-MWS | 03-19-24 16:55 | WATER | Sulfide | |
| 02 | RWQ-MWI | 03-19-24 17:35 | WATER | Sulfide | |

1.2°C

| | Relinquished By: | Date/Time: | Received By: | Date/Time: |
|---|---|---|---|---|
| | C Jebeau | 3/21/24 | MM | 3/25 17:30 |
| | MC | 3/25 2300 | | 3/21/24 22:05 |
| | | 3/21/24 | Dan Hallal MC | 3/22/24 0830 DH |
| Form No: AL_subcoc | Dan Hallal MC | 3/22/24 0803 | | 3/24/24 805 |



Serial_No:04032413:55

DC#_Title: ENV-FRM-FAIR-007 v01_Sample Condition Upon Receipt Form
Effective Date: 7/26/2023

24C1494

## Sample Condition Upon Receipt Form (SCUR)

Pace ANALYTICAL SERVICES

Affix Sample Label Here

**Date and Initials of person:**
**Examining contents:** NF
**Label:**
**Deliver to location:**
**pH:** >10

Thermometer Used: 7ITR03 Date: 3/22/24 Time: 805 Initials: NF

State of Origin:

**Cooler #1 Temp.°C** 1.1 **(Visual)** 0.1 **(Correction Factor)** 1.2 **(Actual)** ☐ Samples on ice, cooling process has begun

**Courier:** ☐ Fed Ex ☐ UPS ☐ USPS ☐ Client ☐ Commercial ☒ Pace ☐ Other

**Shipping Method:** ☐ First Overnight ☐ Priority Overnight ☐ Standard Overnight ☐ Ground ☐ Other

**Tracking #**

**Custody Seal on Cooler/Box Present:** ☐ Yes ☒ No **Seals intact:** ☐ Yes ☒ No **Ice:** (Wet) Blue Melted None

**Packing Material:** ☐ Bubble Wrap ☐ Bubble Bags ☒ None ☐ Other

**Samples were collected by Pace employee** ☐ Yes ☒ No ☐ N/A

| | | Comments: |
|---|---|---|
| Chain of Custody Present | ☑Yes ☐ No ☐ N/A | |
| Chain of Custody Filled Out | ☑Yes ☐ No ☐ N/A | |
| Relinquished Signature on COC | ☑Yes ☐ No ☐ N/A | |
| Sampler Name and Signature on COC | ☑Yes ☐ No ☐ N/A | |
| Samples Arrived within Hold Time | ☑Yes ☐ No ☐ N/A | |
| Rush TAT requested on COC | ☐Yes ☑ No ☐ N/A | |
| Sufficient Volume | ☑Yes ☐ No ☐ N/A | |
| Correct Containers Used | ☑Yes ☐ No ☐ N/A | |
| Containers Intact | ☑Yes ☐ No ☐ N/A | |
| Sample Labels match COC (sample IDs & date/time of collection) | ☑Yes ☐ No ☐ N/A | |
| All containers needing acid/base preservation have been checked. | ☑Yes ☐ No ☐ N/A | Preservation Information:<br>Preservative:<br>Lot #/Trace #:<br>Date: Time:<br>Initials: |
| All Containers needing preservation are found to be in compliance with EPA recommendation:<br>Exceptions: Vials, Microbiology, O&G, Metals | ☑Yes ☐ No ☐ N/A | |
| Headspace in VOA Vials? ( >6mm): | ☐Yes ☐ No ☑N/A | |
| Trip Blank Present: | ☐Yes ☐ No ☑N/A | |

**Additional Login Comments:**

lot # 232221

**Client notification/ Resolution**

Person Contacted: Date/Time:

Comments/Resolution:

Pace Analytical Services, LLC-Fairfield
Methodology Summary

## Extractable Petroleum Hydrocarbons:

### *Gas Chromatography/Flame Ionization Detector*

New Jersey Department of Environmental Protection Site Remediation Program Extractable Petroleum Hydrocarbons Methodology (Version 3.0).
USEPA SW-846 Test Methods for Evaluating Solid Waste Physical/Chemical Methods Update III, Method 8015D or NJDEP Office of Quality Assurance Quantitation of Semi-Volatile Petroleum Products in Water, Soil and Sediment OQA-QAM-025, Revision 6.

## Metals:

### *Inductively-Coupled Plasma Atomic Emission Spectrometry or Inductively-Coupled Plasma Mass Spectroscopy*

**Wastewater and Groundwater Samples:** USEPA Methods for the Analysis of Water and Wastes, Method 200.7, Method 200.8.
**Soil Samples:** USEPA Methods for Evaluating Solid Waste Physical/Chemical Methods Update III, Method 6010D.

## Mercury:

### *Cold Vapor Atomic Absorption Spectrometry*

**Wastewater and Groundwater Samples:** USEPA Methods for the Analysis of Water and Wastes, Method 245.1.
**Soil Samples**: USEPA SW-846 Test Methods for Evaluating Solid Waste Physical/Chemical Methods Update III, Method 7471B.

## Volatile Organic Compounds:

### *Purge and Trap Gas Chromatography/Mass Spectroscopy*

**Drinking Water Samples:** USEPA Methods for the Determination of Organic Compounds in Drinking Water, Method 524.2.
**Wastewater Samples:** USEPA Methods for the Analysis of Water and Wastes, Method 624.1.
**Soil and Groundwater Samples:** USEPA SW-846 Test Methods for Evaluating Solid Waste Physical/Chemical Methods Update VI, Method 8260D.

## Semi-Volatile Organic Compounds:

### *Gas Chromatography/Mass Spectroscopy*

**Wastewater Samples:** USEPA Methods for the Analysis of Water and Wastes, Method 625.1.
**Soil and Groundwater Samples:** USEPA SW-846 Test Methods for Evaluating Solid Waste Physical/Chemical Methods Update VI, Method 8270E.

## PFAS Compounds:

### *Liquid Chromatography/Tandem Mass Spectroscopy*

**Drinking Water Samples:** USEPA Methods for the Determination of Selected Perfluorinated Alkyl Acids in Drinking Water by Solid Phase Extraction and Liquid Chromatography/Tandem Mass Spectrometry (LC/MS/MS), Method 537 (v1.1).

## Pesticides:

### *Gas Chromatography/Electron Capture Detector*

**Wastewater Samples:** USEPA Methods for the Analysis of Water and Wastes, Method 608.3.
**Soil and Groundwater Samples:** USEPA SW-846 Test Methods for Evaluating Solid Waste Physical/Chemical Methods Update III, Method 8081B.

## Polychlorinated Biphenyls (PCBs):

### *Gas Chromatography/Electron Capture Detector*

**Wastewater Samples:** USEPA Methods for the Analysis of Water and Wastes, Method 608.3.
**Soil and Groundwater Samples:** USEPA SW-846 Test Methods for Evaluating Solid Waste Physical/Chemical Methods Update III, Method 8082A.

## General Chemistry Methods:

### *Various general chemistry methods are taken from* "Standard Methods for the Examination of Water and Wastewater, 22nd Edition", .

Specific method citations can be found on the Analytical Results Summary page of this report listed under 'Method'.

** A complete list of Pace Fairfield's certified Methods are on the Standards And Docs page of the Results Retrieval System

Pace Analytical Services, LLC-Fairfield
Data Reporting Abbreviations and Qualifiers



**Method Detection Limit (MDL):**

The MDL is defined as the minimum measured concentration of a substance that can be reported with 99% confidence that the measured concentration is distinguishable from method blank results. The value is calculated following the guidelines defined in:

"Definition and Procedure for the Determination of the Method Detection Limit, Revision 2"
EPA 821-R-16-006, published December 2016.

**Reporting Limit (RL):**

The RL is the Concentration of the lowest calibration standard that was included in the initial calibration of the instrument. On analytical reports this value is corrected for percent moisture and any concentration or dilution factors.

**Concentration (Conc.) / Result:**

If the compound is detected, the measured concentration is reported. If this column is "ND", or contains a 'less than' (<) symbol, the compound was not detected.

**Tentatively Identified Compound (TIC):**

A TIC is a non-targeted compound, not included in the calibration, identified by a mass spectral library search OR requested to be identified and reported by the client.

**Abbreviations:**

| | |
|---|---|
| **ND** | Non-Detect |
| **TNTC** | Too Numerous To Count |

**Qualifers:**

| | |
|---|---|
| **U** | Compound not detected |

## DATA OF KNOWN QUALITY CONFORMANCE/NON-CONFORMANCE SUMMARY QUESTIONNAIRE

**Laboratory Name:** Pace Analytical Services, LLC-Fairfield **Client:** Pace - Alpha Analytical Laboratories

**Project Location:** L2415158 **Project Number:** 24C1494

**Laboratory Sample ID(s):** 01-02 **Sampling Date(s):** March 19,2024

**List DKQP Methods Used:** SM 4500-S-D-11

| | | |
|---|---|---|
| 1 | For each analytical method referenced in this laboratory report package, were all specified QA/QC performance criteria followed, including the requirement to explain any criteria falling outside of acceptable guidelines, as specified in the NJDEP Data of Known Quality performance standards? | ☑ Yes ☐ No |
| 1A | Were the method specified handling, preservation, and holding time requirements met? | ☑ Yes ☐ No |
| 1B | EPH Method: Was the EPH method conducted without significant modifications (see Section 11.3 of respective DKQ methods) | ☐ Yes ☐ No ☑ N/A |
| 2 | Were all samples received by the laboratory in a condition consistent with that described on the associated chain-of-custody document(s)? | ☑ Yes ☐ No |
| 3 | Were samples received at an appropriate temperature (4±2° C)? | ☐ Yes ☑ No ☐ N/A |
| 4 | Were all QA/QC performance criteria specified in the NJDEP DKQP standards achieved? | ☑ Yes ☐ No |
| 5 | Were reporting limits specified or referenced on the chain-of-custody or communicated to the laboratory prior to sample receipt?<br>Were these reporting limits met? | ☑ Yes ☐ No<br>☑ Yes ☐ No ☐ N/A |
| 6 | For each analytical method referenced in this laboratory report package, were results reported for all constituents identified in the method-specific analyte lists presented in the DKQP documents and/or site-specific QAPP? | ☑ Yes ☐ No |
| 7 | Are project-specific matrix spikes and/or laboratory duplicates included in this data set? | ☐ Yes ☑ No |

**Notes: For all questions to which the response was "No° (with the exception of question #7), additional information should be provided in an attached narrative. If the answer to question #1, #1A, or #1B is "No", the data package does not meet the requirements for Data of Known Quality.°**

**A-5**

Pace Analytical Services, LLC-Fairfield

## QUALITY CONTROL
## Conformance/Non-Conformance Summary



**ANALYSIS: Sulfide [SM 4500-S-D-11]**

COMMENTS:
All samples met QC criteria.

Reviewed By: _____ (IK) 4/1/2024
Sudip Pradhan - Laboratory Director — Date

*For any questions about your Quality Control, please call us at 973-227-0422*

PEOPLE ADVANCING SCIENCE

*Pace Analytical Services, LLC-Fairfield*

# Positive Results Only Summary

**24C1494-01 (Water)** Sample Name: **RWQ-MWS**

**SM 4500-S-D-11 - General Chemistry**

| Analyte | Result | Qual | MDL | RL | Units | Dilution | Analyzed |
|---|---|---|---|---|---|---|---|
| Sulfide | 0.0190 | | 0.00500 | 0.0100 | mg/L | 1 | 3/25/24 11:00 |

**24C1494-02 (Water)** Sample Name: **RWQ-MWI**

**SM 4500-S-D-11 - General Chemistry**

| Analyte | Result | Qual | MDL | RL | Units | Dilution | Analyzed |
|---|---|---|---|---|---|---|---|
| Sulfide | 0.0190 | | 0.00500 | 0.0100 | mg/L | 1 | 3/25/24 11:00 |

**ND** - Indicates compound analyzed for but not detected
**J** - Indicates estimated value
**B** - Indicates compound found in associated blank
**E** - Concentration exceeds highest calibration standard

**D** - Indicates result is based on a dilution
**H** - Indicates a Hold Time violation
**P** - Greater than 25% diff. between 2 GC columns.
**MDL** - Minimum detection limit, **RL** - Reporting limit
**D1** - Sample was Decanted (Dissolved)

PEOPLE ADVANCING SCIENCE

*Pace Analytical Services, LLC-Fairfield*

# All Results Summary

**Client:** Pace - Alpha Analytical Laboratories
**Project:** L2415158
**Work Order:** 24C1494
**Date to Lab:** 3/22/2024 8:05:00AM

**24C1494-01 (Water)** Sample Name: **RWQ-MWS** Collected: **3/19/2024 4:55:00PM**

**SM 4500-S-D-11 - General Chemistry**

| Analyte | Result | Qual | MDL | RL | Units | Dilution | Analyzed |
|---|---|---|---|---|---|---|---|
| Sulfide | 0.0190 | | 0.00500 | 0.0100 | mg/L | 1 | 3/25/24 11:00 |

**24C1494-02 (Water)** Sample Name: **RWQ-MWI** Collected: **3/19/2024 5:35:00PM**

**SM 4500-S-D-11 - General Chemistry**

| Analyte | Result | Qual | MDL | RL | Units | Dilution | Analyzed |
|---|---|---|---|---|---|---|---|
| Sulfide | 0.0190 | | 0.00500 | 0.0100 | mg/L | 1 | 3/25/24 11:00 |

**ND, U** - Indicates compound analyzed for but not detected
**J** - Indicates estimated value
**B** - Indicates compound found in associated blank
**E** - Concentration exceeds highest calibration standard
**D** - Indicates result is based on a dilution
**H** - Indicates a Hold Time violation
**P** - Greater than 25% diff. between 2 GC columns.
**MDL** - Minimum detection limit, **RL** - Reporting limit
**D1** - Sample was Decanted (Dissolved)

PEOPLE ADVANCING SCIENCE

*Pace Analytical Services, LLC-Fairfield*

# GENERAL CHEMISTRY



Pace - Alpha Analytical Laboratories

Work Order: 24C1494

Project: L2415158

# ANALYSIS DATA SHEET

## General Chemistry

**Client:** Pace - Alpha Analytical Laboratories
**Project:** L2415158
**Work Order:** 24C1494

### General Chemistry

**24C1494-01 (Water) - RWQ-MWS**

| Analyte | Units | Conc. | RL | DF | Qual | Analyzed | Method |
|---|---|---|---|---|---|---|---|
| Sulfide | mg/L | 0.0190 | 0.0100 | 1 | | 03/25/24 11:00 | SM 4500-S-D-11 |

**24C1494-02 (Water) - RWQ-MWI**

| Analyte | Units | Conc. | RL | DF | Qual | Analyzed | Method |
|---|---|---|---|---|---|---|---|
| Sulfide | mg/L | 0.0190 | 0.0100 | 1 | | 03/25/24 11:00 | SM 4500-S-D-11 |



**ND** - Indicates compound analyzed for but not detected
**J** - Indicates estimated value
**B** - Indicates compound found in associated blank
**E** - Concentration exceeds highest calibration standard
**D** - Indicates result is based on a dilution
**H** - Indicates a Hold Time violation
**P** - Greater than 25% diff. between 2 GC columns.
**MDL** - Minimum detection limit, **RL** - Reporting limit

F-I

## Pace Analytical Services, LLC-Fairfield

### General Chemistry - Quality Control

| Sulfide | | Result | Reporting Limit | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit |
|---|---|---|---|---|---|---|---|---|---|---|
| **Batch BBC1691** | | | Prepared & Analyzed: 3/25/2024 | | | | | | | |
| BBC1691-BLK1 | | ND | 0.0100 | mg/L | | | | | | |
| BBC1691-BS1 | | 0.371 | 0.0100 | mg/L | 0.400 | | 92.8 | 80-120 | | |
| BBC1691-DUP1 | **Source: 24C1374-01** | 0.0360 | 0.0100 | mg/L | | 0.0240 | | | 40.00* | 20 |
| BBC1691-MS1 | **Source: 24C1374-01** | 0.436 | 0.0100 | mg/L | 0.400 | 0.0240 | 103 | 70-130 | | |
| BBC1691-MSD1 | **Source: 24C1374-01** | 0.390 | 0.0100 | mg/L | 0.400 | 0.0240 | 91.5 | 70-130 | 11.10 | 20 |

**ND** - Indicates compound analyzed for but not detected
**J** - Indicates estimated value
**B** - Indicates compound found in associated blank
**E** - Concentration exceeds highest calibration standard
**D** - Indicates result is based on a dilution
**H** - Indicates a Hold Time violation
**P** - Greater than 25% diff. between 2 GC columns.
**MDL** - Minimum detection limit, **RL** - Reporting limit

F-III

# ANALYTICAL REPORT

| | |
|---|---|
| Lab Number: | L2415529 |
| Client: | Tradepoint Atlantic<br>1600 Sparrows Point Boulevard<br>Baltimore, MD 21219 |
| ATTN: | Robert Tworkowski |
| Phone: | (443) 649-5073 |
| Project Name: | RWM-Q1 |
| Project Number: | 21010103 |
| Report Date: | 04/05/24 |

The original project report/data package is held by Alpha Analytical. This report/data package is paginated and should be reproduced only in its entirety. Alpha Analytical holds no responsibility for results and/or data that are not consistent with the original.

Certifications & Approvals: MA (M-MA086), NH NELAP (2064), CT (PH-0826), IL (200077), IN (C-MA-03), KY (KY98045), ME (MA00086), MD (348), NJ (MA935), NY (11148), NC (25700/666), OH (CL108), OR (MA-1316), PA (68-03671), RI (LAO00065), TX (T104704476), VT (VT-0935), VA (460195), USDA (Permit #525-23-122-91930).

Eight Walkup Drive, Westborough, MA 01581-1019
508-898-9220 (Fax) 508-898-9193 800-624-9220 - www.alphalab.com

**Project Name:** RWM-Q1
**Project Number:** 21010103

**Lab Number:** L2415529
**Report Date:** 04/05/24

| Alpha Sample ID | Client ID | Matrix | Sample Location | Collection Date/Time | Receive Date |
|---|---|---|---|---|---|
| L2415529-01 | RW12-MWS | WATER | Not Specified | 03/20/24 12:55 | 03/21/24 |
| L2415529-02 | RW12-MWI | WATER | Not Specified | 03/20/24 13:30 | 03/21/24 |
| L2415529-03 | RWA-MWS | WATER | Not Specified | 03/20/24 14:20 | 03/21/24 |
| L2415529-04 | RWA-MWI | WATER | Not Specified | 03/20/24 15:00 | 03/21/24 |
| L2415529-05 | RWS-MWS | WATER | Not Specified | 03/20/24 15:55 | 03/21/24 |
| L2415529-06 | RWS-MWI | WATER | Not Specified | 03/20/24 16:45 | 03/21/24 |

| | | | |
|---|---|---|---|
| **Project Name:** | RWM-Q1 | **Lab Number:** | L2415529 |
| **Project Number:** | 21010103 | **Report Date:** | 04/05/24 |

## Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet NELAP requirements for all NELAP accredited parameters unless otherwise noted in the following narrative. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. Tentatively Identified Compounds (TICs), if requested, are reported for compounds identified to be present and are not part of the method/program Target Compound List, even if only a subset of the TCL are being reported. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively.

When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances, the specific failure is not narrated but noted in the associated QC Outlier Summary Report, located directly after the Case Narrative. QC information is also incorporated in the Data Usability Assessment table (Format 11) of our Data Merger tool, where it can be reviewed in conjunction with the sample result, associated regulatory criteria and any associated data usability implications.

Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

HOLD POLICY - For samples submitted on hold, Alpha's policy is to hold samples (with the exception of Air canisters) free of charge for 21 calendar days from the date the project is completed. After 21 calendar days, we will dispose of all samples submitted including those put on hold unless you have contacted your Alpha Project Manager and made arrangements for Alpha to continue to hold the samples. Air canisters will be disposed after 3 business days from the date the project is completed.

Please contact Project Management at 800-624-9220 with any questions.

| | | | |
|---|---|---|---|
| **Project Name:** | RWM-Q1 | **Lab Number:** | L2415529 |
| **Project Number:** | 21010103 | **Report Date:** | 04/05/24 |

**Case Narrative (continued)**

Report Submission

All non-detect (ND) or estimated concentrations (J-qualified) have been quantitated to the limit noted in the MDL column.

The analysis of Sulfide was subcontracted. A copy of the laboratory report is included as an addendum. Please note: This data is only available in PDF format and is not available on Data Merger.

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature: Michelle M. Morris

Title: Technical Director/Representative Date: 04/05/24

# METALS

**Project Name:** RWM-Q1 **Lab Number:** L2415529

**Project Number:** 21010103 **Report Date:** 04/05/24

## SAMPLE RESULTS

Lab ID: L2415529-01 Date Collected: 03/20/24 12:55

Client ID: RW12-MWS Date Received: 03/21/24

Sample Location: Not Specified Field Prep: Refer to COC

Sample Depth:

Matrix: Water

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dissolved Metals - Mansfield Lab** | | | | | | | | | | | |
| Cadmium, Dissolved | 5.974 | | ug/l | 0.2000 | 0.0599 | 1 | 03/26/24 16:26 | 03/27/24 20:13 | EPA 3005A | 1,6020B | EJF |
| Zinc, Dissolved | 6243. | | ug/l | 10.00 | 3.410 | 1 | 03/26/24 16:26 | 03/27/24 20:13 | EPA 3005A | 1,6020B | EJF |

**Project Name:** RWM-Q1 **Lab Number:** L2415529

**Project Number:** 21010103 **Report Date:** 04/05/24

## SAMPLE RESULTS

Lab ID: L2415529-02 Date Collected: 03/20/24 13:30

Client ID: RW12-MWI Date Received: 03/21/24

Sample Location: Not Specified Field Prep: Refer to COC

Sample Depth:

Matrix: Water

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dissolved Metals - Mansfield Lab** | | | | | | | | | | | |
| Cadmium, Dissolved | 289.0 | | ug/l | 2.000 | 0.5990 | 10 | 03/26/24 16:26 | 03/28/24 08:26 | EPA 3005A | 1,6020B | EJF |
| Zinc, Dissolved | 1418. | | ug/l | 10.00 | 3.410 | 1 | 03/26/24 16:26 | 03/27/24 20:17 | EPA 3005A | 1,6020B | EJF |

**Project Name:** RWM-Q1 **Lab Number:** L2415529

**Project Number:** 21010103 **Report Date:** 04/05/24

## SAMPLE RESULTS

Lab ID: L2415529-03 Date Collected: 03/20/24 14:20

Client ID: RWA-MWS Date Received: 03/21/24

Sample Location: Not Specified Field Prep: Refer to COC

Sample Depth:

Matrix: Water

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dissolved Metals - Mansfield Lab** | | | | | | | | | | | |
| Cadmium, Dissolved | 1.784 | | ug/l | 0.2000 | 0.0599 | 1 | 03/26/24 16:26 | 03/27/24 20:40 | EPA 3005A | 1,6020B | EJF |
| Zinc, Dissolved | 152.4 | | ug/l | 10.00 | 3.410 | 1 | 03/26/24 16:26 | 03/28/24 08:45 | EPA 3005A | 1,6020B | EJF |

**Project Name:** RWM-Q1 **Lab Number:** L2415529

**Project Number:** 21010103 **Report Date:** 04/05/24

## SAMPLE RESULTS

Lab ID: L2415529-04 Date Collected: 03/20/24 15:00

Client ID: RWA-MWI Date Received: 03/21/24

Sample Location: Not Specified Field Prep: Refer to COC

Sample Depth:

Matrix: Water

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dissolved Metals - Mansfield Lab** | | | | | | | | | | | |
| Cadmium, Dissolved | 8386. | | ug/l | 20.00 | 5.990 | 100 | 03/26/24 16:26 | 03/28/24 08:49 | EPA 3005A | 1,6020B | EJF |
| Zinc, Dissolved | 379700 | | ug/l | 1000. | 341.0 | 100 | 03/26/24 16:26 | 03/28/24 08:49 | EPA 3005A | 1,6020B | EJF |

**Project Name:** RWM-Q1 **Lab Number:** L2415529

**Project Number:** 21010103 **Report Date:** 04/05/24

## SAMPLE RESULTS

Lab ID: L2415529-05 Date Collected: 03/20/24 15:55

Client ID: RWS-MWS Date Received: 03/21/24

Sample Location: Not Specified Field Prep: Refer to COC

Sample Depth:

Matrix: Water

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dissolved Metals - Mansfield Lab** | | | | | | | | | | | |
| Cadmium, Dissolved | 1.028 | | ug/l | 0.2000 | 0.0599 | 1 | 03/26/24 16:26 | 03/27/24 20:49 | EPA 3005A | 1,6020B | EJF |
| Zinc, Dissolved | 167200 | | ug/l | 500.0 | 170.5 | 50 | 03/26/24 16:26 | 03/28/24 09:24 | EPA 3005A | 1,6020B | EJF |

**Project Name:** RWM-Q1 **Lab Number:** L2415529

**Project Number:** 21010103 **Report Date:** 04/05/24

## SAMPLE RESULTS

Lab ID: L2415529-06 Date Collected: 03/20/24 16:45

Client ID: RWS-MWI Date Received: 03/21/24

Sample Location: Not Specified Field Prep: Refer to COC

Sample Depth:

Matrix: Water

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dissolved Metals - Mansfield Lab** | | | | | | | | | | | |
| Cadmium, Dissolved | 0.0805 | J | ug/l | 0.2000 | 0.0599 | 1 | 03/26/24 16:26 | 03/27/24 20:53 | EPA 3005A | 1,6020B | EJF |
| Zinc, Dissolved | 767800 | | ug/l | 1000. | 341.0 | 100 | 03/26/24 16:26 | 03/28/24 09:42 | EPA 3005A | 1,6020B | EJF |

**Project Name:** RWM-Q1 **Lab Number:** L2415529

**Project Number:** 21010103 **Report Date:** 04/05/24

# Method Blank Analysis
# Batch Quality Control

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|
| Dissolved Metals - Mansfield Lab for sample(s): 01-06 Batch: WG1901018-1 | | | | | | | | | | |
| Cadmium, Dissolved | ND | | ug/l | 0.2000 | 0.0599 | 1 | 03/26/24 16:26 | 03/27/24 18:55 | 1,6020B | EJF |
| Zinc, Dissolved | ND | | ug/l | 10.00 | 3.410 | 1 | 03/26/24 16:26 | 03/27/24 18:55 | 1,6020B | EJF |

**Prep Information**

Digestion Method: EPA 3005A

# Lab Control Sample Analysis

## Batch Quality Control

**Project Name:** RWM-Q1

**Project Number:** 21010103

**Lab Number:** L2415529

**Report Date:** 04/05/24

| Parameter | LCS %Recovery | Qual | LCSD %Recovery | Qual | %Recovery Limits | RPD | Qual | RPD Limits |
|---|---|---|---|---|---|---|---|---|
| Dissolved Metals - Mansfield Lab Associated sample(s): 01-06 Batch: WG1901018-2 | | | | | | | | |
| Cadmium, Dissolved | 96 | | - | | 80-120 | - | | |
| Zinc, Dissolved | 97 | | - | | 80-120 | - | | |

# Matrix Spike Analysis
## Batch Quality Control

**Project Name:** RWM-Q1
**Project Number:** 21010103

**Lab Number:** L2415529
**Report Date:** 04/05/24

| Parameter | Native Sample | MS Added | MS Found | MS %Recovery | Qual | MSD Found | MSD %Recovery | Qual | Recovery Limits | RPD | Qual | RPD Limits |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Dissolved Metals - Mansfield Lab Associated sample(s): 01-06 QC Batch ID: WG1901018-3 QC Sample: L2413949-02 Client ID: MS Sample | | | | | | | | | | | | |
| Cadmium, Dissolved | ND | 53 | 50.75 | 96 | | - | - | | 75-125 | - | | 20 |
| Zinc, Dissolved | ND | 500 | 486.8 | 97 | | - | - | | 75-125 | - | | 20 |

**Project Name:** RWM-Q1
**Project Number:** 21010103

**Lab Number:** L2415529
**Report Date:** 04/05/24

## Sample Receipt and Container Information

Were project specific reporting limits specified? YES

### Cooler Information

| Cooler | Custody Seal |
|---|---|
| A | Absent |

### Container Information

| Container ID | Container Type | Cooler | Initial pH | Final pH | Temp deg C | Pres | Seal | Frozen Date/Time | Analysis(*) |
|---|---|---|---|---|---|---|---|---|---|
| L2415529-01A | Plastic 250ml HNO3 preserved | A | <2 | <2 | 3.5 | Y | Absent | | ZN-6020S-PPB(180),CD-6020S-PPB(180) |
| L2415529-02A | Plastic 250ml HNO3 preserved | A | <2 | <2 | 3.5 | Y | Absent | | ZN-6020S-PPB(180),CD-6020S-PPB(180) |
| L2415529-02B | Plastic 250ml Zn Acetate/NaOH preserved | A | >9 | >9 | 3.5 | Y | Absent | | SUB-SULFIDE() |
| L2415529-03A | Plastic 250ml HNO3 preserved | A | <2 | <2 | 3.5 | Y | Absent | | ZN-6020S-PPB(180),CD-6020S-PPB(180) |
| L2415529-04A | Plastic 250ml HNO3 preserved | A | <2 | <2 | 3.5 | Y | Absent | | ZN-6020S-PPB(180),CD-6020S-PPB(180) |
| L2415529-05A | Plastic 250ml HNO3 preserved | A | <2 | <2 | 3.5 | Y | Absent | | ZN-6020S-PPB(180),CD-6020S-PPB(180) |
| L2415529-06A | Plastic 250ml HNO3 preserved | A | <2 | <2 | 3.5 | Y | Absent | | ZN-6020S-PPB(180),CD-6020S-PPB(180) |



*Values in parentheses indicate holding time in days

| | | | |
|---|---|---|---|
| **Project Name:** | RWM-Q1 | **Lab Number:** | L2415529 |
| **Project Number:** | 21010103 | **Report Date:** | 04/05/24 |

## GLOSSARY

***Acronyms***

| | |
|---|---|
| DL | - Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the limit of quantitation (LOQ). The DL includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.) |
| EDL | - Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME). |
| EMPC | - Estimated Maximum Possible Concentration: The concentration that results from the signal present at the retention time of an analyte when the ions meet all of the identification criteria except the ion abundance ratio criteria. An EMPC is a worst-case estimate of the concentration. |
| EPA | - Environmental Protection Agency. |
| LCS | - Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes. |
| LCSD | - Laboratory Control Sample Duplicate: Refer to LCS. |
| LFB | - Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes. |
| LOD | - Limit of Detection: This value represents the level to which a target analyte can reliably be detected for a specific analyte in a specific matrix by a specific method. The LOD includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.) |
| LOQ | - Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)<br><br>Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.) |
| MDL | - Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. |
| MS | - Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available. For Method 332.0, the spike recovery is calculated using the native concentration, including estimated values. |
| MSD | - Matrix Spike Sample Duplicate: Refer to MS. |
| NA | - Not Applicable. |
| NC | - Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit. |
| NDPA/DPA | - N-Nitrosodiphenylamine/Diphenylamine. |
| NI | - Not Ignitable. |
| NP | - Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil. |
| NR | - No Results: Term is utilized when 'No Target Compounds Requested' is reported for the analysis of Volatile or Semivolatile Organic TIC only requests. |
| RL | - Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable. |
| RPD | - Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report. |
| SRM | - Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples. |
| STLP | - Semi-dynamic Tank Leaching Procedure per EPA Method 1315. |
| TEF | - Toxic Equivalency Factors: The values assigned to each dioxin and furan to evaluate their toxicity relative to 2,3,7,8-TCDD. |
| TEQ | - Toxic Equivalent: The measure of a sample's toxicity derived by multiplying each dioxin and furan by its corresponding TEF and then summing the resulting values. |
| TIC | - Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations. |

*Report Format: DU Report with 'J' Qualifiers*

| | | | |
|---|---|---|---|
| **Project Name:** | RWM-Q1 | **Lab Number:** | L2415529 |
| **Project Number:** | 21010103 | **Report Date:** | 04/05/24 |

***Footnotes***

1 - The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

***Terms***

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Chlordane: The target compound Chlordane (CAS No. 57-74-9) is reported for GC ECD analyses. Per EPA,this compound "refers to a mixture of chlordane isomers, other chlorinated hydrocarbons and numerous other components." (Reference: USEPA Toxicological Review of Chlordane, In Support of Summary Information on the Integrated Risk Information System (IRIS), December 1997.)

Difference: With respect to Total Oxidizable Precursor (TOP) Assay analysis, the difference is defined as the Post-Treatment value minus the Pre-Treatment value.

Final pH: As it pertains to Sample Receipt & Container Information section of the report, Final pH reflects pH of container determined after adjustment at the laboratory, if applicable. If no adjustment required, value reflects Initial pH.

Frozen Date/Time: With respect to Volatile Organics in soil, Frozen Date/Time reflects the date/time at which associated Reagent Water-preserved vials were initially frozen. Note: If frozen date/time is beyond 48 hours from sample collection, value will be reflected in 'bold'.

Gasoline Range Organics (GRO): Gasoline Range Organics (GRO) results include all chromatographic peaks eluting from Methyl tert butyl ether through Naphthalene, with the exception of GRO analysis in support of State of Ohio programs, which includes all chromatographic peaks eluting from Hexane through Dodecane.

Initial pH: As it pertains to Sample Receipt & Container Information section of the report, Initial pH reflects pH of container determined upon receipt, if applicable.

PAH Total: With respect to Alkylated PAH analyses, the 'PAHs, Total' result is defined as the summation of results for all or a subset of the following compounds: Naphthalene, C1-C4 Naphthalenes, 2-Methylnaphthalene, 1-Methylnaphthalene, Biphenyl, Acenaphthylene, Acenaphthene, Fluorene, C1-C3 Fluorenes, Phenanthrene, C1-C4 Phenanthrenes/Anthracenes, Anthracene, Fluoranthene, Pyrene, C1-C4 Fluoranthenes/Pyrenes, Benz(a)anthracene, Chrysene, C1-C4 Chrysenes, Benzo(b)fluoranthene, Benzo(j)+(k)fluoranthene, Benzo(e)pyrene, Benzo(a)pyrene, Perylene, Indeno(1,2,3-cd)pyrene, Dibenz(ah)+(ac)anthracene, Benzo(g,h,i)perylene. If a 'Total' result is requested, the results of its individual components will also be reported.

PFAS Total: With respect to PFAS analyses, the 'PFAS, Total (5)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA and PFOS. In addition, the 'PFAS, Total (6)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA, PFDA and PFOS. For MassDEP DW compliance analysis only, the 'PFAS, Total (6)' result is defined as the summation of results at or above the RL. Note: If a 'Total' result is requested, the results of its individual components will also be reported.

Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

***Data Qualifiers***

**A** - Spectra identified as "Aldol Condensates" are byproducts of the extraction/concentration procedures when acetone is introduced in the process.

**B** - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).

**C** - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.

**D** - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.

**E** - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.

**F** - The ratio of quantifier ion response to qualifier ion response falls outside of the laboratory criteria. Results are considered to be an estimated maximum concentration.

**G** - The concentration may be biased high due to matrix interferences (i.e, co-elution) with non-target compound(s). The result should be considered estimated.

**H** - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.

**I** - The lower value for the two columns has been reported due to obvious interference.

**J** - Estimated value. The Target analyte concentration is below the quantitation limit (RL), but above the Method Detection Limit (MDL) or Estimated Detection Limit (EDL) for SPME-related analyses. This represents an estimated concentration for Tentatively

*Report Format: DU Report with 'J' Qualifiers*

| | | | |
|---|---|---|---|
| **Project Name:** | RWM-Q1 | **Lab Number:** | L2415529 |
| **Project Number:** | 21010103 | **Report Date:** | 04/05/24 |

***Data Qualifiers***

Identified Compounds (TICs). For calculated parameters, this represents that one or more values used in the calculation were estimated.

**M** - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.

**ND** - Not detected at the method detection limit (MDL) for the sample, or estimated detection limit (EDL) for SPME-related analyses.

**NJ** - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where the identification is based on a mass spectral library search.

**P** - The RPD between the results for the two columns exceeds the method-specified criteria.

**Q** - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)

**R** - Analytical results are from sample re-analysis.

**RE** - Analytical results are from sample re-extraction.

**S** - Analytical results are from modified screening analysis.

**V** - The surrogate associated with this target analyte has a recovery outside the QC acceptance limits. (Applicable to MassDEP DW Compliance samples only.)

**Z** - The batch matrix spike and/or duplicate associated with this target analyte has a recovery/RPD outside the QC acceptance limits. (Applicable to MassDEP DW Compliance samples only.)

| | | | |
|---|---|---|---|
| **Project Name:** | RWM-Q1 | **Lab Number:** | L2415529 |
| **Project Number:** | 21010103 | **Report Date:** | 04/05/24 |

## REFERENCES

1 Test Methods for Evaluating Solid Waste: Physical/Chemical Methods. EPA SW-846. Third Edition. Updates I - VI, 2018.

## LIMITATION OF LIABILITIES

Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Analytical shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Alpha Analytical.

We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.

# Certification Information

**The following analytes are not included in our Primary NELAP Scope of Accreditation:**

**Westborough Facility**
**EPA 624.1:** m/p-xylene, o-xylene, Naphthalene
**EPA 625.1:** alpha-Terpineol
**EPA 8260D:** NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene, Azobenzene; SCM: Iodomethane (methyl iodide), 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.
**EPA 8270E:** NPW: Dimethylnaphthalene,1,4-Diphenylhydrazine, alpha-Terpineol; SCM: Dimethylnaphthalene,1,4-Diphenylhydrazine.
**SM4500**: NPW: Amenable Cyanide; SCM: Total Phosphorus, TKN, NO2, NO3.

**Mansfield Facility**
**SM 2540D:** TSS.
**EPA TO-15:** Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene, 3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene.
**Biological Tissue Matrix:** EPA 3050B

**The following analytes are included in our Massachusetts DEP Scope of Accreditation**

**Westborough Facility:**

***Drinking Water***
**EPA 300.0**: Chloride, Nitrate-N, Fluoride, Sulfate; **EPA 353.2**: Nitrate-N, Nitrite-N; **SM4500NO3-F**: Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE, EPA 180.1, SM2130B, SM4500Cl-D, SM2320B, SM2540C, SM4500H-B, SM4500NO2-B**
**EPA 524.2:** THMs and VOCs; **EPA 504.1:** EDB, DBCP.
**Microbiology**: **SM9215B; SM9223-P/A, SM9223B-Colilert-QT,SM9222D**.

***Non-Potable Water***
**SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2320B, SM4500CL-E, SM4500F-BC, SM4500NH3-BH:** Ammonia-N and Kjeldahl-N, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **EPA 351.1, SM4500NO3-F, EPA 353.2**: Nitrate-N**, SM4500P-E, SM4500P-B, E, SM4500SO4-E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, EPA 420.1, SM4500-CN-CE, SM2540D, EPA 300: Chloride, Sulfate, Nitrate.**
**EPA 624.1**: Volatile Halocarbons & Aromatics,
**EPA 608.3**: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs
**EPA 625.1**: SVOC (Acid/Base/Neutral Extractables).
**Microbiology**: **SM9223B-Colilert-QT; Enterolert-QT, SM9221E, EPA 1600, EPA 1603, SM9222D.**

**Mansfield Facility:**

***Drinking Water***
**EPA 200.7:** Al, Ba, Cd, Cr, Cu, Fe, Mn, Ni, Na, Ag, Ca, Zn. **EPA 200.8:** Al, Sb, As, Ba, Be, Cd, Cr, Cu, Pb, Mn, Ni, Se, Ag, TL, Zn. **EPA 245.1** Hg.
**EPA 522, EPA 537.1.**

***Non-Potable Water***
**EPA 200.7:** Al, Sb, As, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, K, Se, Ag, Na, Sr, TL, Ti, V, Zn.
**EPA 200.8:** Al, Sb**,** As, Be, Cd, Cr, Cu, Fe, Pb, Mn, Ni, K, Se, Ag, Na, TL, Zn.
**EPA 245.1** Hg.
**SM2340B**

For a complete listing of analytes and methods, please contact your Alpha Project Manager.

# CHAIN OF CUSTODY

PAGE 1 OF 1

Date Rec'd in Lab: 3/22/24

ALPHA Job #: L2415529

ALPHA ANALYTICAL
WESTBORO, MA TEL: 508-898-9220 FAX: 508-898-9193
MANSFIELD, MA TEL: 508-822-9300 FAX: 508-822-3288

**Client Information**

Client: TRC

Address:

Phone:

Fax:

Email:

☐ These samples have been previously analyzed by Alpha

**Project Information**

Project Name: RWM-Q1

Project Location:

Project #: 21010103

Project Manager: BoB T

ALPHA Quote #:

**Turn-Around Time**

☒ Standard ☐ RUSH (only confirmed if pre-approved)

Date Due: Time:

**Report Information - Data Deliverables**

☐ FAX ☐ EMAIL

☐ ADEx ☐ Add'l Deliverables

**Billing Information**

☐ Same as Client info PO #:

**Regulatory Requirements/Report Limits**

| State /Fed Program | Criteria |
|---|---|
| | |

Other Project Specific Requirements/Comments/Detection Limits:

ANALYSIS: Diss. Cd, Zn, Sulfide

SAMPLE HANDLING

Filtration ☒ Done ☐ Not needed ☐ Lab to do

Preservation ☐ Lab to do (Please specify below)

| ALPHA Lab ID (Lab Use Only) | Sample ID | Collection Date | Collection Time | Sample Matrix | Sampler's Initials | Sample Specific Comments | TOTAL # BOTTLES |
|---|---|---|---|---|---|---|---|
| 15529 | ~~RW03R-MWS~~ | 3/20/24 | ~~0915~~ | GW | TB | Submitted on 3/20 | 4 |
| | ~~RW03R-MWI~~ | | 0950 | | | | |
| -01 | RW12-MWS | 3/20/24 | 1255 | | | | 1 |
| -02 | RW12-MWI | | 1730 | | | | 2 |
| -03 | RWA-MWS | | 1420 | | | | 1 |
| -04 | RWA-MWI | | 1500 | | | | 1 |
| -05 | RWS-MWS | | 1555 | | | | 1 |
| -06 | RWS-MWI | | 1645 | | | | 1 |

| | Container Type | | | | | | |
|---|---|---|---|---|---|---|---|
| | Preservative | | | | | | |

| Relinquished By: | Date/Time | Received By: | Date/Time |
|---|---|---|---|
| ABM | 3/21/24 1500 | Alex Wiesbrock | 3/21/24 1517 |
| Alex Wiesbrock | 3/21/24 1800 | | 3/21/24 1800 |
| | 3/22/24 2400 | Anthony Green | MAR 21 2024 2133 |
| Anthony Green | 3/22/24 0105 | | 3/22/24 0105 |

3/22/24 0310

3/22/24 0310

Please print clearly, legibly and completely. Samples can not be logged in and turnaround time clock will not start until any ambiguities are resolved. All samples submitted are subject to Alpha's Terms and Conditions. See reverse side.

FORM NO: 01-01 (rev. 14-OCT-07)

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*Pace Analytical Services, LLC-Fairfield*

# ANALYTICAL RESULTS

## REDUCED DELIVERABLES FORMAT

Work Order Number: 24C1655

Pace - Alpha Analytical Laboratories

Project: L2415529



Sudip Pradhan
Laboratory Director

**All Results meet the requirements of the National Environmental Laboratory Accreditation Conference and/or State specific certifications as applicable.**

**Report Date:** Apr 05, 2024

1275 Bloomfield Ave., Bldg. 6, Fairfield, New Jersey 07004
(t) 973.227.0422 (f) 973.227.2813 (w) www.pacelabs.com

**NELAC** National Environmental Laboratory Accreditation Conference
NJDEP #07010 / NYDOH #11634 / PADEP #68-02903

sections 1 2 3 4 5 6 7 8

# CONTENTS

1. Sample Summary . . . 3
2. Chain of Custody . . . 4
3. Methodology Summary . . . 6
4. Abbreviations and Qualifiers . . . 7
5. Conformance/Non-Conformance Summary . . . 8
6. Positive Results Summary . . . 9
7. All Results Summary . . . 10
8. General Chemistry . . . 11
8.1. General Chemistry Results . . . 12

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*Pace Analytical Services, LLC-Fairfield*

# Sample Summary

**Work Order:** 24C1655

**Client:** Pace - Alpha Analytical Laboratories

**Project:** L2415529

| Sample ID | Laboratory ID | Matrix | Date Sampled | Date Received |
|---|---|---|---|---|
| RW12-MWI | 24C1655-01 | Water | 03/20/2024 13:30 | 03/26/2024 08:10 |

**Pace**
Pace Analytical Services-Fairfield
www.pacelabs.com

## Subcontract Chain of Custo

APL/ Pace Fairfield
1275 Bloomfield Ave.
Bldg. 6
Fairfield, NJ 07004

24C1655
Pace - Alpha Analytical Laboratories
L2415529

**Alpha Job Number**
L2415529

| Client Information | Project Information | Regulatory Requirements/Report Limits |
|---|---|---|
| Client: Alpha Analytical Labs<br>Address: Eight Walkup Drive<br>Westborough, MA 01581-1019<br><br>Phone: 508.844.4115<br>Email: Mitchell.Ostrowski@pacelabs.com | Project Location: MD<br>Project Manager: Mitchell Ostrowski<br>**Turnaround & Deliverables Information**<br>Due Date:<br>Deliverables: | State/Federal Program:<br>Regulatory Criteria: |

**Project Specific Requirements and/or Report Requirements**

Reference following Alpha Job Number on final report/deliverables: L2415529

Report to include Method Blank, LCS/LCSD:

Additional Comments: Invoices to: invoices@pacelabs.coupahost.com Reports to: west.subreports@pacelabs.com

| Lab ID | Client ID | Collection Date/Time | Sample Matrix | Analysis | Batch QC |
|---|---|---|---|---|---|
| | RW12-MWI | 03-20-24 13:30 | WATER | Sulfide | |

| | Relinquished By: | Date/Time: | Received By: | Date/Time: |
|---|---|---|---|---|
| | | 3/20/24 | | 3/25 17:30 |
| | | 3/25 22:00 | | 3/25/24 22:05 |
| | | 3/25/24 | | 3/26/24 0630 |
| Form No: AL_subcoc | | 3/26/24 0505 | | 3/26/24 0710 |



Serial_No:04052417:05

DC#_Title: ENV-FRM-FAIR-007 v01_Sample Condition Upon Receipt Form
Effective Date: 7/26/2023

24C1655

## Sample Condition Upon Receipt Form (SCUR)

Pace ANALYTICAL SERVICES

Affix Sample Label Here

**Date and Initials of person:**
Examining contents: 3/24 AK
Label: 3/24 AK
Deliver to location:
pH: 3/24 AK

Thermometer Used: IR03 Date: 3/26/24 Time: 0810 Initials: AK

State of Origin: NJ

**Cooler #1 Temp.°C** 1.8 **(Visual)** 0.1 **(Correction Factor)** 1.9 **(Actual)** ☐ Samples on ice, cooling process has begun

**Courier:** ☐ Fed Ex ☐ UPS ☐ USPS ☐ Client ☐ Commercial ☑ Pace ☐ Other

**Shipping Method:** ☐ First Overnight ☐ Priority Overnight ☐ Standard Overnight ☐ Ground ☐ Other

**Tracking #**

**Custody Seal on Cooler/Box Present:** ☐ Yes ☑ No **Seals intact:** ☐ Yes ☑ No **Ice:** (Wet) Blue Melted None

**Packing Material:** ☐ Bubble Wrap ☐ Bubble Bags ☐ None ☐ Other

**Samples were collected by Pace employee** ☐ Yes ☑ No ☐ N/A

| | | **Comments:** |
|---|---|---|
| Chain of Custody Present | ☑Yes ☐ No ☐ N/A | |
| Chain of Custody Filled Out | ☑Yes ☐ No ☐ N/A | |
| Relinquished Signature on COC | ☑Yes ☐ No ☐ N/A | |
| Sampler Name and Signature on COC | ☑Yes ☐ No ☐ N/A | |
| Samples Arrived within Hold Time | ☑Yes ☐ No ☐ N/A | |
| Rush TAT requested on COC | ☐Yes ☑ No ☐ N/A | |
| Sufficient Volume | ☑Yes ☐ No ☐ N/A | |
| Correct Containers Used | ☑Yes ☐ No ☐ N/A | |
| Containers Intact | ☑Yes ☐ No ☐ N/A | |
| Sample Labels match COC (sample IDs & date/time of collection) | ☑Yes ☐ No ☐ N/A | |
| All containers needing acid/base preservation have been checked. | ☑Yes ☐ No ☐ N/A | Preservation Information:<br>Preservative: |
| All Containers needing preservation are found to be in compliance with EPA recommendation: | ☑Yes ☐ No ☐ N/A | Lot #/Trace #:<br>Date: Time: |
| Exceptions: Vials, Microbiology, O&G, Metals | | Initials: |
| Headspace in VOA Vials? ( >6mm): | ☐Yes ☐ No ☑N/A | |
| Trip Blank Present: | ☐Yes ☐ No ☑N/A | |

**Additional Login Comments:**

**Client notification/ Resolution**

Person Contacted: Date/Time:

Comments/Resolution:

Qualtrax ID: 188127 Pace® Analytical Services, LLC Page 1 of 1

Pace Analytical Services, LLC-Fairfield
Methodology Summary

## Extractable Petroleum Hydrocarbons:

### *Gas Chromatography/Flame Ionization Detector*

New Jersey Department of Environmental Protection Site Remediation Program Extractable Petroleum Hydrocarbons Methodology (Version 3.0).
USEPA SW-846 Test Methods for Evaluating Solid Waste Physical/Chemical Methods Update III, Method 8015D or NJDEP Office of Quality Assurance Quantitation of Semi-Volatile Petroleum Products in Water, Soil and Sediment OQA-QAM-025, Revision 6.

## Metals:

### *Inductively-Coupled Plasma Atomic Emission Spectrometry or Inductively-Coupled Plasma Mass Spectroscopy*

**Wastewater and Groundwater Samples:** USEPA Methods for the Analysis of Water and Wastes, Method 200.7, Method 200.8.
**Soil Samples:** USEPA Methods for Evaluating Solid Waste Physical/Chemical Methods Update III, Method 6010D.

## Mercury:

### *Cold Vapor Atomic Absorption Spectrometry*

**Wastewater and Groundwater Samples:** USEPA Methods for the Analysis of Water and Wastes, Method 245.1.
**Soil Samples**: USEPA SW-846 Test Methods for Evaluating Solid Waste Physical/Chemical Methods Update III, Method 7471B.

## Volatile Organic Compounds:

### *Purge and Trap Gas Chromatography/Mass Spectroscopy*

**Drinking Water Samples:** USEPA Methods for the Determination of Organic Compounds in Drinking Water, Method 524.2.
**Wastewater Samples:** USEPA Methods for the Analysis of Water and Wastes, Method 624.1.
**Soil and Groundwater Samples:** USEPA SW-846 Test Methods for Evaluating Solid Waste Physical/Chemical Methods Update VI, Method 8260D.

## Semi-Volatile Organic Compounds:

### *Gas Chromatography/Mass Spectroscopy*

**Wastewater Samples:** USEPA Methods for the Analysis of Water and Wastes, Method 625.1.
**Soil and Groundwater Samples:** USEPA SW-846 Test Methods for Evaluating Solid Waste Physical/Chemical Methods Update VI, Method 8270E.

## PFAS Compounds:

### *Liquid Chromatography/Tandem Mass Spectroscopy*

**Drinking Water Samples:** USEPA Methods for the Determination of Selected Perfluorinated Alkyl Acids in Drinking Water by Solid Phase Extraction and Liquid Chromatography/Tandem Mass Spectrometry (LC/MS/MS), Method 537 (v1.1).

## Pesticides:

### *Gas Chromatography/Electron Capture Detector*

**Wastewater Samples:** USEPA Methods for the Analysis of Water and Wastes, Method 608.3.
**Soil and Groundwater Samples:** USEPA SW-846 Test Methods for Evaluating Solid Waste Physical/Chemical Methods Update III, Method 8081B.

## Polychlorinated Biphenyls (PCBs):

### *Gas Chromatography/Electron Capture Detector*

**Wastewater Samples:** USEPA Methods for the Analysis of Water and Wastes, Method 608.3.
**Soil and Groundwater Samples:** USEPA SW-846 Test Methods for Evaluating Solid Waste Physical/Chemical Methods Update III, Method 8082A.

## General Chemistry Methods:

### *Various general chemistry methods are taken from* "Standard Methods for the Examination of Water and Wastewater, 22nd Edition", .

Specific method citations can be found on the Analytical Results Summary page of this report listed under 'Method'.

** A complete list of Pace Fairfield's certified Methods are on the Standards And Docs page of the Results Retrieval System

Pace Analytical Services, LLC-Fairfield
Data Reporting Abbreviations and Qualifiers



**Method Detection Limit (MDL):**

The MDL is defined as the minimum measured concentration of a substance that can be reported with 99% confidence that the measured concentration is distinguishable from method blank results. The value is calculated following the guidelines defined in:

"Definition and Procedure for the Determination of the Method Detection Limit, Revision 2"
EPA 821-R-16-006, published December 2016.

**Reporting Limit (RL):**

The RL is the Concentration of the lowest calibration standard that was included in the initial calibration of the instrument. On analytical reports this value is corrected for percent moisture and any concentration or dilution factors.

**Concentration (Conc.) / Result:**

If the compound is detected, the measured concentration is reported. If this column is "ND", or contains a 'less than' (<) symbol, the compound was not detected.

**Tentatively Identified Compound (TIC):**

A TIC is a non-targeted compound, not included in the calibration, identified by a mass spectral library search OR requested to be identified and reported by the client.

**Abbreviations:**

| | |
|---|---|
| **ND** | Non-Detect |
| **TNTC** | Too Numerous To Count |

**Qualifers:**

| | |
|---|---|
| **D** | The concentration is from a dilution |
| **U** | Compound not detected |

Pace Analytical Services, LLC-Fairfield



## QUALITY CONTROL
## Conformance/Non-Conformance Summary

**ANALYSIS: General Chemisty [SM 4500-S-D-11]**

COMMENTS:
All samples met QC criteria.

Reviewed By: _____ (TS) 4/5/2024
Sudip Pradhan - Laboratory Director — Date

*For any questions about your Quality Control, please call us at 973-227-0422*

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*Pace Analytical Services, LLC-Fairfield*

# Positive Results Only Summary



No positive results found

**ND** - Indicates compound analyzed for but not detected
**J** - Indicates estimated value
**B** - Indicates compound found in associated blank
**E** - Concentration exceeds highest calibration standard

**D** - Indicates result is based on a dilution
**H** - Indicates a Hold Time violation
**P** - Greater than 25% diff. between 2 GC columns.
**MDL** - Minimum detection limit, **RL** - Reporting limit
**D1** - Sample was Decanted (Dissolved)

PEOPLE ADVANCING SCIENCE

*Pace Analytical Services, LLC-Fairfield*

# All Results Summary

| | | | |
|---|---|---|---|
| **Client:** | Pace - Alpha Analytical Laboratories | **Work Order:** | 24C1655 |
| **Project:** | L2415529 | **Date to Lab:** | 3/26/2024 8:10:00AM |

**24C1655-01 (Water)** Sample Name: **RW12-MWI** Collected: **3/20/2024 1:30:00PM**

**SM 4500-S-D-11 - General Chemistry**

| Analyte | Result | Qual | MDL | RL | Units | Dilution | Analyzed |
|---|---|---|---|---|---|---|---|
| Sulfide | ND | U | 0.125 | 0.250 | mg/L | 25 | 3/27/24 12:00 |

**ND, U** - Indicates compound analyzed for but not detected
**J** - Indicates estimated value
**B** - Indicates compound found in associated blank
**E** - Concentration exceeds highest calibration standard
**D** - Indicates result is based on a dilution
**H** - Indicates a Hold Time violation
**P** - Greater than 25% diff. between 2 GC columns.
**MDL** - Minimum detection limit, **RL** - Reporting limit
**D1** - Sample was Decanted (Dissolved)

PEOPLE ADVANCING SCIENCE

*Pace Analytical Services, LLC-Fairfield*

# GENERAL CHEMISTRY

Pace - Alpha Analytical Laboratories

Work Order: 24C1655

Project: L2415529

# ANALYSIS DATA SHEET

## General Chemistry

**Client:** Pace - Alpha Analytical Laboratories
**Project:** L2415529
**Work Order:** 24C1655

### General Chemistry

**24C1655-01 (Water) - RW12-MWI**

| Analyte | Units | Conc. | RL | DF | Qual | Analyzed | Method |
|---|---|---|---|---|---|---|---|
| Sulfide | mg/L | ND | 0.250 | 25 | U | 03/27/24 12:00 | SM 4500-S-D-11 |

8 8.1.

**ND** - Indicates compound analyzed for but not detected
**J** - Indicates estimated value
**B** - Indicates compound found in associated blank
**E** - Concentration exceeds highest calibration standard

**D** - Indicates result is based on a dilution
**H** - Indicates a Hold Time violation
**P** - Greater than 25% diff. between 2 GC columns.
**MDL** - Minimum detection limit, **RL** - Reporting limit

F-I

## Pace Analytical Services, LLC-Fairfield

### General Chemistry - Quality Control

| Sulfide | | Result | Reporting Limit | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit |
|---|---|---|---|---|---|---|---|---|---|---|
| **Batch BBD0130** | | | Prepared & Analyzed: 3/27/2024 | | | | | | | |
| BBD0130-BLK1 | | ND | 0.0100 | mg/L | | | | | | |
| BBD0130-BS1 | | 0.341 | 0.0100 | mg/L | 0.400 | | 85.2 | 80-120 | | |
| BBD0130-DUP1 | **Source: 24C1654-01** | ND | 0.250 | mg/L | | ND | | | | 20 |
| BBD0130-MS1 | **Source: 24C1654-01** | 9.50 | 0.250 | mg/L | 10.0 | ND | 95.0 | 70-130 | | |
| BBD0130-MSD1 | **Source: 24C1654-01** | 9.10 | 0.250 | mg/L | 10.0 | ND | 91.0 | 70-130 | 4.30 | 20 |

8

8.1.

**ND** - Indicates compound analyzed for but not detected
**J** - Indicates estimated value
**B** - Indicates compound found in associated blank
**E** - Concentration exceeds highest calibration standard

**D** - Indicates result is based on a dilution
**H** - Indicates a Hold Time violation
**P** - Greater than 25% diff. between 2 GC columns.
**MDL** - Minimum detection limit, **RL** - Reporting limit

F-III

# ANALYTICAL REPORT

| | |
|---|---|
| Lab Number: | L2415551 |
| Client: | Tradepoint Atlantic<br>1600 Sparrows Point Boulevard<br>Baltimore, MD 21219 |
| ATTN: | Robert Tworkowski |
| Phone: | (443) 649-5073 |
| Project Name: | RWM-Q1 |
| Project Number: | 21010103 |
| Report Date: | 04/05/24 |

The original project report/data package is held by Alpha Analytical. This report/data package is paginated and should be reproduced only in its entirety. Alpha Analytical holds no responsibility for results and/or data that are not consistent with the original.

Certifications & Approvals: MA (M-MA086), NH NELAP (2064), CT (PH-0826), IL (200077), IN (C-MA-03), KY (KY98045), ME (MA00086), MD (348), NJ (MA935), NY (11148), NC (25700/666), OH (CL108), OR (MA-1316), PA (68-03671), RI (LAO00065), TX (T104704476), VT (VT-0935), VA (460195), USDA (Permit #525-23-122-91930).

Eight Walkup Drive, Westborough, MA 01581-1019
508-898-9220 (Fax) 508-898-9193 800-624-9220 - www.alphalab.com

**Project Name:** RWM-Q1
**Project Number:** 21010103

**Lab Number:** L2415551
**Report Date:** 04/05/24

| Alpha Sample ID | Client ID | Matrix | Sample Location | Collection Date/Time | Receive Date |
|---|---|---|---|---|---|
| L2415551-01 | RWJ-MWS | WATER | Not Specified | 03/21/24 11:25 | 03/21/24 |
| L2415551-02 | RWJ-MWI | WATER | Not Specified | 03/21/24 12:35 | 03/21/24 |
| L2415551-03 | RWK-MWS | WATER | Not Specified | 03/21/24 13:05 | 03/21/24 |
| L2415551-04 | RWK-MWI | WATER | Not Specified | 03/21/24 14:00 | 03/21/24 |

| | | | |
|---|---|---|---|
| **Project Name:** | RWM-Q1 | **Lab Number:** | L2415551 |
| **Project Number:** | 21010103 | **Report Date:** | 04/05/24 |

## Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet NELAP requirements for all NELAP accredited parameters unless otherwise noted in the following narrative. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. Tentatively Identified Compounds (TICs), if requested, are reported for compounds identified to be present and are not part of the method/program Target Compound List, even if only a subset of the TCL are being reported. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively.

When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances, the specific failure is not narrated but noted in the associated QC Outlier Summary Report, located directly after the Case Narrative. QC information is also incorporated in the Data Usability Assessment table (Format 11) of our Data Merger tool, where it can be reviewed in conjunction with the sample result, associated regulatory criteria and any associated data usability implications.

Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

HOLD POLICY - For samples submitted on hold, Alpha's policy is to hold samples (with the exception of Air canisters) free of charge for 21 calendar days from the date the project is completed. After 21 calendar days, we will dispose of all samples submitted including those put on hold unless you have contacted your Alpha Project Manager and made arrangements for Alpha to continue to hold the samples. Air canisters will be disposed after 3 business days from the date the project is completed.

Please contact Project Management at 800-624-9220 with any questions.

**Project Name:** RWM-Q1 **Lab Number:** L2415551
**Project Number:** 21010103 **Report Date:** 04/05/24

**Case Narrative (continued)**

Report Submission

April 05, 2024: This final report includes the results of all requested analyses.

March 28, 2024: This is a preliminary report.

All non-detect (ND) or estimated concentrations (J-qualified) have been quantitated to the limit noted in the MDL column.

The analysis of Sulfide was subcontracted. A copy of the laboratory report is included as an addendum. Please note: This data is only available in PDF format and is not available on Data Merger.

Sample Receipt

L2415551-02: The sample was received below the appropriate pH for the Sulfide analysis. The laboratory added additional NaOH to a pH >9.

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature: Tiffani Morrissey - Tiffani Morrissey

Title: Technical Director/Representative Date: 04/05/24

# METALS

**Project Name:** RWM-Q1 **Lab Number:** L2415551

**Project Number:** 21010103 **Report Date:** 04/05/24

## SAMPLE RESULTS

Lab ID: L2415551-01 Date Collected: 03/21/24 11:25

Client ID: RWJ-MWS Date Received: 03/21/24

Sample Location: Not Specified Field Prep: Refer to COC

Sample Depth:

Matrix: Water

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dissolved Metals - Mansfield Lab** | | | | | | | | | | | |
| Cadmium, Dissolved | ND | | ug/l | 0.2000 | 0.0599 | 1 | 03/27/24 10:33 | 03/27/24 21:41 | EPA 3005A | 1,6020B | EJF |
| Zinc, Dissolved | 19.81 | | ug/l | 10.00 | 3.410 | 1 | 03/27/24 10:33 | 03/27/24 21:41 | EPA 3005A | 1,6020B | EJF |

**Project Name:** RWM-Q1 **Lab Number:** L2415551

**Project Number:** 21010103 **Report Date:** 04/05/24

## SAMPLE RESULTS

Lab ID: L2415551-02 Date Collected: 03/21/24 12:35

Client ID: RWJ-MWI Date Received: 03/21/24

Sample Location: Not Specified Field Prep: Refer to COC

Sample Depth:

Matrix: Water

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dissolved Metals - Mansfield Lab** | | | | | | | | | | | |
| Cadmium, Dissolved | 109.5 | | ug/l | 0.2000 | 0.0599 | 1 | 03/27/24 10:33 | 03/27/24 21:46 | EPA 3005A | 1,6020B | EJF |
| Zinc, Dissolved | 7502. | | ug/l | 10.00 | 3.410 | 1 | 03/27/24 10:33 | 03/27/24 21:46 | EPA 3005A | 1,6020B | EJF |

**Project Name:** RWM-Q1 **Lab Number:** L2415551

**Project Number:** 21010103 **Report Date:** 04/05/24

## SAMPLE RESULTS

Lab ID: L2415551-03 Date Collected: 03/21/24 13:05

Client ID: RWK-MWS Date Received: 03/21/24

Sample Location: Not Specified Field Prep: Refer to COC

Sample Depth:

Matrix: Water

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dissolved Metals - Mansfield Lab** | | | | | | | | | | | |
| Cadmium, Dissolved | 0.2839 | | ug/l | 0.2000 | 0.0599 | 1 | 03/27/24 10:33 | 03/27/24 22:10 | EPA 3005A | 1,6020B | EJF |
| Zinc, Dissolved | 18610 | | ug/l | 100.0 | 34.10 | 10 | 03/27/24 10:33 | 03/28/24 09:33 | EPA 3005A | 1,6020B | EJF |

**Project Name:** RWM-Q1 **Lab Number:** L2415551

**Project Number:** 21010103 **Report Date:** 04/05/24

## SAMPLE RESULTS

Lab ID: L2415551-04 Date Collected: 03/21/24 14:00

Client ID: RWK-MWI Date Received: 03/21/24

Sample Location: Not Specified Field Prep: Refer to COC

Sample Depth:

Matrix: Water

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dissolved Metals - Mansfield Lab** | | | | | | | | | | | |
| Cadmium, Dissolved | 168.8 | | ug/l | 2.000 | 0.5990 | 10 | 03/27/24 10:33 | 03/28/24 09:37 | EPA 3005A | 1,6020B | EJF |
| Zinc, Dissolved | 38260 | | ug/l | 100.0 | 34.10 | 10 | 03/27/24 10:33 | 03/28/24 09:37 | EPA 3005A | 1,6020B | EJF |

**Project Name:** RWM-Q1 **Lab Number:** L2415551

**Project Number:** 21010103 **Report Date:** 04/05/24

# Method Blank Analysis
# Batch Quality Control

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|
| Dissolved Metals - Mansfield Lab for sample(s): 01-04 Batch: WG1901385-1 | | | | | | | | | | |
| Cadmium, Dissolved | ND | | ug/l | 0.2000 | 0.0599 | 1 | 03/27/24 10:33 | 03/27/24 21:09 | 1,6020B | EJF |
| Zinc, Dissolved | ND | | ug/l | 10.00 | 3.410 | 1 | 03/27/24 10:33 | 03/27/24 21:09 | 1,6020B | EJF |

**Prep Information**

Digestion Method: EPA 3005A

# Lab Control Sample Analysis

## Batch Quality Control

**Project Name:** RWM-Q1

**Project Number:** 21010103

**Lab Number:** L2415551

**Report Date:** 04/05/24

| Parameter | LCS %Recovery | Qual | LCSD %Recovery | Qual | %Recovery Limits | RPD | Qual | RPD Limits |
|---|---|---|---|---|---|---|---|---|
| Dissolved Metals - Mansfield Lab Associated sample(s): 01-04 Batch: WG1901385-2 | | | | | | | | |
| Cadmium, Dissolved | 103 | | - | | 80-120 | - | | |
| Zinc, Dissolved | 102 | | - | | 80-120 | - | | |

# Matrix Spike Analysis
## Batch Quality Control

**Project Name:** RWM-Q1
**Project Number:** 21010103

**Lab Number:** L2415551
**Report Date:** 04/05/24

| Parameter | Native Sample | MS Added | MS Found | MS %Recovery | Qual | MSD Found | MSD %Recovery | Qual | Recovery Limits | RPD | Qual | RPD Limits |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Dissolved Metals - Mansfield Lab Associated sample(s): 01-04 QC Batch ID: WG1901385-3 QC Sample: L2415471-01 Client ID: MS Sample | | | | | | | | | | | | |
| Cadmium, Dissolved | ND | 53 | 53.53 | 101 | | - | - | | 75-125 | - | | 20 |
| Zinc, Dissolved | 14.29 | 500 | 522.3 | 102 | | - | - | | 75-125 | - | | 20 |

**Project Name:** RWM-Q1
**Project Number:** 21010103

**Lab Number:** L2415551
**Report Date:** 04/05/24

## Sample Receipt and Container Information

Were project specific reporting limits specified? YES

### Cooler Information

| Cooler | Custody Seal |
|---|---|
| A | Absent |

### Container Information

| Container ID | Container Type | Cooler | Initial pH | Final pH | Temp deg C | Pres | Seal | Frozen Date/Time | Analysis(*) |
|---|---|---|---|---|---|---|---|---|---|
| L2415551-01A | Plastic 250ml HNO3 preserved | A | <2 | <2 | 3.5 | Y | Absent | | ZN-6020S-PPB(180),CD-6020S-PPB(180) |
| L2415551-01B | Plastic 250ml Zn Acetate/NaOH preserved | A | >9 | >9 | 3.5 | Y | Absent | | SUB-SULFIDE() |
| L2415551-02A | Plastic 250ml HNO3 preserved | A | <2 | <2 | 3.5 | Y | Absent | | ZN-6020S-PPB(180),CD-6020S-PPB(180) |
| L2415551-02B | Plastic 250ml Zn Acetate/NaOH preserved | A | 7 | >9 | 3.5 | N | Absent | | SUB-SULFIDE() |
| L2415551-03A | Plastic 250ml HNO3 preserved | A | <2 | <2 | 3.5 | Y | Absent | | ZN-6020S-PPB(180),CD-6020S-PPB(180) |
| L2415551-04A | Plastic 250ml HNO3 preserved | A | <2 | <2 | 3.5 | Y | Absent | | ZN-6020S-PPB(180),CD-6020S-PPB(180) |



*Values in parentheses indicate holding time in days

| | | | |
|---|---|---|---|
| **Project Name:** | RWM-Q1 | **Lab Number:** | L2415551 |
| **Project Number:** | 21010103 | **Report Date:** | 04/05/24 |

## GLOSSARY

***Acronyms***

DL - Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the limit of quantitation (LOQ). The DL includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)

EDL - Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME).

EMPC - Estimated Maximum Possible Concentration: The concentration that results from the signal present at the retention time of an analyte when the ions meet all of the identification criteria except the ion abundance ratio criteria. An EMPC is a worst-case estimate of the concentration.

EPA - Environmental Protection Agency.

LCS - Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.

LCSD - Laboratory Control Sample Duplicate: Refer to LCS.

LFB - Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.

LOD - Limit of Detection: This value represents the level to which a target analyte can reliably be detected for a specific analyte in a specific matrix by a specific method. The LOD includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)

LOQ - Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)

Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)

MDL - Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.

MS - Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available. For Method 332.0, the spike recovery is calculated using the native concentration, including estimated values.

MSD - Matrix Spike Sample Duplicate: Refer to MS.

NA - Not Applicable.

NC - Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.

NDPA/DPA - N-Nitrosodiphenylamine/Diphenylamine.

NI - Not Ignitable.

NP - Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil.

NR - No Results: Term is utilized when 'No Target Compounds Requested' is reported for the analysis of Volatile or Semivolatile Organic TIC only requests.

RL - Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.

RPD - Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report.

SRM - Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples.

STLP - Semi-dynamic Tank Leaching Procedure per EPA Method 1315.

TEF - Toxic Equivalency Factors: The values assigned to each dioxin and furan to evaluate their toxicity relative to 2,3,7,8-TCDD.

TEQ - Toxic Equivalent: The measure of a sample's toxicity derived by multiplying each dioxin and furan by its corresponding TEF and then summing the resulting values.

TIC - Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations.

*Report Format: DU Report with 'J' Qualifiers*

| | | | |
|---|---|---|---|
| **Project Name:** | RWM-Q1 | **Lab Number:** | L2415551 |
| **Project Number:** | 21010103 | **Report Date:** | 04/05/24 |

***Footnotes***

1 - The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

***Terms***

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Chlordane: The target compound Chlordane (CAS No. 57-74-9) is reported for GC ECD analyses. Per EPA,this compound "refers to a mixture of chlordane isomers, other chlorinated hydrocarbons and numerous other components." (Reference: USEPA Toxicological Review of Chlordane, In Support of Summary Information on the Integrated Risk Information System (IRIS), December 1997.)

Difference: With respect to Total Oxidizable Precursor (TOP) Assay analysis, the difference is defined as the Post-Treatment value minus the Pre-Treatment value.

Final pH: As it pertains to Sample Receipt & Container Information section of the report, Final pH reflects pH of container determined after adjustment at the laboratory, if applicable. If no adjustment required, value reflects Initial pH.

Frozen Date/Time: With respect to Volatile Organics in soil, Frozen Date/Time reflects the date/time at which associated Reagent Water-preserved vials were initially frozen. Note: If frozen date/time is beyond 48 hours from sample collection, value will be reflected in 'bold'.

Gasoline Range Organics (GRO): Gasoline Range Organics (GRO) results include all chromatographic peaks eluting from Methyl tert butyl ether through Naphthalene, with the exception of GRO analysis in support of State of Ohio programs, which includes all chromatographic peaks eluting from Hexane through Dodecane.

Initial pH: As it pertains to Sample Receipt & Container Information section of the report, Initial pH reflects pH of container determined upon receipt, if applicable.

PAH Total: With respect to Alkylated PAH analyses, the 'PAHs, Total' result is defined as the summation of results for all or a subset of the following compounds: Naphthalene, C1-C4 Naphthalenes, 2-Methylnaphthalene, 1-Methylnaphthalene, Biphenyl, Acenaphthylene, Acenaphthene, Fluorene, C1-C3 Fluorenes, Phenanthrene, C1-C4 Phenanthrenes/Anthracenes, Anthracene, Fluoranthene, Pyrene, C1-C4 Fluoranthenes/Pyrenes, Benz(a)anthracene, Chrysene, C1-C4 Chrysenes, Benzo(b)fluoranthene, Benzo(j)+(k)fluoranthene, Benzo(e)pyrene, Benzo(a)pyrene, Perylene, Indeno(1,2,3-cd)pyrene, Dibenz(ah)+(ac)anthracene, Benzo(g,h,i)perylene. If a 'Total' result is requested, the results of its individual components will also be reported.

PFAS Total: With respect to PFAS analyses, the 'PFAS, Total (5)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA and PFOS. In addition, the 'PFAS, Total (6)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA, PFDA and PFOS. For MassDEP DW compliance analysis only, the 'PFAS, Total (6)' result is defined as the summation of results at or above the RL. Note: If a 'Total' result is requested, the results of its individual components will also be reported.

Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

***Data Qualifiers***

**A** - Spectra identified as "Aldol Condensates" are byproducts of the extraction/concentration procedures when acetone is introduced in the process.

**B** - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).

**C** - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.

**D** - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.

**E** - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.

**F** - The ratio of quantifier ion response to qualifier ion response falls outside of the laboratory criteria. Results are considered to be an estimated maximum concentration.

**G** - The concentration may be biased high due to matrix interferences (i.e, co-elution) with non-target compound(s). The result should be considered estimated.

**H** - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.

**I** - The lower value for the two columns has been reported due to obvious interference.

**J** - Estimated value. The Target analyte concentration is below the quantitation limit (RL), but above the Method Detection Limit (MDL) or Estimated Detection Limit (EDL) for SPME-related analyses. This represents an estimated concentration for Tentatively

*Report Format: DU Report with 'J' Qualifiers*

| | | | |
|---|---|---|---|
| **Project Name:** | RWM-Q1 | **Lab Number:** | L2415551 |
| **Project Number:** | 21010103 | **Report Date:** | 04/05/24 |

***Data Qualifiers***

Identified Compounds (TICs). For calculated parameters, this represents that one or more values used in the calculation were estimated.

**M** - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.

**ND** - Not detected at the method detection limit (MDL) for the sample, or estimated detection limit (EDL) for SPME-related analyses.

**NJ** - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where the identification is based on a mass spectral library search.

**P** - The RPD between the results for the two columns exceeds the method-specified criteria.

**Q** - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)

**R** - Analytical results are from sample re-analysis.

**RE** - Analytical results are from sample re-extraction.

**S** - Analytical results are from modified screening analysis.

**V** - The surrogate associated with this target analyte has a recovery outside the QC acceptance limits. (Applicable to MassDEP DW Compliance samples only.)

**Z** - The batch matrix spike and/or duplicate associated with this target analyte has a recovery/RPD outside the QC acceptance limits. (Applicable to MassDEP DW Compliance samples only.)

| | | | |
|---|---|---|---|
| **Project Name:** | RWM-Q1 | **Lab Number:** | L2415551 |
| **Project Number:** | 21010103 | **Report Date:** | 04/05/24 |

## REFERENCES

1 Test Methods for Evaluating Solid Waste: Physical/Chemical Methods. EPA SW-846. Third Edition. Updates I - VI, 2018.

## LIMITATION OF LIABILITIES

Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Analytical shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Alpha Analytical.

We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.

# Certification Information

**The following analytes are not included in our Primary NELAP Scope of Accreditation:**

**Westborough Facility**
**EPA 624.1:** m/p-xylene, o-xylene, Naphthalene
**EPA 625.1:** alpha-Terpineol
**EPA 8260D:** NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene, Azobenzene; SCM: Iodomethane (methyl iodide), 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.
**EPA 8270E:** NPW: Dimethylnaphthalene,1,4-Diphenylhydrazine, alpha-Terpineol; SCM: Dimethylnaphthalene,1,4-Diphenylhydrazine.
**SM4500**: NPW: Amenable Cyanide; SCM: Total Phosphorus, TKN, NO2, NO3.

**Mansfield Facility**
**SM 2540D:** TSS.
**EPA TO-15:** Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene, 3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene.
**Biological Tissue Matrix:** EPA 3050B

**The following analytes are included in our Massachusetts DEP Scope of Accreditation**

**Westborough Facility:**

***Drinking Water***
**EPA 300.0**: Chloride, Nitrate-N, Fluoride, Sulfate; **EPA 353.2**: Nitrate-N, Nitrite-N; **SM4500NO3-F**: Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE, EPA 180.1, SM2130B, SM4500Cl-D, SM2320B, SM2540C, SM4500H-B, SM4500NO2-B**
**EPA 524.2:** THMs and VOCs; **EPA 504.1:** EDB, DBCP.
**Microbiology**: **SM9215B; SM9223-P/A, SM9223B-Colilert-QT,SM9222D**.

***Non-Potable Water***
**SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2320B, SM4500CL-E, SM4500F-BC, SM4500NH3-BH:** Ammonia-N and Kjeldahl-N, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **EPA 351.1, SM4500NO3-F, EPA 353.2**: Nitrate-N**, SM4500P-E, SM4500P-B, E, SM4500SO4-E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, EPA 420.1, SM4500-CN-CE, SM2540D, EPA 300: Chloride, Sulfate, Nitrate.**
**EPA 624.1**: Volatile Halocarbons & Aromatics,
**EPA 608.3**: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs
**EPA 625.1**: SVOC (Acid/Base/Neutral Extractables).
**Microbiology**: **SM9223B-Colilert-QT; Enterolert-QT, SM9221E, EPA 1600, EPA 1603, SM9222D.**

**Mansfield Facility:**

***Drinking Water***
**EPA 200.7:** Al, Ba, Cd, Cr, Cu, Fe, Mn, Ni, Na, Ag, Ca, Zn. **EPA 200.8:** Al, Sb, As, Ba, Be, Cd, Cr, Cu, Pb, Mn, Ni, Se, Ag, TL, Zn. **EPA 245.1** Hg.
**EPA 522, EPA 537.1.**

***Non-Potable Water***
**EPA 200.7:** Al, Sb, As, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, K, Se, Ag, Na, Sr, TL, Ti, V, Zn.
**EPA 200.8:** Al, Sb**,** As, Be, Cd, Cr, Cu, Fe, Pb, Mn, Ni, K, Se, Ag, Na, TL, Zn.
**EPA 245.1** Hg.
**SM2340B**

For a complete listing of analytes and methods, please contact your Alpha Project Manager.

# CHAIN OF CUSTODY

PAGE 1 OF 1

Date Rec'd in Lab: 3/22/24

ALPHA ANALYTICAL
WESTBORO, MA TEL: 508-898-9220 FAX: 508-898-9193
MANSFIELD, MA TEL: 508-822-9300 FAX: 508-822-3288

**Client Information**

Client: TPA
Address:
Phone:
Fax:
Email:
☐ These samples have been previously analyzed by Alpha

**Project Information**

Project Name: RWJ-Q1
Project Location:
Project #: 210103
Project Manager: Bob Tr
ALPHA Quote #:

**Turn-Around Time**

☐ Standard ☐ RUSH (only confirmed if pre-approved)
Date Due: Time:

**Report Information - Data Deliverables**

☐ FAX ☐ EMAIL
☐ ADEx ☐ Add'l Deliverables

**Billing**

☐ Same as Client info
L2415529 (MD)

**Regulatory Requirements/Report Limits**

| State /Fed Program | Criteria |
|---|---|
| | |

L2415551

Other Project Specific Requirements/Comments/Detection Limits:

ANALYSIS: Diss. Cd 0.2A SulFide

SAMPLE HANDLING
Filtration
☐ Done
☐ Not needed
☐ Lab to do
Preservation
☐ Lab to do
(Please specify below)

| ALPHA Lab ID (Lab Use Only) | Sample ID | Collection Date | Collection Time | Sample Matrix | Sampler's Initials | Sample Specific Comments | TOTAL # BOTTLES |
|---|---|---|---|---|---|---|---|
| (MD) 15529-01 | RWJ-MW5 | 3/21/24 | 1125 | GW | TP | | 2 |
| 15551-02 | RWJ-MW1 | | 1335 | | | | 2 |
| -03 | RWK-MW5 | | 1305 | | | | 1 |
| -04 | RWK-MW1 | | 1400 | | | | 1 |

| Container Type | P | P | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Preservative | C | B | | | | | | | | | | | | | | | | |

| Relinquished By: | Date/Time | Received By: | Date/Time |
|---|---|---|---|
| [signature] | 3/21/24 1506 | Alex Wroblewski | 3/21/24 1535 |
| Alex Wroblewski | 3/21/24 1800 | [signature] | 3/21/24 1600 |
| Anthony Green | 3/22/24 2100 | Anthony Green | MAR 21 2024 2133 |
| Anthony Green | 3/22/24 0105 | [signature] | 3/22/24 0105 |

3/22/24 0310
3/22/24 0310

Please print clearly, legibly and completely. Samples can not be logged in and turnaround time clock will not start until any ambiguities are resolved. All samples submitted are subject to Alpha's Terms and Conditions. See reverse side.

FORM NO. 01-01 (rev. 14-OCT-07)

Pace Analytical Services, LLC-Fairfield

# ANALYTICAL RESULTS

## REDUCED DELIVERABLES FORMAT

Work Order Number: 24C1654

Pace - Alpha Analytical Laboratories

Project: L2415551

Sudip Pradhan
Laboratory Director

**All Results meet the requirements of the National Environmental Laboratory Accreditation Conference and/or State specific certifications as applicable.**

**Report Date:** Apr 03, 2024

1275 Bloomfield Ave., Bldg. 6, Fairfield, New Jersey 07004
(t) 973.227.0422 (f) 973.227.2813 (w) www.pacelabs.com

NELAC National Environmental Laboratory Accreditation Conference
NJDEP #07010 / NYDOH #11634 / PADEP #68-02903

sections 1 2 3 4 5 6 7 8

# CONTENTS

1. Sample Summary . . . 3
2. Chain of Custody . . . 4
3. Methodology Summary . . . 6
4. Abbreviations and Qualifiers . . . 7
5. Conformance/Non-Conformance Summary . . . 8
6. Positive Results Summary . . . 9
7. All Results Summary . . . 10
8. General Chemistry . . . 11
    8.1. General Chemistry Results . . . 12

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*Pace Analytical Services, LLC-Fairfield*

# Sample Summary

**Work Order:** 24C1654

**Client:** Pace - Alpha Analytical Laboratories

**Project:** L2415551

| Sample ID | Laboratory ID | Matrix | Date Sampled | Date Received |
|---|---|---|---|---|
| RWJ-MWS | 24C1654-01 | Water | 03/21/2024 11:25 | 03/26/2024 08:10 |
| RWJ-MWI | 24C1654-02 | Water | 03/21/2024 12:35 | 03/26/2024 08:10 |

**Pace**
Pace Analytical Services-Fairfield
www.pacelabs.com

## Subcontract Chain of Custody

APL/ Pace Fairfield
1275 Bloomfield Ave.
Bldg. 6
Fairfield, NJ 07004

24C1654
Pace - Alpha Analytical Laboratories
L2415551

Alpha Job Number
2415551

| Client Information | Project Information | Regulatory Requirements/Report Limits |
|---|---|---|
| Client: Alpha Analytical Labs<br>Address: Eight Walkup Drive<br>Westborough, MA 01581-1019<br><br>Phone: 508.844.4115<br>Email: Mitchell.Ostrowski@pacelabs.com | Project Location: MD<br>Project Manager: Mitchell Ostrowski<br>**Turnaround & Deliverables Information**<br>Due Date:<br>Deliverables: | State/Federal Program:<br>Regulatory Criteria: |

**Project Specific Requirements and/or Report Requirements**

Reference following Alpha Job Number on final report/deliverables: L2415551

Report to include Method Blank, LCS/LCSD:

Additional Comments: Invoices to: invoices@pacelabs.coupahost.com Reports to: west.subreports@pacelabs.com

| Lab ID | Client ID | Collection Date/Time | Sample Matrix | Analysis | Batch QC |
|---|---|---|---|---|---|
| | RWJ-MWS | 03-21-24 11:25 | WATER | Sulfide | |
| | RWJ-MWI | 03-21-24 12:35 | WATER | Sulfide | |

| | Relinquished By: | Date/Time: | Received By: | Date/Time: |
|---|---|---|---|---|
| | | 3/25/24 | | 3/25 11:50 |
| | | 3/25 12:00 | | 3/25/24 12:05 |
| | | 3/22/24 | | 3/22/24 0630 |
| AL_subcoc | | 3/22/24 0805 | | 3/24/24 0810 |



Serial_No:04052415:53

DC#_Title: ENV-FRM-FAIR-007 v01_Sample Condition Upon Receipt Form
Effective Date: 7/26/2023

24C1654

## Sample Condition Upon Receipt Form (SCUR)

Pace ANALYTICAL SERVICES

Affix Sample Label Here

**Date and Initials of person:**
Examining contents: 3/26 AR
Label: 3/26 AR
Deliver to location:
pH: 3/26 AR

Thermometer Used: TR203 Date: 3/26/24 Time: 0810 Initials: AR

State of Origin: NJ

**Cooler #1 Temp.°C** 1.8 **(Visual)** 0.1 **(Correction Factor)** 1.9 **(Actual)** ☐ Samples on ice, cooling process has begun

**Courier:** ☐ Fed Ex ☐ UPS ☐ USPS ☐ Client ☐ Commercial ☑ Pace ☐ Other

**Shipping Method:** ☐ First Overnight ☐ Priority Overnight ☐ Standard Overnight ☐ Ground ☐ Other

**Tracking #**

**Custody Seal on Cooler/Box Present:** ☐ Yes ☐ No **Seals intact:** ☐ Yes ☐ No **Ice:** (Wet) Blue Melted None

**Packing Material:** ☐ Bubble Wrap ☐ Bubble Bags ☐ None ☐ Other

**Samples were collected by Pace employee** ☐ Yes ☑ No ☐ N/A

| | | Comments: |
|---|---|---|
| Chain of Custody Present | ☑Yes ☐ No ☐ N/A | |
| Chain of Custody Filled Out | ☑Yes ☐ No ☐ N/A | |
| Relinquished Signature on COC | ☑Yes ☐ No ☐ N/A | |
| Sampler Name and Signature on COC | ☑Yes ☐ No ☐ N/A | |
| Samples Arrived within Hold Time | ☑Yes ☐ No ☐ N/A | |
| Rush TAT requested on COC | ☐Yes ☑ No ☐ N/A | |
| Sufficient Volume | ☑Yes ☐ No ☐ N/A | |
| Correct Containers Used | ☑Yes ☐ No ☐ N/A | |
| Containers Intact | ☑Yes ☐ No ☐ N/A | |
| Sample Labels match COC (sample IDs & date/time of collection) | ☑Yes ☐ No ☐ N/A | |
| All containers needing acid/base preservation have been checked. | ☑Yes ☐ No ☐ N/A | Preservation Information: Preservative: |
| All Containers needing preservation are found to be in compliance with EPA recommendation: | ☑Yes ☐ No ☐ N/A | Lot #/Trace #: Date: Time: Initials: |
| Exceptions: Vials, Microbiology, O&G, Metals | | |
| Headspace in VOA Vials? ( >6mm): | ☐Yes ☐ No ☑N/A | |
| Trip Blank Present: | ☐Yes ☐ No ☑N/A | |

**Additional Login Comments:**

**Client notification/ Resolution**

Person Contacted: Date/Time:

Comments/Resolution:

Qualtrax ID: 188127 Pace® Analytical Services, LLC Page 1 of 1

Pace Analytical Services, LLC-Fairfield
Methodology Summary

## Extractable Petroleum Hydrocarbons:

### *Gas Chromatography/Flame Ionization Detector*

New Jersey Department of Environmental Protection Site Remediation Program Extractable Petroleum Hydrocarbons Methodology (Version 3.0).
USEPA SW-846 Test Methods for Evaluating Solid Waste Physical/Chemical Methods Update III, Method 8015D or NJDEP Office of Quality Assurance Quantitation of Semi-Volatile Petroleum Products in Water, Soil and Sediment OQA-QAM-025, Revision 6.

## Metals:

### *Inductively-Coupled Plasma Atomic Emission Spectrometry or Inductively-Coupled Plasma Mass Spectroscopy*

**Wastewater and Groundwater Samples:** USEPA Methods for the Analysis of Water and Wastes, Method 200.7, Method 200.8.
**Soil Samples:** USEPA Methods for Evaluating Solid Waste Physical/Chemical Methods Update III, Method 6010D.

## Mercury:

### *Cold Vapor Atomic Absorption Spectrometry*

**Wastewater and Groundwater Samples:** USEPA Methods for the Analysis of Water and Wastes, Method 245.1.
**Soil Samples**: USEPA SW-846 Test Methods for Evaluating Solid Waste Physical/Chemical Methods Update III, Method 7471B.

## Volatile Organic Compounds:

### *Purge and Trap Gas Chromatography/Mass Spectroscopy*

**Drinking Water Samples:** USEPA Methods for the Determination of Organic Compounds in Drinking Water, Method 524.2.
**Wastewater Samples:** USEPA Methods for the Analysis of Water and Wastes, Method 624.1.
**Soil and Groundwater Samples:** USEPA SW-846 Test Methods for Evaluating Solid Waste Physical/Chemical Methods Update VI, Method 8260D.

## Semi-Volatile Organic Compounds:

### *Gas Chromatography/Mass Spectroscopy*

**Wastewater Samples:** USEPA Methods for the Analysis of Water and Wastes, Method 625.1.
**Soil and Groundwater Samples:** USEPA SW-846 Test Methods for Evaluating Solid Waste Physical/Chemical Methods Update VI, Method 8270E.

## PFAS Compounds:

### *Liquid Chromatography/Tandem Mass Spectroscopy*

**Drinking Water Samples:** USEPA Methods for the Determination of Selected Perfluorinated Alkyl Acids in Drinking Water by Solid Phase Extraction and Liquid Chromatography/Tandem Mass Spectrometry (LC/MS/MS), Method 537 (v1.1).

## Pesticides:

### *Gas Chromatography/Electron Capture Detector*

**Wastewater Samples:** USEPA Methods for the Analysis of Water and Wastes, Method 608.3.
**Soil and Groundwater Samples:** USEPA SW-846 Test Methods for Evaluating Solid Waste Physical/Chemical Methods Update III, Method 8081B.

## Polychlorinated Biphenyls (PCBs):

### *Gas Chromatography/Electron Capture Detector*

**Wastewater Samples:** USEPA Methods for the Analysis of Water and Wastes, Method 608.3.
**Soil and Groundwater Samples:** USEPA SW-846 Test Methods for Evaluating Solid Waste Physical/Chemical Methods Update III, Method 8082A.

## General Chemistry Methods:

### *Various general chemistry methods are taken from* "Standard Methods for the Examination of Water and Wastewater, 22nd Edition", .

Specific method citations can be found on the Analytical Results Summary page of this report listed under 'Method'.

** A complete list of Pace Fairfield's certified Methods are on the Standards And Docs page of the Results Retrieval System

Pace Analytical Services, LLC-Fairfield
Data Reporting Abbreviations and Qualifiers



**Method Detection Limit (MDL):**

The MDL is defined as the minimum measured concentration of a substance that can be reported with 99% confidence that the measured concentration is distinguishable from method blank results. The value is calculated following the guidelines defined in:

"Definition and Procedure for the Determination of the Method Detection Limit, Revision 2"
EPA 821-R-16-006, published December 2016.

**Reporting Limit (RL):**

The RL is the Concentration of the lowest calibration standard that was included in the initial calibration of the instrument. On analytical reports this value is corrected for percent moisture and any concentration or dilution factors.

**Concentration (Conc.) / Result:**

If the compound is detected, the measured concentration is reported. If this column is "ND", or contains a 'less than' (<) symbol, the compound was not detected.

**Tentatively Identified Compound (TIC):**

A TIC is a non-targeted compound, not included in the calibration, identified by a mass spectral library search OR requested to be identified and reported by the client.

**Abbreviations:**

| | |
|---|---|
| **ND** | Non-Detect |
| **TNTC** | Too Numerous To Count |

**Qualifers:**

| | |
|---|---|
| **D** | The concentration is from a dilution |
| **U** | Compound not detected |

Data Reporting Abbreviations and Qualifiers

Pace Analytical Services, LLC-Fairfield



## QUALITY CONTROL
## Conformance/Non-Conformance Summary

**ANALYSIS: General Chemistry [SM 4500-S-D-11]**

COMMENTS:
All samples met QC criteria.

Reviewed By: _____ (TS) 4/3/2024
Sudip Pradhan - Laboratory Director — Date

*For any questions about your Quality Control, please call us at 973-227-0422*

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*Pace Analytical Services, LLC-Fairfield*

# Positive Results Only Summary



No positive results found

**ND** - Indicates compound analyzed for but not detected
**J** - Indicates estimated value
**B** - Indicates compound found in associated blank
**E** - Concentration exceeds highest calibration standard

**D** - Indicates result is based on a dilution
**H** - Indicates a Hold Time violation
**P** - Greater than 25% diff. between 2 GC columns.
**MDL** - Minimum detection limit, **RL** - Reporting limit
**D1** - Sample was Decanted (Dissolved)

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*Pace Analytical Services, LLC-Fairfield*

# All Results Summary

**Client:** Pace - Alpha Analytical Laboratories
**Project:** L2415551
**Work Order:** 24C1654
**Date to Lab:** 3/26/2024 8:10:00AM

**24C1654-01 (Water)** Sample Name: **RWJ-MWS** Collected: **3/21/2024 11:25:00AM**

**SM 4500-S-D-11 - General Chemistry**

| Analyte | Result | Qual | MDL | RL | Units | Dilution | Analyzed |
|---|---|---|---|---|---|---|---|
| Sulfide | ND | U | 0.125 | 0.250 | mg/L | 25 | 3/27/24 10:00 |

**24C1654-02 (Water)** Sample Name: **RWJ-MWI** Collected: **3/21/2024 12:35:00PM**

**SM 4500-S-D-11 - General Chemistry**

| Analyte | Result | Qual | MDL | RL | Units | Dilution | Analyzed |
|---|---|---|---|---|---|---|---|
| Sulfide | ND | U | 0.125 | 0.250 | mg/L | 25 | 3/27/24 10:00 |

**ND, U** - Indicates compound analyzed for but not detected
**J** - Indicates estimated value
**B** - Indicates compound found in associated blank
**E** - Concentration exceeds highest calibration standard

**D** - Indicates result is based on a dilution
**H** - Indicates a Hold Time violation
**P** - Greater than 25% diff. between 2 GC columns.
**MDL** - Minimum detection limit, **RL** - Reporting limit
**D1** - Sample was Decanted (Dissolved)

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*Pace Analytical Services, LLC-Fairfield*

# GENERAL CHEMISTRY

Pace - Alpha Analytical Laboratories

Work Order: 24C1654

Project: L2415551

# ANALYSIS DATA SHEET

## General Chemistry

**Client:** Pace - Alpha Analytical Laboratories
**Project:** L2415551
**Work Order:** 24C1654

### General Chemistry

**24C1654-01 (Water) - RWJ-MWS**

| Analyte | Units | Conc. | RL | DF | Qual | Analyzed | Method |
|---|---|---|---|---|---|---|---|
| Sulfide | mg/L | ND | 0.250 | 25 | U | 03/27/24 10:00 | SM 4500-S-D-11 |

**24C1654-02 (Water) - RWJ-MWI**

| Analyte | Units | Conc. | RL | DF | Qual | Analyzed | Method |
|---|---|---|---|---|---|---|---|
| Sulfide | mg/L | ND | 0.250 | 25 | U | 03/27/24 10:00 | SM 4500-S-D-11 |

8 8.1.

**ND** - Indicates compound analyzed for but not detected
**J** - Indicates estimated value
**B** - Indicates compound found in associated blank
**E** - Concentration exceeds highest calibration standard
**D** - Indicates result is based on a dilution
**H** - Indicates a Hold Time violation
**P** - Greater than 25% diff. between 2 GC columns.
**MDL** - Minimum detection limit, **RL** - Reporting limit

F-I

## Pace Analytical Services, LLC-Fairfield

### General Chemistry - Quality Control

| Sulfide | | Result | Reporting Limit | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit |
|---|---|---|---|---|---|---|---|---|---|---|
| **Batch BBD0130** | | | Prepared & Analyzed: 4/2/2024 | | | | | | | |
| BBD0130-BLK1 | | ND | 0.0100 | mg/L | | | | | | |
| BBD0130-BS1 | | 0.341 | 0.0100 | mg/L | 0.400 | | 85.2 | 80-120 | | |
| BBD0130-DUP1 | **Source: 24C1654-01** | ND | 0.250 | mg/L | | ND | | | | 20 |
| BBD0130-MS1 | **Source: 24C1654-01** | 9.50 | 0.250 | mg/L | 10.0 | ND | 95.0 | 70-130 | | |
| BBD0130-MSD1 | **Source: 24C1654-01** | 9.10 | 0.250 | mg/L | 10.0 | ND | 91.0 | 70-130 | 4.30 | 20 |

8

8.1.

**ND** - Indicates compound analyzed for but not detected
**J** - Indicates estimated value
**B** - Indicates compound found in associated blank
**E** - Concentration exceeds highest calibration standard

**D** - Indicates result is based on a dilution
**H** - Indicates a Hold Time violation
**P** - Greater than 25% diff. between 2 GC columns.
**MDL** - Minimum detection limit, **RL** - Reporting limit

F-III

# ANALYTICAL REPORT

| | |
|---|---|
| Lab Number: | L2416133 |
| Client: | Tradepoint Atlantic<br>1600 Sparrows Point Boulevard<br>Baltimore, MD 21219 |
| ATTN: | Robert Tworkowski |
| Phone: | (443) 649-5073 |
| Project Name: | RWM-Q1 |
| Project Number: | 21010103 |
| Report Date: | 04/04/24 |

The original project report/data package is held by Alpha Analytical. This report/data package is paginated and should be reproduced only in its entirety. Alpha Analytical holds no responsibility for results and/or data that are not consistent with the original.

Certifications & Approvals: MA (M-MA086), NH NELAP (2064), CT (PH-0826), IL (200077), IN (C-MA-03), KY (KY98045), ME (MA00086), MD (348), NJ (MA935), NY (11148), NC (25700/666), OH (CL108), OR (MA-1316), PA (68-03671), RI (LAO00065), TX (T104704476), VT (VT-0935), VA (460195), USDA (Permit #525-23-122-91930).

Eight Walkup Drive, Westborough, MA 01581-1019
508-898-9220 (Fax) 508-898-9193 800-624-9220 - www.alphalab.com

**Project Name:** RWM-Q1
**Project Number:** 21010103

**Lab Number:** L2416133
**Report Date:** 04/04/24

| Alpha Sample ID | Client ID | Matrix | Sample Location | Collection Date/Time | Receive Date |
|---|---|---|---|---|---|
| L2416133-01 | RW16-MWS | WATER | Not Specified | 03/25/24 11:50 | 03/25/24 |
| L2416133-02 | RW16-MWI | WATER | Not Specified | 03/25/24 12:30 | 03/25/24 |
| L2416133-03 | RWN-MWS | WATER | Not Specified | 03/25/24 13:25 | 03/25/24 |
| L2416133-04 | RW13-MWI | WATER | Not Specified | 03/25/24 14:10 | 03/25/24 |
| L2416133-05 | RW15-MWI | WATER | Not Specified | 03/25/24 15:00 | 03/25/24 |
| L2416133-06 | RW18-MWS | WATER | Not Specified | 03/25/24 15:40 | 03/25/24 |

| | | | |
|---|---|---|---|
| **Project Name:** | RWM-Q1 | **Lab Number:** | L2416133 |
| **Project Number:** | 21010103 | **Report Date:** | 04/04/24 |

## Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet NELAP requirements for all NELAP accredited parameters unless otherwise noted in the following narrative. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. Tentatively Identified Compounds (TICs), if requested, are reported for compounds identified to be present and are not part of the method/program Target Compound List, even if only a subset of the TCL are being reported. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively.

When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances, the specific failure is not narrated but noted in the associated QC Outlier Summary Report, located directly after the Case Narrative. QC information is also incorporated in the Data Usability Assessment table (Format 11) of our Data Merger tool, where it can be reviewed in conjunction with the sample result, associated regulatory criteria and any associated data usability implications.

Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

HOLD POLICY - For samples submitted on hold, Alpha's policy is to hold samples (with the exception of Air canisters) free of charge for 21 calendar days from the date the project is completed. After 21 calendar days, we will dispose of all samples submitted including those put on hold unless you have contacted your Alpha Project Manager and made arrangements for Alpha to continue to hold the samples. Air canisters will be disposed after 3 business days from the date the project is completed.

Please contact Project Management at 800-624-9220 with any questions.

| | | | |
|---|---|---|---|
| **Project Name:** | RWM-Q1 | **Lab Number:** | L2416133 |
| **Project Number:** | 21010103 | **Report Date:** | 04/04/24 |

**Case Narrative (continued)**

Report Submission

All non-detect (ND) or estimated concentrations (J-qualified) have been quantitated to the limit noted in the MDL column.

The analysis of Sulfide was subcontracted. A copy of the laboratory report is included as an addendum. Please note: This data is only available in PDF format and is not available on Data Merger.

Sample Receipt

L2416133-02: The sample identified as "RW16-MWI" on the chain of custody was identified as "RW16-MWS" on the container label. At the client's request, the sample is reported as "RW16-MWI".

L2416133-06: The sample identified as "RW18-MWI" on the chain of custody was identified as "RW18-MWS" on the container label. At the client's request, the sample is reported as "RW18-MWS".

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature: Caitlin Walukevich

Caitlin Walukevich

Title: Technical Director/Representative

Date: 04/04/24

# METALS

**Project Name:** RWM-Q1 **Lab Number:** L2416133

**Project Number:** 21010103 **Report Date:** 04/04/24

## SAMPLE RESULTS

Lab ID: L2416133-01 Date Collected: 03/25/24 11:50

Client ID: RW16-MWS Date Received: 03/25/24

Sample Location: Not Specified Field Prep: Refer to COC

Sample Depth:

Matrix: Water

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dissolved Metals - Mansfield Lab** | | | | | | | | | | | |
| Cadmium, Dissolved | 0.0662 | J | ug/l | 0.2000 | 0.0599 | 1 | 03/27/24 17:13 | 03/31/24 17:40 | EPA 3005A | 1,6020B | WKP |
| Zinc, Dissolved | ND | | ug/l | 10.00 | 3.410 | 1 | 03/27/24 17:13 | 03/31/24 17:40 | EPA 3005A | 1,6020B | WKP |

**Project Name:** RWM-Q1 **Lab Number:** L2416133

**Project Number:** 21010103 **Report Date:** 04/04/24

## SAMPLE RESULTS

Lab ID: L2416133-02 Date Collected: 03/25/24 12:30

Client ID: RW16-MWI Date Received: 03/25/24

Sample Location: Not Specified Field Prep: Refer to COC

Sample Depth:

Matrix: Water

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dissolved Metals - Mansfield Lab** | | | | | | | | | | | |
| Cadmium, Dissolved | ND | | ug/l | 0.2000 | 0.0599 | 1 | 03/27/24 17:13 | 03/31/24 17:45 | EPA 3005A | 1,6020B | WKP |
| Zinc, Dissolved | ND | | ug/l | 10.00 | 3.410 | 1 | 03/27/24 17:13 | 03/31/24 17:45 | EPA 3005A | 1,6020B | WKP |

**Project Name:** RWM-Q1 **Lab Number:** L2416133

**Project Number:** 21010103 **Report Date:** 04/04/24

## SAMPLE RESULTS

Lab ID: L2416133-03 Date Collected: 03/25/24 13:25

Client ID: RWN-MWS Date Received: 03/25/24

Sample Location: Not Specified Field Prep: Refer to COC

Sample Depth:

Matrix: Water

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dissolved Metals - Mansfield Lab** | | | | | | | | | | | |
| Cadmium, Dissolved | 2350. | | ug/l | 200.0 | 59.90 | 1000 | 03/27/24 17:13 | 03/31/24 18:53 | EPA 3005A | 1,6020B | WKP |
| Zinc, Dissolved | 662200 | | ug/l | 10000 | 3410. | 1000 | 03/27/24 17:13 | 03/31/24 18:53 | EPA 3005A | 1,6020B | WKP |

**Project Name:** RWM-Q1 **Lab Number:** L2416133

**Project Number:** 21010103 **Report Date:** 04/04/24

## SAMPLE RESULTS

Lab ID: L2416133-04 Date Collected: 03/25/24 14:10

Client ID: RW13-MWI Date Received: 03/25/24

Sample Location: Not Specified Field Prep: Refer to COC

Sample Depth:

Matrix: Water

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dissolved Metals - Mansfield Lab** | | | | | | | | | | | |
| Cadmium, Dissolved | 38540 | | ug/l | 1000. | 299.5 | 5000 | 03/27/24 17:13 | 03/31/24 18:58 | EPA 3005A | 1,6020B | WKP |
| Zinc, Dissolved | 540700 | | ug/l | 50000 | 17050 | 5000 | 03/27/24 17:13 | 03/31/24 18:58 | EPA 3005A | 1,6020B | WKP |

**Project Name:** RWM-Q1 **Lab Number:** L2416133

**Project Number:** 21010103 **Report Date:** 04/04/24

## SAMPLE RESULTS

Lab ID: L2416133-05 Date Collected: 03/25/24 15:00

Client ID: RW15-MWI Date Received: 03/25/24

Sample Location: Not Specified Field Prep: Refer to COC

Sample Depth:

Matrix: Water

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dissolved Metals - Mansfield Lab** | | | | | | | | | | | |
| Cadmium, Dissolved | 4.679 | | ug/l | 0.2000 | 0.0599 | 1 | 03/27/24 17:13 | 03/31/24 17:59 | EPA 3005A | 1,6020B | WKP |
| Zinc, Dissolved | 31.51 | | ug/l | 10.00 | 3.410 | 1 | 03/27/24 17:13 | 03/31/24 17:59 | EPA 3005A | 1,6020B | WKP |

**Project Name:** RWM-Q1 **Lab Number:** L2416133

**Project Number:** 21010103 **Report Date:** 04/04/24

## SAMPLE RESULTS

Lab ID: L2416133-06 Date Collected: 03/25/24 15:40

Client ID: RW18-MWS Date Received: 03/25/24

Sample Location: Not Specified Field Prep: Refer to COC

Sample Depth:

Matrix: Water

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dissolved Metals - Mansfield Lab** | | | | | | | | | | | |
| Cadmium, Dissolved | 0.3824 | | ug/l | 0.2000 | 0.0599 | 1 | 03/27/24 17:13 | 03/31/24 18:03 | EPA 3005A | 1,6020B | WKP |
| Zinc, Dissolved | 19.99 | | ug/l | 10.00 | 3.410 | 1 | 03/27/24 17:13 | 03/31/24 18:03 | EPA 3005A | 1,6020B | WKP |

**Project Name:** RWM-Q1 **Lab Number:** L2416133

**Project Number:** 21010103 **Report Date:** 04/04/24

# Method Blank Analysis
# Batch Quality Control

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|
| Dissolved Metals - Mansfield Lab for sample(s): 01-06 Batch: WG1901606-1 | | | | | | | | | | |
| Cadmium, Dissolved | ND | | ug/l | 0.2000 | 0.0599 | 1 | 03/27/24 17:13 | 03/29/24 08:28 | 1,6020B | EJF |
| Zinc, Dissolved | ND | | ug/l | 10.00 | 3.410 | 1 | 03/27/24 17:13 | 03/29/24 08:28 | 1,6020B | EJF |

**Prep Information**

Digestion Method: EPA 3005A

# Lab Control Sample Analysis

## Batch Quality Control

**Project Name:** RWM-Q1

**Project Number:** 21010103

**Lab Number:** L2416133

**Report Date:** 04/04/24

| Parameter | LCS %Recovery | Qual | LCSD %Recovery | Qual | %Recovery Limits | RPD | Qual | RPD Limits |
|---|---|---|---|---|---|---|---|---|
| Dissolved Metals - Mansfield Lab Associated sample(s): 01-06 Batch: WG1901606-2 | | | | | | | | |
| Cadmium, Dissolved | 89 | | - | | 80-120 | - | | |
| Zinc, Dissolved | 92 | | - | | 80-120 | - | | |

# Matrix Spike Analysis
## Batch Quality Control

**Project Name:** RWM-Q1
**Project Number:** 21010103

**Lab Number:** L2416133
**Report Date:** 04/04/24

| Parameter | Native Sample | MS Added | MS Found | MS %Recovery | Qual | MSD Found | MSD %Recovery | Qual | Recovery Limits | RPD | Qual | RPD Limits |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Dissolved Metals - Mansfield Lab Associated sample(s): 01-06 QC Batch ID: WG1901606-3 QC Sample: L2415830-01 Client ID: MS Sample | | | | | | | | | | | | |
| Cadmium, Dissolved | ND | 53 | 49.06 | 92 | | - | - | | 75-125 | - | | 20 |
| Zinc, Dissolved | 22.53 | 500 | 482.2 | 92 | | - | - | | 75-125 | - | | 20 |

**Project Name:** RWM-Q1
**Project Number:** 21010103

**Lab Number:** L2416133
**Report Date:** 04/04/24

## Sample Receipt and Container Information

Were project specific reporting limits specified? YES

### Cooler Information

| Cooler | Custody Seal |
|---|---|
| A | Absent |

### Container Information

| Container ID | Container Type | Cooler | Initial pH | Final pH | Temp deg C | Pres | Seal | Frozen Date/Time | Analysis(*) |
|---|---|---|---|---|---|---|---|---|---|
| L2416133-01A | Plastic 250ml HNO3 preserved | A | <2 | <2 | 4.3 | Y | Absent | | ZN-6020S-PPB(180),CD-6020S-PPB(180) |
| L2416133-02A | Plastic 250ml HNO3 preserved | A | <2 | <2 | 4.3 | Y | Absent | | ZN-6020S-PPB(180),CD-6020S-PPB(180) |
| L2416133-03A | Plastic 250ml HNO3 preserved | A | <2 | <2 | 4.3 | Y | Absent | | ZN-6020S-PPB(180),CD-6020S-PPB(180) |
| L2416133-03B | Plastic 250ml Zn Acetate/NaOH preserved | A | 6 | >9 | 4.3 | N | Absent | | SUB-SULFIDE() |
| L2416133-04A | Plastic 250ml HNO3 preserved | A | <2 | <2 | 4.3 | Y | Absent | | ZN-6020S-PPB(180),CD-6020S-PPB(180) |
| L2416133-05A | Plastic 250ml HNO3 preserved | A | <2 | <2 | 4.3 | Y | Absent | | ZN-6020S-PPB(180),CD-6020S-PPB(180) |
| L2416133-06A | Plastic 250ml HNO3 preserved | A | <2 | <2 | 4.3 | Y | Absent | | ZN-6020S-PPB(180),CD-6020S-PPB(180) |



*Values in parentheses indicate holding time in days

| | | | |
|---|---|---|---|
| **Project Name:** | RWM-Q1 | **Lab Number:** | L2416133 |
| **Project Number:** | 21010103 | **Report Date:** | 04/04/24 |

## GLOSSARY

***Acronyms***

| | |
|---|---|
| DL | - Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the limit of quantitation (LOQ). The DL includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.) |
| EDL | - Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME). |
| EMPC | - Estimated Maximum Possible Concentration: The concentration that results from the signal present at the retention time of an analyte when the ions meet all of the identification criteria except the ion abundance ratio criteria. An EMPC is a worst-case estimate of the concentration. |
| EPA | - Environmental Protection Agency. |
| LCS | - Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes. |
| LCSD | - Laboratory Control Sample Duplicate: Refer to LCS. |
| LFB | - Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes. |
| LOD | - Limit of Detection: This value represents the level to which a target analyte can reliably be detected for a specific analyte in a specific matrix by a specific method. The LOD includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.) |
| LOQ | - Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)<br><br>Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.) |
| MDL | - Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. |
| MS | - Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available. For Method 332.0, the spike recovery is calculated using the native concentration, including estimated values. |
| MSD | - Matrix Spike Sample Duplicate: Refer to MS. |
| NA | - Not Applicable. |
| NC | - Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit. |
| NDPA/DPA | - N-Nitrosodiphenylamine/Diphenylamine. |
| NI | - Not Ignitable. |
| NP | - Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil. |
| NR | - No Results: Term is utilized when 'No Target Compounds Requested' is reported for the analysis of Volatile or Semivolatile Organic TIC only requests. |
| RL | - Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable. |
| RPD | - Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report. |
| SRM | - Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples. |
| STLP | - Semi-dynamic Tank Leaching Procedure per EPA Method 1315. |
| TEF | - Toxic Equivalency Factors: The values assigned to each dioxin and furan to evaluate their toxicity relative to 2,3,7,8-TCDD. |
| TEQ | - Toxic Equivalent: The measure of a sample's toxicity derived by multiplying each dioxin and furan by its corresponding TEF and then summing the resulting values. |
| TIC | - Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations. |

*Report Format: DU Report with 'J' Qualifiers*

| | | | |
|---|---|---|---|
| **Project Name:** | RWM-Q1 | **Lab Number:** | L2416133 |
| **Project Number:** | 21010103 | **Report Date:** | 04/04/24 |

***Footnotes***

1 - The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

***Terms***

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Chlordane: The target compound Chlordane (CAS No. 57-74-9) is reported for GC ECD analyses. Per EPA,this compound "refers to a mixture of chlordane isomers, other chlorinated hydrocarbons and numerous other components." (Reference: USEPA Toxicological Review of Chlordane, In Support of Summary Information on the Integrated Risk Information System (IRIS), December 1997.)

Difference: With respect to Total Oxidizable Precursor (TOP) Assay analysis, the difference is defined as the Post-Treatment value minus the Pre-Treatment value.

Final pH: As it pertains to Sample Receipt & Container Information section of the report, Final pH reflects pH of container determined after adjustment at the laboratory, if applicable. If no adjustment required, value reflects Initial pH.

Frozen Date/Time: With respect to Volatile Organics in soil, Frozen Date/Time reflects the date/time at which associated Reagent Water-preserved vials were initially frozen. Note: If frozen date/time is beyond 48 hours from sample collection, value will be reflected in 'bold'.

Gasoline Range Organics (GRO): Gasoline Range Organics (GRO) results include all chromatographic peaks eluting from Methyl tert butyl ether through Naphthalene, with the exception of GRO analysis in support of State of Ohio programs, which includes all chromatographic peaks eluting from Hexane through Dodecane.

Initial pH: As it pertains to Sample Receipt & Container Information section of the report, Initial pH reflects pH of container determined upon receipt, if applicable.

PAH Total: With respect to Alkylated PAH analyses, the 'PAHs, Total' result is defined as the summation of results for all or a subset of the following compounds: Naphthalene, C1-C4 Naphthalenes, 2-Methylnaphthalene, 1-Methylnaphthalene, Biphenyl, Acenaphthylene, Acenaphthene, Fluorene, C1-C3 Fluorenes, Phenanthrene, C1-C4 Phenanthrenes/Anthracenes, Anthracene, Fluoranthene, Pyrene, C1-C4 Fluoranthenes/Pyrenes, Benz(a)anthracene, Chrysene, C1-C4 Chrysenes, Benzo(b)fluoranthene, Benzo(j)+(k)fluoranthene, Benzo(e)pyrene, Benzo(a)pyrene, Perylene, Indeno(1,2,3-cd)pyrene, Dibenz(ah)+(ac)anthracene, Benzo(g,h,i)perylene. If a 'Total' result is requested, the results of its individual components will also be reported.

PFAS Total: With respect to PFAS analyses, the 'PFAS, Total (5)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA and PFOS. In addition, the 'PFAS, Total (6)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA, PFDA and PFOS. For MassDEP DW compliance analysis only, the 'PFAS, Total (6)' result is defined as the summation of results at or above the RL. Note: If a 'Total' result is requested, the results of its individual components will also be reported.

Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

***Data Qualifiers***

**A** - Spectra identified as "Aldol Condensates" are byproducts of the extraction/concentration procedures when acetone is introduced in the process.

**B** - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).

**C** - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.

**D** - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.

**E** - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.

**F** - The ratio of quantifier ion response to qualifier ion response falls outside of the laboratory criteria. Results are considered to be an estimated maximum concentration.

**G** - The concentration may be biased high due to matrix interferences (i.e, co-elution) with non-target compound(s). The result should be considered estimated.

**H** - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.

**I** - The lower value for the two columns has been reported due to obvious interference.

**J** - Estimated value. The Target analyte concentration is below the quantitation limit (RL), but above the Method Detection Limit (MDL) or Estimated Detection Limit (EDL) for SPME-related analyses. This represents an estimated concentration for Tentatively

*Report Format: DU Report with 'J' Qualifiers*

| | | | |
|---|---|---|---|
| **Project Name:** | RWM-Q1 | **Lab Number:** | L2416133 |
| **Project Number:** | 21010103 | **Report Date:** | 04/04/24 |

***Data Qualifiers***

Identified Compounds (TICs). For calculated parameters, this represents that one or more values used in the calculation were estimated.

**M** - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.

**ND** - Not detected at the method detection limit (MDL) for the sample, or estimated detection limit (EDL) for SPME-related analyses.

**NJ** - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where the identification is based on a mass spectral library search.

**P** - The RPD between the results for the two columns exceeds the method-specified criteria.

**Q** - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)

**R** - Analytical results are from sample re-analysis.

**RE** - Analytical results are from sample re-extraction.

**S** - Analytical results are from modified screening analysis.

**V** - The surrogate associated with this target analyte has a recovery outside the QC acceptance limits. (Applicable to MassDEP DW Compliance samples only.)

**Z** - The batch matrix spike and/or duplicate associated with this target analyte has a recovery/RPD outside the QC acceptance limits. (Applicable to MassDEP DW Compliance samples only.)

| | | | |
|---|---|---|---|
| **Project Name:** | RWM-Q1 | **Lab Number:** | L2416133 |
| **Project Number:** | 21010103 | **Report Date:** | 04/04/24 |

## REFERENCES

1 Test Methods for Evaluating Solid Waste: Physical/Chemical Methods. EPA SW-846. Third Edition. Updates I - VI, 2018.

## LIMITATION OF LIABILITIES

Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Analytical shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Alpha Analytical.

We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.

# Certification Information

**The following analytes are not included in our Primary NELAP Scope of Accreditation:**

**Westborough Facility**
**EPA 624.1:** m/p-xylene, o-xylene, Naphthalene
**EPA 625.1:** alpha-Terpineol
**EPA 8260D:** NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene, Azobenzene; SCM: Iodomethane (methyl iodide), 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.
**EPA 8270E:** NPW: Dimethylnaphthalene,1,4-Diphenylhydrazine, alpha-Terpineol; SCM: Dimethylnaphthalene,1,4-Diphenylhydrazine.
**SM4500**: NPW: Amenable Cyanide; SCM: Total Phosphorus, TKN, NO2, NO3.

**Mansfield Facility**
**SM 2540D:** TSS.
**EPA TO-15:** Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene, 3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene.
**Biological Tissue Matrix:** EPA 3050B

**The following analytes are included in our Massachusetts DEP Scope of Accreditation**

**Westborough Facility:**

***Drinking Water***
**EPA 300.0**: Chloride, Nitrate-N, Fluoride, Sulfate; **EPA 353.2**: Nitrate-N, Nitrite-N; **SM4500NO3-F**: Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE, EPA 180.1, SM2130B, SM4500Cl-D, SM2320B, SM2540C, SM4500H-B, SM4500NO2-B**
**EPA 524.2:** THMs and VOCs; **EPA 504.1:** EDB, DBCP.
**Microbiology**: **SM9215B; SM9223-P/A, SM9223B-Colilert-QT,SM9222D**.

***Non-Potable Water***
**SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2320B, SM4500CL-E, SM4500F-BC, SM4500NH3-BH:** Ammonia-N and Kjeldahl-N, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **EPA 351.1, SM4500NO3-F, EPA 353.2**: Nitrate-N**, SM4500P-E, SM4500P-B, E, SM4500SO4-E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, EPA 420.1, SM4500-CN-CE, SM2540D, EPA 300: Chloride, Sulfate, Nitrate.**
**EPA 624.1**: Volatile Halocarbons & Aromatics,
**EPA 608.3**: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs
**EPA 625.1**: SVOC (Acid/Base/Neutral Extractables).
**Microbiology**: **SM9223B-Colilert-QT; Enterolert-QT, SM9221E, EPA 1600, EPA 1603, SM9222D.**

**Mansfield Facility:**

***Drinking Water***
**EPA 200.7:** Al, Ba, Cd, Cr, Cu, Fe, Mn, Ni, Na, Ag, Ca, Zn. **EPA 200.8:** Al, Sb, As, Ba, Be, Cd, Cr, Cu, Pb, Mn, Ni, Se, Ag, TL, Zn. **EPA 245.1** Hg.
**EPA 522, EPA 537.1.**

***Non-Potable Water***
**EPA 200.7:** Al, Sb, As, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, K, Se, Ag, Na, Sr, TL, Ti, V, Zn.
**EPA 200.8:** Al, Sb**,** As, Be, Cd, Cr, Cu, Fe, Pb, Mn, Ni, K, Se, Ag, Na, TL, Zn.
**EPA 245.1** Hg.
**SM2340B**

For a complete listing of analytes and methods, please contact your Alpha Project Manager.

# CHAIN OF CUSTODY

PAGE 1 OF 1

ALPHA ANALYTICAL
WESTBORO, MA TEL: 508-898-9220 FAX: 508-898-9193
MANSFIELD, MA TEL: 508-822-9300 FAX: 508-822-3288

Date Rec'd in Lab: 3/26/24

ALPHA Job #: L2416133

**Client Information**

Client: TPA

Address:

Phone:

Fax:

Email:

☐ These samples have been previously analyzed by Alpha

**Project Information**

Project Name: RWM-Q1

Project Location:

Project #: 210103

Project Manager: Bob T.

ALPHA Quote #:

**Turn-Around Time**

☒ Standard ☐ RUSH (only confirmed if pre-approved!)

Date Due: Time:

**Report Information - Data Deliverables**

☐ FAX ☐ EMAIL

☐ ADEx ☐ Add'l Deliverables

**Billing Information**

☐ Same as Client info PO #:

**Regulatory Requirements/Report Limits**

| State /Fed Program | Criteria |
|---|---|
| | |

Other Project Specific Requirements/Comments/Detection Limits:

ANALYSIS: Diss Cd + Zn Sulfides

**SAMPLE HANDLING**

Filtration
☐ Done
☐ Not needed
☐ Lab to do
Preservation
☐ Lab to do
(Please specify below)

| ALPHA Lab ID (Lab Use Only) | Sample ID | Collection Date | Collection Time | Sample Matrix | Sampler's Initials | Sample Specific Comments | TOTAL # BOTTLES |
|---|---|---|---|---|---|---|---|
| 16133-01 | RW16-MWS | | 1150 | | | | 1 |
| -02 | RW16-MWI | | 1230 | | | | 1 |
| -03 | RW11-MWS | | 1325 | | | | 2 |
| -04 | RW13-MWI | | 1410 | | | | 1 |
| -05 | RW15-MWI | | 1500 | | | | 1 |
| -06 | RW18-MWI | | 1540 | | | | 1 |

Container Type: P P

Preservative: 4 0

| Relinquished By: | Date/Time | Received By: | Date/Time |
|---|---|---|---|
| | 3/25 1550 | | 3/25/24 1555 |
| | 3/25/24 1800 | | 3/25/24 1800 |
| Anthony Green | 3/26/24 0015 | Anthony Green | MAR 25 2024 0201 3/26/24 0015 |

3/26/24 0240

3/26/24 0240

Please print clearly, legibly and completely. Samples can not be logged in and turnaround time clock will not start until any ambiguities are resolved. All samples submitted are subject to Alpha's Terms and Conditions. See reverse side.

PEOPLE ADVANCING SCIENCE

*Pace Analytical Services, LLC-Fairfield*

# ANALYTICAL RESULTS

## LEVEL II DELIVERABLES FORMAT

Work Order Number: 24C1733

Pace - Alpha Analytical Laboratories

Project: L2416133



Sudip Pradhan
Laboratory Director

**All Results meet the requirements of the National Environmental Laboratory Accreditation Conference and/or State specific certifications as applicable.**

**Report Date:** Apr 04, 2024

1275 Bloomfield Ave., Bldg. 6, Fairfield, New Jersey 07004
(t) 973.227.0422 (f) 973.227.2813 (w) www.pacelabs.com

**NELAC** National Environmental Laboratory Accreditation Conference
NJDEP #07010 / NYDOH #11634 / PADEP #68-02903

sections 1 2 3 4 5 6 7 8

# CONTENTS

1. Sample Summary . . . 3
2. Chain of Custody . . . 4
3. Methodology Summary . . . 8
4. Abbreviations and Qualifiers . . . 9
5. Conformance/Non-Conformance Summary . . . 10
6. Positive Results Summary . . . 11
7. All Results Summary . . . 12
8. General Chemistry . . . 13
    8.1. General Chemistry Results . . . 14

PEOPLE ADVANCING SCIENCE

*Pace Analytical Services, LLC-Fairfield*

# Sample Summary

**Work Order:** 24C1733

**Client:** Pace - Alpha Analytical Laboratories

**Project:** L2416133

| Sample ID | Laboratory ID | Matrix | Date Sampled | Date Received |
|---|---|---|---|---|
| RWN-MWS | 24C1733-01 | Water | 03/25/2024 13:25 | 03/27/2024 08:10 |

**Pace**
Pace Analytical Services-Fairfield
www.pacelabs.com

## Subcontract Chain of Custo

APL/ Pace Fairfield
1275 Bloomfield Ave.
Bldg. 6
Fairfield, NJ 07004

24C1733
Pace - Alpha Analytical Laboratories
L2416133

**Alpha Job Number**
L2416133

| Client Information | Project Information | s/Report Limits |
|---|---|---|
| Client: Alpha Analytical Labs<br>Address: Eight Walkup Drive<br>Westborough, MA 01581-1019<br><br>Phone: 508.844.4115<br>Email: Mitchell.Ostrowski@pacelabs.com | Project Location: MD<br>Project Manager: Mitchell Ostrowski<br>**Turnaround & Deliverables Information**<br>Due Date:<br>Deliverables: | State/Federal Program:<br>Regulatory Criteria: |

**Project Specific Requirements and/or Report Requirements**

Reference following Alpha Job Number on final report/deliverables: L2416133

Report to include Method Blank, LCS/LCSD:

Additional Comments: Invoices to: invoices@pacelabs.coupahost.com Reports to: west.subreports@pacelabs.com

| Lab ID | Client ID | Collection Date/Time | Sample Matrix | Analysis | Batch QC |
|---|---|---|---|---|---|
| 01 | RWN-MWS | 03-25-24 13:25 | WATER | Sulfide | |

| | Relinquished By: | Date/Time: | Received By: | Date/Time: |
|---|---|---|---|---|
| | | 3/26/24 | | 3/26 17:30 |
| | AM | 3/26 22:00 | | |
| | | 3/26/24 | | 3/26/24 22:05 |
| Form No: AL_subcoc | | 3/27/24 0805 | | 3/27/24 0630 |
| | | | | 3/27/24 0810 |



Serial_No:04042414:34

DC#_Title: ENV-FRM-FAIR-007 v01_Sample Condition Upon Receipt Form
Effective Date: 7/26/2023

24C1733

## Sample Condition Upon Receipt Form (SCUR)

Affix Sample Label Here

**Date and Initials of person:**
**Examining contents:** 3/27 AK
**Label:** 3/27 AK
**Deliver to location:**
**pH:** 3/27 AK

Thermometer Used: TR03 Date: 3/27/24 Time: 0810 Initials: AK

State of Origin: NJ

**Cooler #1 Temp.°C** 2.0 **(Visual)** 01 **(Correction Factor)** 2.1 **(Actual)** ☐ Samples on ice, cooling process has begun

**Courier:** ☐ Fed Ex ☐ UPS ☐ USPS ☐ Client ☐ Commercial ☑ Pace ☐ Other

**Shipping Method:** ☐ First Overnight ☐ Priority Overnight ☐ Standard Overnight ☐ Ground ☐ Other

**Tracking #**

**Custody Seal on Cooler/Box Present:** ☐ Yes ☑ No **Seals intact:** ☐ Yes ☑ No **Ice:** (Wet) Blue Melted None

**Packing Material:** ☐ Bubble Wrap ☐ Bubble Bags ☐ None ☐ Other

**Samples were collected by Pace employee** ☐ Yes ☑ No ☐ N/A

| | | **Comments:** |
|---|---|---|
| Chain of Custody Present | ☐Yes ☐ No ☐ N/A | |
| Chain of Custody Filled Out | ☐Yes ☐ No ☐ N/A | |
| Relinquished Signature on COC | ☐Yes ☐ No ☐ N/A | |
| Sampler Name and Signature on COC | ☐Yes ☐ No ☐ N/A | |
| Samples Arrived within Hold Time | ☐Yes ☐ No ☐ N/A | |
| Rush TAT requested on COC | ☐Yes ☐ No ☐ N/A | |
| Sufficient Volume | ☐Yes ☐ No ☐ N/A | |
| Correct Containers Used | ☐Yes ☐ No ☐ N/A | |
| Containers Intact | ☐Yes ☐ No ☐ N/A | |
| Sample Labels match COC (sample IDs & date/time of collection) | ☐Yes ☐ No ☐ N/A | |
| All containers needing acid/base preservation have been checked. | ☐Yes ☐ No ☐ N/A | Preservation Information:<br>Preservative:<br>Lot #/Trace #:<br>Date: Time:<br>Initials: |
| All Containers needing preservation are found to be in compliance with EPA recommendation:<br>Exceptions: Vials, Microbiology, O&G, Metals | ☐Yes ☐ No ☐ N/A | |
| Headspace in VOA Vials? ( >6mm): | ☐Yes ☐ No ☐N/A | |
| Trip Blank Present: | ☐Yes ☐ No ☐N/A | |

**Additional Login Comments:**

**Client notification/ Resolution**

Person Contacted: Date/Time:

Comments/Resolution:

Qualtrax ID: 188127 Pace® Analytical Services, LLC Page 1 of 1

**Pace**
Pace Analytical Services-Fairfield
www.pacelabs.com

## Subcontract Chain of Custo

APL/ Pace Fairfield
1275 Bloomfield Ave.
Bldg. 6
Fairfield, NJ 07004

24C1733
Pace - Alpha Analytical Laboratories
L2416133

**Alpha Job Number**
L2416133

| Client Information | Project Information | s/Report Limits |
|---|---|---|
| Client: Alpha Analytical Labs<br>Address: Eight Walkup Drive<br>Westborough, MA 01581-1019<br><br>Phone: 508.844.4115<br>Email: Mitchell.Ostrowski@pacelabs.com | Project Location: MD<br>Project Manager: Mitchell Ostrowski<br>**Turnaround & Deliverables Information**<br>Due Date:<br>Deliverables: | State/Federal Program:<br>Regulatory Criteria: |

**Project Specific Requirements and/or Report Requirements**

Reference following Alpha Job Number on final report/deliverables: L2416133

Report to include Method Blank, LCS/LCSD:

Additional Comments: Invoices to: invoices@pacelabs.coupahost.com Reports to: west.subreports@pacelabs.com

| Lab ID | Client ID | Collection Date/Time | Sample Matrix | Analysis | Batch QC |
|---|---|---|---|---|---|
| 01 | RWN-MWS | 03-25-24 13:25 | WATER | Sulfide | |

| | Relinquished By: | Date/Time: | Received By: | Date/Time: |
|---|---|---|---|---|
| | | 3/26/24 | | 3/26 17:30 |
| | NM | 3/26 22:00 | NM | |
| | | 3/26/24 | | 3/26/24 22:05 |
| Form No: AL_subcoc | | 3/27/24 0805 | | 3/27/24 0630 |
| | | | | 3/27/24 0810 |



Serial_No:04042414:34

DC#_Title: ENV-FRM-FAIR-007 v01_Sample Condition Upon Receipt Form
Effective Date: 7/26/2023

24C1733

## Sample Condition Upon Receipt Form (SCUR)

Affix Sample Label Here

**Date and Initials of person:**
**Examining contents:** 3/27 AK
**Label:** 3/27 AK
**Deliver to location:**
**pH:** 3/27 AK

Thermometer Used: TR03 Date: 3/27/24 Time: 0810 Initials: AK

State of Origin: NJ

**Cooler #1 Temp.°C** 2.0 **(Visual)** 01 **(Correction Factor)** 2.1 **(Actual)** ☐ Samples on ice, cooling process has begun

**Courier:** ☐ Fed Ex ☐ UPS ☐ USPS ☐ Client ☐ Commercial ☑ Pace ☐ Other

**Shipping Method:** ☐ First Overnight ☐ Priority Overnight ☐ Standard Overnight ☐ Ground ☐ Other

**Tracking #**

**Custody Seal on Cooler/Box Present:** ☐ Yes ☑ No **Seals intact:** ☐ Yes ☑ No **Ice:** (Wet) Blue Melted None

**Packing Material:** ☐ Bubble Wrap ☐ Bubble Bags ☐ None ☐ Other

**Samples were collected by Pace employee** ☐ Yes ☑ No ☐ N/A

| | | **Comments:** |
|---|---|---|
| Chain of Custody Present | ☐Yes ☐ No ☐ N/A | |
| Chain of Custody Filled Out | ☐Yes ☐ No ☐ N/A | |
| Relinquished Signature on COC | ☐Yes ☐ No ☐ N/A | |
| Sampler Name and Signature on COC | ☐Yes ☐ No ☐ N/A | |
| Samples Arrived within Hold Time | ☐Yes ☐ No ☐ N/A | |
| Rush TAT requested on COC | ☐Yes ☐ No ☐ N/A | |
| Sufficient Volume | ☐Yes ☐ No ☐ N/A | |
| Correct Containers Used | ☐Yes ☐ No ☐ N/A | |
| Containers Intact | ☐Yes ☐ No ☐ N/A | |
| Sample Labels match COC (sample IDs & date/time of collection) | ☐Yes ☐ No ☐ N/A | |
| All containers needing acid/base preservation have been checked. | ☐Yes ☐ No ☐ N/A | Preservation Information:<br>Preservative:<br>Lot #/Trace #:<br>Date: Time:<br>Initials: |
| All Containers needing preservation are found to be in compliance with EPA recommendation:<br>Exceptions: Vials, Microbiology, O&G, Metals | ☐Yes ☐ No ☐ N/A | |
| Headspace in VOA Vials? ( >6mm): | ☐Yes ☐ No ☐N/A | |
| Trip Blank Present: | ☐Yes ☐ No ☐N/A | |

**Additional Login Comments:**

**Client notification/ Resolution**

Person Contacted: Date/Time:

Comments/Resolution:

Qualtrax ID: 188127 Pace® Analytical Services, LLC Page 1 of 1

Pace Analytical Services, LLC-Fairfield
Methodology Summary

## Extractable Petroleum Hydrocarbons:

### *Gas Chromatography/Flame Ionization Detector*

New Jersey Department of Environmental Protection Site Remediation Program Extractable Petroleum Hydrocarbons Methodology (Version 3.0).
USEPA SW-846 Test Methods for Evaluating Solid Waste Physical/Chemical Methods Update III, Method 8015D or NJDEP Office of Quality Assurance Quantitation of Semi-Volatile Petroleum Products in Water, Soil and Sediment OQA-QAM-025, Revision 6.

## Metals:

### *Inductively-Coupled Plasma Atomic Emission Spectrometry or Inductively-Coupled Plasma Mass Spectroscopy*

**Wastewater and Groundwater Samples:** USEPA Methods for the Analysis of Water and Wastes, Method 200.7, Method 200.8.
**Soil Samples:** USEPA Methods for Evaluating Solid Waste Physical/Chemical Methods Update III, Method 6010D.

## Mercury:

### *Cold Vapor Atomic Absorption Spectrometry*

**Wastewater and Groundwater Samples:** USEPA Methods for the Analysis of Water and Wastes, Method 245.1.
**Soil Samples**: USEPA SW-846 Test Methods for Evaluating Solid Waste Physical/Chemical Methods Update III, Method 7471B.

## Volatile Organic Compounds:

### *Purge and Trap Gas Chromatography/Mass Spectroscopy*

**Drinking Water Samples:** USEPA Methods for the Determination of Organic Compounds in Drinking Water, Method 524.2.
**Wastewater Samples:** USEPA Methods for the Analysis of Water and Wastes, Method 624.1.
**Soil and Groundwater Samples:** USEPA SW-846 Test Methods for Evaluating Solid Waste Physical/Chemical Methods Update VI, Method 8260D.

## Semi-Volatile Organic Compounds:

### *Gas Chromatography/Mass Spectroscopy*

**Wastewater Samples:** USEPA Methods for the Analysis of Water and Wastes, Method 625.1.
**Soil and Groundwater Samples:** USEPA SW-846 Test Methods for Evaluating Solid Waste Physical/Chemical Methods Update VI, Method 8270E.

## PFAS Compounds:

### *Liquid Chromatography/Tandem Mass Spectroscopy*

**Drinking Water Samples:** USEPA Methods for the Determination of Selected Perfluorinated Alkyl Acids in Drinking Water by Solid Phase Extraction and Liquid Chromatography/Tandem Mass Spectrometry (LC/MS/MS), Method 537 (v1.1).

## Pesticides:

### *Gas Chromatography/Electron Capture Detector*

**Wastewater Samples:** USEPA Methods for the Analysis of Water and Wastes, Method 608.3.
**Soil and Groundwater Samples:** USEPA SW-846 Test Methods for Evaluating Solid Waste Physical/Chemical Methods Update III, Method 8081B.

## Polychlorinated Biphenyls (PCBs):

### *Gas Chromatography/Electron Capture Detector*

**Wastewater Samples:** USEPA Methods for the Analysis of Water and Wastes, Method 608.3.
**Soil and Groundwater Samples:** USEPA SW-846 Test Methods for Evaluating Solid Waste Physical/Chemical Methods Update III, Method 8082A.

## General Chemistry Methods:

### *Various general chemistry methods are taken from* "Standard Methods for the Examination of Water and Wastewater, 22nd Edition", .

Specific method citations can be found on the Analytical Results Summary page of this report listed under 'Method'.

** A complete list of Pace Fairfield's certified Methods are on the Standards And Docs page of the Results Retrieval System

Pace Analytical Services, LLC-Fairfield
Data Reporting Abbreviations and Qualifiers



**Method Detection Limit (MDL):**

The MDL is defined as the minimum measured concentration of a substance that can be reported with 99% confidence that the measured concentration is distinguishable from method blank results. The value is calculated following the guidelines defined in:

"Definition and Procedure for the Determination of the Method Detection Limit, Revision 2"
EPA 821-R-16-006, published December 2016.

**Reporting Limit (RL):**

The RL is the Concentration of the lowest calibration standard that was included in the initial calibration of the instrument. On analytical reports this value is corrected for percent moisture and any concentration or dilution factors.

**Concentration (Conc.) / Result:**

If the compound is detected, the measured concentration is reported. If this column is "ND", or contains a 'less than' (<) symbol, the compound was not detected.

**Tentatively Identified Compound (TIC):**

A TIC is a non-targeted compound, not included in the calibration, identified by a mass spectral library search OR requested to be identified and reported by the client.

**Abbreviations:**

| | |
|---|---|
| **ND** | Non-Detect |
| **TNTC** | Too Numerous To Count |

**Qualifers:**

| | |
|---|---|
| **D** | The concentration is from a dilution |
| **U** | Compound not detected |

Pace Analytical Services, LLC-Fairfield



## QUALITY CONTROL
## Conformance/Non-Conformance Summary

**ANALYSIS: Sulfide [SM 4500-S-D-11]**

COMMENTS:
All samples met QC criteria.

Reviewed By: _____ (IK) 4/4/2024
Sudip Pradhan - Laboratory Director — Date

*For any questions about your Quality Control, please call us at 973-227-0422*

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*Pace Analytical Services, LLC-Fairfield*

# Positive Results Only Summary



No positive results found

**ND** - Indicates compound analyzed for but not detected
**J** - Indicates estimated value
**B** - Indicates compound found in associated blank
**E** - Concentration exceeds highest calibration standard

**D** - Indicates result is based on a dilution
**H** - Indicates a Hold Time violation
**P** - Greater than 25% diff. between 2 GC columns.
**MDL** - Minimum detection limit, **RL** - Reporting limit
**D1** - Sample was Decanted (Dissolved)

PEOPLE ADVANCING SCIENCE

*Pace Analytical Services, LLC-Fairfield*

# All Results Summary

**Client:** Pace - Alpha Analytical Laboratories
**Project:** L2416133
**Work Order:** 24C1733
**Date to Lab:** 3/27/2024 8:10:00AM

**24C1733-01 (Water)** Sample Name: **RWN-MWS** Collected: **3/25/2024 1:25:00PM**

**SM 4500-S-D-11 - General Chemistry**

| Analyte | Result | Qual | MDL | RL | Units | Dilution | Analyzed |
|---|---|---|---|---|---|---|---|
| Sulfide | ND | U | 0.0500 | 0.100 | mg/L | 10 | 3/29/24 11:00 |

**ND, U** - Indicates compound analyzed for but not detected
**J** - Indicates estimated value
**B** - Indicates compound found in associated blank
**E** - Concentration exceeds highest calibration standard
**D** - Indicates result is based on a dilution
**H** - Indicates a Hold Time violation
**P** - Greater than 25% diff. between 2 GC columns.
**MDL** - Minimum detection limit, **RL** - Reporting limit
**D1** - Sample was Decanted (Dissolved)

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*Pace Analytical Services, LLC-Fairfield*

# GENERAL CHEMISTRY

Pace - Alpha Analytical Laboratories

Work Order: 24C1733

Project: L2416133

# ANALYSIS DATA SHEET

## General Chemistry

**Client:** Pace - Alpha Analytical Laboratories
**Project:** L2416133
**Work Order:** 24C1733

### General Chemistry

**24C1733-01 (Water) - RWN-MWS**

| Analyte | Units | Conc. | RL | DF | Qual | Analyzed | Method |
|---|---|---|---|---|---|---|---|
| Sulfide | mg/L | ND | 0.100 | 10 | U | 03/29/24 11:00 | SM 4500-S-D-11 |

8 8.1.

**ND** - Indicates compound analyzed for but not detected
**J** - Indicates estimated value
**B** - Indicates compound found in associated blank
**E** - Concentration exceeds highest calibration standard
**D** - Indicates result is based on a dilution
**H** - Indicates a Hold Time violation
**P** - Greater than 25% diff. between 2 GC columns.
**MDL** - Minimum detection limit, **RL** - Reporting limit

F-I

## Pace Analytical Services, LLC-Fairfield

### General Chemistry - Quality Control

| Sulfide | | Result | Reporting Limit | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit |
|---|---|---|---|---|---|---|---|---|---|---|
| **Batch BBD0207** | | | Prepared & Analyzed: 3/29/2024 | | | | | | | |
| BBD0207-BLK1 | | ND | 0.0100 | mg/L | | | | | | |
| BBD0207-BS1 | | 0.352 | 0.0100 | mg/L | 0.400 | | 88.0 | 80-120 | | |
| BBD0207-DUP1 | **Source: 24C1733-01** | ND | 0.100 | mg/L | | ND | | | | 20 |
| BBD0207-MS1 | **Source: 24C1733-01** | 3.18 | 0.100 | mg/L | 4.00 | ND | 79.5 | 70-130 | | |
| BBD0207-MSD1 | **Source: 24C1733-01** | 3.34 | 0.100 | mg/L | 4.00 | ND | 83.5 | 70-130 | 4.91 | 20 |

8.1.

**ND** - Indicates compound analyzed for but not detected
**J** - Indicates estimated value
**B** - Indicates compound found in associated blank
**E** - Concentration exceeds highest calibration standard

**D** - Indicates result is based on a dilution
**H** - Indicates a Hold Time violation
**P** - Greater than 25% diff. between 2 GC columns.
**MDL** - Minimum detection limit, **RL** - Reporting limit

F-III

# ANALYTICAL REPORT

| | |
|---|---|
| Lab Number: | L2417351 |
| Client: | Tradepoint Atlantic<br>1600 Sparrows Point Boulevard<br>Baltimore, MD 21219 |
| ATTN: | Robert Tworkowski |
| Phone: | (443) 649-5073 |
| Project Name: | RWM-Q1 |
| Project Number: | 21010103 |
| Report Date: | 04/05/24 |

The original project report/data package is held by Alpha Analytical. This report/data package is paginated and should be reproduced only in its entirety. Alpha Analytical holds no responsibility for results and/or data that are not consistent with the original.

Certifications & Approvals: MA (M-MA086), NH NELAP (2064), CT (PH-0826), IL (200077), IN (C-MA-03), KY (KY98045), ME (MA00086), MD (348), NJ (MA935), NY (11148), NC (25700/666), OH (CL108), OR (MA-1316), PA (68-03671), RI (LAO00065), TX (T104704476), VT (VT-0935), VA (460195), USDA (Permit #525-23-122-91930).

Eight Walkup Drive, Westborough, MA 01581-1019
508-898-9220 (Fax) 508-898-9193 800-624-9220 - www.alphalab.com

**Project Name:** RWM-Q1
**Project Number:** 21010103

**Lab Number:** L2417351
**Report Date:** 04/05/24

| Alpha Sample ID | Client ID | Matrix | Sample Location | Collection Date/Time | Receive Date |
|---|---|---|---|---|---|
| L2417351-01 | RW18-MWI | WATER | Not Specified | 03/29/24 09:50 | 03/29/24 |
| L2417351-02 | RWR-MWS | WATER | Not Specified | 03/29/24 10:30 | 03/29/24 |
| L2417351-03 | RWR-MWI | WATER | Not Specified | 03/29/24 11:10 | 03/29/24 |
| L2417351-04 | RW09-MWI | WATER | Not Specified | 03/29/24 13:40 | 03/29/24 |
| L2417351-05 | RWH-MWS | WATER | Not Specified | 03/29/24 14:25 | 03/29/24 |
| L2417351-06 | RWH-MWI | WATER | Not Specified | 03/29/24 15:00 | 03/29/24 |

| | | | |
|---|---|---|---|
| **Project Name:** | RWM-Q1 | **Lab Number:** | L2417351 |
| **Project Number:** | 21010103 | **Report Date:** | 04/05/24 |

## Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet NELAP requirements for all NELAP accredited parameters unless otherwise noted in the following narrative. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. Tentatively Identified Compounds (TICs), if requested, are reported for compounds identified to be present and are not part of the method/program Target Compound List, even if only a subset of the TCL are being reported. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively.

When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances, the specific failure is not narrated but noted in the associated QC Outlier Summary Report, located directly after the Case Narrative. QC information is also incorporated in the Data Usability Assessment table (Format 11) of our Data Merger tool, where it can be reviewed in conjunction with the sample result, associated regulatory criteria and any associated data usability implications.

Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

HOLD POLICY - For samples submitted on hold, Alpha's policy is to hold samples (with the exception of Air canisters) free of charge for 21 calendar days from the date the project is completed. After 21 calendar days, we will dispose of all samples submitted including those put on hold unless you have contacted your Alpha Project Manager and made arrangements for Alpha to continue to hold the samples. Air canisters will be disposed after 3 business days from the date the project is completed.

Please contact Project Management at 800-624-9220 with any questions.

| | | | |
|---|---|---|---|
| **Project Name:** | RWM-Q1 | **Lab Number:** | L2417351 |
| **Project Number:** | 21010103 | **Report Date:** | 04/05/24 |

**Case Narrative (continued)**

Report Submission

All non-detect (ND) or estimated concentrations (J-qualified) have been quantitated to the limit noted in the MDL column.

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature: Michelle M. Morris

Title: Technical Director/Representative Date: 04/05/24

# METALS

**Project Name:** RWM-Q1 **Lab Number:** L2417351

**Project Number:** 21010103 **Report Date:** 04/05/24

## SAMPLE RESULTS

Lab ID: L2417351-01 Date Collected: 03/29/24 09:50

Client ID: RW18-MWI Date Received: 03/29/24

Sample Location: Not Specified Field Prep: Refer to COC

Sample Depth:

Matrix: Water

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dissolved Metals - Mansfield Lab** | | | | | | | | | | | |
| Cadmium, Dissolved | 7.655 | | ug/l | 0.2000 | 0.0599 | 1 | 04/02/24 12:30 | 04/03/24 19:52 | EPA 3005A | 1,6020B | NTB |
| Zinc, Dissolved | 252600 | | ug/l | 1000. | 341.0 | 100 | 04/02/24 12:30 | 04/05/24 10:49 | EPA 3005A | 1,6020B | EJF |

**Project Name:** RWM-Q1 **Lab Number:** L2417351

**Project Number:** 21010103 **Report Date:** 04/05/24

## SAMPLE RESULTS

Lab ID: L2417351-02 Date Collected: 03/29/24 10:30

Client ID: RWR-MWS Date Received: 03/29/24

Sample Location: Not Specified Field Prep: Refer to COC

Sample Depth:

Matrix: Water

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dissolved Metals - Mansfield Lab** | | | | | | | | | | | |
| Cadmium, Dissolved | 15.34 | | ug/l | 0.2000 | 0.0599 | 1 | 04/02/24 12:30 | 04/03/24 19:56 | EPA 3005A | 1,6020B | NTB |
| Zinc, Dissolved | 280800 | | ug/l | 1000. | 341.0 | 100 | 04/02/24 12:30 | 04/05/24 10:53 | EPA 3005A | 1,6020B | EJF |

**Project Name:** RWM-Q1 **Lab Number:** L2417351

**Project Number:** 21010103 **Report Date:** 04/05/24

## SAMPLE RESULTS

Lab ID: L2417351-03 Date Collected: 03/29/24 11:10

Client ID: RWR-MWI Date Received: 03/29/24

Sample Location: Not Specified Field Prep: Refer to COC

Sample Depth:

Matrix: Water

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dissolved Metals - Mansfield Lab** | | | | | | | | | | | |
| Cadmium, Dissolved | 684.9 | | ug/l | 20.00 | 5.990 | 100 | 04/02/24 12:30 | 04/05/24 10:58 | EPA 3005A | 1,6020B | EJF |
| Zinc, Dissolved | 2730000 | | ug/l | 5000. | 1705. | 500 | 04/02/24 12:30 | 04/05/24 11:03 | EPA 3005A | 1,6020B | EJF |

**Project Name:** RWM-Q1 **Lab Number:** L2417351

**Project Number:** 21010103 **Report Date:** 04/05/24

## SAMPLE RESULTS

Lab ID: L2417351-04 Date Collected: 03/29/24 13:40

Client ID: RW09-MWI Date Received: 03/29/24

Sample Location: Not Specified Field Prep: Refer to COC

Sample Depth:

Matrix: Water

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dissolved Metals - Mansfield Lab** | | | | | | | | | | | |
| Cadmium, Dissolved | 6.329 | | ug/l | 0.2000 | 0.0599 | 1 | 04/02/24 12:30 | 04/03/24 20:19 | EPA 3005A | 1,6020B | NTB |
| Zinc, Dissolved | 57500 | | ug/l | 100.0 | 34.10 | 10 | 04/02/24 12:30 | 04/05/24 11:07 | EPA 3005A | 1,6020B | EJF |

**Project Name:** RWM-Q1 **Lab Number:** L2417351

**Project Number:** 21010103 **Report Date:** 04/05/24

## SAMPLE RESULTS

Lab ID: L2417351-05 Date Collected: 03/29/24 14:25

Client ID: RWH-MWS Date Received: 03/29/24

Sample Location: Not Specified Field Prep: Refer to COC

Sample Depth:

Matrix: Water

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dissolved Metals - Mansfield Lab** | | | | | | | | | | | |
| Cadmium, Dissolved | 11.47 | | ug/l | 0.2000 | 0.0599 | 1 | 04/02/24 12:30 | 04/03/24 20:23 | EPA 3005A | 1,6020B | NTB |
| Zinc, Dissolved | 8314. | | ug/l | 10.00 | 3.410 | 1 | 04/02/24 12:30 | 04/05/24 11:12 | EPA 3005A | 1,6020B | EJF |

**Project Name:** RWM-Q1 **Lab Number:** L2417351

**Project Number:** 21010103 **Report Date:** 04/05/24

## SAMPLE RESULTS

Lab ID: L2417351-06 Date Collected: 03/29/24 15:00

Client ID: RWH-MWI Date Received: 03/29/24

Sample Location: Not Specified Field Prep: Refer to COC

Sample Depth:

Matrix: Water

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dissolved Metals - Mansfield Lab** | | | | | | | | | | | |
| Cadmium, Dissolved | 5315. | | ug/l | 20.00 | 5.990 | 100 | 04/02/24 12:30 | 04/05/24 11:17 | EPA 3005A | 1,6020B | EJF |
| Zinc, Dissolved | 494000 | | ug/l | 1000. | 341.0 | 100 | 04/02/24 12:30 | 04/05/24 11:17 | EPA 3005A | 1,6020B | EJF |

**Project Name:** RWM-Q1 **Lab Number:** L2417351

**Project Number:** 21010103 **Report Date:** 04/05/24

# Method Blank Analysis
# Batch Quality Control

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|
| Dissolved Metals - Mansfield Lab for sample(s): 01-06 Batch: WG1903804-1 | | | | | | | | | | |
| Cadmium, Dissolved | ND | | ug/l | 0.2000 | 0.0599 | 1 | 04/02/24 12:30 | 04/03/24 19:20 | 1,6020B | NTB |
| Zinc, Dissolved | ND | | ug/l | 10.00 | 3.410 | 1 | 04/02/24 12:30 | 04/05/24 10:39 | 1,6020B | EJF |

**Prep Information**

Digestion Method: EPA 3005A

# Lab Control Sample Analysis

## Batch Quality Control

**Project Name:** RWM-Q1

**Project Number:** 21010103

**Lab Number:** L2417351

**Report Date:** 04/05/24

| Parameter | LCS %Recovery | Qual | LCSD %Recovery | Qual | %Recovery Limits | RPD | Qual | RPD Limits |
|---|---|---|---|---|---|---|---|---|
| Dissolved Metals - Mansfield Lab Associated sample(s): 01-06 Batch: WG1903804-2 | | | | | | | | |
| Cadmium, Dissolved | 103 | | - | | 80-120 | - | | |
| Zinc, Dissolved | 110 | | - | | 80-120 | - | | |

# Matrix Spike Analysis
## Batch Quality Control

**Project Name:** RWM-Q1
**Project Number:** 21010103

**Lab Number:** L2417351
**Report Date:** 04/05/24

| Parameter | Native Sample | MS Added | MS Found | MS %Recovery | Qual | MSD Found | MSD %Recovery | Qual | Recovery Limits | RPD | Qual | RPD Limits |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Dissolved Metals - Mansfield Lab Associated sample(s): 01-06 QC Batch ID: WG1903804-3 QC Sample: L2417070-02 Client ID: MS Sample | | | | | | | | | | | | |
| Cadmium, Dissolved | ND | 53 | 53.59 | 101 | | - | - | | 75-125 | - | | 20 |
| Zinc, Dissolved | ND | 500 | 551.6 | 110 | | - | - | | 75-125 | - | | 20 |

**Project Name:** RWM-Q1
**Project Number:** 21010103

**Lab Number:** L2417351
**Report Date:** 04/05/24

## Sample Receipt and Container Information

Were project specific reporting limits specified? YES

### Cooler Information

| Cooler | Custody Seal |
|---|---|
| A | Absent |

### Container Information

| Container ID | Container Type | Cooler | Initial pH | Final pH | Temp deg C | Pres | Seal | Frozen Date/Time | Analysis(*) |
|---|---|---|---|---|---|---|---|---|---|
| L2417351-01A | Plastic 250ml HNO3 preserved | A | <2 | <2 | 4.7 | Y | Absent | | ZN-6020S-PPB(180),CD-6020S-PPB(180) |
| L2417351-02A | Plastic 250ml HNO3 preserved | A | <2 | <2 | 4.7 | Y | Absent | | ZN-6020S-PPB(180),CD-6020S-PPB(180) |
| L2417351-03A | Plastic 250ml HNO3 preserved | A | <2 | <2 | 4.7 | Y | Absent | | ZN-6020S-PPB(180),CD-6020S-PPB(180) |
| L2417351-04A | Plastic 250ml HNO3 preserved | A | <2 | <2 | 4.7 | Y | Absent | | ZN-6020S-PPB(180),CD-6020S-PPB(180) |
| L2417351-05A | Plastic 250ml HNO3 preserved | A | <2 | <2 | 4.7 | Y | Absent | | ZN-6020S-PPB(180),CD-6020S-PPB(180) |
| L2417351-06A | Plastic 250ml HNO3 preserved | A | <2 | <2 | 4.7 | Y | Absent | | ZN-6020S-PPB(180),CD-6020S-PPB(180) |



*Values in parentheses indicate holding time in days

| | | | |
|---|---|---|---|
| **Project Name:** | RWM-Q1 | **Lab Number:** | L2417351 |
| **Project Number:** | 21010103 | **Report Date:** | 04/05/24 |

## GLOSSARY

***Acronyms***

| | |
|---|---|
| DL | - Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the limit of quantitation (LOQ). The DL includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.) |
| EDL | - Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME). |
| EMPC | - Estimated Maximum Possible Concentration: The concentration that results from the signal present at the retention time of an analyte when the ions meet all of the identification criteria except the ion abundance ratio criteria. An EMPC is a worst-case estimate of the concentration. |
| EPA | - Environmental Protection Agency. |
| LCS | - Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes. |
| LCSD | - Laboratory Control Sample Duplicate: Refer to LCS. |
| LFB | - Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes. |
| LOD | - Limit of Detection: This value represents the level to which a target analyte can reliably be detected for a specific analyte in a specific matrix by a specific method. The LOD includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.) |
| LOQ | - Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)<br><br>Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.) |
| MDL | - Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. |
| MS | - Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available. For Method 332.0, the spike recovery is calculated using the native concentration, including estimated values. |
| MSD | - Matrix Spike Sample Duplicate: Refer to MS. |
| NA | - Not Applicable. |
| NC | - Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit. |
| NDPA/DPA | - N-Nitrosodiphenylamine/Diphenylamine. |
| NI | - Not Ignitable. |
| NP | - Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil. |
| NR | - No Results: Term is utilized when 'No Target Compounds Requested' is reported for the analysis of Volatile or Semivolatile Organic TIC only requests. |
| RL | - Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable. |
| RPD | - Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report. |
| SRM | - Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples. |
| STLP | - Semi-dynamic Tank Leaching Procedure per EPA Method 1315. |
| TEF | - Toxic Equivalency Factors: The values assigned to each dioxin and furan to evaluate their toxicity relative to 2,3,7,8-TCDD. |
| TEQ | - Toxic Equivalent: The measure of a sample's toxicity derived by multiplying each dioxin and furan by its corresponding TEF and then summing the resulting values. |
| TIC | - Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations. |

*Report Format: DU Report with 'J' Qualifiers*

| | | | |
|---|---|---|---|
| **Project Name:** | RWM-Q1 | **Lab Number:** | L2417351 |
| **Project Number:** | 21010103 | **Report Date:** | 04/05/24 |

***Footnotes***

1 - The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

***Terms***

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Chlordane: The target compound Chlordane (CAS No. 57-74-9) is reported for GC ECD analyses. Per EPA,this compound "refers to a mixture of chlordane isomers, other chlorinated hydrocarbons and numerous other components." (Reference: USEPA Toxicological Review of Chlordane, In Support of Summary Information on the Integrated Risk Information System (IRIS), December 1997.)

Difference: With respect to Total Oxidizable Precursor (TOP) Assay analysis, the difference is defined as the Post-Treatment value minus the Pre-Treatment value.

Final pH: As it pertains to Sample Receipt & Container Information section of the report, Final pH reflects pH of container determined after adjustment at the laboratory, if applicable. If no adjustment required, value reflects Initial pH.

Frozen Date/Time: With respect to Volatile Organics in soil, Frozen Date/Time reflects the date/time at which associated Reagent Water-preserved vials were initially frozen. Note: If frozen date/time is beyond 48 hours from sample collection, value will be reflected in 'bold'.

Gasoline Range Organics (GRO): Gasoline Range Organics (GRO) results include all chromatographic peaks eluting from Methyl tert butyl ether through Naphthalene, with the exception of GRO analysis in support of State of Ohio programs, which includes all chromatographic peaks eluting from Hexane through Dodecane.

Initial pH: As it pertains to Sample Receipt & Container Information section of the report, Initial pH reflects pH of container determined upon receipt, if applicable.

PAH Total: With respect to Alkylated PAH analyses, the 'PAHs, Total' result is defined as the summation of results for all or a subset of the following compounds: Naphthalene, C1-C4 Naphthalenes, 2-Methylnaphthalene, 1-Methylnaphthalene, Biphenyl, Acenaphthylene, Acenaphthene, Fluorene, C1-C3 Fluorenes, Phenanthrene, C1-C4 Phenanthrenes/Anthracenes, Anthracene, Fluoranthene, Pyrene, C1-C4 Fluoranthenes/Pyrenes, Benz(a)anthracene, Chrysene, C1-C4 Chrysenes, Benzo(b)fluoranthene, Benzo(j)+(k)fluoranthene, Benzo(e)pyrene, Benzo(a)pyrene, Perylene, Indeno(1,2,3-cd)pyrene, Dibenz(ah)+(ac)anthracene, Benzo(g,h,i)perylene. If a 'Total' result is requested, the results of its individual components will also be reported.

PFAS Total: With respect to PFAS analyses, the 'PFAS, Total (5)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA and PFOS. In addition, the 'PFAS, Total (6)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA, PFDA and PFOS. For MassDEP DW compliance analysis only, the 'PFAS, Total (6)' result is defined as the summation of results at or above the RL. Note: If a 'Total' result is requested, the results of its individual components will also be reported.

Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

***Data Qualifiers***

**A** - Spectra identified as "Aldol Condensates" are byproducts of the extraction/concentration procedures when acetone is introduced in the process.

**B** - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).

**C** - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.

**D** - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.

**E** - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.

**F** - The ratio of quantifier ion response to qualifier ion response falls outside of the laboratory criteria. Results are considered to be an estimated maximum concentration.

**G** - The concentration may be biased high due to matrix interferences (i.e, co-elution) with non-target compound(s). The result should be considered estimated.

**H** - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.

**I** - The lower value for the two columns has been reported due to obvious interference.

**J** - Estimated value. The Target analyte concentration is below the quantitation limit (RL), but above the Method Detection Limit (MDL) or Estimated Detection Limit (EDL) for SPME-related analyses. This represents an estimated concentration for Tentatively

*Report Format: DU Report with 'J' Qualifiers*

| | | | |
|---|---|---|---|
| **Project Name:** | RWM-Q1 | **Lab Number:** | L2417351 |
| **Project Number:** | 21010103 | **Report Date:** | 04/05/24 |

***Data Qualifiers***

Identified Compounds (TICs). For calculated parameters, this represents that one or more values used in the calculation were estimated.

**M** - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.

**ND** - Not detected at the method detection limit (MDL) for the sample, or estimated detection limit (EDL) for SPME-related analyses.

**NJ** - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where the identification is based on a mass spectral library search.

**P** - The RPD between the results for the two columns exceeds the method-specified criteria.

**Q** - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)

**R** - Analytical results are from sample re-analysis.

**RE** - Analytical results are from sample re-extraction.

**S** - Analytical results are from modified screening analysis.

**V** - The surrogate associated with this target analyte has a recovery outside the QC acceptance limits. (Applicable to MassDEP DW Compliance samples only.)

**Z** - The batch matrix spike and/or duplicate associated with this target analyte has a recovery/RPD outside the QC acceptance limits. (Applicable to MassDEP DW Compliance samples only.)

| | | | |
|---|---|---|---|
| **Project Name:** | RWM-Q1 | **Lab Number:** | L2417351 |
| **Project Number:** | 21010103 | **Report Date:** | 04/05/24 |

## REFERENCES

1 Test Methods for Evaluating Solid Waste: Physical/Chemical Methods. EPA SW-846. Third Edition. Updates I - VI, 2018.

## LIMITATION OF LIABILITIES

Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Analytical shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Alpha Analytical.

We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.

# Certification Information

**The following analytes are not included in our Primary NELAP Scope of Accreditation:**

**Westborough Facility**
**EPA 624.1:** m/p-xylene, o-xylene, Naphthalene
**EPA 625.1:** alpha-Terpineol
**EPA 8260D:** NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene, Azobenzene; SCM: Iodomethane (methyl iodide), 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.
**EPA 8270E:** NPW: Dimethylnaphthalene,1,4-Diphenylhydrazine, alpha-Terpineol; SCM: Dimethylnaphthalene,1,4-Diphenylhydrazine.
**SM4500**: NPW: Amenable Cyanide; SCM: Total Phosphorus, TKN, NO2, NO3.

**Mansfield Facility**
**SM 2540D:** TSS.
**EPA TO-15:** Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene, 3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene.
**Biological Tissue Matrix:** EPA 3050B

**The following analytes are included in our Massachusetts DEP Scope of Accreditation**

**Westborough Facility:**

***Drinking Water***
**EPA 300.0**: Chloride, Nitrate-N, Fluoride, Sulfate; **EPA 353.2**: Nitrate-N, Nitrite-N; **SM4500NO3-F**: Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE, EPA 180.1, SM2130B, SM4500Cl-D, SM2320B, SM2540C, SM4500H-B, SM4500NO2-B**
**EPA 524.2:** THMs and VOCs; **EPA 504.1:** EDB, DBCP.
**Microbiology**: **SM9215B; SM9223-P/A, SM9223B-Colilert-QT,SM9222D**.

***Non-Potable Water***
**SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2320B, SM4500CL-E, SM4500F-BC, SM4500NH3-BH:** Ammonia-N and Kjeldahl-N, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **EPA 351.1, SM4500NO3-F, EPA 353.2**: Nitrate-N**, SM4500P-E, SM4500P-B, E, SM4500SO4-E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, EPA 420.1, SM4500-CN-CE, SM2540D, EPA 300: Chloride, Sulfate, Nitrate.**
**EPA 624.1**: Volatile Halocarbons & Aromatics,
**EPA 608.3**: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs
**EPA 625.1**: SVOC (Acid/Base/Neutral Extractables).
**Microbiology**: **SM9223B-Colilert-QT; Enterolert-QT, SM9221E, EPA 1600, EPA 1603, SM9222D.**

**Mansfield Facility:**

***Drinking Water***
**EPA 200.7:** Al, Ba, Cd, Cr, Cu, Fe, Mn, Ni, Na, Ag, Ca, Zn. **EPA 200.8:** Al, Sb, As, Ba, Be, Cd, Cr, Cu, Pb, Mn, Ni, Se, Ag, TL, Zn. **EPA 245.1** Hg.
**EPA 522, EPA 537.1.**

***Non-Potable Water***
**EPA 200.7:** Al, Sb, As, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, K, Se, Ag, Na, Sr, TL, Ti, V, Zn.
**EPA 200.8:** Al, Sb**,** As, Be, Cd, Cr, Cu, Fe, Pb, Mn, Ni, K, Se, Ag, Na, TL, Zn.
**EPA 245.1** Hg.
**SM2340B**

For a complete listing of analytes and methods, please contact your Alpha Project Manager.

# CHAIN OF CUSTODY

PAGE 1 OF 1

ALPHA ANALYTICAL
WESTBORO, MA TEL: 508-898-9220 FAX: 508-898-9193
MANSFIELD, MA TEL: 508-822-9300 FAX: 508-822-3288

Date Rec'd in Lab: 3/30/24

ALPHA Job #: L2417351

**Client Information**

Client: TPA

Address:

Phone:

Fax:

Email:

☐ These samples have been previously analyzed by Alpha

**Project Information**

Project Name: RWM-01

Project Location:

Project #: 210103

Project Manager: Bob T.

ALPHA Quote #:

**Turn-Around Time**

☑ Standard ☐ RUSH (only confirmed if pre-approved)

Date Due: Time:

**Report Information - Data Deliverables**

☐ FAX ☐ EMAIL

☐ ADEx ☐ Add'l Deliverables

**Billing Information**

☐ Same as Client info PO #:

**Regulatory Requirements/Report Limits**

| State /Fed Program | Criteria |
|---|---|
| | |

Other Project Specific Requirements/Comments/Detection Limits:

ANALYSIS: DJS 2, 6Cd

**SAMPLE HANDLING**

Filtration
☑ Done
☐ Not needed
☐ Lab to do
Preservation
☐ Lab to do
(Please specify below)

| ALPHA Lab ID (Lab Use Only) | Sample ID | Collection Date | Collection Time | Sample Matrix | Sampler's Initials | | Sample Specific Comments | TOTAL # BOTTLES |
|---|---|---|---|---|---|---|---|---|
| 17351-01 | RW18-MW1 | 3/29/24 | 0950 | GW | AP | X | | 1 |
| 02 | RWR-MW5 | | 1030 | | | X | | 1 |
| 03 | RWR-MW7 | | 1115 | | | X | | 1 |
| 04 | RW29-MW1 | | 1340 | | | X | | 1 |
| 05 | RWH-MW5 | | 1425 | | | X | | 1 |
| 06 | RWH-MW1 | | 1500 | | | X | | 1 |

Container Type: A

Preservative: C

Pol: 3/29/24 0220
3/30/24 0220

| Relinquished By: | Date/Time | Received By: | Date/Time |
|---|---|---|---|
| AP | 3/29/24 1500 | D.Robinson PACE | 3/29/24 1500 |
| D.Robinson PACE | 3/29/24 1800 | Anthony Green | 3/29/24 1800 |
| Anthony Green | 3/30/24 0220 | MAR 29 2024 2132 | 3/30/24 0220 |

Please print clearly, legibly and completely. Samples can not be logged in and turnaround time clock will not start until any ambiguities are resolved. All samples submitted are subject to Alpha's Terms and Conditions. See reverse side.

FORM NO: 01-01 (rev. 14-OCT-07)

# ANALYTICAL REPORT

| | |
|---|---|
| Lab Number: | L2417909 |
| Client: | Tradepoint Atlantic<br>1600 Sparrows Point Boulevard<br>Baltimore, MD 21219 |
| ATTN: | Robert Tworkowski |
| Phone: | (443) 649-5073 |
| Project Name: | RWM-Q1 |
| Project Number: | 21010103 |
| Report Date: | 04/08/24 |

The original project report/data package is held by Alpha Analytical. This report/data package is paginated and should be reproduced only in its entirety. Alpha Analytical holds no responsibility for results and/or data that are not consistent with the original.

Certifications & Approvals: MA (M-MA086), NH NELAP (2064), CT (PH-0826), IL (200077), IN (C-MA-03), KY (KY98045), ME (MA00086), MD (348), NJ (MA935), NY (11148), NC (25700/666), OH (CL108), OR (MA-1316), PA (68-03671), RI (LAO00065), TX (T104704476), VT (VT-0935), VA (460195), USDA (Permit #525-23-122-91930).

Eight Walkup Drive, Westborough, MA 01581-1019
508-898-9220 (Fax) 508-898-9193 800-624-9220 - www.alphalab.com

**Project Name:** RWM-Q1
**Project Number:** 21010103

**Lab Number:** L2417909
**Report Date:** 04/08/24

| Alpha Sample ID | Client ID | Matrix | Sample Location | Collection Date/Time | Receive Date |
|---|---|---|---|---|---|
| L2417909-01 | RW06R-MWS | WATER | Not Specified | 04/01/24 13:45 | 04/02/24 |
| L2417909-02 | RW06R-MWD | WATER | Not Specified | 04/01/24 14:20 | 04/02/24 |
| L2417909-03 | RW23-MWS | WATER | Not Specified | 04/01/24 15:15 | 04/02/24 |
| L2417909-04 | RW23-MWI | WATER | Not Specified | 04/01/24 15:55 | 04/02/24 |
| L2417909-05 | RW11-MWS | WATER | Not Specified | 04/02/24 14:20 | 04/02/24 |
| L2417909-06 | RW11-MWI | WATER | Not Specified | 04/02/24 14:50 | 04/02/24 |

| | | | |
|---|---|---|---|
| **Project Name:** | RWM-Q1 | **Lab Number:** | L2417909 |
| **Project Number:** | 21010103 | **Report Date:** | 04/08/24 |

## Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet NELAP requirements for all NELAP accredited parameters unless otherwise noted in the following narrative. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. Tentatively Identified Compounds (TICs), if requested, are reported for compounds identified to be present and are not part of the method/program Target Compound List, even if only a subset of the TCL are being reported. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively.

When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances, the specific failure is not narrated but noted in the associated QC Outlier Summary Report, located directly after the Case Narrative. QC information is also incorporated in the Data Usability Assessment table (Format 11) of our Data Merger tool, where it can be reviewed in conjunction with the sample result, associated regulatory criteria and any associated data usability implications.

Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

HOLD POLICY - For samples submitted on hold, Alpha's policy is to hold samples (with the exception of Air canisters) free of charge for 21 calendar days from the date the project is completed. After 21 calendar days, we will dispose of all samples submitted including those put on hold unless you have contacted your Alpha Project Manager and made arrangements for Alpha to continue to hold the samples. Air canisters will be disposed after 3 business days from the date the project is completed.

Please contact Project Management at 800-624-9220 with any questions.

| | | | |
|---|---|---|---|
| **Project Name:** | RWM-Q1 | **Lab Number:** | L2417909 |
| **Project Number:** | 21010103 | **Report Date:** | 04/08/24 |

**Case Narrative (continued)**

Report Submission

All non-detect (ND) or estimated concentrations (J-qualified) have been quantitated to the limit noted in the MDL column.

Sample Receipt

L2417909-01: The collection date and time on the chain of custody was 01-APR-24 13:25; however, the collection date/time on the container label was 01-APR-24 13:45. At the client's request, the collection date/time is reported as 01-APR-24 13:45.

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature: Tiffani Morrissey - Tiffani Morrissey

Title: Technical Director/Representative Date: 04/08/24

# METALS

**Project Name:** RWM-Q1 **Lab Number:** L2417909

**Project Number:** 21010103 **Report Date:** 04/08/24

## SAMPLE RESULTS

Lab ID: L2417909-01 Date Collected: 04/01/24 13:45

Client ID: RW06R-MWS Date Received: 04/02/24

Sample Location: Not Specified Field Prep: Refer to COC

Sample Depth:

Matrix: Water

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dissolved Metals - Mansfield Lab** | | | | | | | | | | | |
| Cadmium, Dissolved | ND | | ug/l | 0.2000 | 0.0599 | 1 | 04/04/24 11:18 | 04/08/24 10:41 | EPA 3005A | 1,6020B | NTB |
| Zinc, Dissolved | 3.552 | J | ug/l | 10.00 | 3.410 | 1 | 04/04/24 11:18 | 04/08/24 10:41 | EPA 3005A | 1,6020B | NTB |

**Project Name:** RWM-Q1 **Lab Number:** L2417909

**Project Number:** 21010103 **Report Date:** 04/08/24

## SAMPLE RESULTS

Lab ID: L2417909-02 Date Collected: 04/01/24 14:20

Client ID: RW06R-MWD Date Received: 04/02/24

Sample Location: Not Specified Field Prep: Refer to COC

Sample Depth:

Matrix: Water

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dissolved Metals - Mansfield Lab** | | | | | | | | | | | |
| Cadmium, Dissolved | ND | | ug/l | 0.2000 | 0.0599 | 1 | 04/04/24 11:18 | 04/08/24 10:46 | EPA 3005A | 1,6020B | NTB |
| Zinc, Dissolved | 10.24 | | ug/l | 10.00 | 3.410 | 1 | 04/04/24 11:18 | 04/08/24 10:46 | EPA 3005A | 1,6020B | NTB |

**Project Name:** RWM-Q1 **Lab Number:** L2417909

**Project Number:** 21010103 **Report Date:** 04/08/24

## SAMPLE RESULTS

Lab ID: L2417909-03 Date Collected: 04/01/24 15:15

Client ID: RW23-MWS Date Received: 04/02/24

Sample Location: Not Specified Field Prep: Refer to COC

Sample Depth:

Matrix: Water

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dissolved Metals - Mansfield Lab** | | | | | | | | | | | |
| Cadmium, Dissolved | ND | | ug/l | 0.2000 | 0.0599 | 1 | 04/04/24 11:18 | 04/08/24 10:50 | EPA 3005A | 1,6020B | NTB |
| Zinc, Dissolved | 5.737 | J | ug/l | 10.00 | 3.410 | 1 | 04/04/24 11:18 | 04/08/24 10:50 | EPA 3005A | 1,6020B | NTB |

**Project Name:** RWM-Q1 **Lab Number:** L2417909

**Project Number:** 21010103 **Report Date:** 04/08/24

## SAMPLE RESULTS

Lab ID: L2417909-04 Date Collected: 04/01/24 15:55

Client ID: RW23-MWI Date Received: 04/02/24

Sample Location: Not Specified Field Prep: Refer to COC

Sample Depth:

Matrix: Water

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dissolved Metals - Mansfield Lab** | | | | | | | | | | | |
| Cadmium, Dissolved | 2687. | | ug/l | 40.00 | 11.98 | 200 | 04/04/24 11:18 | 04/08/24 11:38 | EPA 3005A | 1,6020B | NTB |
| Zinc, Dissolved | 139800 | | ug/l | 200.0 | 68.20 | 20 | 04/04/24 11:18 | 04/08/24 11:29 | EPA 3005A | 1,6020B | NTB |

**Project Name:** RWM-Q1 **Lab Number:** L2417909

**Project Number:** 21010103 **Report Date:** 04/08/24

## SAMPLE RESULTS

Lab ID: L2417909-05 Date Collected: 04/02/24 14:20

Client ID: RW11-MWS Date Received: 04/02/24

Sample Location: Not Specified Field Prep: Refer to COC

Sample Depth:

Matrix: Water

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dissolved Metals - Mansfield Lab** | | | | | | | | | | | |
| Cadmium, Dissolved | 0.0883 | J | ug/l | 0.2000 | 0.0599 | 1 | 04/04/24 11:18 | 04/08/24 11:24 | EPA 3005A | 1,6020B | NTB |
| Zinc, Dissolved | 254.3 | | ug/l | 10.00 | 3.410 | 1 | 04/04/24 11:18 | 04/08/24 11:24 | EPA 3005A | 1,6020B | NTB |

**Project Name:** RWM-Q1 **Lab Number:** L2417909

**Project Number:** 21010103 **Report Date:** 04/08/24

## SAMPLE RESULTS

Lab ID: L2417909-06 Date Collected: 04/02/24 14:50

Client ID: RW11-MWI Date Received: 04/02/24

Sample Location: Not Specified Field Prep: Refer to COC

Sample Depth:

Matrix: Water

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dissolved Metals - Mansfield Lab** | | | | | | | | | | | |
| Cadmium, Dissolved | 1.448 | | ug/l | 0.2000 | 0.0599 | 1 | 04/04/24 11:18 | 04/08/24 11:18 | EPA 3005A | 1,6020B | NTB |
| Zinc, Dissolved | 264.3 | | ug/l | 10.00 | 3.410 | 1 | 04/04/24 11:18 | 04/08/24 11:18 | EPA 3005A | 1,6020B | NTB |

**Project Name:** RWM-Q1 **Lab Number:** L2417909

**Project Number:** 21010103 **Report Date:** 04/08/24

# Method Blank Analysis
# Batch Quality Control

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|
| Dissolved Metals - Mansfield Lab for sample(s): 01-06 Batch: WG1904579-1 | | | | | | | | | | |
| Cadmium, Dissolved | ND | | ug/l | 0.2000 | 0.0599 | 1 | 04/04/24 11:18 | 04/08/24 09:15 | 1,6020B | NTB |
| Zinc, Dissolved | ND | | ug/l | 10.00 | 3.410 | 1 | 04/04/24 11:18 | 04/08/24 09:15 | 1,6020B | NTB |

**Prep Information**

Digestion Method: EPA 3005A

# Lab Control Sample Analysis

## Batch Quality Control

**Project Name:** RWM-Q1

**Project Number:** 21010103

**Lab Number:** L2417909

**Report Date:** 04/08/24

| Parameter | LCS %Recovery | Qual | LCSD %Recovery | Qual | %Recovery Limits | RPD | Qual | RPD Limits |
|---|---|---|---|---|---|---|---|---|
| Dissolved Metals - Mansfield Lab Associated sample(s): 01-06 Batch: WG1904579-2 | | | | | | | | |
| Cadmium, Dissolved | 98 | | - | | 80-120 | - | | |
| Zinc, Dissolved | 102 | | - | | 80-120 | - | | |

# Matrix Spike Analysis
## Batch Quality Control

**Project Name:** RWM-Q1
**Project Number:** 21010103

**Lab Number:** L2417909
**Report Date:** 04/08/24

| Parameter | Native Sample | MS Added | MS Found | MS %Recovery | Qual | MSD Found | MSD %Recovery | Qual | Recovery Limits | RPD | Qual | RPD Limits |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Dissolved Metals - Mansfield Lab Associated sample(s): 01-06 QC Batch ID: WG1904579-3 QC Sample: L2417903-01 Client ID: MS Sample | | | | | | | | | | | | |
| Cadmium, Dissolved | 0.1590J | 53 | 52.62 | 99 | | - | - | | 75-125 | - | | 20 |
| Zinc, Dissolved | 7.840J | 500 | 483.3 | 97 | | - | - | | 75-125 | - | | 20 |

**Project Name:** RWM-Q1
**Project Number:** 21010103

**Lab Number:** L2417909
**Report Date:** 04/08/24

## Sample Receipt and Container Information

Were project specific reporting limits specified? YES

### Cooler Information

| Cooler | Custody Seal |
|---|---|
| A | Absent |

### Container Information

| Container ID | Container Type | Cooler | Initial pH | Final pH | Temp deg C | Pres | Seal | Frozen Date/Time | Analysis(*) |
|---|---|---|---|---|---|---|---|---|---|
| L2417909-01A | Plastic 250ml HNO3 preserved | A | <2 | <2 | 5.1 | Y | Absent | | ZN-6020S-PPB(180),CD-6020S-PPB(180) |
| L2417909-02A | Plastic 250ml HNO3 preserved | A | <2 | <2 | 5.1 | Y | Absent | | ZN-6020S-PPB(180),CD-6020S-PPB(180) |
| L2417909-03A | Plastic 250ml HNO3 preserved | A | <2 | <2 | 5.1 | Y | Absent | | ZN-6020S-PPB(180),CD-6020S-PPB(180) |
| L2417909-04A | Plastic 250ml HNO3 preserved | A | <2 | <2 | 5.1 | Y | Absent | | ZN-6020S-PPB(180),CD-6020S-PPB(180) |
| L2417909-05A | Plastic 250ml HNO3 preserved | A | <2 | <2 | 5.1 | Y | Absent | | ZN-6020S-PPB(180),CD-6020S-PPB(180) |
| L2417909-06A | Plastic 250ml HNO3 preserved | A | <2 | <2 | 5.1 | Y | Absent | | ZN-6020S-PPB(180),CD-6020S-PPB(180) |



*Values in parentheses indicate holding time in days

| | | | |
|---|---|---|---|
| **Project Name:** | RWM-Q1 | **Lab Number:** | L2417909 |
| **Project Number:** | 21010103 | **Report Date:** | 04/08/24 |

## GLOSSARY

***Acronyms***

| | |
|---|---|
| DL | - Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the limit of quantitation (LOQ). The DL includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.) |
| EDL | - Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME). |
| EMPC | - Estimated Maximum Possible Concentration: The concentration that results from the signal present at the retention time of an analyte when the ions meet all of the identification criteria except the ion abundance ratio criteria. An EMPC is a worst-case estimate of the concentration. |
| EPA | - Environmental Protection Agency. |
| LCS | - Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes. |
| LCSD | - Laboratory Control Sample Duplicate: Refer to LCS. |
| LFB | - Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes. |
| LOD | - Limit of Detection: This value represents the level to which a target analyte can reliably be detected for a specific analyte in a specific matrix by a specific method. The LOD includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.) |
| LOQ | - Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)<br><br>Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.) |
| MDL | - Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. |
| MS | - Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available. For Method 332.0, the spike recovery is calculated using the native concentration, including estimated values. |
| MSD | - Matrix Spike Sample Duplicate: Refer to MS. |
| NA | - Not Applicable. |
| NC | - Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit. |
| NDPA/DPA | - N-Nitrosodiphenylamine/Diphenylamine. |
| NI | - Not Ignitable. |
| NP | - Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil. |
| NR | - No Results: Term is utilized when 'No Target Compounds Requested' is reported for the analysis of Volatile or Semivolatile Organic TIC only requests. |
| RL | - Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable. |
| RPD | - Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report. |
| SRM | - Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples. |
| STLP | - Semi-dynamic Tank Leaching Procedure per EPA Method 1315. |
| TEF | - Toxic Equivalency Factors: The values assigned to each dioxin and furan to evaluate their toxicity relative to 2,3,7,8-TCDD. |
| TEQ | - Toxic Equivalent: The measure of a sample's toxicity derived by multiplying each dioxin and furan by its corresponding TEF and then summing the resulting values. |
| TIC | - Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations. |

*Report Format: DU Report with 'J' Qualifiers*

| | | | |
|---|---|---|---|
| **Project Name:** | RWM-Q1 | **Lab Number:** | L2417909 |
| **Project Number:** | 21010103 | **Report Date:** | 04/08/24 |

***Footnotes***

1 - The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

***Terms***

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Chlordane: The target compound Chlordane (CAS No. 57-74-9) is reported for GC ECD analyses. Per EPA,this compound "refers to a mixture of chlordane isomers, other chlorinated hydrocarbons and numerous other components." (Reference: USEPA Toxicological Review of Chlordane, In Support of Summary Information on the Integrated Risk Information System (IRIS), December 1997.)

Difference: With respect to Total Oxidizable Precursor (TOP) Assay analysis, the difference is defined as the Post-Treatment value minus the Pre-Treatment value.

Final pH: As it pertains to Sample Receipt & Container Information section of the report, Final pH reflects pH of container determined after adjustment at the laboratory, if applicable. If no adjustment required, value reflects Initial pH.

Frozen Date/Time: With respect to Volatile Organics in soil, Frozen Date/Time reflects the date/time at which associated Reagent Water-preserved vials were initially frozen. Note: If frozen date/time is beyond 48 hours from sample collection, value will be reflected in 'bold'.

Gasoline Range Organics (GRO): Gasoline Range Organics (GRO) results include all chromatographic peaks eluting from Methyl tert butyl ether through Naphthalene, with the exception of GRO analysis in support of State of Ohio programs, which includes all chromatographic peaks eluting from Hexane through Dodecane.

Initial pH: As it pertains to Sample Receipt & Container Information section of the report, Initial pH reflects pH of container determined upon receipt, if applicable.

PAH Total: With respect to Alkylated PAH analyses, the 'PAHs, Total' result is defined as the summation of results for all or a subset of the following compounds: Naphthalene, C1-C4 Naphthalenes, 2-Methylnaphthalene, 1-Methylnaphthalene, Biphenyl, Acenaphthylene, Acenaphthene, Fluorene, C1-C3 Fluorenes, Phenanthrene, C1-C4 Phenanthrenes/Anthracenes, Anthracene, Fluoranthene, Pyrene, C1-C4 Fluoranthenes/Pyrenes, Benz(a)anthracene, Chrysene, C1-C4 Chrysenes, Benzo(b)fluoranthene, Benzo(j)+(k)fluoranthene, Benzo(e)pyrene, Benzo(a)pyrene, Perylene, Indeno(1,2,3-cd)pyrene, Dibenz(ah)+(ac)anthracene, Benzo(g,h,i)perylene. If a 'Total' result is requested, the results of its individual components will also be reported.

PFAS Total: With respect to PFAS analyses, the 'PFAS, Total (5)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA and PFOS. In addition, the 'PFAS, Total (6)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA, PFDA and PFOS. For MassDEP DW compliance analysis only, the 'PFAS, Total (6)' result is defined as the summation of results at or above the RL. Note: If a 'Total' result is requested, the results of its individual components will also be reported.

Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

***Data Qualifiers***

**A** - Spectra identified as "Aldol Condensates" are byproducts of the extraction/concentration procedures when acetone is introduced in the process.

**B** - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).

**C** - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.

**D** - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.

**E** - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.

**F** - The ratio of quantifier ion response to qualifier ion response falls outside of the laboratory criteria. Results are considered to be an estimated maximum concentration.

**G** - The concentration may be biased high due to matrix interferences (i.e, co-elution) with non-target compound(s). The result should be considered estimated.

**H** - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.

**I** - The lower value for the two columns has been reported due to obvious interference.

**J** - Estimated value. The Target analyte concentration is below the quantitation limit (RL), but above the Method Detection Limit (MDL) or Estimated Detection Limit (EDL) for SPME-related analyses. This represents an estimated concentration for Tentatively

*Report Format: DU Report with 'J' Qualifiers*

| | | | |
|---|---|---|---|
| **Project Name:** | RWM-Q1 | **Lab Number:** | L2417909 |
| **Project Number:** | 21010103 | **Report Date:** | 04/08/24 |

***Data Qualifiers***

Identified Compounds (TICs). For calculated parameters, this represents that one or more values used in the calculation were estimated.

**M** - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.

**ND** - Not detected at the method detection limit (MDL) for the sample, or estimated detection limit (EDL) for SPME-related analyses.

**NJ** - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where the identification is based on a mass spectral library search.

**P** - The RPD between the results for the two columns exceeds the method-specified criteria.

**Q** - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)

**R** - Analytical results are from sample re-analysis.

**RE** - Analytical results are from sample re-extraction.

**S** - Analytical results are from modified screening analysis.

**V** - The surrogate associated with this target analyte has a recovery outside the QC acceptance limits. (Applicable to MassDEP DW Compliance samples only.)

**Z** - The batch matrix spike and/or duplicate associated with this target analyte has a recovery/RPD outside the QC acceptance limits. (Applicable to MassDEP DW Compliance samples only.)

| | | | |
|---|---|---|---|
| **Project Name:** | RWM-Q1 | **Lab Number:** | L2417909 |
| **Project Number:** | 21010103 | **Report Date:** | 04/08/24 |

## REFERENCES

1 Test Methods for Evaluating Solid Waste: Physical/Chemical Methods. EPA SW-846. Third Edition. Updates I - VI, 2018.

## LIMITATION OF LIABILITIES

Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Analytical shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Alpha Analytical.

We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.

# Certification Information

**The following analytes are not included in our Primary NELAP Scope of Accreditation:**

**Westborough Facility**
**EPA 624.1:** m/p-xylene, o-xylene, Naphthalene
**EPA 625.1:** alpha-Terpineol
**EPA 8260D:** NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene, Azobenzene; SCM: Iodomethane (methyl iodide), 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.
**EPA 8270E:** NPW: Dimethylnaphthalene,1,4-Diphenylhydrazine, alpha-Terpineol; SCM: Dimethylnaphthalene,1,4-Diphenylhydrazine.
**SM4500**: NPW: Amenable Cyanide; SCM: Total Phosphorus, TKN, NO2, NO3.

**Mansfield Facility**
**SM 2540D:** TSS.
**EPA TO-15:** Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene, 3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene.
**Biological Tissue Matrix:** EPA 3050B

**The following analytes are included in our Massachusetts DEP Scope of Accreditation**

**Westborough Facility:**

***Drinking Water***
**EPA 300.0**: Chloride, Nitrate-N, Fluoride, Sulfate; **EPA 353.2**: Nitrate-N, Nitrite-N; **SM4500NO3-F**: Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE, EPA 180.1, SM2130B, SM4500Cl-D, SM2320B, SM2540C, SM4500H-B, SM4500NO2-B**
**EPA 524.2:** THMs and VOCs; **EPA 504.1:** EDB, DBCP.
**Microbiology**: **SM9215B; SM9223-P/A, SM9223B-Colilert-QT,SM9222D**.

***Non-Potable Water***
**SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2320B, SM4500CL-E, SM4500F-BC, SM4500NH3-BH:** Ammonia-N and Kjeldahl-N, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **EPA 351.1, SM4500NO3-F, EPA 353.2**: Nitrate-N**, SM4500P-E, SM4500P-B, E, SM4500SO4-E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, EPA 420.1, SM4500-CN-CE, SM2540D, EPA 300: Chloride, Sulfate, Nitrate.**
**EPA 624.1**: Volatile Halocarbons & Aromatics,
**EPA 608.3**: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs
**EPA 625.1**: SVOC (Acid/Base/Neutral Extractables).
**Microbiology**: **SM9223B-Colilert-QT; Enterolert-QT, SM9221E, EPA 1600, EPA 1603, SM9222D.**

**Mansfield Facility:**

***Drinking Water***
**EPA 200.7:** Al, Ba, Cd, Cr, Cu, Fe, Mn, Ni, Na, Ag, Ca, Zn. **EPA 200.8:** Al, Sb, As, Ba, Be, Cd, Cr, Cu, Pb, Mn, Ni, Se, Ag, TL, Zn. **EPA 245.1** Hg.
**EPA 522, EPA 537.1.**

***Non-Potable Water***
**EPA 200.7:** Al, Sb, As, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, K, Se, Ag, Na, Sr, TL, Ti, V, Zn.
**EPA 200.8:** Al, Sb**,** As, Be, Cd, Cr, Cu, Fe, Pb, Mn, Ni, K, Se, Ag, Na, TL, Zn.
**EPA 245.1** Hg.
**SM2340B**

For a complete listing of analytes and methods, please contact your Alpha Project Manager.

# CHAIN OF CUSTODY

PAGE 1 OF 1

ALPHA ANALYTICAL
WESTBORO, MA TEL: 508-898-9220 FAX: 508-898-9193
MANSFIELD, MA TEL: 508-822-9300 FAX: 508-822-3288

Date Rec'd in Lab: 4/3/24

ALPHA Job #: L2417909

**Client Information**

Client: TPA

Address:

Phone:

Fax:

Email:

☐ These samples have been previously analyzed by Alpha

**Project Information**

Project Name: RWMQ1

Project Location:

Project #: 21010103

Project Manager: BOB

ALPHA Quote #:

**Turn-Around Time**

☒ Standard ☐ RUSH (only confirmed if pre-approved!)

Date Due: Time:

**Report Information - Data Deliverables**

☐ FAX ☐ EMAIL

☐ ADEx ☐ Add'l Deliverables

**Billing Information**

☐ Same as Client info PO #:

**Regulatory Requirements/Report Limits**

| State /Fed Program | Criteria |
|---|---|
| | |

Other Project Specific Requirements/Comments/Detection Limits:

ANALYSIS: 1,4-Dioxane 21 + Cd

SAMPLE HANDLING

Filtration ☒ (2)
☐ Done
☐ Not needed
☐ Lab to do

Preservation
☐ Lab to do
(Please specify below)

Sample Specific Comments

| ALPHA Lab ID (Lab Use Only) | Sample ID | Collection Date | Collection Time | Sample Matrix | Sampler's Initials | TOTAL # BOTTLES |
|---|---|---|---|---|---|---|
| 17909 -01 | RWQGR-MWS | 4/1/24 | 1325 | GW | TP | 1 |
| -02 | RWQGR-MWD | | 1420 | | | 1 |
| -03 | RW23-MWS | | 1515 | | | 1 |
| -04 | RW23-MWI | | 1555 | | | 1 |
| -05 | RW11-MWS | 4/2/24 | 1420 | | | 1 |
| -06 | RW11-MWI | | 1450 | | | 1 |

Container Type

Preservative

Rel: 4/3/24 0300

4/3/24 0300

| Relinquished By: | Date/Time | Received By: | Date/Time |
|---|---|---|---|
| D. Robusky PACE | 4/2/24 1510 | D. Robusky PACE | 4/2/24 1510 |
| | 4/2/24 1800 | | 4/2/24 1800 |
| Anthony Green | 4/3/24 0050 | Anthony Green | APR 02 2024 2143 4/3 24 0050 |

Please print clearly, legibly and completely. Samples can not be logged in and turnaround time clock will not start until any ambiguities are resolved. All samples submitted are subject to Alpha's Terms and Conditions. See reverse side.

FORM NO: 01-01 (rev. 14-OCT-07)

# ANALYTICAL REPORT

| | |
|---|---|
| Lab Number: | L2418553 |
| Client: | Tradepoint Atlantic<br>1600 Sparrows Point Boulevard<br>Baltimore, MD 21219 |
| ATTN: | Robert Tworkowski |
| Phone: | (443) 649-5073 |
| Project Name: | RWM-Q1 |
| Project Number: | 21010103 |
| Report Date: | 04/22/24 |

The original project report/data package is held by Alpha Analytical. This report/data package is paginated and should be reproduced only in its entirety. Alpha Analytical holds no responsibility for results and/or data that are not consistent with the original.

Certifications & Approvals: MA (M-MA086), NH NELAP (2064), CT (PH-0826), IL (200077), IN (C-MA-03), KY (KY98045), ME (MA00086), MD (348), NJ (MA935), NY (11148), NC (25700/666), OH (CL108), OR (MA-1316), PA (68-03671), RI (LAO00065), TX (T104704476), VT (VT-0935), VA (460195), USDA (Permit #525-23-122-91930).

Eight Walkup Drive, Westborough, MA 01581-1019
508-898-9220 (Fax) 508-898-9193 800-624-9220 - www.alphalab.com

**Project Name:** RWM-Q1
**Project Number:** 21010103

**Lab Number:** L2418553
**Report Date:** 04/22/24

| Alpha Sample ID | Client ID | Matrix | Sample Location | Collection Date/Time | Receive Date |
|---|---|---|---|---|---|
| L2418553-01 | RWI-MWS | WATER | Not Specified | 04/04/24 11:00 | 04/04/24 |
| L2418553-02 | RWI-MWI | WATER | Not Specified | 04/04/24 11:40 | 04/04/24 |
| L2418553-03 | RWL-MWS | WATER | Not Specified | 04/04/24 12:30 | 04/04/24 |
| L2418553-04 | RWL-MWI | WATER | Not Specified | 04/04/24 13:45 | 04/04/24 |
| L2418553-05 | RW10-MWI | WATER | Not Specified | 04/04/24 14:20 | 04/04/24 |
| L2418553-06 | RW19-MWI | WATER | Not Specified | 04/04/24 15:05 | 04/04/24 |
| L2418553-07 | RWP-MWI | WATER | Not Specified | 04/04/24 15:40 | 04/04/24 |

| | | | |
|---|---|---|---|
| **Project Name:** | RWM-Q1 | **Lab Number:** | L2418553 |
| **Project Number:** | 21010103 | **Report Date:** | 04/22/24 |

## Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet NELAP requirements for all NELAP accredited parameters unless otherwise noted in the following narrative. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. Tentatively Identified Compounds (TICs), if requested, are reported for compounds identified to be present and are not part of the method/program Target Compound List, even if only a subset of the TCL are being reported. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively.

When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances, the specific failure is not narrated but noted in the associated QC Outlier Summary Report, located directly after the Case Narrative. QC information is also incorporated in the Data Usability Assessment table (Format 11) of our Data Merger tool, where it can be reviewed in conjunction with the sample result, associated regulatory criteria and any associated data usability implications.

Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

HOLD POLICY - For samples submitted on hold, Alpha's policy is to hold samples (with the exception of Air canisters) free of charge for 21 calendar days from the date the project is completed. After 21 calendar days, we will dispose of all samples submitted including those put on hold unless you have contacted your Alpha Project Manager and made arrangements for Alpha to continue to hold the samples. Air canisters will be disposed after 3 business days from the date the project is completed.

Please contact Project Management at 800-624-9220 with any questions.

**Project Name:** RWM-Q1 **Lab Number:** L2418553
**Project Number:** 21010103 **Report Date:** 04/22/24

**Case Narrative (continued)**

Report Submission

April 22, 2024: This final report includes the results of all requested analyses.

April 10, 2024: This is a preliminary report.

All non-detect (ND) or estimated concentrations (J-qualified) have been quantitated to the limit noted in the MDL column.

The analysis of Sulfide was subcontracted. A copy of the laboratory report is included as an addendum. Please note: This data is only available in PDF format and is not available on Data Merger.

Sample Receipt

L2418553-03: The sample identified as "RWL-MWS" on the chain of custody was identified as "RWL-MWI" on the container label. At the client's request, the sample is reported as "RWL-MWS".

L2418553-04: The sample was received below the appropriate pH for the subcontracted Sulfide analysis. The laboratory added additional NaOH to a pH >9.

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature: Tiffani Morrissey - Tiffani Morrissey

Title: Technical Director/Representative Date: 04/22/24

# METALS

**Project Name:** RWM-Q1 **Lab Number:** L2418553

**Project Number:** 21010103 **Report Date:** 04/22/24

## SAMPLE RESULTS

Lab ID: L2418553-01 Date Collected: 04/04/24 11:00

Client ID: RWI-MWS Date Received: 04/04/24

Sample Location: Not Specified Field Prep: Refer to COC

Sample Depth:

Matrix: Water

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dissolved Metals - Mansfield Lab** | | | | | | | | | | | |
| Cadmium, Dissolved | 8.828 | | ug/l | 0.2000 | 0.0599 | 1 | 04/08/24 11:27 | 04/10/24 09:49 | EPA 3005A | 1,6020B | EJF |
| Zinc, Dissolved | 82.62 | | ug/l | 10.00 | 3.410 | 1 | 04/08/24 11:27 | 04/10/24 09:49 | EPA 3005A | 1,6020B | EJF |

**Project Name:** RWM-Q1 **Lab Number:** L2418553

**Project Number:** 21010103 **Report Date:** 04/22/24

## SAMPLE RESULTS

Lab ID: L2418553-02 Date Collected: 04/04/24 11:40

Client ID: RWI-MWI Date Received: 04/04/24

Sample Location: Not Specified Field Prep: Refer to COC

Sample Depth:

Matrix: Water

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dissolved Metals - Mansfield Lab** | | | | | | | | | | | |
| Cadmium, Dissolved | 7153. | | ug/l | 20.00 | 5.990 | 100 | 04/08/24 11:27 | 04/10/24 11:45 | EPA 3005A | 1,6020B | EJF |
| Zinc, Dissolved | 563700 | | ug/l | 1000. | 341.0 | 100 | 04/08/24 11:27 | 04/10/24 11:45 | EPA 3005A | 1,6020B | EJF |

**Project Name:** RWM-Q1 **Lab Number:** L2418553

**Project Number:** 21010103 **Report Date:** 04/22/24

## SAMPLE RESULTS

Lab ID: L2418553-03 Date Collected: 04/04/24 12:30

Client ID: RWL-MWS Date Received: 04/04/24

Sample Location: Not Specified Field Prep: Refer to COC

Sample Depth:

Matrix: Water

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dissolved Metals - Mansfield Lab** | | | | | | | | | | | |
| Cadmium, Dissolved | 4.627 | | ug/l | 0.2000 | 0.0599 | 1 | 04/08/24 11:27 | 04/10/24 09:59 | EPA 3005A | 1,6020B | EJF |
| Zinc, Dissolved | 3047. | | ug/l | 10.00 | 3.410 | 1 | 04/08/24 11:27 | 04/10/24 09:59 | EPA 3005A | 1,6020B | EJF |

**Project Name:** RWM-Q1 **Lab Number:** L2418553

**Project Number:** 21010103 **Report Date:** 04/22/24

## SAMPLE RESULTS

Lab ID: L2418553-04 Date Collected: 04/04/24 13:45

Client ID: RWL-MWI Date Received: 04/04/24

Sample Location: Not Specified Field Prep: Refer to COC

Sample Depth:

Matrix: Water

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dissolved Metals - Mansfield Lab** | | | | | | | | | | | |
| Cadmium, Dissolved | 787.8 | | ug/l | 2.000 | 0.5990 | 10 | 04/08/24 11:27 | 04/10/24 11:50 | EPA 3005A | 1,6020B | EJF |
| Zinc, Dissolved | 47080 | | ug/l | 100.0 | 34.10 | 10 | 04/08/24 11:27 | 04/10/24 11:50 | EPA 3005A | 1,6020B | EJF |

**Project Name:** RWM-Q1 **Lab Number:** L2418553

**Project Number:** 21010103 **Report Date:** 04/22/24

## SAMPLE RESULTS

Lab ID: L2418553-05 Date Collected: 04/04/24 14:20

Client ID: RW10-MWI Date Received: 04/04/24

Sample Location: Not Specified Field Prep: Refer to COC

Sample Depth:

Matrix: Water

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dissolved Metals - Mansfield Lab** | | | | | | | | | | | |
| Cadmium, Dissolved | 0.3548 | | ug/l | 0.2000 | 0.0599 | 1 | 04/08/24 11:27 | 04/10/24 10:08 | EPA 3005A | 1,6020B | EJF |
| Zinc, Dissolved | 43.23 | | ug/l | 10.00 | 3.410 | 1 | 04/08/24 11:27 | 04/10/24 10:08 | EPA 3005A | 1,6020B | EJF |

**Project Name:** RWM-Q1 **Lab Number:** L2418553

**Project Number:** 21010103 **Report Date:** 04/22/24

## SAMPLE RESULTS

Lab ID: L2418553-06 Date Collected: 04/04/24 15:05

Client ID: RW19-MWI Date Received: 04/04/24

Sample Location: Not Specified Field Prep: Refer to COC

Sample Depth:

Matrix: Water

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dissolved Metals - Mansfield Lab** | | | | | | | | | | | |
| Cadmium, Dissolved | 259.6 | | ug/l | 1.000 | 0.2995 | 5 | 04/08/24 11:27 | 04/10/24 10:13 | EPA 3005A | 1,6020B | EJF |
| Zinc, Dissolved | 4833000 | | ug/l | 10000 | 3410. | 1000 | 04/08/24 11:27 | 04/10/24 12:33 | EPA 3005A | 1,6020B | EJF |

**Project Name:** RWM-Q1 **Lab Number:** L2418553

**Project Number:** 21010103 **Report Date:** 04/22/24

## SAMPLE RESULTS

Lab ID: L2418553-07 Date Collected: 04/04/24 15:40

Client ID: RWP-MWI Date Received: 04/04/24

Sample Location: Not Specified Field Prep: Refer to COC

Sample Depth:

Matrix: Water

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dissolved Metals - Mansfield Lab** | | | | | | | | | | | |
| Cadmium, Dissolved | 6017. | | ug/l | 100.0 | 29.95 | 500 | 04/08/24 11:27 | 04/10/24 11:59 | EPA 3005A | 1,6020B | EJF |
| Zinc, Dissolved | 2706000 | | ug/l | 5000. | 1705. | 500 | 04/08/24 11:27 | 04/10/24 11:59 | EPA 3005A | 1,6020B | EJF |

**Project Name:** RWM-Q1 **Lab Number:** L2418553

**Project Number:** 21010103 **Report Date:** 04/22/24

# Method Blank Analysis
# Batch Quality Control

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|
| Dissolved Metals - Mansfield Lab for sample(s): 01-07 Batch: WG1905961-1 | | | | | | | | | | |
| Cadmium, Dissolved | ND | | ug/l | 0.2000 | 0.0599 | 1 | 04/08/24 11:27 | 04/10/24 08:33 | 1,6020B | EJF |
| Zinc, Dissolved | ND | | ug/l | 10.00 | 3.410 | 1 | 04/08/24 11:27 | 04/10/24 08:33 | 1,6020B | EJF |

**Prep Information**

Digestion Method: EPA 3005A

# Lab Control Sample Analysis

## Batch Quality Control

**Project Name:** RWM-Q1

**Project Number:** 21010103

**Lab Number:** L2418553

**Report Date:** 04/22/24

| Parameter | LCS %Recovery | Qual | LCSD %Recovery | Qual | %Recovery Limits | RPD | Qual | RPD Limits |
|---|---|---|---|---|---|---|---|---|
| Dissolved Metals - Mansfield Lab Associated sample(s): 01-07 Batch: WG1905961-2 | | | | | | | | |
| Cadmium, Dissolved | 96 | | - | | 80-120 | - | | |
| Zinc, Dissolved | 100 | | - | | 80-120 | - | | |

# Matrix Spike Analysis
## Batch Quality Control

**Project Name:** RWM-Q1
**Project Number:** 21010103

**Lab Number:** L2418553
**Report Date:** 04/22/24

| Parameter | Native Sample | MS Added | MS Found | MS %Recovery | Qual | MSD Found | MSD %Recovery | Qual | Recovery Limits | RPD | Qual | RPD Limits |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Dissolved Metals - Mansfield Lab Associated sample(s): 01-07 QC Batch ID: WG1905961-3 QC Sample: L2418128-04 Client ID: MS Sample | | | | | | | | | | | | |
| Cadmium, Dissolved | ND | 53 | 51.22 | 97 | | - | - | | 75-125 | - | | 20 |
| Zinc, Dissolved | ND | 500 | 483.4 | 97 | | - | - | | 75-125 | - | | 20 |

**Project Name:** RWM-Q1
**Project Number:** 21010103

**Lab Number:** L2418553
**Report Date:** 04/22/24

## Sample Receipt and Container Information

Were project specific reporting limits specified? YES

### Cooler Information

| Cooler | Custody Seal |
|---|---|
| A | Absent |

### Container Information

| Container ID | Container Type | Cooler | Initial pH | Final pH | Temp deg C | Pres | Seal | Frozen Date/Time | Analysis(*) |
|---|---|---|---|---|---|---|---|---|---|
| L2418553-01A | Plastic 250ml HNO3 preserved | A | <2 | <2 | 2.9 | Y | Absent | | ZN-6020S-PPB(180),CD-6020S-PPB(180) |
| L2418553-02A | Plastic 250ml HNO3 preserved | A | <2 | <2 | 2.9 | Y | Absent | | ZN-6020S-PPB(180),CD-6020S-PPB(180) |
| L2418553-03A | Plastic 250ml HNO3 preserved | A | <2 | <2 | 2.9 | Y | Absent | | ZN-6020S-PPB(180),CD-6020S-PPB(180) |
| L2418553-03B | Plastic 250ml Zn Acetate/NaOH preserved | A | >9 | >9 | 2.9 | Y | Absent | | SUB-SULFIDE() |
| L2418553-04A | Plastic 250ml HNO3 preserved | A | <2 | <2 | 2.9 | Y | Absent | | ZN-6020S-PPB(180),CD-6020S-PPB(180) |
| L2418553-04B | Plastic 250ml Zn Acetate/NaOH preserved | A | 7 | >9 | 2.9 | N | Absent | | SUB-SULFIDE() |
| L2418553-05A | Plastic 250ml HNO3 preserved | A | <2 | <2 | 2.9 | Y | Absent | | ZN-6020S-PPB(180),CD-6020S-PPB(180) |
| L2418553-06A | Plastic 250ml HNO3 preserved | A | <2 | <2 | 2.9 | Y | Absent | | ZN-6020S-PPB(180),CD-6020S-PPB(180) |
| L2418553-07A | Plastic 250ml HNO3 preserved | A | <2 | <2 | 2.9 | Y | Absent | | ZN-6020S-PPB(180),CD-6020S-PPB(180) |



*Values in parentheses indicate holding time in days

| | | | |
|---|---|---|---|
| **Project Name:** | RWM-Q1 | **Lab Number:** | L2418553 |
| **Project Number:** | 21010103 | **Report Date:** | 04/22/24 |

## GLOSSARY

***Acronyms***

| | |
|---|---|
| DL | - Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the limit of quantitation (LOQ). The DL includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.) |
| EDL | - Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME). |
| EMPC | - Estimated Maximum Possible Concentration: The concentration that results from the signal present at the retention time of an analyte when the ions meet all of the identification criteria except the ion abundance ratio criteria. An EMPC is a worst-case estimate of the concentration. |
| EPA | - Environmental Protection Agency. |
| LCS | - Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes. |
| LCSD | - Laboratory Control Sample Duplicate: Refer to LCS. |
| LFB | - Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes. |
| LOD | - Limit of Detection: This value represents the level to which a target analyte can reliably be detected for a specific analyte in a specific matrix by a specific method. The LOD includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.) |
| LOQ | - Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)<br><br>Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.) |
| MDL | - Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. |
| MS | - Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available. For Method 332.0, the spike recovery is calculated using the native concentration, including estimated values. |
| MSD | - Matrix Spike Sample Duplicate: Refer to MS. |
| NA | - Not Applicable. |
| NC | - Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit. |
| NDPA/DPA | - N-Nitrosodiphenylamine/Diphenylamine. |
| NI | - Not Ignitable. |
| NP | - Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil. |
| NR | - No Results: Term is utilized when 'No Target Compounds Requested' is reported for the analysis of Volatile or Semivolatile Organic TIC only requests. |
| RL | - Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable. |
| RPD | - Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report. |
| SRM | - Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples. |
| STLP | - Semi-dynamic Tank Leaching Procedure per EPA Method 1315. |
| TEF | - Toxic Equivalency Factors: The values assigned to each dioxin and furan to evaluate their toxicity relative to 2,3,7,8-TCDD. |
| TEQ | - Toxic Equivalent: The measure of a sample's toxicity derived by multiplying each dioxin and furan by its corresponding TEF and then summing the resulting values. |
| TIC | - Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations. |

*Report Format: DU Report with 'J' Qualifiers*

| | | | |
|---|---|---|---|
| **Project Name:** | RWM-Q1 | **Lab Number:** | L2418553 |
| **Project Number:** | 21010103 | **Report Date:** | 04/22/24 |

***Footnotes***

1 - The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

***Terms***

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Chlordane: The target compound Chlordane (CAS No. 57-74-9) is reported for GC ECD analyses. Per EPA,this compound "refers to a mixture of chlordane isomers, other chlorinated hydrocarbons and numerous other components." (Reference: USEPA Toxicological Review of Chlordane, In Support of Summary Information on the Integrated Risk Information System (IRIS), December 1997.)

Difference: With respect to Total Oxidizable Precursor (TOP) Assay analysis, the difference is defined as the Post-Treatment value minus the Pre-Treatment value.

Final pH: As it pertains to Sample Receipt & Container Information section of the report, Final pH reflects pH of container determined after adjustment at the laboratory, if applicable. If no adjustment required, value reflects Initial pH.

Frozen Date/Time: With respect to Volatile Organics in soil, Frozen Date/Time reflects the date/time at which associated Reagent Water-preserved vials were initially frozen. Note: If frozen date/time is beyond 48 hours from sample collection, value will be reflected in 'bold'.

Gasoline Range Organics (GRO): Gasoline Range Organics (GRO) results include all chromatographic peaks eluting from Methyl tert butyl ether through Naphthalene, with the exception of GRO analysis in support of State of Ohio programs, which includes all chromatographic peaks eluting from Hexane through Dodecane.

Initial pH: As it pertains to Sample Receipt & Container Information section of the report, Initial pH reflects pH of container determined upon receipt, if applicable.

PAH Total: With respect to Alkylated PAH analyses, the 'PAHs, Total' result is defined as the summation of results for all or a subset of the following compounds: Naphthalene, C1-C4 Naphthalenes, 2-Methylnaphthalene, 1-Methylnaphthalene, Biphenyl, Acenaphthylene, Acenaphthene, Fluorene, C1-C3 Fluorenes, Phenanthrene, C1-C4 Phenanthrenes/Anthracenes, Anthracene, Fluoranthene, Pyrene, C1-C4 Fluoranthenes/Pyrenes, Benz(a)anthracene, Chrysene, C1-C4 Chrysenes, Benzo(b)fluoranthene, Benzo(j)+(k)fluoranthene, Benzo(e)pyrene, Benzo(a)pyrene, Perylene, Indeno(1,2,3-cd)pyrene, Dibenz(ah)+(ac)anthracene, Benzo(g,h,i)perylene. If a 'Total' result is requested, the results of its individual components will also be reported.

PFAS Total: With respect to PFAS analyses, the 'PFAS, Total (5)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA and PFOS. In addition, the 'PFAS, Total (6)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA, PFDA and PFOS. For MassDEP DW compliance analysis only, the 'PFAS, Total (6)' result is defined as the summation of results at or above the RL. Note: If a 'Total' result is requested, the results of its individual components will also be reported.

Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

***Data Qualifiers***

**A** - Spectra identified as "Aldol Condensates" are byproducts of the extraction/concentration procedures when acetone is introduced in the process.

**B** - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).

**C** - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.

**D** - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.

**E** - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.

**F** - The ratio of quantifier ion response to qualifier ion response falls outside of the laboratory criteria. Results are considered to be an estimated maximum concentration.

**G** - The concentration may be biased high due to matrix interferences (i.e, co-elution) with non-target compound(s). The result should be considered estimated.

**H** - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.

**I** - The lower value for the two columns has been reported due to obvious interference.

**J** - Estimated value. The Target analyte concentration is below the quantitation limit (RL), but above the Method Detection Limit (MDL) or Estimated Detection Limit (EDL) for SPME-related analyses. This represents an estimated concentration for Tentatively

*Report Format: DU Report with 'J' Qualifiers*

| | | | |
|---|---|---|---|
| **Project Name:** | RWM-Q1 | **Lab Number:** | L2418553 |
| **Project Number:** | 21010103 | **Report Date:** | 04/22/24 |

***Data Qualifiers***

Identified Compounds (TICs). For calculated parameters, this represents that one or more values used in the calculation were estimated.

**M** - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.

**ND** - Not detected at the method detection limit (MDL) for the sample, or estimated detection limit (EDL) for SPME-related analyses.

**NJ** - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where the identification is based on a mass spectral library search.

**P** - The RPD between the results for the two columns exceeds the method-specified criteria.

**Q** - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)

**R** - Analytical results are from sample re-analysis.

**RE** - Analytical results are from sample re-extraction.

**S** - Analytical results are from modified screening analysis.

**V** - The surrogate associated with this target analyte has a recovery outside the QC acceptance limits. (Applicable to MassDEP DW Compliance samples only.)

**Z** - The batch matrix spike and/or duplicate associated with this target analyte has a recovery/RPD outside the QC acceptance limits. (Applicable to MassDEP DW Compliance samples only.)

| | | | |
|---|---|---|---|
| **Project Name:** | RWM-Q1 | **Lab Number:** | L2418553 |
| **Project Number:** | 21010103 | **Report Date:** | 04/22/24 |

## REFERENCES

1 Test Methods for Evaluating Solid Waste: Physical/Chemical Methods. EPA SW-846. Third Edition. Updates I - VI, 2018.

## LIMITATION OF LIABILITIES

Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Analytical shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Alpha Analytical.

We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.

# Certification Information

**The following analytes are not included in our Primary NELAP Scope of Accreditation:**

**Westborough Facility**
**EPA 624.1:** m/p-xylene, o-xylene, Naphthalene
**EPA 625.1:** alpha-Terpineol
**EPA 8260D:** NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene; SCM: Iodomethane (methyl iodide), 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.
**EPA 8270E:** NPW: Dimethylnaphthalene,1,4-Diphenylhydrazine, alpha-Terpineol, Azobenzene; SCM: Dimethylnaphthalene,1,4-Diphenylhydrazine.
**SM4500**: NPW: Amenable Cyanide; SCM: Total Phosphorus, TKN, NO2, NO3.

**Mansfield Facility**
**SM 2540D:** TSS.
**EPA TO-15:** Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene, 3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene.
**Nonpotable Water: EPA RSK-175 Dissolved Gases**
**Biological Tissue Matrix:** EPA 3050B

**The following analytes are included in our Massachusetts DEP Scope of Accreditation**

**Westborough Facility:**

***Drinking Water***
**EPA 300.0**: Chloride, Nitrate-N, Fluoride, Sulfate; **EPA 353.2**: Nitrate-N, Nitrite-N; **SM4500NO3-F**: Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE, EPA 180.1, SM2130B, SM4500Cl-D, SM2320B, SM2540C, SM4500H-B, SM4500NO2-B**
**EPA 524.2:** THMs and VOCs; **EPA 504.1:** EDB, DBCP.
**Microbiology**: **SM9215B; SM9223-P/A, SM9223B-Colilert-QT,SM9222D**.

***Non-Potable Water***
**SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2320B, SM4500CL-E, SM4500F-BC, SM4500NH3-BH:** Ammonia-N and Kjeldahl-N, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **EPA 351.1, SM4500NO3-F, EPA 353.2**: Nitrate-N**, SM4500P-E, SM4500P-B, E, SM4500SO4-E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, EPA 420.1, SM4500-CN-CE, SM2540D, EPA 300: Chloride, Sulfate, Nitrate.**
**EPA 624.1**: Volatile Halocarbons & Aromatics,
**EPA 608.3**: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs
**EPA 625.1**: SVOC (Acid/Base/Neutral Extractables).
**Microbiology**: **SM9223B-Colilert-QT; Enterolert-QT, EPA 1600, EPA 1603, SM9222D.**

**Mansfield Facility:**

***Drinking Water***
**EPA 200.7:** Al, Ba, Cd, Cr, Cu, Fe, Mn, Ni, Na, Ag, Ca, Zn. **EPA 200.8:** Al, Sb, As, Ba, Be, Cd, Cr, Cu, Pb, Mn, Ni, Se, Ag, TL, Zn. **EPA 245.1** Hg.
**EPA 522, EPA 537.1.**

***Non-Potable Water***
**EPA 200.7:** Al, Sb, As, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, K, Se, Ag, Na, Sr, TL, Ti, V, Zn.
**EPA 200.8:** Al, Sb**,** As, Be, Cd, Cr, Cu, Fe, Pb, Mn, Ni, K, Se, Ag, Na, TL, Zn.
**EPA 245.1** Hg.
**SM2340B**

For a complete listing of analytes and methods, please contact your Alpha Project Manager.

# CHAIN OF CUSTODY

PAGE 1 OF 1

ALPHA ANALYTICAL
WESTBORO, MA TEL: 508-898-9220 FAX: 508-898-9193
MANSFIELD, MA TEL: 508-822-9300 FAX: 508-822-3288

Date Rec'd in Lab: 04/05/24

ALPHA Job #: L2418553

**Client Information**

Client: TPA

Address:

Phone:

Fax:

Email:

☐ These samples have been previously analyzed by Alpha

**Project Information**

Project Name: RWM - Q1

Project Location:

Project #: 21010103

Project Manager: Bob T.

ALPHA Quote #:

**Turn-Around Time**

☑ Standard ☐ RUSH (only confirmed if pre-approved!)

Date Due: Time:

**Report Information - Data Deliverables**

☐ FAX ☐ EMAIL

☐ ADEx ☐ Add'l Deliverables

**Billing Information**

☐ Same as Client info PO #:

**Regulatory Requirements/Report Limits**

| State /Fed Program | Criteria |
|---|---|
| | |

Other Project Specific Requirements/Comments/Detection Limits:

| ALPHA Lab ID (Lab Use Only) | Sample ID | Collection Date | Collection Time | Sample Matrix | Sampler's Initials | ANALYSIS: Diss. Cd + Zn / Sulfides | SAMPLE HANDLING | TOTAL # BOTTLES |
|---|---|---|---|---|---|---|---|---|
| 18553-01 | RWI-MWS | 4/4/24 | 1100 | GW | TB | X | | 1 |
| 02 | RWI-MWI | | 1140 | | | X | | 1 |
| 03 | RWL-MWS | | 1230 | | | X X | | 2 |
| 04 | RWL-MWI | | 1345 | | | X X | | 2 |
| 05 | RW10-MWI | | 1420 | | | X | | 1 |
| 06 | RW19-MWI | | 1505 | | | X | | 1 |
| 07 | RWP-MWI | | 1540 | | | X | | 1 |

SAMPLE HANDLING: Filtration ☑ Done ☐ Not needed ☐ Lab to do; Preservation ☐ Lab to do (Please specify below); Sample Specific Comments

Container Type: P P

Preservative: 0

Rel: 4/5/24 0305

4/5/24 0205

| Relinquished By: | Date/Time | Received By: | Date/Time |
|---|---|---|---|
| ARM RJB | 4/4/24 1600 | RJB | 4-4 1440 |
| ALEX LUKASHEVICH | 4/4/24 18:10 | ALEX LUKASHEVICH | 4/4/24 18:18 |
| Paul Mansell | 4/4/24 2200 | Paul Mansell | 4/5/24 0100 |

Please print clearly, legibly and completely. Samples can not be logged in and turnaround time clock will not start until any ambiguities are resolved. All samples submitted are subject to Alpha's Terms and Conditions. See reverse side.

FORM NO. 01-01 (rev. 14-OCT-07)

PEOPLE ADVANCING SCIENCE

*Pace Analytical Services, LLC-Fairfield*

# ANALYTICAL RESULTS

## LEVEL II DELIVERABLES FORMAT

Work Order Number: 24D0600

Pace - Alpha Analytical Laboratories

Project: L2418553



Sudip Pradhan
Laboratory Director

**All Results meet the requirements of the National Environmental Laboratory Accreditation Conference and/or State specific certifications as applicable.**

**Report Date:** Apr 19, 2024

1275 Bloomfield Ave., Bldg. 6, Fairfield, New Jersey 07004
(t) 973.227.0422 (f) 973.227.2813 (w) www.pacelabs.com

**NELAC** National Environmental Laboratory Accreditation Conference
NJDEP #07010 / NYDOH #11634 / PADEP #68-02903

sections 1 2 3 4 5 6 7 8

# CONTENTS

1. Sample Summary . . . 3
2. Chain of Custody . . . 4
3. Methodology Summary . . . 6
4. Abbreviations and Qualifiers . . . 7
5. Conformance/Non-Conformance Summary . . . 8
6. Positive Results Summary . . . 9
7. All Results Summary . . . 10
8. General Chemistry . . . 11
    8.1. General Chemistry Results . . . 12

PEOPLE ADVANCING SCIENCE

*Pace Analytical Services, LLC-Fairfield*

# Sample Summary

**Work Order:** 24D0600

**Client:** Pace - Alpha Analytical Laboratories

**Project:** L2418553

| Sample ID | Laboratory ID | Matrix | Date Sampled | Date Received |
|---|---|---|---|---|
| RWL-MWS | 24D0600-01 | Water | 04/04/2024 12:30 | 04/09/2024 08:10 |
| RWL-MWI | 24D0600-02 | Water | 04/04/2024 13:45 | 04/09/2024 08:10 |

# Subcontract Chain of Custody

APL/ Pace Fairfield
1275 Bloomfield Ave.
Bldg. 6
Fairfield, NJ 07004

24D0600

Pace - Alpha Analytical Laboratories
L2418553

**Alpha Job Number**
L2418553

## Client Information

Client: Alpha Analytical Labs
Address: Eight Walkup Drive
Westborough, MA 01581-1019

Phone: 508.844.4115
Email: Mitchell.Ostrowski@pacelabs.com

## Project Information

Project Location: MD
Project Manager: Mitchell Ostrowski

## Turnaround & Deliverables Information

Due Date:
Deliverables:

## Requirements/Report Limits

State/Federal Program:
Regulatory Criteria:

## Project Specific Requirements and/or Report Requirements

Reference following Alpha Job Number on final report/deliverables: L2418553

Report to include Method Blank, LCS/LCSD:

Additional Comments: Invoices to: invoices@pacelabs.coupahost.com Reports to: west.subreports@pacelabs.com

| Lab ID | Client ID | Collection Date/Time | Sample Matrix | Analysis | Batch QC |
|---|---|---|---|---|---|
| -01 | RWL-MWS | 04-04-24 12:30 | WATER | Sulfide | |
| -02 | RWL-MWI | 04-04-24 13:45 | WATER | Sulfide | |

0.1°C

| | Relinquished By: | Date/Time: | Received By: | Date/Time: |
|---|---|---|---|---|
| | | 4/8/24 | | |
| | | 4/8 2300 | | 4/8 17:30 |
| | | 4/9/24 | | 4/9/24 0630 |
| Form No: AL_subcoc | | | | 4/9/24 820 |



Serial_No:04222418:42

DC#_Title: ENV-FRM-FAIR-007 v01_Sample Condition Upon Receipt Form
Effective Date: 7/26/2023

24D0600

## Sample Condition Upon Receipt Form (SCUR)

Pace ANALYTICAL SERVICES

Affix Sample Label Here

**Date and Initials of person:**
**Examining contents:** nf
**Label:**
**Deliver to location:**
**pH:** 7-9

Thermometer Used: 21TR03 Date: 4/9/24 Time: 810 Initials: nf

State of Origin:

**Cooler #1 Temp.°C** 0.0 **(Visual)** +0.1 **(Correction Factor)** 0.1 **(Actual)** ☐ Samples on ice, cooling process has begun

**Courier:** ☐ Fed Ex ☐ UPS ☐ USPS ☐ Client ☐ Commercial ☒ Pace ☐ Other

**Shipping Method:** ☐ First Overnight ☐ Priority Overnight ☐ Standard Overnight ☐ Ground ☐ Other

**Tracking #**

**Custody Seal on Cooler/Box Present:** ☐ Yes ☒ No **Seals intact:** ☐ Yes ☒ No **Ice:** (Wet) Blue Melted None

**Packing Material:** ☐ Bubble Wrap ☐ Bubble Bags ☒ None ☐ Other

**Samples were collected by Pace employee** ☐ Yes ☒ No ☐ N/A

| | | Comments: |
|---|---|---|
| Chain of Custody Present | ☑Yes ☐ No ☐ N/A | |
| Chain of Custody Filled Out | ☑Yes ☐ No ☐ N/A | |
| Relinquished Signature on COC | ☑Yes ☐ No ☐ N/A | |
| Sampler Name and Signature on COC | ☑Yes ☐ No ☐ N/A | |
| Samples Arrived within Hold Time | ☑Yes ☐ No ☐ N/A | |
| Rush TAT requested on COC | ☐Yes ☑ No ☐ N/A | |
| Sufficient Volume | ☑Yes ☐ No ☐ N/A | |
| Correct Containers Used | ☑Yes ☐ No ☐ N/A | |
| Containers Intact | ☑Yes ☐ No ☐ N/A | |
| Sample Labels match COC (sample IDs & date/time of collection) | ☑Yes ☐ No ☐ N/A | |
| All containers needing acid/base preservation have been checked. All Containers needing preservation are found to be in compliance with EPA recommendation: Exceptions: Vials, Microbiology, O&G, Metals | ☑Yes ☐ No ☐ N/A ☑Yes ☐ No ☐ N/A | Preservation Information: Preservative: NaOH + Zinc Acetate Lot #/Trace #: 2405572 & 2401146 Date: 4/9/24 Time: 1125 Initials: nf |
| Headspace in VOA Vials? ( >6mm): | ☐Yes ☐ No ☑N/A | |
| Trip Blank Present: | ☐Yes ☐ No ☑N/A | |

**Additional Login Comments:**

lot pH #:

**Client notification/ Resolution**

Person Contacted: Date/Time:

Comments/Resolution:

Pace Analytical Services, LLC-Fairfield
Methodology Summary

## Extractable Petroleum Hydrocarbons:

### *Gas Chromatography/Flame Ionization Detector*

New Jersey Department of Environmental Protection Site Remediation Program Extractable Petroleum Hydrocarbons Methodology (Version 3.0).
USEPA SW-846 Test Methods for Evaluating Solid Waste Physical/Chemical Methods Update III, Method 8015D or NJDEP Office of Quality Assurance Quantitation of Semi-Volatile Petroleum Products in Water, Soil and Sediment OQA-QAM-025, Revision 6.

## Metals:

### *Inductively-Coupled Plasma Atomic Emission Spectrometry or Inductively-Coupled Plasma Mass Spectroscopy*

**Wastewater and Groundwater Samples:** USEPA Methods for the Analysis of Water and Wastes, Method 200.7, Method 200.8.
**Soil Samples:** USEPA Methods for Evaluating Solid Waste Physical/Chemical Methods Update III, Method 6010D.

## Mercury:

### *Cold Vapor Atomic Absorption Spectrometry*

**Wastewater and Groundwater Samples:** USEPA Methods for the Analysis of Water and Wastes, Method 245.1.
**Soil Samples**: USEPA SW-846 Test Methods for Evaluating Solid Waste Physical/Chemical Methods Update III, Method 7471B.

## Volatile Organic Compounds:

### *Purge and Trap Gas Chromatography/Mass Spectroscopy*

**Drinking Water Samples:** USEPA Methods for the Determination of Organic Compounds in Drinking Water, Method 524.2.
**Wastewater Samples:** USEPA Methods for the Analysis of Water and Wastes, Method 624.1.
**Soil and Groundwater Samples:** USEPA SW-846 Test Methods for Evaluating Solid Waste Physical/Chemical Methods Update VI, Method 8260D.

## Semi-Volatile Organic Compounds:

### *Gas Chromatography/Mass Spectroscopy*

**Wastewater Samples:** USEPA Methods for the Analysis of Water and Wastes, Method 625.1.
**Soil and Groundwater Samples:** USEPA SW-846 Test Methods for Evaluating Solid Waste Physical/Chemical Methods Update VI, Method 8270E.

## PFAS Compounds:

### *Liquid Chromatography/Tandem Mass Spectroscopy*

**Drinking Water Samples:** USEPA Methods for the Determination of Selected Perfluorinated Alkyl Acids in Drinking Water by Solid Phase Extraction and Liquid Chromatography/Tandem Mass Spectrometry (LC/MS/MS), Method 537 (v1.1).

## Pesticides:

### *Gas Chromatography/Electron Capture Detector*

**Wastewater Samples:** USEPA Methods for the Analysis of Water and Wastes, Method 608.3.
**Soil and Groundwater Samples:** USEPA SW-846 Test Methods for Evaluating Solid Waste Physical/Chemical Methods Update III, Method 8081B.

## Polychlorinated Biphenyls (PCBs):

### *Gas Chromatography/Electron Capture Detector*

**Wastewater Samples:** USEPA Methods for the Analysis of Water and Wastes, Method 608.3.
**Soil and Groundwater Samples:** USEPA SW-846 Test Methods for Evaluating Solid Waste Physical/Chemical Methods Update III, Method 8082A.

## General Chemistry Methods:

### *Various general chemistry methods are taken from* "Standard Methods for the Examination of Water and Wastewater, 22nd Edition", .

Specific method citations can be found on the Analytical Results Summary page of this report listed under 'Method'.

** A complete list of Pace Fairfield's certified Methods are on the Standards And Docs page of the Results Retrieval System

Pace Analytical Services, LLC-Fairfield
Data Reporting Abbreviations and Qualifiers



**Method Detection Limit (MDL):**

The MDL is defined as the minimum measured concentration of a substance that can be reported with 99% confidence that the measured concentration is distinguishable from method blank results. The value is calculated following the guidelines defined in:

"Definition and Procedure for the Determination of the Method Detection Limit, Revision 2"
EPA 821-R-16-006, published December 2016.

**Reporting Limit (RL):**

The RL is the Concentration of the lowest calibration standard that was included in the initial calibration of the instrument. On analytical reports this value is corrected for percent moisture and any concentration or dilution factors.

**Concentration (Conc.) / Result:**

If the compound is detected, the measured concentration is reported. If this column is "ND", or contains a 'less than' (<) symbol, the compound was not detected.

**Tentatively Identified Compound (TIC):**

A TIC is a non-targeted compound, not included in the calibration, identified by a mass spectral library search OR requested to be identified and reported by the client.

**Abbreviations:**

| | |
|---|---|
| **ND** | Non-Detect |
| **TNTC** | Too Numerous To Count |

**Qualifers:**

| | |
|---|---|
| **U** | Compound not detected |

Pace Analytical Services, LLC-Fairfield



## QUALITY CONTROL
## Conformance/Non-Conformance Summary

**ANALYSIS: Sulfide [SM 4500-S-D-11]**

COMMENTS:
All samples met QC criteria.

Reviewed By: _____ (IK) 4/19/2024
Sudip Pradhan - Laboratory Director — Date

*For any questions about your Quality Control, please call us at 973-227-0422*

PEOPLE ADVANCING SCIENCE

*Pace Analytical Services, LLC-Fairfield*

# Positive Results Only Summary

**24D0600-01 (Water)** Sample Name: **RWL-MWS**

**SM 4500-S-D-11 - General Chemistry**

| Analyte | Result | Qual | MDL | RL | Units | Dilution | Analyzed |
|---|---|---|---|---|---|---|---|
| Sulfide | 0.0290 | | 0.00500 | 0.0100 | mg/L | 1 | 4/10/24 12:00 |

**ND** - Indicates compound analyzed for but not detected
**J** - Indicates estimated value
**B** - Indicates compound found in associated blank
**E** - Concentration exceeds highest calibration standard

**D** - Indicates result is based on a dilution
**H** - Indicates a Hold Time violation
**P** - Greater than 25% diff. between 2 GC columns.
**MDL** - Minimum detection limit, **RL** - Reporting limit
**D1** - Sample was Decanted (Dissolved)

PEOPLE ADVANCING SCIENCE

*Pace Analytical Services, LLC-Fairfield*

# All Results Summary

**Client:** Pace - Alpha Analytical Laboratories
**Project:** L2418553
**Work Order:** 24D0600
**Date to Lab:** 4/9/2024 8:10:00AM

**24D0600-01 (Water)** Sample Name: **RWL-MWS** Collected: **4/4/2024 12:30:00PM**

**SM 4500-S-D-11 - General Chemistry**

| Analyte | Result | Qual | MDL | RL | Units | Dilution | Analyzed |
|---|---|---|---|---|---|---|---|
| **Sulfide** | **0.0290** | | **0.00500** | **0.0100** | **mg/L** | **1** | **4/10/24 12:00** |

**24D0600-02 (Water)** Sample Name: **RWL-MWI** Collected: **4/4/2024 1:45:00PM**

**SM 4500-S-D-11 - General Chemistry**

| Analyte | Result | Qual | MDL | RL | Units | Dilution | Analyzed |
|---|---|---|---|---|---|---|---|
| Sulfide | ND | U | 0.00500 | 0.0100 | mg/L | 1 | 4/10/24 12:00 |

**ND, U** - Indicates compound analyzed for but not detected
**J** - Indicates estimated value
**B** - Indicates compound found in associated blank
**E** - Concentration exceeds highest calibration standard
**D** - Indicates result is based on a dilution
**H** - Indicates a Hold Time violation
**P** - Greater than 25% diff. between 2 GC columns.
**MDL** - Minimum detection limit, **RL** - Reporting limit
**D1** - Sample was Decanted (Dissolved)

PEOPLE ADVANCING SCIENCE

*Pace Analytical Services, LLC-Fairfield*

# GENERAL CHEMISTRY

Pace - Alpha Analytical Laboratories

Work Order: 24D0600

Project: L2418553

# ANALYSIS DATA SHEET

## General Chemistry

**Client:** Pace - Alpha Analytical Laboratories
**Project:** L2418553
**Work Order:** 24D0600

### General Chemistry

**24D0600-01 (Water) - RWL-MWS**

| Analyte | Units | Conc. | RL | DF | Qual | Analyzed | Method |
|---|---|---|---|---|---|---|---|
| Sulfide | mg/L | 0.0290 | 0.0100 | 1 | | 04/10/24 12:00 | SM 4500-S-D-11 |

**24D0600-02 (Water) - RWL-MWI**

| Analyte | Units | Conc. | RL | DF | Qual | Analyzed | Method |
|---|---|---|---|---|---|---|---|
| Sulfide | mg/L | ND | 0.0100 | 1 | U | 04/10/24 12:00 | SM 4500-S-D-11 |

8 8.1.

**ND** - Indicates compound analyzed for but not detected
**J** - Indicates estimated value
**B** - Indicates compound found in associated blank
**E** - Concentration exceeds highest calibration standard
**D** - Indicates result is based on a dilution
**H** - Indicates a Hold Time violation
**P** - Greater than 25% diff. between 2 GC columns.
**MDL** - Minimum detection limit, **RL** - Reporting limit

F-I

## Pace Analytical Services, LLC-Fairfield

### General Chemistry - Quality Control

| Sulfide | | Result | Reporting Limit | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit |
|---|---|---|---|---|---|---|---|---|---|---|
| **Batch BBD0624** | | | Prepared & Analyzed: 4/10/2024 | | | | | | | |
| BBD0624-BLK1 | | ND | 0.0100 | mg/L | | | | | | |
| BBD0624-BS1 | | 0.380 | 0.0100 | mg/L | 0.400 | | 95.0 | 80-120 | | |
| BBD0624-DUP1 | **Source: 24D0394-02** | ND | 0.0100 | mg/L | | ND | | | | 20 |
| BBD0624-MS1 | **Source: 24D0394-02** | 0.374 | 0.0100 | mg/L | 0.400 | ND | 93.5 | 70-130 | | |
| BBD0624-MSD1 | **Source: 24D0394-02** | 0.374 | 0.0100 | mg/L | 0.400 | ND | 93.5 | 70-130 | 0.00 | 20 |

8 8.1.

**ND** - Indicates compound analyzed for but not detected
**J** - Indicates estimated value
**B** - Indicates compound found in associated blank
**E** - Concentration exceeds highest calibration standard

**D** - Indicates result is based on a dilution
**H** - Indicates a Hold Time violation
**P** - Greater than 25% diff. between 2 GC columns.
**MDL** - Minimum detection limit, **RL** - Reporting limit

F-III

# ANALYTICAL REPORT

| | |
|---|---|
| Lab Number: | L2418751 |
| Client: | Tradepoint Atlantic<br>1600 Sparrows Point Boulevard<br>Baltimore, MD 21219 |
| ATTN: | Robert Tworkowski |
| Phone: | (443) 649-5073 |
| Project Name: | RWM-Q1 |
| Project Number: | 21010103 |
| Report Date: | 04/22/24 |

The original project report/data package is held by Alpha Analytical. This report/data package is paginated and should be reproduced only in its entirety. Alpha Analytical holds no responsibility for results and/or data that are not consistent with the original.

Certifications & Approvals: MA (M-MA086), NH NELAP (2064), CT (PH-0826), IL (200077), IN (C-MA-03), KY (KY98045), ME (MA00086), MD (348), NJ (MA935), NY (11148), NC (25700/666), OH (CL108), OR (MA-1316), PA (68-03671), RI (LAO00065), TX (T104704476), VT (VT-0935), VA (460195), USDA (Permit #525-23-122-91930).

Eight Walkup Drive, Westborough, MA 01581-1019
508-898-9220 (Fax) 508-898-9193 800-624-9220 - www.alphalab.com

**Project Name:** RWM-Q1
**Project Number:** 21010103

**Lab Number:** L2418751
**Report Date:** 04/22/24

| Alpha Sample ID | Client ID | Matrix | Sample Location | Collection Date/Time | Receive Date |
|---|---|---|---|---|---|
| L2418751-01 | RW21-MWI | WATER | Not Specified | 04/05/24 10:30 | 04/05/24 |
| L2418751-02 | RWO-MWS | WATER | Not Specified | 04/05/24 11:30 | 04/05/24 |
| L2418751-03 | RWO-MWI | WATER | Not Specified | 04/05/24 12:15 | 04/05/24 |

| | | | |
|---|---|---|---|
| **Project Name:** | RWM-Q1 | **Lab Number:** | L2418751 |
| **Project Number:** | 21010103 | **Report Date:** | 04/22/24 |

## Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet NELAP requirements for all NELAP accredited parameters unless otherwise noted in the following narrative. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. Tentatively Identified Compounds (TICs), if requested, are reported for compounds identified to be present and are not part of the method/program Target Compound List, even if only a subset of the TCL are being reported. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively.

When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances, the specific failure is not narrated but noted in the associated QC Outlier Summary Report, located directly after the Case Narrative. QC information is also incorporated in the Data Usability Assessment table (Format 11) of our Data Merger tool, where it can be reviewed in conjunction with the sample result, associated regulatory criteria and any associated data usability implications.

Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

HOLD POLICY - For samples submitted on hold, Alpha's policy is to hold samples (with the exception of Air canisters) free of charge for 21 calendar days from the date the project is completed. After 21 calendar days, we will dispose of all samples submitted including those put on hold unless you have contacted your Alpha Project Manager and made arrangements for Alpha to continue to hold the samples. Air canisters will be disposed after 3 business days from the date the project is completed.

Please contact Project Management at 800-624-9220 with any questions.

**Project Name:** RWM-Q1 **Lab Number:** L2418751
**Project Number:** 21010103 **Report Date:** 04/22/24

**Case Narrative (continued)**

Report Submission

April 22, 2024: This final report includes the results of all requested analyses.

April 12, 2024: This is a preliminary report.

All non-detect (ND) or estimated concentrations (J-qualified) have been quantitated to the limit noted in the MDL column.

The analysis of Sulfide was subcontracted. A copy of the laboratory report is included as an addendum. Please note: This data is only available in PDF format and is not available on Data Merger.

Sample Receipt

L2418751-01: The sample was received below the appropriate pH for the Subcontracted Sulfide analysis. The laboratory added additional NaOH; however, the pH would not adjust into the proper range.

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature: Tiffani Morrissey - Tiffani Morrissey

Title: Technical Director/Representative Date: 04/22/24

# METALS

**Project Name:** RWM-Q1 **Lab Number:** L2418751

**Project Number:** 21010103 **Report Date:** 04/22/24

## SAMPLE RESULTS

Lab ID: L2418751-01 Date Collected: 04/05/24 10:30

Client ID: RW21-MWI Date Received: 04/05/24

Sample Location: Not Specified Field Prep: Refer to COC

Sample Depth:

Matrix: Water

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dissolved Metals - Mansfield Lab** | | | | | | | | | | | |
| Cadmium, Dissolved | 30.40 | | ug/l | 2.000 | 0.5990 | 10 | 04/08/24 17:23 | 04/12/24 07:52 | EPA 3005A | 1,6020B | EJF |
| Zinc, Dissolved | 348100 | | ug/l | 10000 | 3410. | 1000 | 04/08/24 17:23 | 04/12/24 08:47 | EPA 3005A | 1,6020B | EJF |

**Project Name:** RWM-Q1 **Lab Number:** L2418751

**Project Number:** 21010103 **Report Date:** 04/22/24

## SAMPLE RESULTS

Lab ID: L2418751-02 Date Collected: 04/05/24 11:30

Client ID: RWO-MWS Date Received: 04/05/24

Sample Location: Not Specified Field Prep: Refer to COC

Sample Depth:

Matrix: Water

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dissolved Metals - Mansfield Lab** | | | | | | | | | | | |
| Cadmium, Dissolved | ND | | ug/l | 0.2000 | 0.0599 | 1 | 04/08/24 17:23 | 04/12/24 08:52 | EPA 3005A | 1,6020B | EJF |
| Zinc, Dissolved | ND | | ug/l | 10.00 | 3.410 | 1 | 04/08/24 17:23 | 04/12/24 08:52 | EPA 3005A | 1,6020B | EJF |

**Project Name:** RWM-Q1 **Lab Number:** L2418751

**Project Number:** 21010103 **Report Date:** 04/22/24

## SAMPLE RESULTS

Lab ID: L2418751-03 Date Collected: 04/05/24 12:15

Client ID: RWO-MWI Date Received: 04/05/24

Sample Location: Not Specified Field Prep: Refer to COC

Sample Depth:

Matrix: Water

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dissolved Metals - Mansfield Lab** | | | | | | | | | | | |
| Cadmium, Dissolved | 17.06 | | ug/l | 2.000 | 0.5990 | 10 | 04/08/24 17:23 | 04/12/24 08:01 | EPA 3005A | 1,6020B | EJF |
| Zinc, Dissolved | 147600 | | ug/l | 5000. | 1705. | 500 | 04/08/24 17:23 | 04/12/24 08:56 | EPA 3005A | 1,6020B | EJF |

**Project Name:** RWM-Q1 **Lab Number:** L2418751

**Project Number:** 21010103 **Report Date:** 04/22/24

# Method Blank Analysis
# Batch Quality Control

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|
| Dissolved Metals - Mansfield Lab for sample(s): 01-03 Batch: WG1906065-1 | | | | | | | | | | |
| Cadmium, Dissolved | ND | | ug/l | 0.2000 | 0.0599 | 1 | 04/08/24 17:23 | 04/12/24 06:17 | 1,6020B | EJF |
| Zinc, Dissolved | ND | | ug/l | 10.00 | 3.410 | 1 | 04/08/24 17:23 | 04/12/24 06:17 | 1,6020B | EJF |

**Prep Information**

Digestion Method: EPA 3005A

# Lab Control Sample Analysis

## Batch Quality Control

**Project Name:** RWM-Q1

**Project Number:** 21010103

**Lab Number:** L2418751

**Report Date:** 04/22/24

| Parameter | LCS %Recovery | Qual | LCSD %Recovery | Qual | %Recovery Limits | RPD | Qual | RPD Limits |
|---|---|---|---|---|---|---|---|---|
| Dissolved Metals - Mansfield Lab Associated sample(s): 01-03 Batch: WG1906065-2 | | | | | | | | |
| Cadmium, Dissolved | 97 | | - | | 80-120 | - | | |
| Zinc, Dissolved | 95 | | - | | 80-120 | - | | |

# Matrix Spike Analysis
## Batch Quality Control

**Project Name:** RWM-Q1
**Project Number:** 21010103

**Lab Number:** L2418751
**Report Date:** 04/22/24

| Parameter | Native Sample | MS Added | MS Found | MS %Recovery | Qual | MSD Found | MSD %Recovery | Qual | Recovery Limits | RPD | Qual | RPD Limits |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Dissolved Metals - Mansfield Lab Associated sample(s): 01-03 QC Batch ID: WG1906065-3 WG1906065-4 QC Sample: L2418624-08 Client ID: MS Sample | | | | | | | | | | | | |
| Cadmium, Dissolved | ND | 53 | 56.25 | 106 | | 58.33 | 110 | | 75-125 | 4 | | 20 |
| Zinc, Dissolved | ND | 500 | 507.2 | 101 | | 528.5 | 106 | | 75-125 | 4 | | 20 |

**Project Name:** RWM-Q1
**Project Number:** 21010103

**Lab Number:** L2418751
**Report Date:** 04/22/24

## Sample Receipt and Container Information

Were project specific reporting limits specified? YES

### Cooler Information

| Cooler | Custody Seal |
|---|---|
| A | Absent |

### Container Information

| Container ID | Container Type | Cooler | Initial pH | Final pH | Temp deg C | Pres | Seal | Frozen Date/Time | Analysis(*) |
|---|---|---|---|---|---|---|---|---|---|
| L2418751-01A | Plastic 250ml HNO3 preserved | A | <2 | <2 | 2.3 | Y | Absent | | ZN-6020S-PPB(180),CD-6020S-PPB(180) |
| L2418751-01B | Plastic 250ml Zn Acetate/NaOH preserved | A | 7 | 9 | 2.3 | N | Absent | | SUB-SULFIDE() |
| L2418751-02A | Plastic 250ml HNO3 preserved | A | <2 | <2 | 2.3 | Y | Absent | | ZN-6020S-PPB(180),CD-6020S-PPB(180) |
| L2418751-03A | Plastic 250ml HNO3 preserved | A | <2 | <2 | 2.3 | Y | Absent | | ZN-6020S-PPB(180),CD-6020S-PPB(180) |



*Values in parentheses indicate holding time in days

| | | | |
|---|---|---|---|
| **Project Name:** | RWM-Q1 | **Lab Number:** | L2418751 |
| **Project Number:** | 21010103 | **Report Date:** | 04/22/24 |

## GLOSSARY

***Acronyms***

| | |
|---|---|
| DL | - Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the limit of quantitation (LOQ). The DL includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.) |
| EDL | - Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME). |
| EMPC | - Estimated Maximum Possible Concentration: The concentration that results from the signal present at the retention time of an analyte when the ions meet all of the identification criteria except the ion abundance ratio criteria. An EMPC is a worst-case estimate of the concentration. |
| EPA | - Environmental Protection Agency. |
| LCS | - Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes. |
| LCSD | - Laboratory Control Sample Duplicate: Refer to LCS. |
| LFB | - Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes. |
| LOD | - Limit of Detection: This value represents the level to which a target analyte can reliably be detected for a specific analyte in a specific matrix by a specific method. The LOD includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.) |
| LOQ | - Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)<br><br>Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.) |
| MDL | - Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. |
| MS | - Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available. For Method 332.0, the spike recovery is calculated using the native concentration, including estimated values. |
| MSD | - Matrix Spike Sample Duplicate: Refer to MS. |
| NA | - Not Applicable. |
| NC | - Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit. |
| NDPA/DPA | - N-Nitrosodiphenylamine/Diphenylamine. |
| NI | - Not Ignitable. |
| NP | - Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil. |
| NR | - No Results: Term is utilized when 'No Target Compounds Requested' is reported for the analysis of Volatile or Semivolatile Organic TIC only requests. |
| RL | - Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable. |
| RPD | - Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report. |
| SRM | - Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples. |
| STLP | - Semi-dynamic Tank Leaching Procedure per EPA Method 1315. |
| TEF | - Toxic Equivalency Factors: The values assigned to each dioxin and furan to evaluate their toxicity relative to 2,3,7,8-TCDD. |
| TEQ | - Toxic Equivalent: The measure of a sample's toxicity derived by multiplying each dioxin and furan by its corresponding TEF and then summing the resulting values. |
| TIC | - Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations. |

*Report Format: DU Report with 'J' Qualifiers*

| | | | |
|---|---|---|---|
| **Project Name:** | RWM-Q1 | **Lab Number:** | L2418751 |
| **Project Number:** | 21010103 | **Report Date:** | 04/22/24 |

***Footnotes***

1 - The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

***Terms***

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Chlordane: The target compound Chlordane (CAS No. 57-74-9) is reported for GC ECD analyses. Per EPA,this compound "refers to a mixture of chlordane isomers, other chlorinated hydrocarbons and numerous other components." (Reference: USEPA Toxicological Review of Chlordane, In Support of Summary Information on the Integrated Risk Information System (IRIS), December 1997.)

Difference: With respect to Total Oxidizable Precursor (TOP) Assay analysis, the difference is defined as the Post-Treatment value minus the Pre-Treatment value.

Final pH: As it pertains to Sample Receipt & Container Information section of the report, Final pH reflects pH of container determined after adjustment at the laboratory, if applicable. If no adjustment required, value reflects Initial pH.

Frozen Date/Time: With respect to Volatile Organics in soil, Frozen Date/Time reflects the date/time at which associated Reagent Water-preserved vials were initially frozen. Note: If frozen date/time is beyond 48 hours from sample collection, value will be reflected in 'bold'.

Gasoline Range Organics (GRO): Gasoline Range Organics (GRO) results include all chromatographic peaks eluting from Methyl tert butyl ether through Naphthalene, with the exception of GRO analysis in support of State of Ohio programs, which includes all chromatographic peaks eluting from Hexane through Dodecane.

Initial pH: As it pertains to Sample Receipt & Container Information section of the report, Initial pH reflects pH of container determined upon receipt, if applicable.

PAH Total: With respect to Alkylated PAH analyses, the 'PAHs, Total' result is defined as the summation of results for all or a subset of the following compounds: Naphthalene, C1-C4 Naphthalenes, 2-Methylnaphthalene, 1-Methylnaphthalene, Biphenyl, Acenaphthylene, Acenaphthene, Fluorene, C1-C3 Fluorenes, Phenanthrene, C1-C4 Phenanthrenes/Anthracenes, Anthracene, Fluoranthene, Pyrene, C1-C4 Fluoranthenes/Pyrenes, Benz(a)anthracene, Chrysene, C1-C4 Chrysenes, Benzo(b)fluoranthene, Benzo(j)+(k)fluoranthene, Benzo(e)pyrene, Benzo(a)pyrene, Perylene, Indeno(1,2,3-cd)pyrene, Dibenz(ah)+(ac)anthracene, Benzo(g,h,i)perylene. If a 'Total' result is requested, the results of its individual components will also be reported.

PFAS Total: With respect to PFAS analyses, the 'PFAS, Total (5)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA and PFOS. In addition, the 'PFAS, Total (6)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA, PFDA and PFOS. For MassDEP DW compliance analysis only, the 'PFAS, Total (6)' result is defined as the summation of results at or above the RL. Note: If a 'Total' result is requested, the results of its individual components will also be reported.

Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

***Data Qualifiers***

**A** - Spectra identified as "Aldol Condensates" are byproducts of the extraction/concentration procedures when acetone is introduced in the process.

**B** - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).

**C** - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.

**D** - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.

**E** - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.

**F** - The ratio of quantifier ion response to qualifier ion response falls outside of the laboratory criteria. Results are considered to be an estimated maximum concentration.

**G** - The concentration may be biased high due to matrix interferences (i.e, co-elution) with non-target compound(s). The result should be considered estimated.

**H** - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.

**I** - The lower value for the two columns has been reported due to obvious interference.

**J** - Estimated value. The Target analyte concentration is below the quantitation limit (RL), but above the Method Detection Limit (MDL) or Estimated Detection Limit (EDL) for SPME-related analyses. This represents an estimated concentration for Tentatively

*Report Format: DU Report with 'J' Qualifiers*

| | | | |
|---|---|---|---|
| **Project Name:** | RWM-Q1 | **Lab Number:** | L2418751 |
| **Project Number:** | 21010103 | **Report Date:** | 04/22/24 |

***Data Qualifiers***

Identified Compounds (TICs). For calculated parameters, this represents that one or more values used in the calculation were estimated.

**M** - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.

**ND** - Not detected at the method detection limit (MDL) for the sample, or estimated detection limit (EDL) for SPME-related analyses.

**NJ** - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where the identification is based on a mass spectral library search.

**P** - The RPD between the results for the two columns exceeds the method-specified criteria.

**Q** - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)

**R** - Analytical results are from sample re-analysis.

**RE** - Analytical results are from sample re-extraction.

**S** - Analytical results are from modified screening analysis.

**V** - The surrogate associated with this target analyte has a recovery outside the QC acceptance limits. (Applicable to MassDEP DW Compliance samples only.)

**Z** - The batch matrix spike and/or duplicate associated with this target analyte has a recovery/RPD outside the QC acceptance limits. (Applicable to MassDEP DW Compliance samples only.)

| | | | |
|---|---|---|---|
| **Project Name:** | RWM-Q1 | **Lab Number:** | L2418751 |
| **Project Number:** | 21010103 | **Report Date:** | 04/22/24 |

## REFERENCES

1 Test Methods for Evaluating Solid Waste: Physical/Chemical Methods. EPA SW-846. Third Edition. Updates I - VI, 2018.

## LIMITATION OF LIABILITIES

Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Analytical shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Alpha Analytical.

We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.

# Certification Information

**The following analytes are not included in our Primary NELAP Scope of Accreditation:**

**Westborough Facility**
**EPA 624.1:** m/p-xylene, o-xylene, Naphthalene
**EPA 625.1:** alpha-Terpineol
**EPA 8260D:** NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene; SCM: Iodomethane (methyl iodide), 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.
**EPA 8270E:** NPW: Dimethylnaphthalene,1,4-Diphenylhydrazine, alpha-Terpineol, Azobenzene; SCM: Dimethylnaphthalene,1,4-Diphenylhydrazine.
**SM4500**: NPW: Amenable Cyanide; SCM: Total Phosphorus, TKN, NO2, NO3.

**Mansfield Facility**
**SM 2540D:** TSS.
**EPA TO-15:** Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene, 3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene.
**Nonpotable Water: EPA RSK-175 Dissolved Gases**
**Biological Tissue Matrix:** EPA 3050B

**The following analytes are included in our Massachusetts DEP Scope of Accreditation**

**Westborough Facility:**

***Drinking Water***
**EPA 300.0**: Chloride, Nitrate-N, Fluoride, Sulfate; **EPA 353.2**: Nitrate-N, Nitrite-N; **SM4500NO3-F**: Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE, EPA 180.1, SM2130B, SM4500Cl-D, SM2320B, SM2540C, SM4500H-B, SM4500NO2-B**
**EPA 524.2:** THMs and VOCs; **EPA 504.1:** EDB, DBCP.
**Microbiology**: **SM9215B; SM9223-P/A, SM9223B-Colilert-QT,SM9222D**.

***Non-Potable Water***
**SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2320B, SM4500CL-E, SM4500F-BC, SM4500NH3-BH:** Ammonia-N and Kjeldahl-N, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **EPA 351.1, SM4500NO3-F, EPA 353.2**: Nitrate-N**, SM4500P-E, SM4500P-B, E, SM4500SO4-E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, EPA 420.1, SM4500-CN-CE, SM2540D, EPA 300: Chloride, Sulfate, Nitrate.**
**EPA 624.1**: Volatile Halocarbons & Aromatics,
**EPA 608.3**: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs
**EPA 625.1**: SVOC (Acid/Base/Neutral Extractables).
**Microbiology**: **SM9223B-Colilert-QT; Enterolert-QT, EPA 1600, EPA 1603, SM9222D.**

**Mansfield Facility:**

***Drinking Water***
**EPA 200.7:** Al, Ba, Cd, Cr, Cu, Fe, Mn, Ni, Na, Ag, Ca, Zn. **EPA 200.8:** Al, Sb, As, Ba, Be, Cd, Cr, Cu, Pb, Mn, Ni, Se, Ag, TL, Zn. **EPA 245.1** Hg.
**EPA 522, EPA 537.1.**

***Non-Potable Water***
**EPA 200.7:** Al, Sb, As, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, K, Se, Ag, Na, Sr, TL, Ti, V, Zn.
**EPA 200.8:** Al, Sb**,** As, Be, Cd, Cr, Cu, Fe, Pb, Mn, Ni, K, Se, Ag, Na, TL, Zn.
**EPA 245.1** Hg.
**SM2340B**

For a complete listing of analytes and methods, please contact your Alpha Project Manager.

# CHAIN OF CUSTODY

PAGE 1 OF 1

ALPHA ANALYTICAL
WESTBORO, MA TEL: 508-898-9220 FAX: 508-898-9193
MANSFIELD, MA TEL: 508-822-9300 FAX: 508-822-3288

Date Rec'd in Lab: 4/6/24

ALPHA Job #: L2418751

## Client Information

Client: TPA

Address:

Phone:

Fax:

Email:

☐ These samples have been previously analyzed by Alpha

## Project Information

Project Name: RWM QC

Project Location:

Project #: 210103

Project Manager: Bob T.

ALPHA Quote #:

## Turn-Around Time

☒ Standard ☐ RUSH (only confirmed if pre-approved)

Date Due: Time:

## Report Information - Data Deliverables

☐ FAX ☐ EMAIL

☐ ADEx ☐ Add'l Deliverables

## Billing Information

☐ Same as Client info PO #:

## Regulatory Requirements/Report Limits

| State /Fed Program | Criteria |
|---|---|
| | |

Other Project Specific Requirements/Comments/Detection Limits:

ANALYSIS: Diss Cd, Zn, Sulfides

SAMPLE HANDLING

Filtration ☒ Done ☐ Not needed ☐ Lab to do

Preservation ☐ Lab to do (Please specify below)

| ALPHA Lab ID (Lab Use Only) | Sample ID | Collection Date | Collection Time | Sample Matrix | Sampler's Initials | Sample Specific Comments | TOTAL # BOTTLES |
|---|---|---|---|---|---|---|---|
| 18751 -01 | RW21-MWI | 4/5/24 | 1030 | GW | TB | | 2 |
| -02 | RW0-MWS | " | 1130 | " | " | | 1 |
| -03 | RW0-MWI | " | 1215 | " | " | | 1 |

Container Type: P P

Preservative: C C

Rel: [signature] 4/6/24 0315

[signature] 4/6/24 0315

| Relinquished By: | Date/Time | Received By: | Date/Time |
|---|---|---|---|
| [signature] PACE | 4/5/24 1400 | [signature] PACE | 4/5/24 1400 |
| Paul Maggelli | 4/5/24 0115 | Paul Maggelli | 4/5/24 2130 |

Please print clearly, legibly and completely. Samples can not be logged in and turnaround time clock will not start until any ambiguities are resolved. All samples submitted are subject to Alpha's Terms and Conditions. See reverse side.

FORM NO: 01-01 (rev. 14-OCT-07)

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*Pace Analytical Services, LLC-Fairfield*

# ANALYTICAL RESULTS

## LEVEL II DELIVERABLES FORMAT

Work Order Number: 24D0598

Pace - Alpha Analytical Laboratories

Project: L2418751



Sudip Pradhan
Laboratory Director

**All Results meet the requirements of the National Environmental Laboratory Accreditation Conference and/or State specific certifications as applicable.**

**Report Date:** Apr 19, 2024

1275 Bloomfield Ave., Bldg. 6, Fairfield, New Jersey 07004
(t) 973.227.0422 (f) 973.227.2813 (w) www.pacelabs.com

**NELAC** National Environmental Laboratory Accreditation Conference
NJDEP #07010 / NYDOH #11634 / PADEP #68-02903

sections 1 2 3 4 5 6 7 8

# CONTENTS

1. Sample Summary . . . 3
2. Chain of Custody . . . 4
3. Methodology Summary . . . 6
4. Abbreviations and Qualifiers . . . 7
5. Conformance/Non-Conformance Summary . . . 8
6. Positive Results Summary . . . 9
7. All Results Summary . . . 10
8. General Chemistry . . . 11
    8.1. General Chemistry Results . . . 12

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# Sample Summary

**Work Order:** 24D0598

**Client:** Pace - Alpha Analytical Laboratories

**Project:** L2418751

| Sample ID | Laboratory ID | Matrix | Date Sampled | Date Received |
|---|---|---|---|---|
| RW21-MWI | 24D0598-01 | Water | 04/05/2024 10:30 | 04/09/2024 08:10 |

# Subcontract Chain of Custody

APL/ Pace Fairfield
1275 Bloomfield Ave.
Bldg. 6
Fairfield, NJ 07004

24D0598

**Alpha Job Number**
L2418751

Pace - Alpha Analytical Laboratories
L2418751

## Client Information

Client: Alpha Analytical Labs
Address: Eight Walkup Drive
Westborough, MA 01581-1019

Phone: 508.844.4115
Email: Mitchell.Ostrowski@pacelabs.com

## Project Information

Project Location: MD
Project Manager: Mitchell Ostrowski

## Turnaround & Deliverables Information

Due Date:
Deliverables:

## rements/Report Limits

State/Federal Program:
Regulatory Criteria:

## Project Specific Requirements and/or Report Requirements

Reference following Alpha Job Number on final report/deliverables: L2418751

Report to include Method Blank, LCS/LCSD:

Additional Comments: Invoices to: invoices@pacelabs.coupahost.com Reports to: west.subreports@pacelabs.com

| Lab ID | Client ID | Collection Date/Time | Sample Matrix | Analysis | Batch QC |
|---|---|---|---|---|---|
| 01 | RW21-MWI | 04-05-24 10:30 | WATER | Sulfide | |

0.1°C

| Relinquished By: | Date/Time: | Received By: | Date/Time: |
|---|---|---|---|
| | 4/8/24 | | 4/8/24 1022 |
| | 4/8/24 | Dan Rubel MC | 4/9/24 0630 |
| | | | 4/9/24 810 |
| Dan Rubel MC | 4/8/24 0800 | | |

Form No: AL_subcoc



Serial_No:04222419:16

DC#_Title: ENV-FRM-FAIR-007 v01_Sample Condition Upon Receipt Form
Effective Date: 7/26/2023

24D0598

## Sample Condition Upon Receipt Form (SCUR)

Affix Sample Label Here

**Date and Initials of person:**
**Examining contents:** nf
**Label:**
**Deliver to location:**
**pH:** >9

Thermometer Used: 7ITR03 Date: 4/9/24 Time: 810 Initials: nf

State of Origin:

**Cooler #1 Temp.°C** 0.0 **(Visual)** +0.1 **(Correction Factor)** 0.1 **(Actual)** ☐ Samples on ice, cooling process has begun

**Courier:** ☐ Fed Ex ☐ UPS ☐ USPS ☐ Client ☐ Commercial ☒ Pace ☐ Other

**Shipping Method:** ☐ First Overnight ☐ Priority Overnight ☐ Standard Overnight ☐ Ground
☐ Other

**Tracking #**

**Custody Seal on Cooler/Box Present:** ☐ Yes ☒ No **Seals intact:** ☐ Yes ☒ No **Ice:** (Wet) Blue Melted None

**Packing Material:** ☐ Bubble Wrap ☐ Bubble Bags ☒ None ☐ Other

**Samples were collected by Pace employee** ☐ Yes ☒ No ☐ N/A

| | | Comments: |
|---|---|---|
| Chain of Custody Present | ☑Yes ☐ No ☐ N/A | |
| Chain of Custody Filled Out | ☑Yes ☐ No ☐ N/A | |
| Relinquished Signature on COC | ☑Yes ☐ No ☐ N/A | |
| Sampler Name and Signature on COC | ☑Yes ☐ No ☐ N/A | |
| Samples Arrived within Hold Time | ☑Yes ☐ No ☐ N/A | |
| Rush TAT requested on COC | ☐Yes ☑ No ☐ N/A | |
| Sufficient Volume | ☑Yes ☐ No ☐ N/A | |
| Correct Containers Used | ☑Yes ☐ No ☐ N/A | |
| Containers Intact | ☑Yes ☐ No ☐ N/A | |
| Sample Labels match COC (sample IDs & date/time of collection) | ☑Yes ☐ No ☐ N/A | |
| All containers needing acid/base preservation have been checked. | ☑Yes ☐ No ☐ N/A | Preservation Information:<br>Preservative:<br>Lot #/Trace #: |
| All Containers needing preservation are found to be in compliance with EPA recommendation:<br>Exceptions: Vials, Microbiology, O&G, Metals | ☑Yes ☐ No ☐ N/A | Date: Time:<br>Initials: |
| Headspace in VOA Vials? ( >6mm): | ☐Yes ☐ No ☑N/A | |
| Trip Blank Present: | ☐Yes ☐ No ☑N/A | |

**Additional Login Comments:**

lot pH #:

**Client notification/ Resolution**

Person Contacted: Date/Time:

Comments/Resolution:

Qualtrax ID: 188127 Pace® Analytical Services, LLC Page 1 of 1

Pace Analytical Services, LLC-Fairfield
Methodology Summary

## Extractable Petroleum Hydrocarbons:

### *Gas Chromatography/Flame Ionization Detector*

New Jersey Department of Environmental Protection Site Remediation Program Extractable Petroleum Hydrocarbons Methodology (Version 3.0).
USEPA SW-846 Test Methods for Evaluating Solid Waste Physical/Chemical Methods Update III, Method 8015D or NJDEP Office of Quality Assurance Quantitation of Semi-Volatile Petroleum Products in Water, Soil and Sediment OQA-QAM-025, Revision 6.

## Metals:

### *Inductively-Coupled Plasma Atomic Emission Spectrometry or Inductively-Coupled Plasma Mass Spectroscopy*

**Wastewater and Groundwater Samples:** USEPA Methods for the Analysis of Water and Wastes, Method 200.7, Method 200.8.
**Soil Samples:** USEPA Methods for Evaluating Solid Waste Physical/Chemical Methods Update III, Method 6010D.

## Mercury:

### *Cold Vapor Atomic Absorption Spectrometry*

**Wastewater and Groundwater Samples:** USEPA Methods for the Analysis of Water and Wastes, Method 245.1.
**Soil Samples**: USEPA SW-846 Test Methods for Evaluating Solid Waste Physical/Chemical Methods Update III, Method 7471B.

## Volatile Organic Compounds:

### *Purge and Trap Gas Chromatography/Mass Spectroscopy*

**Drinking Water Samples:** USEPA Methods for the Determination of Organic Compounds in Drinking Water, Method 524.2.
**Wastewater Samples:** USEPA Methods for the Analysis of Water and Wastes, Method 624.1.
**Soil and Groundwater Samples:** USEPA SW-846 Test Methods for Evaluating Solid Waste Physical/Chemical Methods Update VI, Method 8260D.

## Semi-Volatile Organic Compounds:

### *Gas Chromatography/Mass Spectroscopy*

**Wastewater Samples:** USEPA Methods for the Analysis of Water and Wastes, Method 625.1.
**Soil and Groundwater Samples:** USEPA SW-846 Test Methods for Evaluating Solid Waste Physical/Chemical Methods Update VI, Method 8270E.

## PFAS Compounds:

### *Liquid Chromatography/Tandem Mass Spectroscopy*

**Drinking Water Samples:** USEPA Methods for the Determination of Selected Perfluorinated Alkyl Acids in Drinking Water by Solid Phase Extraction and Liquid Chromatography/Tandem Mass Spectrometry (LC/MS/MS), Method 537 (v1.1).

## Pesticides:

### *Gas Chromatography/Electron Capture Detector*

**Wastewater Samples:** USEPA Methods for the Analysis of Water and Wastes, Method 608.3.
**Soil and Groundwater Samples:** USEPA SW-846 Test Methods for Evaluating Solid Waste Physical/Chemical Methods Update III, Method 8081B.

## Polychlorinated Biphenyls (PCBs):

### *Gas Chromatography/Electron Capture Detector*

**Wastewater Samples:** USEPA Methods for the Analysis of Water and Wastes, Method 608.3.
**Soil and Groundwater Samples:** USEPA SW-846 Test Methods for Evaluating Solid Waste Physical/Chemical Methods Update III, Method 8082A.

## General Chemistry Methods:

### *Various general chemistry methods are taken from* "Standard Methods for the Examination of Water and Wastewater, 22nd Edition", .

Specific method citations can be found on the Analytical Results Summary page of this report listed under 'Method'.

** A complete list of Pace Fairfield's certified Methods are on the Standards And Docs page of the Results Retrieval System

Methodology Summary

Pace Analytical Services, LLC-Fairfield
Data Reporting Abbreviations and Qualifiers



**Method Detection Limit (MDL):**

The MDL is defined as the minimum measured concentration of a substance that can be reported with 99% confidence that the measured concentration is distinguishable from method blank results. The value is calculated following the guidelines defined in:

"Definition and Procedure for the Determination of the Method Detection Limit, Revision 2"
EPA 821-R-16-006, published December 2016.

**Reporting Limit (RL):**

The RL is the Concentration of the lowest calibration standard that was included in the initial calibration of the instrument. On analytical reports this value is corrected for percent moisture and any concentration or dilution factors.

**Concentration (Conc.) / Result:**

If the compound is detected, the measured concentration is reported. If this column is "ND", or contains a 'less than' (<) symbol, the compound was not detected.

**Tentatively Identified Compound (TIC):**

A TIC is a non-targeted compound, not included in the calibration, identified by a mass spectral library search OR requested to be identified and reported by the client.

**Abbreviations:**

| | |
|---|---|
| **ND** | Non-Detect |
| **TNTC** | Too Numerous To Count |

**Qualifers:**

| | |
|---|---|
| **U** | Compound not detected |

Pace Analytical Services, LLC-Fairfield



## QUALITY CONTROL
## Conformance/Non-Conformance Summary

**ANALYSIS: Sulfide [SM 4500-S-D-11]**

COMMENTS:
All samples met QC criteria.

Reviewed By: _____ (IK) 4/19/2024
Sudip Pradhan - Laboratory Director — Date

*For any questions about your Quality Control, please call us at 973-227-0422*

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*Pace Analytical Services, LLC-Fairfield*

# Positive Results Only Summary



No positive results found

**ND** - Indicates compound analyzed for but not detected
**J** - Indicates estimated value
**B** - Indicates compound found in associated blank
**E** - Concentration exceeds highest calibration standard

**D** - Indicates result is based on a dilution
**H** - Indicates a Hold Time violation
**P** - Greater than 25% diff. between 2 GC columns.
**MDL** - Minimum detection limit, **RL** - Reporting limit
**D1** - Sample was Decanted (Dissolved)

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*Pace Analytical Services, LLC-Fairfield*

# All Results Summary

**Client:** Pace - Alpha Analytical Laboratories
**Project:** L2418751
**Work Order:** 24D0598
**Date to Lab:** 4/9/2024 8:10:00AM

**24D0598-01 (Water)** Sample Name: **RW21-MWI** Collected: **4/5/2024 10:30:00AM**

**SM 4500-S-D-11 - General Chemistry**

| Analyte | Result | Qual | MDL | RL | Units | Dilution | Analyzed |
|---|---|---|---|---|---|---|---|
| Sulfide | ND | U | 0.125 | 0.250 | mg/L | 25 | 4/10/24 12:00 |

**ND, U** - Indicates compound analyzed for but not detected
**J** - Indicates estimated value
**B** - Indicates compound found in associated blank
**E** - Concentration exceeds highest calibration standard
**D** - Indicates result is based on a dilution
**H** - Indicates a Hold Time violation
**P** - Greater than 25% diff. between 2 GC columns.
**MDL** - Minimum detection limit, **RL** - Reporting limit
**D1** - Sample was Decanted (Dissolved)

Pace Analytical Services, LLC-Fairfield

# GENERAL CHEMISTRY

Pace - Alpha Analytical Laboratories

Work Order: 24D0598

Project: L2418751

# ANALYSIS DATA SHEET

## General Chemistry

**Client:** Pace - Alpha Analytical Laboratories
**Project:** L2418751
**Work Order:** 24D0598

### General Chemistry

**24D0598-01 (Water) - RW21-MWI**

| Analyte | Units | Conc. | RL | DF | Qual | Analyzed | Method |
|---|---|---|---|---|---|---|---|
| Sulfide | mg/L | ND | 0.250 | 25 | U | 04/10/24 12:00 | SM 4500-S-D-11 |

8 8.1.

**ND** - Indicates compound analyzed for but not detected
**J** - Indicates estimated value
**B** - Indicates compound found in associated blank
**E** - Concentration exceeds highest calibration standard
**D** - Indicates result is based on a dilution
**H** - Indicates a Hold Time violation
**P** - Greater than 25% diff. between 2 GC columns.
**MDL** - Minimum detection limit, **RL** - Reporting limit

F-I

## Pace Analytical Services, LLC-Fairfield

### General Chemistry - Quality Control

| Sulfide | | Result | Reporting Limit | Units | Spike Level | Source Result | %REC | %REC Limits | RPD | RPD Limit |
|---|---|---|---|---|---|---|---|---|---|---|
| **Batch BBD0624** | | Prepared & Analyzed: 4/10/2024 | | | | | | | | |
| BBD0624-BLK1 | | ND | 0.0100 | mg/L | | | | | | |
| BBD0624-BS1 | | 0.380 | 0.0100 | mg/L | 0.400 | | 95.0 | 80-120 | | |
| BBD0624-DUP1 | **Source: 24D0394-02** | ND | 0.0100 | mg/L | | ND | | | | 20 |
| BBD0624-MS1 | **Source: 24D0394-02** | 0.374 | 0.0100 | mg/L | 0.400 | ND | 93.5 | 70-130 | | |
| BBD0624-MSD1 | **Source: 24D0394-02** | 0.374 | 0.0100 | mg/L | 0.400 | ND | 93.5 | 70-130 | 0.00 | 20 |

8 8.1.

**ND** - Indicates compound analyzed for but not detected
**J** - Indicates estimated value
**B** - Indicates compound found in associated blank
**E** - Concentration exceeds highest calibration standard

**D** - Indicates result is based on a dilution
**H** - Indicates a Hold Time violation
**P** - Greater than 25% diff. between 2 GC columns.
**MDL** - Minimum detection limit, **RL** - Reporting limit

F-III

# ANALYTICAL REPORT

| | |
|---|---|
| Lab Number: | L2419292 |
| Client: | Tradepoint Atlantic<br>1600 Sparrows Point Boulevard<br>Baltimore, MD 21219 |
| ATTN: | Robert Tworkowski |
| Phone: | (443) 649-5073 |
| Project Name: | RWM-Q1 |
| Project Number: | 21010103 |
| Report Date: | 04/23/24 |

The original project report/data package is held by Alpha Analytical. This report/data package is paginated and should be reproduced only in its entirety. Alpha Analytical holds no responsibility for results and/or data that are not consistent with the original.

Certifications & Approvals: MA (M-MA086), NH NELAP (2064), CT (PH-0826), IL (200077), IN (C-MA-03), KY (KY98045), ME (MA00086), MD (348), NJ (MA935), NY (11148), NC (25700/666), OH (CL108), OR (MA-1316), PA (68-03671), RI (LAO00065), TX (T104704476), VT (VT-0935), VA (460195), USDA (Permit #525-23-122-91930).

Eight Walkup Drive, Westborough, MA 01581-1019
508-898-9220 (Fax) 508-898-9193 800-624-9220 - www.alphalab.com

**Project Name:** RWM-Q1
**Project Number:** 21010103

**Lab Number:** L2419292
**Report Date:** 04/23/24

| Alpha Sample ID | Client ID | Matrix | Sample Location | Collection Date/Time | Receive Date |
|---|---|---|---|---|---|
| L2419292-01 | RW07-MWS | WATER | Not Specified | 04/08/24 13:35 | 04/09/24 |
| L2419292-02 | RW07-MWI | WATER | Not Specified | 04/08/24 14:00 | 04/09/24 |
| L2419292-03 | RW22R-MWS | WATER | Not Specified | 04/09/24 10:55 | 04/09/24 |
| L2419292-04 | RW22R-MWI | WATER | Not Specified | 04/09/24 11:30 | 04/09/24 |
| L2419292-05 | RWF-MWS | WATER | Not Specified | 04/09/24 12:20 | 04/09/24 |
| L2419292-06 | RWF-MWI | WATER | Not Specified | 04/09/24 13:05 | 04/09/24 |
| L2419292-07 | RW05R-MWI | WATER | Not Specified | 04/09/24 13:55 | 04/09/24 |
| L2419292-08 | RWG-MWS | WATER | Not Specified | 04/09/24 15:20 | 04/09/24 |
| L2419292-09 | RWG-MWI | WATER | Not Specified | 04/09/24 15:45 | 04/09/24 |

| | | | |
|---|---|---|---|
| **Project Name:** | RWM-Q1 | **Lab Number:** | L2419292 |
| **Project Number:** | 21010103 | **Report Date:** | 04/23/24 |

## Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet NELAP requirements for all NELAP accredited parameters unless otherwise noted in the following narrative. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. Tentatively Identified Compounds (TICs), if requested, are reported for compounds identified to be present and are not part of the method/program Target Compound List, even if only a subset of the TCL are being reported. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively.

When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances, the specific failure is not narrated but noted in the associated QC Outlier Summary Report, located directly after the Case Narrative. QC information is also incorporated in the Data Usability Assessment table (Format 11) of our Data Merger tool, where it can be reviewed in conjunction with the sample result, associated regulatory criteria and any associated data usability implications.

Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

HOLD POLICY - For samples submitted on hold, Alpha's policy is to hold samples (with the exception of Air canisters) free of charge for 21 calendar days from the date the project is completed. After 21 calendar days, we will dispose of all samples submitted including those put on hold unless you have contacted your Alpha Project Manager and made arrangements for Alpha to continue to hold the samples. Air canisters will be disposed after 3 business days from the date the project is completed.

Please contact Project Management at 800-624-9220 with any questions.

**Project Name:** RWM-Q1 **Lab Number:** L2419292
**Project Number:** 21010103 **Report Date:** 04/23/24

**Case Narrative (continued)**

Report Submission

April 23, 2024: This final report includes the results of all requested analyses.

April 16, 2024: This is a preliminary report.

All non-detect (ND) or estimated concentrations (J-qualified) have been quantitated to the limit noted in the MDL column.

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature: Cristin Walker

Title: Technical Director/Representative Date: 04/23/24

# METALS

**Project Name:** RWM-Q1 **Lab Number:** L2419292

**Project Number:** 21010103 **Report Date:** 04/23/24

## SAMPLE RESULTS

Lab ID: L2419292-01 Date Collected: 04/08/24 13:35

Client ID: RW07-MWS Date Received: 04/09/24

Sample Location: Not Specified Field Prep: Refer to COC

Sample Depth:

Matrix: Water

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dissolved Metals - Mansfield Lab** | | | | | | | | | | | |
| Cadmium, Dissolved | 4.380 | | ug/l | 0.2000 | 0.0599 | 1 | 04/11/24 13:17 | 04/15/24 12:08 | EPA 3005A | 1,6020B | EJF |
| Zinc, Dissolved | 149.2 | | ug/l | 10.00 | 3.410 | 1 | 04/11/24 13:17 | 04/15/24 12:08 | EPA 3005A | 1,6020B | EJF |

**Project Name:** RWM-Q1 **Lab Number:** L2419292

**Project Number:** 21010103 **Report Date:** 04/23/24

## SAMPLE RESULTS

Lab ID: L2419292-02 Date Collected: 04/08/24 14:00

Client ID: RW07-MWI Date Received: 04/09/24

Sample Location: Not Specified Field Prep: Refer to COC

Sample Depth:

Matrix: Water

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dissolved Metals - Mansfield Lab** | | | | | | | | | | | |
| Cadmium, Dissolved | 1.523 | | ug/l | 0.2000 | 0.0599 | 1 | 04/11/24 13:17 | 04/15/24 12:12 | EPA 3005A | 1,6020B | EJF |
| Zinc, Dissolved | 499.8 | | ug/l | 10.00 | 3.410 | 1 | 04/11/24 13:17 | 04/15/24 12:12 | EPA 3005A | 1,6020B | EJF |

**Project Name:** RWM-Q1 **Lab Number:** L2419292

**Project Number:** 21010103 **Report Date:** 04/23/24

## SAMPLE RESULTS

Lab ID: L2419292-03 Date Collected: 04/09/24 10:55

Client ID: RW22R-MWS Date Received: 04/09/24

Sample Location: Not Specified Field Prep: Refer to COC

Sample Depth:

Matrix: Water

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dissolved Metals - Mansfield Lab** | | | | | | | | | | | |
| Cadmium, Dissolved | 28.10 | | ug/l | 0.2000 | 0.0599 | 1 | 04/11/24 13:17 | 04/15/24 12:17 | EPA 3005A | 1,6020B | EJF |
| Zinc, Dissolved | 88690 | | ug/l | 100.0 | 34.10 | 10 | 04/11/24 13:17 | 04/15/24 12:48 | EPA 3005A | 1,6020B | EJF |

**Project Name:** RWM-Q1 **Lab Number:** L2419292

**Project Number:** 21010103 **Report Date:** 04/23/24

## SAMPLE RESULTS

Lab ID: L2419292-04 Date Collected: 04/09/24 11:30

Client ID: RW22R-MWI Date Received: 04/09/24

Sample Location: Not Specified Field Prep: Refer to COC

Sample Depth:

Matrix: Water

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dissolved Metals - Mansfield Lab** | | | | | | | | | | | |
| Cadmium, Dissolved | 1.893 | | ug/l | 0.2000 | 0.0599 | 1 | 04/11/24 13:17 | 04/15/24 12:21 | EPA 3005A | 1,6020B | EJF |
| Zinc, Dissolved | 82310 | | ug/l | 100.0 | 34.10 | 10 | 04/11/24 13:17 | 04/15/24 13:06 | EPA 3005A | 1,6020B | EJF |

**Project Name:** RWM-Q1 **Lab Number:** L2419292

**Project Number:** 21010103 **Report Date:** 04/23/24

## SAMPLE RESULTS

Lab ID: L2419292-05 Date Collected: 04/09/24 12:20

Client ID: RWF-MWS Date Received: 04/09/24

Sample Location: Not Specified Field Prep: Refer to COC

Sample Depth:

Matrix: Water

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dissolved Metals - Mansfield Lab** | | | | | | | | | | | |
| Cadmium, Dissolved | 1.024 | | ug/l | 0.2000 | 0.0599 | 1 | 04/11/24 13:17 | 04/15/24 12:26 | EPA 3005A | 1,6020B | EJF |
| Zinc, Dissolved | 22400 | | ug/l | 100.0 | 34.10 | 10 | 04/11/24 13:17 | 04/15/24 13:11 | EPA 3005A | 1,6020B | EJF |

**Project Name:** RWM-Q1 **Lab Number:** L2419292

**Project Number:** 21010103 **Report Date:** 04/23/24

## SAMPLE RESULTS

Lab ID: L2419292-06 Date Collected: 04/09/24 13:05

Client ID: RWF-MWI Date Received: 04/09/24

Sample Location: Not Specified Field Prep: Refer to COC

Sample Depth:

Matrix: Water

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dissolved Metals - Mansfield Lab** | | | | | | | | | | | |
| Cadmium, Dissolved | 1558. | | ug/l | 4.000 | 1.198 | 20 | 04/11/24 13:17 | 04/15/24 13:29 | EPA 3005A | 1,6020B | EJF |
| Zinc, Dissolved | 58150 | | ug/l | 200.0 | 68.20 | 20 | 04/11/24 13:17 | 04/15/24 13:29 | EPA 3005A | 1,6020B | EJF |

**Project Name:** RWM-Q1 **Lab Number:** L2419292

**Project Number:** 21010103 **Report Date:** 04/23/24

## SAMPLE RESULTS

Lab ID: L2419292-07 Date Collected: 04/09/24 13:55

Client ID: RW05R-MWI Date Received: 04/09/24

Sample Location: Not Specified Field Prep: Refer to COC

Sample Depth:

Matrix: Water

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dissolved Metals - Mansfield Lab** | | | | | | | | | | | |
| Cadmium, Dissolved | 1622. | | ug/l | 4.000 | 1.198 | 20 | 04/11/24 13:17 | 04/15/24 13:33 | EPA 3005A | 1,6020B | EJF |
| Zinc, Dissolved | 60490 | | ug/l | 200.0 | 68.20 | 20 | 04/11/24 13:17 | 04/15/24 13:33 | EPA 3005A | 1,6020B | EJF |

**Project Name:** RWM-Q1 **Lab Number:** L2419292

**Project Number:** 21010103 **Report Date:** 04/23/24

## SAMPLE RESULTS

Lab ID: L2419292-09 Date Collected: 04/09/24 15:45

Client ID: RWG-MWI Date Received: 04/09/24

Sample Location: Not Specified Field Prep: Refer to COC

Sample Depth:

Matrix: Water

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dissolved Metals - Mansfield Lab** | | | | | | | | | | | |
| Cadmium, Dissolved | 130.7 | | ug/l | 2.000 | 0.5990 | 10 | 04/11/24 13:17 | 04/15/24 13:24 | EPA 3005A | 1,6020B | EJF |
| Zinc, Dissolved | 2787. | | ug/l | 10.00 | 3.410 | 1 | 04/11/24 13:17 | 04/15/24 12:39 | EPA 3005A | 1,6020B | EJF |

**Project Name:** RWM-Q1 **Lab Number:** L2419292

**Project Number:** 21010103 **Report Date:** 04/23/24

# Method Blank Analysis
# Batch Quality Control

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|
| Dissolved Metals - Mansfield Lab for sample(s): 01-07,09 Batch: WG1907469-1 | | | | | | | | | | |
| Cadmium, Dissolved | ND | | ug/l | 0.2000 | 0.0599 | 1 | 04/11/24 13:17 | 04/15/24 11:09 | 1,6020B | EJF |
| Zinc, Dissolved | ND | | ug/l | 10.00 | 3.410 | 1 | 04/11/24 13:17 | 04/15/24 11:09 | 1,6020B | EJF |

**Prep Information**

Digestion Method: EPA 3005A

# Lab Control Sample Analysis

## Batch Quality Control

**Project Name:** RWM-Q1

**Project Number:** 21010103

**Lab Number:** L2419292

**Report Date:** 04/23/24

| Parameter | LCS %Recovery | Qual | LCSD %Recovery | Qual | %Recovery Limits | RPD | Qual | RPD Limits |
|---|---|---|---|---|---|---|---|---|
| Dissolved Metals - Mansfield Lab Associated sample(s): 01-07,09 Batch: WG1907469-2 | | | | | | | | |
| Cadmium, Dissolved | 104 | | - | | 80-120 | - | | |
| Zinc, Dissolved | 101 | | - | | 80-120 | - | | |

# Matrix Spike Analysis
## Batch Quality Control

**Project Name:** RWM-Q1
**Project Number:** 21010103

**Lab Number:** L2419292
**Report Date:** 04/23/24

| Parameter | Native Sample | MS Added | MS Found | MS %Recovery | Qual | MSD Found | MSD %Recovery | Qual | Recovery Limits | RPD | Qual | RPD Limits |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Dissolved Metals - Mansfield Lab Associated sample(s): 01-07,09 QC Batch ID: WG1907469-3 QC Sample: L2419285-01 Client ID: MS Sample | | | | | | | | | | | | |
| Cadmium, Dissolved | ND | 53 | 52.79 | 100 | | - | - | | 75-125 | - | | 20 |
| Zinc, Dissolved | 8.639J | 500 | 491.8 | 98 | | - | - | | 75-125 | - | | 20 |

**Project Name:** RWM-Q1
**Project Number:** 21010103

**Lab Number:** L2419292
**Report Date:** 04/23/24

## Sample Receipt and Container Information

Were project specific reporting limits specified? YES

### Cooler Information

| Cooler | Custody Seal |
|---|---|
| A | Absent |

### Container Information

| Container ID | Container Type | Cooler | Initial pH | Final pH | Temp deg C | Pres | Seal | Frozen Date/Time | Analysis(*) |
|---|---|---|---|---|---|---|---|---|---|
| L2419292-01A | Plastic 250ml HNO3 preserved | A | <2 | <2 | 2.3 | Y | Absent | | ZN-6020S-PPB(180),CD-6020S-PPB(180) |
| L2419292-02A | Plastic 250ml HNO3 preserved | A | <2 | <2 | 2.3 | Y | Absent | | ZN-6020S-PPB(180),CD-6020S-PPB(180) |
| L2419292-03A | Plastic 250ml HNO3 preserved | A | <2 | <2 | 2.3 | Y | Absent | | ZN-6020S-PPB(180),CD-6020S-PPB(180) |
| L2419292-04A | Plastic 250ml HNO3 preserved | A | <2 | <2 | 2.3 | Y | Absent | | ZN-6020S-PPB(180),CD-6020S-PPB(180) |
| L2419292-05A | Plastic 250ml HNO3 preserved | A | <2 | <2 | 2.3 | Y | Absent | | ZN-6020S-PPB(180),CD-6020S-PPB(180) |
| L2419292-06A | Plastic 250ml HNO3 preserved | A | <2 | <2 | 2.3 | Y | Absent | | ZN-6020S-PPB(180),CD-6020S-PPB(180) |
| L2419292-07A | Plastic 250ml HNO3 preserved | A | <2 | <2 | 2.3 | Y | Absent | | ZN-6020S-PPB(180),CD-6020S-PPB(180) |
| L2419292-08A | Plastic 250ml HNO3 preserved | A | <2 | <2 | 2.3 | Y | Absent | | HOLD-METAL-DISSOLVED(180) |
| L2419292-09A | Plastic 250ml HNO3 preserved | A | <2 | <2 | 2.3 | Y | Absent | | ZN-6020S-PPB(180),CD-6020S-PPB(180) |



*Values in parentheses indicate holding time in days

| | | | |
|---|---|---|---|
| **Project Name:** | RWM-Q1 | **Lab Number:** | L2419292 |
| **Project Number:** | 21010103 | **Report Date:** | 04/23/24 |

## GLOSSARY

***Acronyms***

DL - Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the limit of quantitation (LOQ). The DL includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)

EDL - Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME).

EMPC - Estimated Maximum Possible Concentration: The concentration that results from the signal present at the retention time of an analyte when the ions meet all of the identification criteria except the ion abundance ratio criteria. An EMPC is a worst-case estimate of the concentration.

EPA - Environmental Protection Agency.

LCS - Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.

LCSD - Laboratory Control Sample Duplicate: Refer to LCS.

LFB - Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.

LOD - Limit of Detection: This value represents the level to which a target analyte can reliably be detected for a specific analyte in a specific matrix by a specific method. The LOD includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)

LOQ - Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)

Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)

MDL - Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.

MS - Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available. For Method 332.0, the spike recovery is calculated using the native concentration, including estimated values.

MSD - Matrix Spike Sample Duplicate: Refer to MS.

NA - Not Applicable.

NC - Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.

NDPA/DPA - N-Nitrosodiphenylamine/Diphenylamine.

NI - Not Ignitable.

NP - Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil.

NR - No Results: Term is utilized when 'No Target Compounds Requested' is reported for the analysis of Volatile or Semivolatile Organic TIC only requests.

RL - Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.

RPD - Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report.

SRM - Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples.

STLP - Semi-dynamic Tank Leaching Procedure per EPA Method 1315.

TEF - Toxic Equivalency Factors: The values assigned to each dioxin and furan to evaluate their toxicity relative to 2,3,7,8-TCDD.

TEQ - Toxic Equivalent: The measure of a sample's toxicity derived by multiplying each dioxin and furan by its corresponding TEF and then summing the resulting values.

TIC - Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations.

*Report Format: DU Report with 'J' Qualifiers*

| | | | |
|---|---|---|---|
| **Project Name:** | RWM-Q1 | **Lab Number:** | L2419292 |
| **Project Number:** | 21010103 | **Report Date:** | 04/23/24 |

***Footnotes***

1 - The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

***Terms***

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Chlordane: The target compound Chlordane (CAS No. 57-74-9) is reported for GC ECD analyses. Per EPA,this compound "refers to a mixture of chlordane isomers, other chlorinated hydrocarbons and numerous other components." (Reference: USEPA Toxicological Review of Chlordane, In Support of Summary Information on the Integrated Risk Information System (IRIS), December 1997.)

Difference: With respect to Total Oxidizable Precursor (TOP) Assay analysis, the difference is defined as the Post-Treatment value minus the Pre-Treatment value.

Final pH: As it pertains to Sample Receipt & Container Information section of the report, Final pH reflects pH of container determined after adjustment at the laboratory, if applicable. If no adjustment required, value reflects Initial pH.

Frozen Date/Time: With respect to Volatile Organics in soil, Frozen Date/Time reflects the date/time at which associated Reagent Water-preserved vials were initially frozen. Note: If frozen date/time is beyond 48 hours from sample collection, value will be reflected in 'bold'.

Gasoline Range Organics (GRO): Gasoline Range Organics (GRO) results include all chromatographic peaks eluting from Methyl tert butyl ether through Naphthalene, with the exception of GRO analysis in support of State of Ohio programs, which includes all chromatographic peaks eluting from Hexane through Dodecane.

Initial pH: As it pertains to Sample Receipt & Container Information section of the report, Initial pH reflects pH of container determined upon receipt, if applicable.

PAH Total: With respect to Alkylated PAH analyses, the 'PAHs, Total' result is defined as the summation of results for all or a subset of the following compounds: Naphthalene, C1-C4 Naphthalenes, 2-Methylnaphthalene, 1-Methylnaphthalene, Biphenyl, Acenaphthylene, Acenaphthene, Fluorene, C1-C3 Fluorenes, Phenanthrene, C1-C4 Phenanthrenes/Anthracenes, Anthracene, Fluoranthene, Pyrene, C1-C4 Fluoranthenes/Pyrenes, Benz(a)anthracene, Chrysene, C1-C4 Chrysenes, Benzo(b)fluoranthene, Benzo(j)+(k)fluoranthene, Benzo(e)pyrene, Benzo(a)pyrene, Perylene, Indeno(1,2,3-cd)pyrene, Dibenz(ah)+(ac)anthracene, Benzo(g,h,i)perylene. If a 'Total' result is requested, the results of its individual components will also be reported.

PFAS Total: With respect to PFAS analyses, the 'PFAS, Total (5)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA and PFOS. In addition, the 'PFAS, Total (6)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA, PFDA and PFOS. For MassDEP DW compliance analysis only, the 'PFAS, Total (6)' result is defined as the summation of results at or above the RL. Note: If a 'Total' result is requested, the results of its individual components will also be reported.

Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

***Data Qualifiers***

**A** - Spectra identified as "Aldol Condensates" are byproducts of the extraction/concentration procedures when acetone is introduced in the process.

**B** - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).

**C** - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.

**D** - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.

**E** - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.

**F** - The ratio of quantifier ion response to qualifier ion response falls outside of the laboratory criteria. Results are considered to be an estimated maximum concentration.

**G** - The concentration may be biased high due to matrix interferences (i.e, co-elution) with non-target compound(s). The result should be considered estimated.

**H** - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.

**I** - The lower value for the two columns has been reported due to obvious interference.

**J** - Estimated value. The Target analyte concentration is below the quantitation limit (RL), but above the Method Detection Limit (MDL) or Estimated Detection Limit (EDL) for SPME-related analyses. This represents an estimated concentration for Tentatively

*Report Format: DU Report with 'J' Qualifiers*

| | | | |
|---|---|---|---|
| **Project Name:** | RWM-Q1 | **Lab Number:** | L2419292 |
| **Project Number:** | 21010103 | **Report Date:** | 04/23/24 |

***Data Qualifiers***

Identified Compounds (TICs). For calculated parameters, this represents that one or more values used in the calculation were estimated.

**M** - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.

**ND** - Not detected at the method detection limit (MDL) for the sample, or estimated detection limit (EDL) for SPME-related analyses.

**NJ** - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where the identification is based on a mass spectral library search.

**P** - The RPD between the results for the two columns exceeds the method-specified criteria.

**Q** - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)

**R** - Analytical results are from sample re-analysis.

**RE** - Analytical results are from sample re-extraction.

**S** - Analytical results are from modified screening analysis.

**V** - The surrogate associated with this target analyte has a recovery outside the QC acceptance limits. (Applicable to MassDEP DW Compliance samples only.)

**Z** - The batch matrix spike and/or duplicate associated with this target analyte has a recovery/RPD outside the QC acceptance limits. (Applicable to MassDEP DW Compliance samples only.)

| | | | |
|---|---|---|---|
| **Project Name:** | RWM-Q1 | **Lab Number:** | L2419292 |
| **Project Number:** | 21010103 | **Report Date:** | 04/23/24 |

## REFERENCES

1 Test Methods for Evaluating Solid Waste: Physical/Chemical Methods. EPA SW-846. Third Edition. Updates I - VI, 2018.

## LIMITATION OF LIABILITIES

Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Analytical shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Alpha Analytical.

We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.

# Certification Information

**The following analytes are not included in our Primary NELAP Scope of Accreditation:**

**Westborough Facility**
**EPA 624.1:** m/p-xylene, o-xylene, Naphthalene
**EPA 625.1:** alpha-Terpineol
**EPA 8260D:** NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene; SCM: Iodomethane (methyl iodide), 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.
**EPA 8270E:** NPW: Dimethylnaphthalene,1,4-Diphenylhydrazine, alpha-Terpineol, Azobenzene; SCM: Dimethylnaphthalene,1,4-Diphenylhydrazine.
**SM4500**: NPW: Amenable Cyanide; SCM: Total Phosphorus, TKN, NO2, NO3.

**Mansfield Facility**
**SM 2540D:** TSS.
**EPA TO-15:** Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene, 3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene.
**Nonpotable Water: EPA RSK-175 Dissolved Gases**
**Biological Tissue Matrix:** EPA 3050B

**The following analytes are included in our Massachusetts DEP Scope of Accreditation**

**Westborough Facility:**

***Drinking Water***
**EPA 300.0**: Chloride, Nitrate-N, Fluoride, Sulfate; **EPA 353.2**: Nitrate-N, Nitrite-N; **SM4500NO3-F**: Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE, EPA 180.1, SM2130B, SM4500Cl-D, SM2320B, SM2540C, SM4500H-B, SM4500NO2-B**
**EPA 524.2:** THMs and VOCs; **EPA 504.1:** EDB, DBCP.
**Microbiology**: **SM9215B; SM9223-P/A, SM9223B-Colilert-QT,SM9222D**.

***Non-Potable Water***
**SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2320B, SM4500CL-E, SM4500F-BC, SM4500NH3-BH:** Ammonia-N and Kjeldahl-N, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **EPA 351.1, SM4500NO3-F, EPA 353.2**: Nitrate-N**, SM4500P-E, SM4500P-B, E, SM4500SO4-E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, EPA 420.1, SM4500-CN-CE, SM2540D, EPA 300: Chloride, Sulfate, Nitrate.**
**EPA 624.1**: Volatile Halocarbons & Aromatics,
**EPA 608.3**: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs
**EPA 625.1**: SVOC (Acid/Base/Neutral Extractables).
**Microbiology**: **SM9223B-Colilert-QT; Enterolert-QT, EPA 1600, EPA 1603, SM9222D.**

**Mansfield Facility:**

***Drinking Water***
**EPA 200.7:** Al, Ba, Cd, Cr, Cu, Fe, Mn, Ni, Na, Ag, Ca, Zn. **EPA 200.8:** Al, Sb, As, Ba, Be, Cd, Cr, Cu, Pb, Mn, Ni, Se, Ag, TL, Zn. **EPA 245.1** Hg.
**EPA 522, EPA 537.1.**

***Non-Potable Water***
**EPA 200.7:** Al, Sb, As, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, K, Se, Ag, Na, Sr, TL, Ti, V, Zn.
**EPA 200.8:** Al, Sb**,** As, Be, Cd, Cr, Cu, Fe, Pb, Mn, Ni, K, Se, Ag, Na, TL, Zn.
**EPA 245.1** Hg.
**SM2340B**

For a complete listing of analytes and methods, please contact your Alpha Project Manager.

# CHAIN OF CUSTODY

PAGE 1 OF 1

ALPHA ANALYTICAL
WESTBORO, MA TEL: 508-898-9220 FAX: 508-898-9193
MANSFIELD, MA TEL: 508-822-9300 FAX: 508-822-3288

Date Rec'd in Lab: 04/10/24

ALPHA Job #: L2419292

## Client Information

Client: TPA

Address:

Phone:

Fax:

Email:

☐ These samples have been previously analyzed by Alpha

## Project Information

Project Name: RWM-Q1

Project Location:

Project #: 210103

Project Manager: BoB T.

ALPHA Quote #:

## Turn-Around Time

☑ Standard ☐ RUSH (only confirmed if pre-approved!)

Date Due: Time:

## Report Information - Data Deliverables

☐ FAX ☐ EMAIL

☐ ADEx ☐ Add'l Deliverables

## Billing Information

☐ Same as Client info PO #:

## Regulatory Requirements/Report Limits

| State /Fed Program | Criteria |
|---|---|
| | |

Other Project Specific Requirements/Comments/Detection Limits:

ANALYSIS: Diss. Zn + Cd, Sulfides

SAMPLE HANDLING

Filtration ☑ Done ☐ Not needed ☐ Lab to do

Preservation ☐ Lab to do (Please specify below)

| ALPHA Lab ID (Lab Use Only) | Sample ID | Collection Date | Collection Time | Sample Matrix | Sampler's Initials | Sample Specific Comments | TOTAL # BOTTLES |
|---|---|---|---|---|---|---|---|
| 19292-01 | RWQ7-MWS | 4/8/24 | 1335 | GW | TP | | 1 |
| -02 | RWQ7-MWI | 4/8/24 | 1400 | | | | 1 |
| -03 | RW22R-MWS | 4/9/24 | 1055 | | | | 1 |
| -04 | RW22R-MWI | | 1130 | | | | 1 |
| -05 | RWF-MWS | | 1220 | | | | 1 |
| -06 | RWF-MWI | | 1305 | | | | 1 |
| -07 | RWQ5R-MWI | | 1355 | | | | 1 |
| -08 | RWG-MWS | | 1520 | | | Hold - Do Not Analyze | 1 |
| -09 | RWG-MWI | | 1545 | | | | 1 |

Container Type

Preservative

| Relinquished By: | Date/Time | Received By: | Date/Time |
|---|---|---|---|
| ABM | 4/9/24 1600 | Andrew PACE | 4/9/24 1630 |
| Andrew PACE | 4/9/24 1800 | | 4/9/24 1800 |
| Paul Mazzella | 4/9/24 2100 | Paul Mazzella | 4/9/24 2200 |
| Paul Mazzella | 4/9/24 0140 | | 4/10/24 0140 |

Rel: SQ 4/10/24 0345

4/10/24 0345

Please print clearly, legibly and completely. Samples can not be logged in and turnaround time clock will not start until any ambiguities are resolved. All samples submitted are subject to Alpha's Terms and Conditions. See reverse side.

ANALYTICAL REPORT

| | |
|---|---|
| Lab Number: | L2420048 |
| Client: | Tradepoint Atlantic<br>1600 Sparrows Point Boulevard<br>Baltimore, MD 21219 |
| ATTN: | Robert Tworkowski |
| Phone: | (443) 649-5073 |
| Project Name: | RWM-Q1 |
| Project Number: | 21010103 |
| Report Date: | 04/18/24 |

The original project report/data package is held by Alpha Analytical. This report/data package is paginated and should be reproduced only in its entirety. Alpha Analytical holds no responsibility for results and/or data that are not consistent with the original.

Certifications & Approvals: MA (M-MA086), NH NELAP (2064), CT (PH-0826), IL (200077), IN (C-MA-03), KY (KY98045), ME (MA00086), MD (348), NJ (MA935), NY (11148), NC (25700/666), OH (CL108), OR (MA-1316), PA (68-03671), RI (LAO00065), TX (T104704476), VT (VT-0935), VA (460195), USDA (Permit #525-23-122-91930).

Eight Walkup Drive, Westborough, MA 01581-1019
508-898-9220 (Fax) 508-898-9193 800-624-9220 - www.alphalab.com

**Project Name:** RWM-Q1
**Project Number:** 21010103

**Lab Number:** L2420048
**Report Date:** 04/18/24

| Alpha Sample ID | Client ID | Matrix | Sample Location | Collection Date/Time | Receive Date |
|---|---|---|---|---|---|
| L2420048-01 | RW08-MWI | WATER | Not Specified | 04/11/24 12:40 | 04/11/24 |

| | | | |
|---|---|---|---|
| **Project Name:** | RWM-Q1 | **Lab Number:** | L2420048 |
| **Project Number:** | 21010103 | **Report Date:** | 04/18/24 |

## Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet NELAP requirements for all NELAP accredited parameters unless otherwise noted in the following narrative. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. Tentatively Identified Compounds (TICs), if requested, are reported for compounds identified to be present and are not part of the method/program Target Compound List, even if only a subset of the TCL are being reported. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively.

When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances, the specific failure is not narrated but noted in the associated QC Outlier Summary Report, located directly after the Case Narrative. QC information is also incorporated in the Data Usability Assessment table (Format 11) of our Data Merger tool, where it can be reviewed in conjunction with the sample result, associated regulatory criteria and any associated data usability implications.

Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

HOLD POLICY - For samples submitted on hold, Alpha's policy is to hold samples (with the exception of Air canisters) free of charge for 21 calendar days from the date the project is completed. After 21 calendar days, we will dispose of all samples submitted including those put on hold unless you have contacted your Alpha Project Manager and made arrangements for Alpha to continue to hold the samples. Air canisters will be disposed after 3 business days from the date the project is completed.

Please contact Project Management at 800-624-9220 with any questions.

| | | | |
|---|---|---|---|
| **Project Name:** | RWM-Q1 | **Lab Number:** | L2420048 |
| **Project Number:** | 21010103 | **Report Date:** | 04/18/24 |

**Case Narrative (continued)**

Report Submission

All non-detect (ND) or estimated concentrations (J-qualified) have been quantitated to the limit noted in the MDL column.

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature: Melissa Sturgis Melissa Sturgis

Title: Technical Director/Representative Date: 04/18/24

# METALS

**Project Name:** RWM-Q1 **Lab Number:** L2420048

**Project Number:** 21010103 **Report Date:** 04/18/24

## SAMPLE RESULTS

Lab ID: L2420048-01 Date Collected: 04/11/24 12:40

Client ID: RW08-MWI Date Received: 04/11/24

Sample Location: Not Specified Field Prep: Refer to COC

Sample Depth:

Matrix: Water

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dissolved Metals - Mansfield Lab** | | | | | | | | | | | |
| Cadmium, Dissolved | 12.00 | | ug/l | 0.2000 | 0.0599 | 1 | 04/15/24 18:50 | 04/17/24 14:37 | EPA 3005A | 1,6020B | EJF |
| Zinc, Dissolved | 62090 | | ug/l | 100.0 | 34.10 | 10 | 04/15/24 18:50 | 04/17/24 15:30 | EPA 3005A | 1,6020B | EJF |

**Project Name:** RWM-Q1 **Lab Number:** L2420048

**Project Number:** 21010103 **Report Date:** 04/18/24

# Method Blank Analysis
# Batch Quality Control

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|
| Dissolved Metals - Mansfield Lab for sample(s): 01 Batch: WG1908921-1 | | | | | | | | | | |
| Cadmium, Dissolved | ND | | ug/l | 0.2000 | 0.0599 | 1 | 04/15/24 18:50 | 04/16/24 18:37 | 1,6020B | NTB |
| Zinc, Dissolved | ND | | ug/l | 10.00 | 3.410 | 1 | 04/15/24 18:50 | 04/16/24 18:37 | 1,6020B | NTB |

**Prep Information**

Digestion Method: EPA 3005A

# Lab Control Sample Analysis

## Batch Quality Control

**Project Name:** RWM-Q1

**Project Number:** 21010103

**Lab Number:** L2420048

**Report Date:** 04/18/24

| Parameter | LCS %Recovery | Qual | LCSD %Recovery | Qual | %Recovery Limits | RPD | Qual | RPD Limits |
|---|---|---|---|---|---|---|---|---|
| Dissolved Metals - Mansfield Lab Associated sample(s): 01 Batch: WG1908921-2 | | | | | | | | |
| Cadmium, Dissolved | 100 | | - | | 80-120 | - | | |
| Zinc, Dissolved | 101 | | - | | 80-120 | - | | |

# Matrix Spike Analysis
## Batch Quality Control

**Project Name:** RWM-Q1
**Project Number:** 21010103

**Lab Number:** L2420048
**Report Date:** 04/18/24

| Parameter | Native Sample | MS Added | MS Found | MS %Recovery | Qual | MSD Found | MSD %Recovery | Qual | Recovery Limits | RPD | Qual | RPD Limits |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Dissolved Metals - Mansfield Lab Associated sample(s): 01 QC Batch ID: WG1908921-3 QC Sample: L2419631-12 Client ID: MS Sample | | | | | | | | | | | | |
| Cadmium, Dissolved | ND | 53 | 52.15 | 98 | | - | - | | 75-125 | - | | 20 |
| Zinc, Dissolved | 9.041J | 500 | 518.3 | 104 | | - | - | | 75-125 | - | | 20 |

**Project Name:** RWM-Q1
**Project Number:** 21010103

**Lab Number:** L2420048
**Report Date:** 04/18/24

## Sample Receipt and Container Information

Were project specific reporting limits specified? YES

### Cooler Information

| Cooler | Custody Seal |
|---|---|
| A | Absent |

### Container Information

| Container ID | Container Type | Cooler | Initial pH | Final pH | Temp deg C | Pres | Seal | Frozen Date/Time | Analysis(*) |
|---|---|---|---|---|---|---|---|---|---|
| L2420048-01A | Plastic 250ml HNO3 preserved | A | <2 | <2 | 3.2 | Y | Absent | | ZN-6020S-PPB(180),CD-6020S-PPB(180) |



*Values in parentheses indicate holding time in days

| | | | |
|---|---|---|---|
| **Project Name:** | RWM-Q1 | **Lab Number:** | L2420048 |
| **Project Number:** | 21010103 | **Report Date:** | 04/18/24 |

## GLOSSARY

***Acronyms***

| | |
|---|---|
| DL | - Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the limit of quantitation (LOQ). The DL includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.) |
| EDL | - Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME). |
| EMPC | - Estimated Maximum Possible Concentration: The concentration that results from the signal present at the retention time of an analyte when the ions meet all of the identification criteria except the ion abundance ratio criteria. An EMPC is a worst-case estimate of the concentration. |
| EPA | - Environmental Protection Agency. |
| LCS | - Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes. |
| LCSD | - Laboratory Control Sample Duplicate: Refer to LCS. |
| LFB | - Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes. |
| LOD | - Limit of Detection: This value represents the level to which a target analyte can reliably be detected for a specific analyte in a specific matrix by a specific method. The LOD includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.) |
| LOQ | - Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)<br><br>Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.) |
| MDL | - Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. |
| MS | - Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available. For Method 332.0, the spike recovery is calculated using the native concentration, including estimated values. |
| MSD | - Matrix Spike Sample Duplicate: Refer to MS. |
| NA | - Not Applicable. |
| NC | - Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit. |
| NDPA/DPA | - N-Nitrosodiphenylamine/Diphenylamine. |
| NI | - Not Ignitable. |
| NP | - Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil. |
| NR | - No Results: Term is utilized when 'No Target Compounds Requested' is reported for the analysis of Volatile or Semivolatile Organic TIC only requests. |
| RL | - Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable. |
| RPD | - Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report. |
| SRM | - Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples. |
| STLP | - Semi-dynamic Tank Leaching Procedure per EPA Method 1315. |
| TEF | - Toxic Equivalency Factors: The values assigned to each dioxin and furan to evaluate their toxicity relative to 2,3,7,8-TCDD. |
| TEQ | - Toxic Equivalent: The measure of a sample's toxicity derived by multiplying each dioxin and furan by its corresponding TEF and then summing the resulting values. |
| TIC | - Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations. |

*Report Format: DU Report with 'J' Qualifiers*

| | | | |
|---|---|---|---|
| **Project Name:** | RWM-Q1 | **Lab Number:** | L2420048 |
| **Project Number:** | 21010103 | **Report Date:** | 04/18/24 |

***Footnotes***

1 - The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

***Terms***

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Chlordane: The target compound Chlordane (CAS No. 57-74-9) is reported for GC ECD analyses. Per EPA,this compound "refers to a mixture of chlordane isomers, other chlorinated hydrocarbons and numerous other components." (Reference: USEPA Toxicological Review of Chlordane, In Support of Summary Information on the Integrated Risk Information System (IRIS), December 1997.)

Difference: With respect to Total Oxidizable Precursor (TOP) Assay analysis, the difference is defined as the Post-Treatment value minus the Pre-Treatment value.

Final pH: As it pertains to Sample Receipt & Container Information section of the report, Final pH reflects pH of container determined after adjustment at the laboratory, if applicable. If no adjustment required, value reflects Initial pH.

Frozen Date/Time: With respect to Volatile Organics in soil, Frozen Date/Time reflects the date/time at which associated Reagent Water-preserved vials were initially frozen. Note: If frozen date/time is beyond 48 hours from sample collection, value will be reflected in 'bold'.

Gasoline Range Organics (GRO): Gasoline Range Organics (GRO) results include all chromatographic peaks eluting from Methyl tert butyl ether through Naphthalene, with the exception of GRO analysis in support of State of Ohio programs, which includes all chromatographic peaks eluting from Hexane through Dodecane.

Initial pH: As it pertains to Sample Receipt & Container Information section of the report, Initial pH reflects pH of container determined upon receipt, if applicable.

PAH Total: With respect to Alkylated PAH analyses, the 'PAHs, Total' result is defined as the summation of results for all or a subset of the following compounds: Naphthalene, C1-C4 Naphthalenes, 2-Methylnaphthalene, 1-Methylnaphthalene, Biphenyl, Acenaphthylene, Acenaphthene, Fluorene, C1-C3 Fluorenes, Phenanthrene, C1-C4 Phenanthrenes/Anthracenes, Anthracene, Fluoranthene, Pyrene, C1-C4 Fluoranthenes/Pyrenes, Benz(a)anthracene, Chrysene, C1-C4 Chrysenes, Benzo(b)fluoranthene, Benzo(j)+(k)fluoranthene, Benzo(e)pyrene, Benzo(a)pyrene, Perylene, Indeno(1,2,3-cd)pyrene, Dibenz(ah)+(ac)anthracene, Benzo(g,h,i)perylene. If a 'Total' result is requested, the results of its individual components will also be reported.

PFAS Total: With respect to PFAS analyses, the 'PFAS, Total (5)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA and PFOS. In addition, the 'PFAS, Total (6)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA, PFDA and PFOS. For MassDEP DW compliance analysis only, the 'PFAS, Total (6)' result is defined as the summation of results at or above the RL. Note: If a 'Total' result is requested, the results of its individual components will also be reported.

Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

***Data Qualifiers***

**A** - Spectra identified as "Aldol Condensates" are byproducts of the extraction/concentration procedures when acetone is introduced in the process.

**B** - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).

**C** - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.

**D** - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.

**E** - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.

**F** - The ratio of quantifier ion response to qualifier ion response falls outside of the laboratory criteria. Results are considered to be an estimated maximum concentration.

**G** - The concentration may be biased high due to matrix interferences (i.e, co-elution) with non-target compound(s). The result should be considered estimated.

**H** - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.

**I** - The lower value for the two columns has been reported due to obvious interference.

**J** - Estimated value. The Target analyte concentration is below the quantitation limit (RL), but above the Method Detection Limit (MDL) or Estimated Detection Limit (EDL) for SPME-related analyses. This represents an estimated concentration for Tentatively

*Report Format: DU Report with 'J' Qualifiers*

| | | | |
|---|---|---|---|
| **Project Name:** | RWM-Q1 | **Lab Number:** | L2420048 |
| **Project Number:** | 21010103 | **Report Date:** | 04/18/24 |

***Data Qualifiers***

Identified Compounds (TICs). For calculated parameters, this represents that one or more values used in the calculation were estimated.

**M** - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.

**ND** - Not detected at the method detection limit (MDL) for the sample, or estimated detection limit (EDL) for SPME-related analyses.

**NJ** - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where the identification is based on a mass spectral library search.

**P** - The RPD between the results for the two columns exceeds the method-specified criteria.

**Q** - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)

**R** - Analytical results are from sample re-analysis.

**RE** - Analytical results are from sample re-extraction.

**S** - Analytical results are from modified screening analysis.

**V** - The surrogate associated with this target analyte has a recovery outside the QC acceptance limits. (Applicable to MassDEP DW Compliance samples only.)

**Z** - The batch matrix spike and/or duplicate associated with this target analyte has a recovery/RPD outside the QC acceptance limits. (Applicable to MassDEP DW Compliance samples only.)

| | | | |
|---|---|---|---|
| **Project Name:** | RWM-Q1 | **Lab Number:** | L2420048 |
| **Project Number:** | 21010103 | **Report Date:** | 04/18/24 |

## REFERENCES

1 Test Methods for Evaluating Solid Waste: Physical/Chemical Methods. EPA SW-846. Third Edition. Updates I - VI, 2018.

## LIMITATION OF LIABILITIES

Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Analytical shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Alpha Analytical.

We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.

# Certification Information

**The following analytes are not included in our Primary NELAP Scope of Accreditation:**

**Westborough Facility**
**EPA 624.1:** m/p-xylene, o-xylene, Naphthalene
**EPA 625.1:** alpha-Terpineol
**EPA 8260D:** NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene; SCM: Iodomethane (methyl iodide), 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.
**EPA 8270E:** NPW: Dimethylnaphthalene,1,4-Diphenylhydrazine, alpha-Terpineol, Azobenzene; SCM: Dimethylnaphthalene,1,4-Diphenylhydrazine.
**SM4500**: NPW: Amenable Cyanide; SCM: Total Phosphorus, TKN, NO2, NO3.

**Mansfield Facility**
**SM 2540D:** TSS.
**EPA TO-15:** Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene, 3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene.
**Nonpotable Water: EPA RSK-175 Dissolved Gases**
**Biological Tissue Matrix:** EPA 3050B

**The following analytes are included in our Massachusetts DEP Scope of Accreditation**

**Westborough Facility:**

***Drinking Water***
**EPA 300.0**: Chloride, Nitrate-N, Fluoride, Sulfate; **EPA 353.2**: Nitrate-N, Nitrite-N; **SM4500NO3-F**: Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE, EPA 180.1, SM2130B, SM4500Cl-D, SM2320B, SM2540C, SM4500H-B, SM4500NO2-B**
**EPA 524.2:** THMs and VOCs; **EPA 504.1:** EDB, DBCP.
**Microbiology**: **SM9215B; SM9223-P/A, SM9223B-Colilert-QT,SM9222D**.

***Non-Potable Water***
**SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2320B, SM4500CL-E, SM4500F-BC, SM4500NH3-BH:** Ammonia-N and Kjeldahl-N, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **EPA 351.1, SM4500NO3-F, EPA 353.2**: Nitrate-N**, SM4500P-E, SM4500P-B, E, SM4500SO4-E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, EPA 420.1, SM4500-CN-CE, SM2540D, EPA 300: Chloride, Sulfate, Nitrate.**
**EPA 624.1**: Volatile Halocarbons & Aromatics,
**EPA 608.3**: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs
**EPA 625.1**: SVOC (Acid/Base/Neutral Extractables).
**Microbiology**: **SM9223B-Colilert-QT; Enterolert-QT, EPA 1600, EPA 1603, SM9222D.**

**Mansfield Facility:**

***Drinking Water***
**EPA 200.7:** Al, Ba, Cd, Cr, Cu, Fe, Mn, Ni, Na, Ag, Ca, Zn. **EPA 200.8:** Al, Sb, As, Ba, Be, Cd, Cr, Cu, Pb, Mn, Ni, Se, Ag, TL, Zn. **EPA 245.1** Hg.
**EPA 522, EPA 537.1.**

***Non-Potable Water***
**EPA 200.7:** Al, Sb, As, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, K, Se, Ag, Na, Sr, TL, Ti, V, Zn.
**EPA 200.8:** Al, Sb**,** As, Be, Cd, Cr, Cu, Fe, Pb, Mn, Ni, K, Se, Ag, Na, TL, Zn.
**EPA 245.1** Hg.
**SM2340B**

For a complete listing of analytes and methods, please contact your Alpha Project Manager.

# CHAIN OF CUSTODY

PAGE 1 OF 1

Date Rec'd in Lab: 4/12/24

ALPHA Job #: L2420048

ALPHA ANALYTICAL
WESTBORO, MA TEL: 508-898-9220 FAX: 508-898-9193
MANSFIELD, MA TEL: 508-822-9300 FAX: 508-822-3288

**Client Information**

Client: TPA

Address:

Phone:

Fax:

Email:

☐ These samples have been previously analyzed by Alpha

**Project Information**

Project Name: RWM - Q1

Project Location:

Project #: 21010103

Project Manager: Bob T.

ALPHA Quote #:

**Turn-Around Time**

☒ Standard ☐ RUSH (only confirmed if pre-approved!)

Date Due: Time:

**Report Information - Data Deliverables**

☐ FAX ☐ EMAIL

☐ ADEx ☐ Add'l Deliverables

**Billing Information**

☐ Same as Client info PO #:

**Regulatory Requirements/Report Limits**

| State /Fed Program | Criteria |
|---|---|
| | |

Other Project Specific Requirements/Comments/Detection Limits:

ANALYSIS: Diss Zn & Cd

**SAMPLE HANDLING**

Filtration
☒ Done
☐ Not needed
☐ Lab to do

Preservation
☐ Lab to do
(Please specify below)

| ALPHA Lab ID (Lab Use Only) | Sample ID | Collection Date | Collection Time | Sample Matrix | Sampler's Initials | Sample Specific Comments | TOTAL # BOTTLES |
|---|---|---|---|---|---|---|---|
| 20048-01 | RWQ8-MW1 | 4/11/24 | 1240 | GW | PP | | 1 |

Rel: 4/12/24 0240

4/12/24 0240

Container Type

Preservative

| Relinquished By: | Date/Time | Received By: | Date/Time |
|---|---|---|---|
| APM | 4/11/24 1700 | | 4-11-24 1530 |
| | 4-11-24 1800 | | 4/11/24 1800 |
| Anthony Green | 4/11/24 2100 | Anthony Green APR 11 2024 2154 | |
| Anthony Green | 4/12/24 0030 | | 4/12/24 0030 |

Please print clearly, legibly and completely. Samples can not be logged in and turnaround time clock will not start until any ambiguities are resolved. All samples submitted are subject to Alpha's Terms and Conditions. See reverse side.

FORM NO. 01-01 (rev. 14-OCT-07)

# ANALYTICAL REPORT

| | |
|---|---|
| Lab Number: | L2451814 |
| Client: | Tradepoint Atlantic<br>1600 Sparrows Point Boulevard<br>Baltimore, MD 21219 |
| ATTN: | Robert Tworkowski |
| Phone: | (443) 649-5073 |
| Project Name: | RWM |
| Project Number: | 21010103 |
| Report Date: | 09/17/24 |

The original project report/data package is held by Alpha Analytical. This report/data package is paginated and should be reproduced only in its entirety. Alpha Analytical holds no responsibility for results and/or data that are not consistent with the original.

Certifications & Approvals: MA (M-MA086), NH NELAP (2064), CT (PH-0826), IL (200077), IN (C-MA-03), KY (KY98045), ME (MA00086), MD (348), NJ (MA935), NY (11148), NC (25700/666), OR (MA-1316), PA (68-03671), RI (LAO00065), TX (T104704476), VT (VT-0935), VA (460195), USDA (Permit #525-23-122-91930A1).

Eight Walkup Drive, Westborough, MA 01581-1019
508-898-9220 (Fax) 508-898-9193 800-624-9220 - www.alphalab.com

**Project Name:** RWM
**Project Number:** 21010103

**Lab Number:** L2451814
**Report Date:** 09/17/24

| Alpha Sample ID | Client ID | Matrix | Sample Location | Collection Date/Time | Receive Date |
|---|---|---|---|---|---|
| L2451814-01 | RWB-MWS | WATER | A3 | 09/10/24 16:05 | 09/10/24 |
| L2451814-02 | RWB-MWI | WATER | A3 | 09/10/24 12:20 | 09/10/24 |
| L2451814-03 | RWD-MWS | WATER | A3 | 09/10/24 13:10 | 09/10/24 |
| L2451814-04 | RWD-MWI | WATER | A3 | 09/10/24 13:40 | 09/10/24 |
| L2451814-05 | RWE-MWS | WATER | A3 | 09/10/24 15:15 | 09/10/24 |
| L2451814-06 | RWE-MWI | WATER | A3 | 09/10/24 15:55 | 09/10/24 |

| | | | |
|---|---|---|---|
| **Project Name:** | RWM | **Lab Number:** | L2451814 |
| **Project Number:** | 21010103 | **Report Date:** | 09/17/24 |

## Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet NELAP requirements for all NELAP accredited parameters unless otherwise noted in the following narrative. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. Tentatively Identified Compounds (TICs), if requested, are reported for compounds identified to be present and are not part of the method/program Target Compound List, even if only a subset of the TCL are being reported. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively.

When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances, the specific failure is not narrated but noted in the associated QC Outlier Summary Report, located directly after the Case Narrative. QC information is also incorporated in the Data Usability Assessment table (Format 11) of our Data Merger tool, where it can be reviewed in conjunction with the sample result, associated regulatory criteria and any associated data usability implications.

Soil/sediments and solids are reported on a dry weight basis unless otherwise noted. Tissues are reported "as received" or on a wet weight basis, unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

HOLD POLICY - For samples submitted on hold, Alpha's policy is to hold samples (with the exception of Air canisters) free of charge for 21 calendar days from the date the project is completed. After 21 calendar days, we will dispose of all samples submitted including those put on hold unless you have contacted your Alpha Project Manager and made arrangements for Alpha to continue to hold the samples. Air canisters will be disposed after 3 business days from the date the project is completed.

Please contact Project Management at 800-624-9220 with any questions.

**Project Name:** RWM
**Project Number:** 21010103

**Lab Number:** L2451814
**Report Date:** 09/17/24

**Case Narrative (continued)**

Report Submission

All non-detect (ND) or estimated concentrations (J-qualified) have been quantitated to the limit noted in the MDL column.

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature: Caitlin Walukevich

Title: Technical Director/Representative Date: 09/17/24

# METALS

**Project Name:** RWM
**Project Number:** 21010103
**Lab Number:** L2451814
**Report Date:** 09/17/24

## SAMPLE RESULTS

Lab ID: L2451814-01
Client ID: RWB-MWS
Sample Location: A3
Sample Depth:
Matrix: Water

Date Collected: 09/10/24 16:05
Date Received: 09/10/24
Field Prep: Refer to COC

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dissolved Metals - Mansfield Lab** | | | | | | | | | | | |
| Cadmium, Dissolved | ND | | ug/l | 0.2000 | 0.0599 | 1 | 09/12/24 03:58 | 09/14/24 13:19 | EPA 3005A | 1,6020B | MRC |
| Zinc, Dissolved | ND | | ug/l | 10.00 | 3.410 | 1 | 09/12/24 03:58 | 09/14/24 13:19 | EPA 3005A | 1,6020B | MRC |

**Project Name:** RWM
**Project Number:** 21010103
**Lab Number:** L2451814
**Report Date:** 09/17/24

## SAMPLE RESULTS

Lab ID: L2451814-02
Client ID: RWB-MWI
Sample Location: A3
Sample Depth:
Matrix: Water

Date Collected: 09/10/24 12:20
Date Received: 09/10/24
Field Prep: Refer to COC

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dissolved Metals - Mansfield Lab** | | | | | | | | | | | |
| Cadmium, Dissolved | ND | | ug/l | 0.2000 | 0.0599 | 1 | 09/12/24 03:58 | 09/14/24 13:23 | EPA 3005A | 1,6020B | MRC |
| Zinc, Dissolved | 14.63 | | ug/l | 10.00 | 3.410 | 1 | 09/12/24 03:58 | 09/14/24 13:23 | EPA 3005A | 1,6020B | MRC |

**Project Name:** RWM
**Project Number:** 21010103
**Lab Number:** L2451814
**Report Date:** 09/17/24

## SAMPLE RESULTS

Lab ID: L2451814-03
Client ID: RWD-MWS
Sample Location: A3
Sample Depth:
Matrix: Water

Date Collected: 09/10/24 13:10
Date Received: 09/10/24
Field Prep: Refer to COC

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dissolved Metals - Mansfield Lab** | | | | | | | | | | | |
| Cadmium, Dissolved | ND | | ug/l | 0.2000 | 0.0599 | 1 | 09/12/24 03:58 | 09/14/24 13:28 | EPA 3005A | 1,6020B | MRC |
| Zinc, Dissolved | ND | | ug/l | 10.00 | 3.410 | 1 | 09/12/24 03:58 | 09/14/24 13:28 | EPA 3005A | 1,6020B | MRC |

**Project Name:** RWM
**Project Number:** 21010103
**Lab Number:** L2451814
**Report Date:** 09/17/24

## SAMPLE RESULTS

Lab ID: L2451814-04
Client ID: RWD-MWI
Sample Location: A3
Sample Depth:
Matrix: Water

Date Collected: 09/10/24 13:40
Date Received: 09/10/24
Field Prep: Refer to COC

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dissolved Metals - Mansfield Lab** | | | | | | | | | | | |
| Cadmium, Dissolved | 504.3 | | ug/l | 2.000 | 0.5990 | 10 | 09/12/24 03:58 | 09/15/24 17:54 | EPA 3005A | 1,6020B | TAA |
| Zinc, Dissolved | 93910 | | ug/l | 100.0 | 34.10 | 10 | 09/12/24 03:58 | 09/15/24 17:54 | EPA 3005A | 1,6020B | TAA |

**Project Name:** RWM
**Project Number:** 21010103
**Lab Number:** L2451814
**Report Date:** 09/17/24

## SAMPLE RESULTS

Lab ID: L2451814-05
Client ID: RWE-MWS
Sample Location: A3
Sample Depth:
Matrix: Water

Date Collected: 09/10/24 15:15
Date Received: 09/10/24
Field Prep: Refer to COC

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dissolved Metals - Mansfield Lab** | | | | | | | | | | | |
| Cadmium, Dissolved | 3.184 | | ug/l | 0.2000 | 0.0599 | 1 | 09/12/24 03:58 | 09/14/24 13:37 | EPA 3005A | 1,6020B | MRC |
| Zinc, Dissolved | 12150 | | ug/l | 100.0 | 34.10 | 10 | 09/12/24 03:58 | 09/15/24 17:58 | EPA 3005A | 1,6020B | TAA |

**Project Name:** RWM
**Project Number:** 21010103
**Lab Number:** L2451814
**Report Date:** 09/17/24

## SAMPLE RESULTS

Lab ID: L2451814-06
Client ID: RWE-MWI
Sample Location: A3
Sample Depth:
Matrix: Water

Date Collected: 09/10/24 15:55
Date Received: 09/10/24
Field Prep: Refer to COC

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dissolved Metals - Mansfield Lab** | | | | | | | | | | | |
| Cadmium, Dissolved | 423.6 | | ug/l | 2.000 | 0.5990 | 10 | 09/12/24 03:58 | 09/15/24 18:03 | EPA 3005A | 1,6020B | TAA |
| Zinc, Dissolved | 70970 | | ug/l | 100.0 | 34.10 | 10 | 09/12/24 03:58 | 09/15/24 18:03 | EPA 3005A | 1,6020B | TAA |

**Project Name:** RWM
**Project Number:** 21010103
**Lab Number:** L2451814
**Report Date:** 09/17/24

# Method Blank Analysis
# Batch Quality Control

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|
| Dissolved Metals - Mansfield Lab for sample(s): 01-06 Batch: WG1970395-1 | | | | | | | | | | |
| Cadmium, Dissolved | ND | | ug/l | 0.2000 | 0.0599 | 1 | 09/12/24 03:58 | 09/13/24 11:44 | 1,6020B | NTB |
| Zinc, Dissolved | ND | | ug/l | 10.00 | 3.410 | 1 | 09/12/24 03:58 | 09/13/24 11:44 | 1,6020B | NTB |

**Prep Information**

Digestion Method: EPA 3005A

# Lab Control Sample Analysis

## Batch Quality Control

**Project Name:** RWM

**Project Number:** 21010103

**Lab Number:** L2451814

**Report Date:** 09/17/24

| Parameter | LCS %Recovery | Qual | LCSD %Recovery | Qual | %Recovery Limits | RPD | Qual | RPD Limits |
|---|---|---|---|---|---|---|---|---|
| Dissolved Metals - Mansfield Lab Associated sample(s): 01-06 Batch: WG1970395-2 | | | | | | | | |
| Cadmium, Dissolved | 106 | | - | | 80-120 | - | | |
| Zinc, Dissolved | 109 | | - | | 80-120 | - | | |

# Matrix Spike Analysis
## Batch Quality Control

**Project Name:** RWM
**Project Number:** 21010103

**Lab Number:** L2451814
**Report Date:** 09/17/24

| Parameter | Native Sample | MS Added | MS Found | MS %Recovery | Qual | MSD Found | MSD %Recovery | Qual | Recovery Limits | RPD | Qual | RPD Limits |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Dissolved Metals - Mansfield Lab Associated sample(s): 01-06 QC Batch ID: WG1970395-3 QC Sample: L2450816-01 Client ID: MS Sample | | | | | | | | | | | | |
| Cadmium, Dissolved | ND | 53 | 53.36 | 101 | | - | - | | 75-125 | - | | 20 |
| Zinc, Dissolved | ND | 500 | 491.2 | 98 | | - | - | | 75-125 | - | | 20 |

**Project Name:** RWM
**Project Number:** 21010103

**Lab Number:** L2451814
**Report Date:** 09/17/24

## Sample Receipt and Container Information

Were project specific reporting limits specified? YES

### Cooler Information

| Cooler | Custody Seal |
|---|---|
| A | Absent |

### Container Information

| Container ID | Container Type | Cooler | Initial pH | Final pH | Temp deg C | Pres | Seal | Frozen Date/Time | Analysis(*) |
|---|---|---|---|---|---|---|---|---|---|
| L2451814-01A | Plastic 250ml HNO3 preserved | A | <2 | <2 | 3.8 | Y | Absent | | ZN-6020S-PPB(180),CD-6020S-PPB(180) |
| L2451814-02A | Plastic 250ml HNO3 preserved | A | <2 | <2 | 3.8 | Y | Absent | | ZN-6020S-PPB(180),CD-6020S-PPB(180) |
| L2451814-03A | Plastic 250ml HNO3 preserved | A | <2 | <2 | 3.8 | Y | Absent | | ZN-6020S-PPB(180),CD-6020S-PPB(180) |
| L2451814-04A | Plastic 250ml HNO3 preserved | A | <2 | <2 | 3.8 | Y | Absent | | ZN-6020S-PPB(180),CD-6020S-PPB(180) |
| L2451814-05A | Plastic 250ml HNO3 preserved | A | <2 | <2 | 3.8 | Y | Absent | | ZN-6020S-PPB(180),CD-6020S-PPB(180) |
| L2451814-06A | Plastic 250ml HNO3 preserved | A | <2 | <2 | 3.8 | Y | Absent | | ZN-6020S-PPB(180),CD-6020S-PPB(180) |



*Values in parentheses indicate holding time in days

| | | | |
|---|---|---|---|
| **Project Name:** | RWM | **Lab Number:** | L2451814 |
| **Project Number:** | 21010103 | **Report Date:** | 09/17/24 |

## GLOSSARY

***Acronyms***

| | |
|---|---|
| DL | - Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the limit of quantitation (LOQ). The DL includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.) |
| EDL | - Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME). |
| EMPC | - Estimated Maximum Possible Concentration: The concentration that results from the signal present at the retention time of an analyte when the ions meet all of the identification criteria except the ion abundance ratio criteria. An EMPC is a worst-case estimate of the concentration. |
| EPA | - Environmental Protection Agency. |
| LCS | - Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes. |
| LCSD | - Laboratory Control Sample Duplicate: Refer to LCS. |
| LFB | - Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes. |
| LOD | - Limit of Detection: This value represents the level to which a target analyte can reliably be detected for a specific analyte in a specific matrix by a specific method. The LOD includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.) |
| LOQ | - Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)<br><br>Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.) |
| MDL | - Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. |
| MS | - Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available. For Method 332.0, the spike recovery is calculated using the native concentration, including estimated values. |
| MSD | - Matrix Spike Sample Duplicate: Refer to MS. |
| NA | - Not Applicable. |
| NC | - Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit. |
| NDPA/DPA | - N-Nitrosodiphenylamine/Diphenylamine. |
| NI | - Not Ignitable. |
| NP | - Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil. |
| NR | - No Results: Term is utilized when 'No Target Compounds Requested' is reported for the analysis of Volatile or Semivolatile Organic TIC only requests. |
| RL | - Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable. |
| RPD | - Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report. |
| SRM | - Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples. |
| STLP | - Semi-dynamic Tank Leaching Procedure per EPA Method 1315. |
| TEF | - Toxic Equivalency Factors: The values assigned to each dioxin and furan to evaluate their toxicity relative to 2,3,7,8-TCDD. |
| TEQ | - Toxic Equivalent: The measure of a sample's toxicity derived by multiplying each dioxin and furan by its corresponding TEF and then summing the resulting values. |
| TIC | - Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations. |

*Report Format: DU Report with 'J' Qualifiers*

| | | | |
|---|---|---|---|
| **Project Name:** | RWM | **Lab Number:** | L2451814 |
| **Project Number:** | 21010103 | **Report Date:** | 09/17/24 |

***Footnotes***

1 - The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

***Terms***

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Chlordane: The target compound Chlordane (CAS No. 57-74-9) is reported for GC ECD analyses. Per EPA,this compound "refers to a mixture of chlordane isomers, other chlorinated hydrocarbons and numerous other components." (Reference: USEPA Toxicological Review of Chlordane, In Support of Summary Information on the Integrated Risk Information System (IRIS), December 1997.)

Difference: With respect to Total Oxidizable Precursor (TOP) Assay analysis, the difference is defined as the Post-Treatment value minus the Pre-Treatment value.

Final pH: As it pertains to Sample Receipt & Container Information section of the report, Final pH reflects pH of container determined after adjustment at the laboratory, if applicable. If no adjustment required, value reflects Initial pH.

Frozen Date/Time: With respect to Volatile Organics in soil, Frozen Date/Time reflects the date/time at which associated Reagent Water-preserved vials were initially frozen. Note: If frozen date/time is beyond 48 hours from sample collection, value will be reflected in 'bold'.

Gasoline Range Organics (GRO): Gasoline Range Organics (GRO) results include all chromatographic peaks eluting from Methyl tert butyl ether through Naphthalene, with the exception of GRO analysis in support of State of Ohio programs, which includes all chromatographic peaks eluting from Hexane through Dodecane.

Initial pH: As it pertains to Sample Receipt & Container Information section of the report, Initial pH reflects pH of container determined upon receipt, if applicable.

PAH Total: With respect to Alkylated PAH analyses, the 'PAHs, Total' result is defined as the summation of results for all or a subset of the following compounds: Naphthalene, C1-C4 Naphthalenes, 2-Methylnaphthalene, 1-Methylnaphthalene, Biphenyl, Acenaphthylene, Acenaphthene, Fluorene, C1-C3 Fluorenes, Phenanthrene, C1-C4 Phenanthrenes/Anthracenes, Anthracene, Fluoranthene, Pyrene, C1-C4 Fluoranthenes/Pyrenes, Benz(a)anthracene, Chrysene, C1-C4 Chrysenes, Benzo(b)fluoranthene, Benzo(j)+(k)fluoranthene, Benzo(e)pyrene, Benzo(a)pyrene, Perylene, Indeno(1,2,3-cd)pyrene, Dibenz(ah)+(ac)anthracene, Benzo(g,h,i)perylene. If a 'Total' result is requested, the results of its individual components will also be reported.

PFAS Total: With respect to PFAS analyses, the 'PFAS, Total (5)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA and PFOS. In addition, the 'PFAS, Total (6)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA, PFDA and PFOS. For MassDEP DW compliance analysis only, the 'PFAS, Total (6)' result is defined as the summation of results at or above the RL. Note: If a 'Total' result is requested, the results of its individual components will also be reported.

Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

***Data Qualifiers***

**A** - Spectra identified as "Aldol Condensates" are byproducts of the extraction/concentration procedures when acetone is introduced in the process.

**B** - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).

**C** - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.

**D** - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.

**E** - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.

**F** - The ratio of quantifier ion response to qualifier ion response falls outside of the laboratory criteria. Results are considered to be an estimated maximum concentration.

**G** - The concentration may be biased high due to matrix interferences (i.e, co-elution) with non-target compound(s). The result should be considered estimated.

**H** - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.

**I** - The lower value for the two columns has been reported due to obvious interference.

**J** - Estimated value. The Target analyte concentration is below the quantitation limit (RL), but above the Method Detection Limit (MDL) or Estimated Detection Limit (EDL) for SPME-related analyses. This represents an estimated concentration for Tentatively

*Report Format: DU Report with 'J' Qualifiers*

| | | | |
|---|---|---|---|
| **Project Name:** | RWM | **Lab Number:** | L2451814 |
| **Project Number:** | 21010103 | **Report Date:** | 09/17/24 |

***Data Qualifiers***

Identified Compounds (TICs). For calculated parameters, this represents that one or more values used in the calculation were estimated.

**M** - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.

**ND** - Not detected at the method detection limit (MDL) for the sample, or estimated detection limit (EDL) for SPME-related analyses.

**NJ** - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where the identification is based on a mass spectral library search.

**P** - The RPD between the results for the two columns exceeds the method-specified criteria.

**Q** - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)

**R** - Analytical results are from sample re-analysis.

**RE** - Analytical results are from sample re-extraction.

**S** - Analytical results are from modified screening analysis.

**V** - The surrogate associated with this target analyte has a recovery outside the QC acceptance limits. (Applicable to MassDEP DW Compliance samples only.)

**Z** - The batch matrix spike and/or duplicate associated with this target analyte has a recovery/RPD outside the QC acceptance limits. (Applicable to MassDEP DW Compliance samples only.)

| | | | |
|---|---|---|---|
| **Project Name:** | RWM | **Lab Number:** | L2451814 |
| **Project Number:** | 21010103 | **Report Date:** | 09/17/24 |

## REFERENCES

1 Test Methods for Evaluating Solid Waste: Physical/Chemical Methods. EPA SW-846. Third Edition. Updates I - VI, 2018.

## LIMITATION OF LIABILITIES

Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Analytical shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Alpha Analytical.

We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.

# Certification Information

**The following analytes are not included in our Primary NELAP Scope of Accreditation:**

**Westborough Facility**
**EPA 624.1:** m/p-xylene, o-xylene, Naphthalene
**EPA 625.1:** alpha-Terpineol
**EPA 8260D:** NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene; SCM: Iodomethane (methyl iodide), 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.
**EPA 8270E:** NPW: Dimethylnaphthalene,1,4-Diphenylhydrazine, alpha-Terpineol, Azobenzene; SCM: Dimethylnaphthalene,1,4-Diphenylhydrazine.
**SM4500**: NPW: Amenable Cyanide; SCM: Total Phosphorus, TKN, NO2, NO3.

**Mansfield Facility**
**SM 2540D:** TSS.
**EPA TO-15:** Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene, 3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene.
**Nonpotable Water: EPA RSK-175 Dissolved Gases**
**Biological Tissue Matrix:** EPA 3050B

**The following analytes are included in our Massachusetts DEP Scope of Accreditation**

**Westborough Facility:**

***Drinking Water***
**EPA 300.0**: Chloride, Nitrate-N, Fluoride, Sulfate; **EPA 353.2**: Nitrate-N, Nitrite-N; **SM4500NO3-F**: Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE, EPA 180.1, SM2130B, SM4500Cl-D, SM2320B, SM2540C, SM4500H-B, SM4500NO2-B**
**EPA 524.2:** THMs and VOCs; **EPA 504.1:** EDB, DBCP.
**Microbiology**: **SM9215B; SM9223-P/A, SM9223B-Colilert-QT,SM9222D**.

***Non-Potable Water***
**SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2320B, SM4500CL-E, SM4500F-BC, SM4500NH3-BH:** Ammonia-N and Kjeldahl-N, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **EPA 351.1, SM4500NO3-F, EPA 353.2**: Nitrate-N**, SM4500P-E, SM4500P-B, E, SM4500SO4-E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, EPA 420.1, SM4500-CN-CE, SM2540D, EPA 300: Chloride, Sulfate, Nitrate.**
**EPA 624.1**: Volatile Halocarbons & Aromatics,
**EPA 608.3**: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs
**EPA 625.1**: SVOC (Acid/Base/Neutral Extractables).
**Microbiology**: **SM9223B-Colilert-QT; Enterolert-QT, EPA 1600, EPA 1603, SM9222D.**

**Mansfield Facility:**

***Drinking Water***
**EPA 200.7:** Al, Ba, Cd, Cr, Cu, Fe, Mn, Ni, Na, Ag, Ca, Zn. **EPA 200.8:** Al, Sb, As, Ba, Be, Cd, Cr, Cu, Pb, Mn, Ni, Se, Ag, TL, Zn. **EPA 245.1** Hg.
**EPA 522, EPA 537.1.**

***Non-Potable Water***
**EPA 200.7:** Al, Sb, As, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, K, Se, Ag, Na, Sr, TL, Ti, V, Zn.
**EPA 200.8:** Al, Sb**,** As, Be, Cd, Cr, Cu, Fe, Pb, Mn, Ni, K, Se, Ag, Na, TL, Zn.
**EPA 245.1** Hg.
**SM2340B**

For a complete listing of analytes and methods, please contact your Alpha Project Manager.

# CHAIN OF CUSTODY

PAGE _____ OF _____

ALPHA ANALYTICAL
WESTBORO, MA TEL: 508-898-9220 FAX: 508-898-9193
MANSFIELD, MA TEL: 508-822-9300 FAX: 508-822-3288

Date Rec'd in Lab: 9/11/24

ALPHA Job #: L2451814

**Client Information**

Client: Tradepoint Atlantic
Address: 6995 Bethlehem Blvd Sparrows Point MD
Phone:
Fax:
Email: JBarng@armgroup.net kguille@armgroup.net
☐ These samples have been previously analyzed by Alpha

**Project Information**

Project Name: RMW
Project Location: A3
Project #: 21010103
Project Manager:
ALPHA Quote #:

**Turn-Around Time**

☒ Standard ☐ RUSH (only confirmed if pre-approved!)
Date Due: Time:

**Report Information - Data Deliverables**

☐ FAX ☐ EMAIL
☐ ADEx ☐ Add'l Deliverables

**Billing Information**

☐ Same as Client info PO #:

**Regulatory Requirements/Report Limits**

| State /Fed Program | Criteria |
|---|---|
| | |

Other Project Specific Requirements/Comments/Detection Limits:

| ALPHA Lab ID (Lab Use Only) | Sample ID | Collection Date | Collection Time | Sample Matrix | Sampler's Initials | ANALYSIS: Dissolved Cadmium | Dissolved Zinc | TOTAL # BOTTLES | Sample Specific Comments |
|---|---|---|---|---|---|---|---|---|---|
| 51814-01 | RWB-MWS | 9/10/24 | 1605 | GW | NM | X | X | | |
| 02 | RWB-MWI | 9/10/24 | 1220 | GW | NM | X | X | | |
| 03 | RWD-MWS | 9/10/24 | 1310 | GW | NM | X | X | | |
| 04 | RWD-MWI | 9/10/24 | 1340 | GW | NM | X | X | | |
| 05 | RWE-MWS | 9/10/24 | 1515 | GW | NM | X | X | | |
| 06 | RWE-MWI | 9/10/24 | 1555 | GW | NM | X | X | | |

**SAMPLE HANDLING**

Filtration
☐ Done
☐ Not needed
☐ Lab to do
Preservation
☐ Lab to do
(Please specify below)

| Container Type | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Preservative | | | | | | | | | | | | | | | | | | | |

| Relinquished By: | Date/Time | Received By: | Date/Time |
|---|---|---|---|
| | 9/10/24 1620 | | 9/10 16:21 |
| | 9/10 1800 | | 9/10/24 1800 |
| Anthony Green | 9/10/24 2400 | Anthony Green SEP 10 2023 2145 | 9/11/24 0045 |
| Anthony Green | 9/11/24 0045 | | 9/11/24 0045 |

Please print clearly, legibly and completely. Samples can not be logged in and turnaround time clock will not start until any ambiguities are resolved. All samples submitted are subject to Alpha's Terms and Conditions. See reverse side.

9/11/24 2:45



(rev. 14-OCT-07)

# ANALYTICAL REPORT

| | |
|---|---|
| Lab Number: | L2452147 |
| Client: | Tradepoint Atlantic<br>1600 Sparrows Point Boulevard<br>Baltimore, MD 21219 |
| ATTN: | Robert Tworkowski |
| Phone: | (443) 649-5073 |
| Project Name: | RWM |
| Project Number: | 21010103 |
| Report Date: | 09/25/24 |

The original project report/data package is held by Alpha Analytical. This report/data package is paginated and should be reproduced only in its entirety. Alpha Analytical holds no responsibility for results and/or data that are not consistent with the original.

Certifications & Approvals: MA (M-MA086), NH NELAP (2064), CT (PH-0826), IL (200077), IN (C-MA-03), KY (KY98045), ME (MA00086), MD (348), NJ (MA935), NY (11148), NC (25700/666), OR (MA-1316), PA (68-03671), RI (LAO00065), TX (T104704476), VT (VT-0935), VA (460195), USDA (Permit #525-23-122-91930A1).

**Project Name:** RWM
**Project Number:** 21010103

**Lab Number:** L2452147
**Report Date:** 09/25/24

| Alpha Sample ID | Client ID | Matrix | Sample Location | Collection Date/Time | Receive Date |
|---|---|---|---|---|---|
| L2452147-01 | RWF-MWS | WATER | A3 | 09/11/24 10:35 | 09/11/24 |
| L2452147-02 | RWF-MWI | WATER | A3 | 09/11/24 11:05 | 09/11/24 |
| L2452147-03 | RW05R-MWI | WATER | A3 | 09/11/24 11:45 | 09/11/24 |
| L2452147-04 | RWA-MWS | WATER | A3 | 09/11/24 13:30 | 09/11/24 |
| L2452147-05 | RWA-MWI | WATER | A3 | 09/11/24 14:15 | 09/11/24 |
| L2452147-06 | RW22R-MWS | WATER | A3 | 09/11/24 15:05 | 09/11/24 |

| | | | |
|---|---|---|---|
| **Project Name:** | RWM | **Lab Number:** | L2452147 |
| **Project Number:** | 21010103 | **Report Date:** | 09/25/24 |

## Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet NELAP requirements for all NELAP accredited parameters unless otherwise noted in the following narrative. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. Tentatively Identified Compounds (TICs), if requested, are reported for compounds identified to be present and are not part of the method/program Target Compound List, even if only a subset of the TCL are being reported. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively.

When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances, the specific failure is not narrated but noted in the associated QC Outlier Summary Report, located directly after the Case Narrative. QC information is also incorporated in the Data Usability Assessment table (Format 11) of our Data Merger tool, where it can be reviewed in conjunction with the sample result, associated regulatory criteria and any associated data usability implications.

Soil/sediments and solids are reported on a dry weight basis unless otherwise noted. Tissues are reported "as received" or on a wet weight basis, unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

HOLD POLICY - For samples submitted on hold, Alpha's policy is to hold samples (with the exception of Air canisters) free of charge for 21 calendar days from the date the project is completed. After 21 calendar days, we will dispose of all samples submitted including those put on hold unless you have contacted your Alpha Project Manager and made arrangements for Alpha to continue to hold the samples. Air canisters will be disposed after 3 business days from the date the project is completed.

Please contact Project Management at 800-624-9220 with any questions.

**Project Name:** RWM **Lab Number:** L2452147
**Project Number:** 21010103 **Report Date:** 09/25/24

**Case Narrative (continued)**

Report Submission

All non-detect (ND) or estimated concentrations (J-qualified) have been quantitated to the limit noted in the MDL column.

Sample Receipt

The samples were field filtered for Dissolved Metals.

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature: Melissa Sturgis Melissa Sturgis

Title: Technical Director/Representative Date: 09/25/24

# METALS

**Project Name:** RWM
**Project Number:** 21010103
**Lab Number:** L2452147
**Report Date:** 09/25/24

## SAMPLE RESULTS

Lab ID: L2452147-01
Client ID: RWF-MWS
Sample Location: A3
Sample Depth:
Matrix: Water

Date Collected: 09/11/24 10:35
Date Received: 09/11/24
Field Prep: Refer to COC

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dissolved Metals - Mansfield Lab** | | | | | | | | | | | |
| Cadmium, Dissolved | 0.6800 | | ug/l | 0.2000 | 0.0599 | 1 | 09/16/24 14:00 | 09/19/24 20:36 | EPA 3005A | 1,6020B | NTB |
| Zinc, Dissolved | 19130 | | ug/l | 10000 | 3410. | 1000 | 09/16/24 14:00 | 09/24/24 18:25 | EPA 3005A | 1,6020B | NTB |

**Project Name:** RWM
**Project Number:** 21010103
**Lab Number:** L2452147
**Report Date:** 09/25/24

## SAMPLE RESULTS

Lab ID: L2452147-02
Client ID: RWF-MWI
Sample Location: A3
Sample Depth:
Matrix: Water

Date Collected: 09/11/24 11:05
Date Received: 09/11/24
Field Prep: Refer to COC

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dissolved Metals - Mansfield Lab** | | | | | | | | | | | |
| Cadmium, Dissolved | 1653. | | ug/l | 200.0 | 59.90 | 1000 | 09/16/24 14:00 | 09/24/24 18:29 | EPA 3005A | 1,6020B | NTB |
| Zinc, Dissolved | 71140 | | ug/l | 10000 | 3410. | 1000 | 09/16/24 14:00 | 09/24/24 18:29 | EPA 3005A | 1,6020B | NTB |

**Project Name:** RWM
**Project Number:** 21010103
**Lab Number:** L2452147
**Report Date:** 09/25/24

## SAMPLE RESULTS

Lab ID: L2452147-03
Client ID: RW05R-MWI
Sample Location: A3
Sample Depth:
Matrix: Water

Date Collected: 09/11/24 11:45
Date Received: 09/11/24
Field Prep: Refer to COC

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dissolved Metals - Mansfield Lab** | | | | | | | | | | | |
| Cadmium, Dissolved | 1996. | | ug/l | 200.0 | 59.90 | 1000 | 09/16/24 14:00 | 09/24/24 18:34 | EPA 3005A | 1,6020B | NTB |
| Zinc, Dissolved | 81220 | | ug/l | 10000 | 3410. | 1000 | 09/16/24 14:00 | 09/24/24 18:34 | EPA 3005A | 1,6020B | NTB |

**Project Name:** RWM
**Project Number:** 21010103
**Lab Number:** L2452147
**Report Date:** 09/25/24

## SAMPLE RESULTS

Lab ID: L2452147-04
Client ID: RWA-MWS
Sample Location: A3
Sample Depth:
Matrix: Water

Date Collected: 09/11/24 13:30
Date Received: 09/11/24
Field Prep: Refer to COC

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dissolved Metals - Mansfield Lab** | | | | | | | | | | | |
| Cadmium, Dissolved | 2.186 | | ug/l | 0.2000 | 0.0599 | 1 | 09/16/24 14:00 | 09/19/24 20:50 | EPA 3005A | 1,6020B | NTB |
| Zinc, Dissolved | 183.9 | | ug/l | 10.00 | 3.410 | 1 | 09/16/24 14:00 | 09/19/24 20:50 | EPA 3005A | 1,6020B | NTB |

**Project Name:** RWM
**Project Number:** 21010103
**Lab Number:** L2452147
**Report Date:** 09/25/24

## SAMPLE RESULTS

Lab ID: L2452147-05
Client ID: RWA-MWI
Sample Location: A3
Sample Depth:
Matrix: Water

Date Collected: 09/11/24 14:15
Date Received: 09/11/24
Field Prep: Refer to COC

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dissolved Metals - Mansfield Lab** | | | | | | | | | | | |
| Cadmium, Dissolved | 8451. | | ug/l | 2000. | 599.0 | 10000 | 09/16/24 14:00 | 09/24/24 18:53 | EPA 3005A | 1,6020B | NTB |
| Zinc, Dissolved | 337700 | | ug/l | 100000 | 34100 | 10000 | 09/16/24 14:00 | 09/24/24 18:53 | EPA 3005A | 1,6020B | NTB |

**Project Name:** RWM
**Project Number:** 21010103
**Lab Number:** L2452147
**Report Date:** 09/25/24

## SAMPLE RESULTS

Lab ID: L2452147-06
Client ID: RW22R-MWS
Sample Location: A3
Sample Depth:
Matrix: Water

Date Collected: 09/11/24 15:05
Date Received: 09/11/24
Field Prep: Refer to COC

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dissolved Metals - Mansfield Lab** | | | | | | | | | | | |
| Cadmium, Dissolved | 26.72 | | ug/l | 0.2000 | 0.0599 | 1 | 09/16/24 14:00 | 09/19/24 21:09 | EPA 3005A | 1,6020B | NTB |
| Zinc, Dissolved | 196900 | | ug/l | 100000 | 34100 | 10000 | 09/16/24 14:00 | 09/24/24 18:58 | EPA 3005A | 1,6020B | NTB |

**Project Name:** RWM
**Project Number:** 21010103

**Lab Number:** L2452147
**Report Date:** 09/25/24

# Method Blank Analysis
# Batch Quality Control

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|
| Dissolved Metals - Mansfield Lab for sample(s): 01-06 Batch: WG1972166-1 | | | | | | | | | | |
| Cadmium, Dissolved | ND | | ug/l | 0.2000 | 0.0599 | 1 | 09/16/24 14:00 | 09/19/24 19:11 | 1,6020B | NTB |
| Zinc, Dissolved | ND | | ug/l | 10.00 | 3.410 | 1 | 09/16/24 14:00 | 09/19/24 19:11 | 1,6020B | NTB |

**Prep Information**

Digestion Method: EPA 3005A

# Lab Control Sample Analysis

## Batch Quality Control

**Project Name:** RWM

**Project Number:** 21010103

**Lab Number:** L2452147

**Report Date:** 09/25/24

| Parameter | LCS %Recovery | Qual | LCSD %Recovery | Qual | %Recovery Limits | RPD | Qual | RPD Limits |
|---|---|---|---|---|---|---|---|---|
| Dissolved Metals - Mansfield Lab Associated sample(s): 01-06 Batch: WG1972166-2 | | | | | | | | |
| Cadmium, Dissolved | 100 | | - | | 80-120 | - | | |
| Zinc, Dissolved | 106 | | - | | 80-120 | - | | |

# Matrix Spike Analysis
## Batch Quality Control

**Project Name:** RWM
**Project Number:** 21010103

**Lab Number:** L2452147
**Report Date:** 09/25/24

| Parameter | Native Sample | MS Added | MS Found | MS %Recovery | Qual | MSD Found | MSD %Recovery | Qual | Recovery Limits | RPD | Qual | RPD Limits |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Dissolved Metals - Mansfield Lab Associated sample(s): 01-06 QC Batch ID: WG1972166-3 QC Sample: L2451849-02 Client ID: MS Sample | | | | | | | | | | | | |
| Cadmium, Dissolved | ND | 53 | 49.91 | 94 | | - | - | | 75-125 | - | | 20 |
| Zinc, Dissolved | 3.467J | 500 | 507.9 | 102 | | - | - | | 75-125 | - | | 20 |

**Project Name:** RWM
**Project Number:** 21010103

**Lab Number:** L2452147
**Report Date:** 09/25/24

## Sample Receipt and Container Information

Were project specific reporting limits specified? YES

### Cooler Information

| Cooler | Custody Seal |
|---|---|
| A | Absent |

### Container Information

| Container ID | Container Type | Cooler | Initial pH | Final pH | Temp deg C | Pres | Seal | Frozen Date/Time | Analysis(*) |
|---|---|---|---|---|---|---|---|---|---|
| L2452147-01A | Plastic 250ml HNO3 preserved | A | <2 | <2 | 3.2 | Y | Absent | | ZN-6020S-PPB(180),CD-6020S-PPB(180) |
| L2452147-02A | Plastic 250ml HNO3 preserved | A | <2 | <2 | 3.2 | Y | Absent | | ZN-6020S-PPB(180),CD-6020S-PPB(180) |
| L2452147-03A | Plastic 250ml HNO3 preserved | A | <2 | <2 | 3.2 | Y | Absent | | ZN-6020S-PPB(180),CD-6020S-PPB(180) |
| L2452147-04A | Plastic 250ml HNO3 preserved | A | <2 | <2 | 3.2 | Y | Absent | | ZN-6020S-PPB(180),CD-6020S-PPB(180) |
| L2452147-05A | Plastic 250ml HNO3 preserved | A | <2 | <2 | 3.2 | Y | Absent | | ZN-6020S-PPB(180),CD-6020S-PPB(180) |
| L2452147-06A | Plastic 250ml HNO3 preserved | A | <2 | <2 | 3.2 | Y | Absent | | ZN-6020S-PPB(180),CD-6020S-PPB(180) |



*Values in parentheses indicate holding time in days

| | | | |
|---|---|---|---|
| **Project Name:** | RWM | **Lab Number:** | L2452147 |
| **Project Number:** | 21010103 | **Report Date:** | 09/25/24 |

## GLOSSARY

***Acronyms***

DL - Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the limit of quantitation (LOQ). The DL includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)

EDL - Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME).

EMPC - Estimated Maximum Possible Concentration: The concentration that results from the signal present at the retention time of an analyte when the ions meet all of the identification criteria except the ion abundance ratio criteria. An EMPC is a worst-case estimate of the concentration.

EPA - Environmental Protection Agency.

LCS - Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.

LCSD - Laboratory Control Sample Duplicate: Refer to LCS.

LFB - Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.

LOD - Limit of Detection: This value represents the level to which a target analyte can reliably be detected for a specific analyte in a specific matrix by a specific method. The LOD includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)

LOQ - Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)

Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)

MDL - Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.

MS - Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available. For Method 332.0, the spike recovery is calculated using the native concentration, including estimated values.

MSD - Matrix Spike Sample Duplicate: Refer to MS.

NA - Not Applicable.

NC - Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.

NDPA/DPA - N-Nitrosodiphenylamine/Diphenylamine.

NI - Not Ignitable.

NP - Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil.

NR - No Results: Term is utilized when 'No Target Compounds Requested' is reported for the analysis of Volatile or Semivolatile Organic TIC only requests.

RL - Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.

RPD - Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report.

SRM - Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples.

STLP - Semi-dynamic Tank Leaching Procedure per EPA Method 1315.

TEF - Toxic Equivalency Factors: The values assigned to each dioxin and furan to evaluate their toxicity relative to 2,3,7,8-TCDD.

TEQ - Toxic Equivalent: The measure of a sample's toxicity derived by multiplying each dioxin and furan by its corresponding TEF and then summing the resulting values.

TIC - Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations.

*Report Format: DU Report with 'J' Qualifiers*

| | | | |
|---|---|---|---|
| **Project Name:** | RWM | **Lab Number:** | L2452147 |
| **Project Number:** | 21010103 | **Report Date:** | 09/25/24 |

***Footnotes***

1 - The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

***Terms***

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Chlordane: The target compound Chlordane (CAS No. 57-74-9) is reported for GC ECD analyses. Per EPA,this compound "refers to a mixture of chlordane isomers, other chlorinated hydrocarbons and numerous other components." (Reference: USEPA Toxicological Review of Chlordane, In Support of Summary Information on the Integrated Risk Information System (IRIS), December 1997.)

Difference: With respect to Total Oxidizable Precursor (TOP) Assay analysis, the difference is defined as the Post-Treatment value minus the Pre-Treatment value.

Final pH: As it pertains to Sample Receipt & Container Information section of the report, Final pH reflects pH of container determined after adjustment at the laboratory, if applicable. If no adjustment required, value reflects Initial pH.

Frozen Date/Time: With respect to Volatile Organics in soil, Frozen Date/Time reflects the date/time at which associated Reagent Water-preserved vials were initially frozen. Note: If frozen date/time is beyond 48 hours from sample collection, value will be reflected in 'bold'.

Gasoline Range Organics (GRO): Gasoline Range Organics (GRO) results include all chromatographic peaks eluting from Methyl tert butyl ether through Naphthalene, with the exception of GRO analysis in support of State of Ohio programs, which includes all chromatographic peaks eluting from Hexane through Dodecane.

Initial pH: As it pertains to Sample Receipt & Container Information section of the report, Initial pH reflects pH of container determined upon receipt, if applicable.

PAH Total: With respect to Alkylated PAH analyses, the 'PAHs, Total' result is defined as the summation of results for all or a subset of the following compounds: Naphthalene, C1-C4 Naphthalenes, 2-Methylnaphthalene, 1-Methylnaphthalene, Biphenyl, Acenaphthylene, Acenaphthene, Fluorene, C1-C3 Fluorenes, Phenanthrene, C1-C4 Phenanthrenes/Anthracenes, Anthracene, Fluoranthene, Pyrene, C1-C4 Fluoranthenes/Pyrenes, Benz(a)anthracene, Chrysene, C1-C4 Chrysenes, Benzo(b)fluoranthene, Benzo(j)+(k)fluoranthene, Benzo(e)pyrene, Benzo(a)pyrene, Perylene, Indeno(1,2,3-cd)pyrene, Dibenz(ah)+(ac)anthracene, Benzo(g,h,i)perylene. If a 'Total' result is requested, the results of its individual components will also be reported.

PFAS Total: With respect to PFAS analyses, the 'PFAS, Total (5)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA and PFOS. In addition, the 'PFAS, Total (6)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA, PFDA and PFOS. For MassDEP DW compliance analysis only, the 'PFAS, Total (6)' result is defined as the summation of results at or above the RL. Note: If a 'Total' result is requested, the results of its individual components will also be reported.

Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

***Data Qualifiers***

**A** - Spectra identified as "Aldol Condensates" are byproducts of the extraction/concentration procedures when acetone is introduced in the process.

**B** - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).

**C** - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.

**D** - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.

**E** - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.

**F** - The ratio of quantifier ion response to qualifier ion response falls outside of the laboratory criteria. Results are considered to be an estimated maximum concentration.

**G** - The concentration may be biased high due to matrix interferences (i.e, co-elution) with non-target compound(s). The result should be considered estimated.

**H** - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.

**I** - The lower value for the two columns has been reported due to obvious interference.

**J** - Estimated value. The Target analyte concentration is below the quantitation limit (RL), but above the Method Detection Limit (MDL) or Estimated Detection Limit (EDL) for SPME-related analyses. This represents an estimated concentration for Tentatively

*Report Format: DU Report with 'J' Qualifiers*

| | | | |
|---|---|---|---|
| **Project Name:** | RWM | **Lab Number:** | L2452147 |
| **Project Number:** | 21010103 | **Report Date:** | 09/25/24 |

***Data Qualifiers***

Identified Compounds (TICs). For calculated parameters, this represents that one or more values used in the calculation were estimated.

**M** - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.

**ND** - Not detected at the method detection limit (MDL) for the sample, or estimated detection limit (EDL) for SPME-related analyses.

**NJ** - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where the identification is based on a mass spectral library search.

**P** - The RPD between the results for the two columns exceeds the method-specified criteria.

**Q** - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)

**R** - Analytical results are from sample re-analysis.

**RE** - Analytical results are from sample re-extraction.

**S** - Analytical results are from modified screening analysis.

**V** - The surrogate associated with this target analyte has a recovery outside the QC acceptance limits. (Applicable to MassDEP DW Compliance samples only.)

**Z** - The batch matrix spike and/or duplicate associated with this target analyte has a recovery/RPD outside the QC acceptance limits. (Applicable to MassDEP DW Compliance samples only.)

| | | | |
|---|---|---|---|
| **Project Name:** | RWM | **Lab Number:** | L2452147 |
| **Project Number:** | 21010103 | **Report Date:** | 09/25/24 |

## REFERENCES

1 Test Methods for Evaluating Solid Waste: Physical/Chemical Methods. EPA SW-846. Third Edition. Updates I - VI, 2018.

## LIMITATION OF LIABILITIES

Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Analytical shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Alpha Analytical.

We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.

# Certification Information

**The following analytes are not included in our Primary NELAP Scope of Accreditation:**

**Westborough Facility**
**EPA 624.1:** m/p-xylene, o-xylene, Naphthalene
**EPA 625.1:** alpha-Terpineol
**EPA 8260D:** NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene; SCM: Iodomethane (methyl iodide), 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.
**EPA 8270E:** NPW: Dimethylnaphthalene,1,4-Diphenylhydrazine, alpha-Terpineol, Azobenzene; SCM: Dimethylnaphthalene,1,4-Diphenylhydrazine.
**SM4500**: NPW: Amenable Cyanide; SCM: Total Phosphorus, TKN, NO2, NO3.

**Mansfield Facility**
**SM 2540D:** TSS.
**EPA TO-15:** Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene, 3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene.
**Nonpotable Water: EPA RSK-175 Dissolved Gases**
**Biological Tissue Matrix:** EPA 3050B

**The following analytes are included in our Massachusetts DEP Scope of Accreditation**

**Westborough Facility:**

***Drinking Water***
**EPA 300.0**: Chloride, Nitrate-N, Fluoride, Sulfate; **EPA 353.2**: Nitrate-N, Nitrite-N; **SM4500NO3-F**: Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE, EPA 180.1, SM2130B, SM4500Cl-D, SM2320B, SM2540C, SM4500H-B, SM4500NO2-B**
**EPA 524.2:** THMs and VOCs; **EPA 504.1:** EDB, DBCP.
**Microbiology**: **SM9215B; SM9223-P/A, SM9223B-Colilert-QT,SM9222D**.

***Non-Potable Water***
**SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2320B, SM4500CL-E, SM4500F-BC, SM4500NH3-BH:** Ammonia-N and Kjeldahl-N, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **EPA 351.1, SM4500NO3-F, EPA 353.2**: Nitrate-N**, SM4500P-E, SM4500P-B, E, SM4500SO4-E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, EPA 420.1, SM4500-CN-CE, SM2540D, EPA 300: Chloride, Sulfate, Nitrate.**
**EPA 624.1**: Volatile Halocarbons & Aromatics,
**EPA 608.3**: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs
**EPA 625.1**: SVOC (Acid/Base/Neutral Extractables).
**Microbiology**: **SM9223B-Colilert-QT; Enterolert-QT, EPA 1600, EPA 1603, SM9222D.**

**Mansfield Facility:**

***Drinking Water***
**EPA 200.7:** Al, Ba, Cd, Cr, Cu, Fe, Mn, Ni, Na, Ag, Ca, Zn. **EPA 200.8:** Al, Sb, As, Ba, Be, Cd, Cr, Cu, Pb, Mn, Ni, Se, Ag, TL, Zn. **EPA 245.1** Hg.
**EPA 522, EPA 537.1.**

***Non-Potable Water***
**EPA 200.7:** Al, Sb, As, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, K, Se, Ag, Na, Sr, TL, Ti, V, Zn.
**EPA 200.8:** Al, Sb**,** As, Be, Cd, Cr, Cu, Fe, Pb, Mn, Ni, K, Se, Ag, Na, TL, Zn.
**EPA 245.1** Hg.
**SM2340B**

For a complete listing of analytes and methods, please contact your Alpha Project Manager.

L2452147 18SEP24

TRADEPOINT

# NEW JERSEY CHAIN OF CUSTODY

ALPHA ANALYTICAL

Westborough, MA 01581
8 Walkup Dr.
TEL: 508-898-9220
FAX: 508-898-9193

Mansfield, MA 02048
320 Forbes Blvd
TEL: 508-822-9300
FAX: 508-822-3288

Service Centers
Mahwah, NJ 07430: 35 Whitney Rd, Suite 5
Albany, NY 12205: 14 Walker Way
Tonawanda, NY 14150: 275 Cooper Ave, Suite 105

Page of

Date Rec'd in Lab 9/12/24

**Client Information**
Client: Tradepoint Atlantic
Address: 6995 Bethlehem Blvd Sparrows Point MD
Phone:
Fax:
Email: JBarna@armgroup.net kduffie@armgroup.net

**Project Information**
Project Name: RMW
Project Location: AB
Project # 21010103
(Use Project name as Project #)
Project Manager:
ALPHAQuote #:

**Turn-Around Time**
Standard [X] Due Date:
Rush (only if pre approved) [ ] # of Days:

**Deliverables**
[ ] NJ Full / Reduced
[ ] EQuIS (1 File) [ ] EQuIS (4 File)
[ ] Other

**Billing Information**
[ ] Same as Client Info
PO #

**Regulatory Requirement**
[ ] SRS Residential/Non Residential
[ ] SRS Impact to Groundwater
[ ] NJ Ground Water Quality Standards
[ ] NJ ICW SPLP Leachate Criteria
[ ] Other

**Site Information**
Is this site impacted by Petroleum? Yes [ ]
Petroleum Product:

These samples have been previously analyzed by Alpha [ ]

**For EPH, selection is REQUIRED:**
[ ] Category 1
[ ] Category 2

**For VOC, selection is REQUIRED:**
[ ] 1,4-Dioxane
[ ] 8011

**Other project specific requirements/comments:**
Please specify Metals or TAL.

**ANALYSIS**

**Sample Filtration**
[ ] Done
[ ] Lab to do
*Preservation*
[ ] Lab to do
*(Please Specify below)*

| ALPHA Lab ID (Lab Use Only) | Sample ID | Collection Date | Collection Time | Sample Matrix | Sampler's Initials | Dissolved Cadmium | Dissolved Zinc | Total Bottle | Sample Specific Comments |
|---|---|---|---|---|---|---|---|---|---|
| 52147-01 | RWF-MW5 | 9/11/24 | 1035 | GW | NM | X | X | | |
| 02 | RWF-MW1 | 9/11/24 | 1105 | GW | NM | X | X | | |
| 03 | RW05R-MW1 | 9/11/24 | 1145 | GW | NM | X | X | | |
| 04 | RWA-MW5 | 9/11/24 | 1330 | GW | NM | X | X | | |
| 05 | RWA-MW1 | 9/11/24 | 1415 | GW | NM | X | X | | |
| 06 | RW22R-MW5 | 9/11/24 | 1505 | GW | NM | X | X | | |
| ~~HOLD~~ 07 | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

Preservative Code:
A = None
B = HCl
C = $HNO_3$
D = $H_2SO_4$
E = NaOH
F = MeOH
G = $NaHSO_4$
H = $Na_2S_2O_3$
K/E = Zn Ac/NaOH
O = Other

Container Code
P = Plastic
A = Amber Glass
V = Vial
G = Glass
B = Bacteria Cup
C = Cube
O = Other
E = Encore
D = BOD Bottle

Westboro: Certification No: MA935
Mansfield: Certification No: MA015

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Container Type | | | | | | | | | | | | | | | |
| Preservative | | | | | | | | | | | | | | | |

| Relinquished By: | Date/Time | Received By: | Date/Time |
|---|---|---|---|
| [illegible] | 9/11/24, 15:20 | [illegible] | 9/11/24 15:20 |
| Face | 9/11/24 1800 | [illegible] | 9/11/24 1800 |
| [illegible] | 9/12/24 2110 | Anthony Green | SEP 11 2023 2154 |
| Anthony Green | 9/12/24 0025 | [illegible] | 9/12/24 0025 |

Please print clearly, legibly and completely. Samples can not be logged in and turnaround time clock will not start until any ambiguities are resolved. BY EXECUTING THIS COC, THE CLIENT HAS READ AND AGREES TO BE BOUND BY ALPHA'S TERMS & CONSTANTS. (See reverse side.)

Form No: 01-14 HC (rev. 30-Sept-2013)

9/12/24 0025 Received 09112124-0225

# ANALYTICAL REPORT

| | |
|---|---|
| Lab Number: | L2452536 |
| Client: | Tradepoint Atlantic<br>1600 Sparrows Point Boulevard<br>Baltimore, MD 21219 |
| ATTN: | Robert Tworkowski |
| Phone: | (443) 649-5073 |
| Project Name: | RWM |
| Project Number: | 21010103 |
| Report Date: | 09/24/24 |

The original project report/data package is held by Alpha Analytical. This report/data package is paginated and should be reproduced only in its entirety. Alpha Analytical holds no responsibility for results and/or data that are not consistent with the original.

Certifications & Approvals: MA (M-MA086), NH NELAP (2064), CT (PH-0826), IL (200077), IN (C-MA-03), KY (KY98045), ME (MA00086), MD (348), NJ (MA935), NY (11148), NC (25700/666), OR (MA-1316), PA (68-03671), RI (LAO00065), TX (T104704476), VT (VT-0935), VA (460195), USDA (Permit #525-23-122-91930A1).

Eight Walkup Drive, Westborough, MA 01581-1019
508-898-9220 (Fax) 508-898-9193 800-624-9220 - www.alphalab.com

**Project Name:** RWM
**Project Number:** 21010103

**Lab Number:** L2452536
**Report Date:** 09/24/24

| Alpha Sample ID | Client ID | Matrix | Sample Location | Collection Date/Time | Receive Date |
|---|---|---|---|---|---|
| L2452536-01 | RW22R-MWI | WATER | A3 | 09/12/24 11:40 | 09/12/24 |
| L2452536-02 | RW07-MWI | WATER | A3 | 09/12/24 12:30 | 09/12/24 |
| L2452536-03 | RWJ-MWS | WATER | A3 | 09/12/24 13:20 | 09/12/24 |
| L2452536-04 | RWJ-MWI | WATER | A3 | 09/12/24 13:55 | 09/12/24 |
| L2452536-05 | RWK-MWS | WATER | A3 | 09/12/24 14:35 | 09/12/24 |
| L2452536-06 | RWK-MWI | WATER | A3 | 09/12/24 15:15 | 09/12/24 |
| L2452536-07 | RWL-MWS | WATER | A3 | 09/12/24 15:55 | 09/12/24 |

| | | | |
|---|---|---|---|
| **Project Name:** | RWM | **Lab Number:** | L2452536 |
| **Project Number:** | 21010103 | **Report Date:** | 09/24/24 |

## Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet NELAP requirements for all NELAP accredited parameters unless otherwise noted in the following narrative. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. Tentatively Identified Compounds (TICs), if requested, are reported for compounds identified to be present and are not part of the method/program Target Compound List, even if only a subset of the TCL are being reported. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively.

When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances, the specific failure is not narrated but noted in the associated QC Outlier Summary Report, located directly after the Case Narrative. QC information is also incorporated in the Data Usability Assessment table (Format 11) of our Data Merger tool, where it can be reviewed in conjunction with the sample result, associated regulatory criteria and any associated data usability implications.

Soil/sediments and solids are reported on a dry weight basis unless otherwise noted. Tissues are reported "as received" or on a wet weight basis, unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

HOLD POLICY - For samples submitted on hold, Alpha's policy is to hold samples (with the exception of Air canisters) free of charge for 21 calendar days from the date the project is completed. After 21 calendar days, we will dispose of all samples submitted including those put on hold unless you have contacted your Alpha Project Manager and made arrangements for Alpha to continue to hold the samples. Air canisters will be disposed after 3 business days from the date the project is completed.

Please contact Project Management at 800-624-9220 with any questions.

**Project Name:** RWM
**Project Number:** 21010103

**Lab Number:** L2452536
**Report Date:** 09/24/24

**Case Narrative (continued)**

Report Submission

All non-detect (ND) or estimated concentrations (J-qualified) have been quantitated to the limit noted in the MDL column.

Dissolved Metals

The WG1973223-3 MS recovery for zinc (0%), performed on L2452536-01, does not apply because the sample concentration is greater than four times the spike amount added.

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature: Kelly O'Neill

Title: Technical Director/Representative Date: 09/24/24

# METALS

**Project Name:** RWM
**Project Number:** 21010103
**Lab Number:** L2452536
**Report Date:** 09/24/24

## SAMPLE RESULTS

Lab ID: L2452536-01
Client ID: RW22R-MWI
Sample Location: A3
Sample Depth:
Matrix: Water

Date Collected: 09/12/24 11:40
Date Received: 09/12/24
Field Prep: Refer to COC

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dissolved Metals - Mansfield Lab** | | | | | | | | | | | |
| Cadmium, Dissolved | 1.564 | | ug/l | 0.2000 | 0.0599 | 1 | 09/18/24 21:34 | 09/24/24 13:08 | EPA 3005A | 1,6020B | NTB |
| Zinc, Dissolved | 109100 | | ug/l | 200.0 | 68.20 | 20 | 09/18/24 21:34 | 09/24/24 14:49 | EPA 3005A | 1,6020B | NTB |

**Project Name:** RWM
**Project Number:** 21010103
**Lab Number:** L2452536
**Report Date:** 09/24/24

## SAMPLE RESULTS

Lab ID: L2452536-02
Client ID: RW07-MWI
Sample Location: A3
Sample Depth:
Matrix: Water

Date Collected: 09/12/24 12:30
Date Received: 09/12/24
Field Prep: Refer to COC

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dissolved Metals - Mansfield Lab** | | | | | | | | | | | |
| Cadmium, Dissolved | 8.475 | | ug/l | 0.2000 | 0.0599 | 1 | 09/18/24 21:34 | 09/24/24 13:30 | EPA 3005A | 1,6020B | NTB |
| Zinc, Dissolved | 8125. | | ug/l | 10.00 | 3.410 | 1 | 09/18/24 21:34 | 09/24/24 13:30 | EPA 3005A | 1,6020B | NTB |

**Project Name:** RWM
**Project Number:** 21010103
**Lab Number:** L2452536
**Report Date:** 09/24/24

## SAMPLE RESULTS

Lab ID: L2452536-03
Client ID: RWJ-MWS
Sample Location: A3
Sample Depth:
Matrix: Water

Date Collected: 09/12/24 13:20
Date Received: 09/12/24
Field Prep: Refer to COC

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dissolved Metals - Mansfield Lab** | | | | | | | | | | | |
| Cadmium, Dissolved | ND | | ug/l | 0.2000 | 0.0599 | 1 | 09/18/24 21:34 | 09/24/24 13:35 | EPA 3005A | 1,6020B | NTB |
| Zinc, Dissolved | ND | | ug/l | 10.00 | 3.410 | 1 | 09/18/24 21:34 | 09/24/24 13:35 | EPA 3005A | 1,6020B | NTB |

**Project Name:** RWM
**Project Number:** 21010103
**Lab Number:** L2452536
**Report Date:** 09/24/24

## SAMPLE RESULTS

Lab ID: L2452536-04
Client ID: RWJ-MWI
Sample Location: A3
Sample Depth:
Matrix: Water

Date Collected: 09/12/24 13:55
Date Received: 09/12/24
Field Prep: Refer to COC

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dissolved Metals - Mansfield Lab** | | | | | | | | | | | |
| Cadmium, Dissolved | 30.18 | | ug/l | 0.2000 | 0.0599 | 1 | 09/18/24 21:34 | 09/24/24 14:01 | EPA 3005A | 1,6020B | NTB |
| Zinc, Dissolved | 3130. | | ug/l | 10.00 | 3.410 | 1 | 09/18/24 21:34 | 09/24/24 14:01 | EPA 3005A | 1,6020B | NTB |

**Project Name:** RWM
**Project Number:** 21010103
**Lab Number:** L2452536
**Report Date:** 09/24/24

## SAMPLE RESULTS

Lab ID: L2452536-05
Client ID: RWK-MWS
Sample Location: A3
Sample Depth:
Matrix: Water

Date Collected: 09/12/24 14:35
Date Received: 09/12/24
Field Prep: Refer to COC

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dissolved Metals - Mansfield Lab** | | | | | | | | | | | |
| Cadmium, Dissolved | 0.3063 | | ug/l | 0.2000 | 0.0599 | 1 | 09/18/24 21:34 | 09/24/24 14:06 | EPA 3005A | 1,6020B | NTB |
| Zinc, Dissolved | 20750 | | ug/l | 100.0 | 34.10 | 10 | 09/18/24 21:34 | 09/24/24 15:07 | EPA 3005A | 1,6020B | NTB |

**Project Name:** RWM
**Project Number:** 21010103
**Lab Number:** L2452536
**Report Date:** 09/24/24

## SAMPLE RESULTS

Lab ID: L2452536-06
Client ID: RWK-MWI
Sample Location: A3
Sample Depth:
Matrix: Water

Date Collected: 09/12/24 15:15
Date Received: 09/12/24
Field Prep: Refer to COC

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dissolved Metals - Mansfield Lab** | | | | | | | | | | | |
| Cadmium, Dissolved | 238.8 | | ug/l | 2.000 | 0.5990 | 10 | 09/18/24 21:34 | 09/24/24 15:26 | EPA 3005A | 1,6020B | NTB |
| Zinc, Dissolved | 35070 | | ug/l | 100.0 | 34.10 | 10 | 09/18/24 21:34 | 09/24/24 15:26 | EPA 3005A | 1,6020B | NTB |

**Project Name:** RWM
**Project Number:** 21010103
**Lab Number:** L2452536
**Report Date:** 09/24/24

## SAMPLE RESULTS

Lab ID: L2452536-07
Client ID: RWL-MWS
Sample Location: A3
Sample Depth:
Matrix: Water

Date Collected: 09/12/24 15:55
Date Received: 09/12/24
Field Prep: Refer to COC

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dissolved Metals - Mansfield Lab** | | | | | | | | | | | |
| Cadmium, Dissolved | 1.450 | | ug/l | 0.2000 | 0.0599 | 1 | 09/18/24 21:34 | 09/24/24 14:14 | EPA 3005A | 1,6020B | NTB |
| Zinc, Dissolved | 24050 | | ug/l | 100.0 | 34.10 | 10 | 09/18/24 21:34 | 09/24/24 15:30 | EPA 3005A | 1,6020B | NTB |

**Project Name:** RWM
**Project Number:** 21010103
**Lab Number:** L2452536
**Report Date:** 09/24/24

# Method Blank Analysis
# Batch Quality Control

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|
| Dissolved Metals - Mansfield Lab for sample(s): 01-07 Batch: WG1973223-1 | | | | | | | | | | |
| Cadmium, Dissolved | ND | | ug/l | 0.2000 | 0.0599 | 1 | 09/18/24 21:34 | 09/24/24 13:57 | 1,6020B | NTB |
| Zinc, Dissolved | ND | | ug/l | 10.00 | 3.410 | 1 | 09/18/24 21:34 | 09/24/24 13:57 | 1,6020B | NTB |

**Prep Information**

Digestion Method: EPA 3005A

# Lab Control Sample Analysis

## Batch Quality Control

**Project Name:** RWM

**Project Number:** 21010103

**Lab Number:** L2452536

**Report Date:** 09/24/24

| Parameter | LCS %Recovery | Qual | LCSD %Recovery | Qual | %Recovery Limits | RPD | Qual | RPD Limits |
|---|---|---|---|---|---|---|---|---|
| Dissolved Metals - Mansfield Lab Associated sample(s): 01-07 Batch: WG1973223-2 | | | | | | | | |
| Cadmium, Dissolved | 98 | | - | | 80-120 | - | | |
| Zinc, Dissolved | 107 | | - | | 80-120 | - | | |

# Matrix Spike Analysis
## Batch Quality Control

**Project Name:** RWM
**Project Number:** 21010103

**Lab Number:** L2452536
**Report Date:** 09/24/24

| Parameter | Native Sample | MS Added | MS Found | MS %Recovery | Qual | MSD Found | MSD %Recovery | Qual | Recovery Limits | RPD | Qual | RPD Limits |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Dissolved Metals - Mansfield Lab Associated sample(s): 01-07 QC Batch ID: WG1973223-3 QC Sample: L2452536-01 Client ID: RW22R-MWI | | | | | | | | | | | | |
| Cadmium, Dissolved | 1.564 | 53 | 58.42 | 107 | | - | - | | 75-125 | - | | 20 |
| Zinc, Dissolved | 109100 | 500 | 107400 | **0** | Q | - | - | | 75-125 | - | | 20 |

# Lab Duplicate Analysis

***Batch Quality Control***

**Project Name:** RWM
**Project Number:** 21010103

***Lab Number:*** L2452536
***Report Date:*** 09/24/24

| Parameter | Native Sample | Duplicate Sample | Units | RPD | Qual | RPD Limits |
|---|---|---|---|---|---|---|
| Dissolved Metals - Mansfield Lab Associated sample(s): 01-07 QC Batch ID: WG1973223-4 QC Sample: L2452536-01 Client ID: RW22R-MWI | | | | | | |
| Cadmium, Dissolved | 1.564 | 1.598 | ug/l | 2 | | 20 |
| Dissolved Metals - Mansfield Lab Associated sample(s): 01-07 QC Batch ID: WG1973223-4 QC Sample: L2452536-01 Client ID: RW22R-MWI | | | | | | |
| Zinc, Dissolved | 109100 | 100700 | ug/l | 8 | | 20 |

**Project Name:** RWM
**Project Number:** 21010103

# Lab Serial Dilution Analysis
## Batch Quality Control

**Lab Number:** L2452536
**Report Date:** 09/24/24

| Parameter | Native Sample | Serial Dilution | Units | % D | Qual | RPD Limits |
|---|---|---|---|---|---|---|
| Dissolved Metals - Mansfield Lab Associated sample(s): 01-07 QC Batch ID: WG1973223-6 QC Sample: L2452536-01 Client ID: RW22R-MWI | | | | | | |
| Zinc, Dissolved | 109100 | 110500 | ug/l | 1 | | 20 |

**Project Name:** RWM
**Project Number:** 21010103

**Lab Number:** L2452536
**Report Date:** 09/24/24

## Sample Receipt and Container Information

Were project specific reporting limits specified? YES

### Cooler Information

| Cooler | Custody Seal |
|---|---|
| A | Absent |

### Container Information

| Container ID | Container Type | Cooler | Initial pH | Final pH | Temp deg C | Pres | Seal | Frozen Date/Time | Analysis(*) |
|---|---|---|---|---|---|---|---|---|---|
| L2452536-01A | Plastic 250ml HNO3 preserved | A | <2 | <2 | 3.4 | Y | Absent | | ZN-6020S-PPB(180),CD-6020S-PPB(180) |
| L2452536-02A | Plastic 250ml HNO3 preserved | A | <2 | <2 | 3.4 | Y | Absent | | ZN-6020S-PPB(180),CD-6020S-PPB(180) |
| L2452536-03A | Plastic 250ml HNO3 preserved | A | <2 | <2 | 3.4 | Y | Absent | | ZN-6020S-PPB(180),CD-6020S-PPB(180) |
| L2452536-04A | Plastic 250ml HNO3 preserved | A | <2 | <2 | 3.4 | Y | Absent | | ZN-6020S-PPB(180),CD-6020S-PPB(180) |
| L2452536-05A | Plastic 250ml HNO3 preserved | A | <2 | <2 | 3.4 | Y | Absent | | ZN-6020S-PPB(180),CD-6020S-PPB(180) |
| L2452536-06A | Plastic 250ml HNO3 preserved | A | <2 | <2 | 3.4 | Y | Absent | | ZN-6020S-PPB(180),CD-6020S-PPB(180) |
| L2452536-07A | Plastic 250ml HNO3 preserved | A | <2 | <2 | 3.4 | Y | Absent | | ZN-6020S-PPB(180),CD-6020S-PPB(180) |



*Values in parentheses indicate holding time in days

| | | | |
|---|---|---|---|
| **Project Name:** | RWM | **Lab Number:** | L2452536 |
| **Project Number:** | 21010103 | **Report Date:** | 09/24/24 |

## GLOSSARY

***Acronyms***

DL - Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the limit of quantitation (LOQ). The DL includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)

EDL - Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME).

EMPC - Estimated Maximum Possible Concentration: The concentration that results from the signal present at the retention time of an analyte when the ions meet all of the identification criteria except the ion abundance ratio criteria. An EMPC is a worst-case estimate of the concentration.

EPA - Environmental Protection Agency.

LCS - Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.

LCSD - Laboratory Control Sample Duplicate: Refer to LCS.

LFB - Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.

LOD - Limit of Detection: This value represents the level to which a target analyte can reliably be detected for a specific analyte in a specific matrix by a specific method. The LOD includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)

LOQ - Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)

Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)

MDL - Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.

MS - Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available. For Method 332.0, the spike recovery is calculated using the native concentration, including estimated values.

MSD - Matrix Spike Sample Duplicate: Refer to MS.

NA - Not Applicable.

NC - Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.

NDPA/DPA - N-Nitrosodiphenylamine/Diphenylamine.

NI - Not Ignitable.

NP - Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil.

NR - No Results: Term is utilized when 'No Target Compounds Requested' is reported for the analysis of Volatile or Semivolatile Organic TIC only requests.

RL - Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.

RPD - Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report.

SRM - Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples.

STLP - Semi-dynamic Tank Leaching Procedure per EPA Method 1315.

TEF - Toxic Equivalency Factors: The values assigned to each dioxin and furan to evaluate their toxicity relative to 2,3,7,8-TCDD.

TEQ - Toxic Equivalent: The measure of a sample's toxicity derived by multiplying each dioxin and furan by its corresponding TEF and then summing the resulting values.

TIC - Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations.

*Report Format: DU Report with 'J' Qualifiers*

| | | | |
|---|---|---|---|
| **Project Name:** | RWM | **Lab Number:** | L2452536 |
| **Project Number:** | 21010103 | **Report Date:** | 09/24/24 |

***Footnotes***

1 - The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

***Terms***

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Chlordane: The target compound Chlordane (CAS No. 57-74-9) is reported for GC ECD analyses. Per EPA,this compound "refers to a mixture of chlordane isomers, other chlorinated hydrocarbons and numerous other components." (Reference: USEPA Toxicological Review of Chlordane, In Support of Summary Information on the Integrated Risk Information System (IRIS), December 1997.)

Difference: With respect to Total Oxidizable Precursor (TOP) Assay analysis, the difference is defined as the Post-Treatment value minus the Pre-Treatment value.

Final pH: As it pertains to Sample Receipt & Container Information section of the report, Final pH reflects pH of container determined after adjustment at the laboratory, if applicable. If no adjustment required, value reflects Initial pH.

Frozen Date/Time: With respect to Volatile Organics in soil, Frozen Date/Time reflects the date/time at which associated Reagent Water-preserved vials were initially frozen. Note: If frozen date/time is beyond 48 hours from sample collection, value will be reflected in 'bold'.

Gasoline Range Organics (GRO): Gasoline Range Organics (GRO) results include all chromatographic peaks eluting from Methyl tert butyl ether through Naphthalene, with the exception of GRO analysis in support of State of Ohio programs, which includes all chromatographic peaks eluting from Hexane through Dodecane.

Initial pH: As it pertains to Sample Receipt & Container Information section of the report, Initial pH reflects pH of container determined upon receipt, if applicable.

PAH Total: With respect to Alkylated PAH analyses, the 'PAHs, Total' result is defined as the summation of results for all or a subset of the following compounds: Naphthalene, C1-C4 Naphthalenes, 2-Methylnaphthalene, 1-Methylnaphthalene, Biphenyl, Acenaphthylene, Acenaphthene, Fluorene, C1-C3 Fluorenes, Phenanthrene, C1-C4 Phenanthrenes/Anthracenes, Anthracene, Fluoranthene, Pyrene, C1-C4 Fluoranthenes/Pyrenes, Benz(a)anthracene, Chrysene, C1-C4 Chrysenes, Benzo(b)fluoranthene, Benzo(j)+(k)fluoranthene, Benzo(e)pyrene, Benzo(a)pyrene, Perylene, Indeno(1,2,3-cd)pyrene, Dibenz(ah)+(ac)anthracene, Benzo(g,h,i)perylene. If a 'Total' result is requested, the results of its individual components will also be reported.

PFAS Total: With respect to PFAS analyses, the 'PFAS, Total (5)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA and PFOS. In addition, the 'PFAS, Total (6)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA, PFDA and PFOS. For MassDEP DW compliance analysis only, the 'PFAS, Total (6)' result is defined as the summation of results at or above the RL. Note: If a 'Total' result is requested, the results of its individual components will also be reported.

Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

***Data Qualifiers***

**A** - Spectra identified as "Aldol Condensates" are byproducts of the extraction/concentration procedures when acetone is introduced in the process.

**B** - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).

**C** - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.

**D** - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.

**E** - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.

**F** - The ratio of quantifier ion response to qualifier ion response falls outside of the laboratory criteria. Results are considered to be an estimated maximum concentration.

**G** - The concentration may be biased high due to matrix interferences (i.e, co-elution) with non-target compound(s). The result should be considered estimated.

**H** - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.

**I** - The lower value for the two columns has been reported due to obvious interference.

**J** - Estimated value. The Target analyte concentration is below the quantitation limit (RL), but above the Method Detection Limit (MDL) or Estimated Detection Limit (EDL) for SPME-related analyses. This represents an estimated concentration for Tentatively

*Report Format: DU Report with 'J' Qualifiers*

| | | | |
|---|---|---|---|
| **Project Name:** | RWM | **Lab Number:** | L2452536 |
| **Project Number:** | 21010103 | **Report Date:** | 09/24/24 |

***Data Qualifiers***

Identified Compounds (TICs). For calculated parameters, this represents that one or more values used in the calculation were estimated.

**M** - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.

**ND** - Not detected at the method detection limit (MDL) for the sample, or estimated detection limit (EDL) for SPME-related analyses.

**NJ** - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where the identification is based on a mass spectral library search.

**P** - The RPD between the results for the two columns exceeds the method-specified criteria.

**Q** - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)

**R** - Analytical results are from sample re-analysis.

**RE** - Analytical results are from sample re-extraction.

**S** - Analytical results are from modified screening analysis.

**V** - The surrogate associated with this target analyte has a recovery outside the QC acceptance limits. (Applicable to MassDEP DW Compliance samples only.)

**Z** - The batch matrix spike and/or duplicate associated with this target analyte has a recovery/RPD outside the QC acceptance limits. (Applicable to MassDEP DW Compliance samples only.)

## REFERENCES

1 Test Methods for Evaluating Solid Waste: Physical/Chemical Methods. EPA SW-846. Third Edition. Updates I - VI, 2018.

## LIMITATION OF LIABILITIES

Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Analytical shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Alpha Analytical.

We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.

# Certification Information

**The following analytes are not included in our Primary NELAP Scope of Accreditation:**

**Westborough Facility**
**EPA 624.1:** m/p-xylene, o-xylene, Naphthalene
**EPA 625.1:** alpha-Terpineol
**EPA 8260D:** NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene; SCM: Iodomethane (methyl iodide), 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.
**EPA 8270E:** NPW: Dimethylnaphthalene,1,4-Diphenylhydrazine, alpha-Terpineol, Azobenzene; SCM: Dimethylnaphthalene,1,4-Diphenylhydrazine.
**SM4500**: NPW: Amenable Cyanide; SCM: Total Phosphorus, TKN, NO2, NO3.

**Mansfield Facility**
**SM 2540D:** TSS.
**EPA TO-15:** Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene, 3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene.
**Nonpotable Water: EPA RSK-175 Dissolved Gases**
**Biological Tissue Matrix:** EPA 3050B

**The following analytes are included in our Massachusetts DEP Scope of Accreditation**

**Westborough Facility:**

***Drinking Water***
**EPA 300.0**: Chloride, Nitrate-N, Fluoride, Sulfate; **EPA 353.2**: Nitrate-N, Nitrite-N; **SM4500NO3-F**: Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE, EPA 180.1, SM2130B, SM4500Cl-D, SM2320B, SM2540C, SM4500H-B, SM4500NO2-B**
**EPA 524.2:** THMs and VOCs; **EPA 504.1:** EDB, DBCP.
**Microbiology**: **SM9215B; SM9223-P/A, SM9223B-Colilert-QT,SM9222D**.

***Non-Potable Water***
**SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2320B, SM4500CL-E, SM4500F-BC, SM4500NH3-BH:** Ammonia-N and Kjeldahl-N, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **EPA 351.1, SM4500NO3-F, EPA 353.2**: Nitrate-N**, SM4500P-E, SM4500P-B, E, SM4500SO4-E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, EPA 420.1, SM4500-CN-CE, SM2540D, EPA 300: Chloride, Sulfate, Nitrate.**
**EPA 624.1**: Volatile Halocarbons & Aromatics,
**EPA 608.3**: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs
**EPA 625.1**: SVOC (Acid/Base/Neutral Extractables).
**Microbiology**: **SM9223B-Colilert-QT; Enterolert-QT, EPA 1600, EPA 1603, SM9222D.**

**Mansfield Facility:**

***Drinking Water***
**EPA 200.7:** Al, Ba, Cd, Cr, Cu, Fe, Mn, Ni, Na, Ag, Ca, Zn. **EPA 200.8:** Al, Sb, As, Ba, Be, Cd, Cr, Cu, Pb, Mn, Ni, Se, Ag, TL, Zn. **EPA 245.1** Hg.
**EPA 522, EPA 537.1.**

***Non-Potable Water***
**EPA 200.7:** Al, Sb, As, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, K, Se, Ag, Na, Sr, TL, Ti, V, Zn.
**EPA 200.8:** Al, Sb**,** As, Be, Cd, Cr, Cu, Fe, Pb, Mn, Ni, K, Se, Ag, Na, TL, Zn.
**EPA 245.1** Hg.
**SM2340B**

For a complete listing of analytes and methods, please contact your Alpha Project Manager.

# NEW JERSEY CHAIN OF CUSTODY

ALPHA

Westborough, MA 01581
8 Walkup Dr.
TEL: 508-898-9220
FAX: 508-898-9193

Mansfield, MA 02048
320 Forbes Blvd
TEL: 508-822-9300
FAX: 508-822-3288

Service Centers
Mahwah, NJ 07430: 35 Whitney Rd, Suite 5
Albany, NY 12205: 14 Walker Way
Tonawanda, NY 14150: 275 Cooper Ave, Suite 105

Page of

Date Rec'd in Lab: 9/13/24

ALPHA Job #: L2452536

**Client Information**
Client: Tradepoint Atlantic
Address: 6995 Bethlehem Blvd Sparrows Point, MD
Phone:
Fax:
Email: JBurns@tradepointatl.com, KGuilfoil@tradepointatl.com

**Project Information**
Project Name: RWM
Project Location: A3
Project # 21010103
(Use Project name as Project #)
Project Manager:
ALPHAQuote #:

**Turn-Around Time**
Standard: ☒ Due Date:
Rush (only if pre approved): ☐ # of Days:

**Deliverables**
☐ NJ Full / Reduced
☐ EQuIS (1 File) ☐ EQuIS (4 File)
☐ Other

**Regulatory Requirement**
☐ SRS Residential/Non Residential
☐ SRS Impact to Groundwater
☐ NJ Ground Water Quality Standards
☐ NJ IGW SPLP Leachate Criteria
☐ Other

**Billing Information**
☐ Same as Client Info
PO #

**Site Information**
Is this site impacted by Petroleum? Yes ☐
Petroleum Product:

These samples have been previously analyzed by Alpha ☐

**For EPH, selection is REQUIRED:**
☐ Category 1
☐ Category 2

**For VOC, selection is REQUIRED:**
☐ 1,4-Dioxane
☐ 8011

**Other project specific requirements/comments:**
**Please specify Metals or TAL.**

**Sample Filtration**
☐ Done
☐ Lab to do
*Preservation*
☐ Lab to do
*(Please Specify below)*

| ALPHA Lab ID (Lab Use Only) | Sample ID | Collection Date | Collection Time | Sample Matrix | Sampler's Initials | ANALYSIS: Dissolved Cadmium | ANALYSIS: Dissolved Zinc | Sample Specific Comments | Total Bottle |
|---|---|---|---|---|---|---|---|---|---|
| 52536-01 | RW22R-MW1 | 9/12/24 | 1140 | GW | LW | X | X | | |
| 02 | RW07-MW4 | 9/12/24 | 1230 | GW | MM | X | X | | |
| 03 | RW3-MW3 | 9/12/24 | 1320 | GW | MM | X | X | | |
| 04 | RW3-MW1 | 9/12/24 | 1355 | GW | MM | X | X | | |
| 05 | RW1C-MW5 | 9/12/24 | 1435 | GW | MM | X | X | | |
| 06 | RW1C-MW1 | 9/12/24 | 1515 | GW | MM | X | X | | |
| 07 | RW1-MW5 | 9/12/24 | 1555 | GW | MM | X | X | | |

Preservative Code:
A = None
B = HCl
C = $HNO_3$
D = $H_2SO_4$
E = NaOH
F = MeOH
G = $NaHSO_4$
H = $Na_2S_2O_3$
K/E = Zn Ac/NaOH
O = Other

Container Code
P = Plastic
A = Amber Glass
V = Vial
G = Glass
B = Bacteria Cup
C = Cube
O = Other
E = Encore
D = BOD Bottle

Westboro: Certification No: MA935
Mansfield: Certification No: MA015

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Container Type | | | | | | | | | | | |
| Preservative | | | | | | | | | | | |

| Relinquished By: | Date/Time | Received By: | Date/Time |
|---|---|---|---|
| | 9/12/24 1610 | RnB | 9-13 1630 |
| RnB | 9-12 1800 | | 9/13/24 1800 |
| | 9/12/24 2400 | Anthony Green | SEP 12 2023 2200 |
| Anthony Green | 9/13/24 0020 | | 9/13/24 0026 |
| | 9/13/24 0210 | Julie | 9/13/24 2:10 |

Please print clearly, legibly and completely. Samples can not be logged in and turnaround time clock will not start until any ambiguities are resolved. BY EXECUTING THIS COC, THE CLIENT HAS READ AND AGREES TO BE BOUND BY ALPHA'S TERMS & CONSTANTS. (See reverse side.)

Form No: 01-14 HC (rev. 30-Sept-2013)

ANALYTICAL REPORT

| | |
|---|---|
| Lab Number: | L2453048 |
| Client: | Tradepoint Atlantic<br>1600 Sparrows Point Boulevard<br>Baltimore, MD 21219 |
| ATTN: | Robert Tworkowski |
| Phone: | (443) 649-5073 |
| Project Name: | RWM |
| Project Number: | 21010103 |
| Report Date: | 10/01/24 |

The original project report/data package is held by Alpha Analytical. This report/data package is paginated and should be reproduced only in its entirety. Alpha Analytical holds no responsibility for results and/or data that are not consistent with the original.

Certifications & Approvals: MA (M-MA086), NH NELAP (2064), CT (PH-0826), IL (200077), IN (C-MA-03), KY (KY98045), ME (MA00086), MD (348), NJ (MA935), NY (11148), NC (25700/666), OR (MA-1316), PA (68-03671), RI (LAO00065), TX (T104704476), VT (VT-0935), VA (460195), USDA (Permit #525-23-122-91930A1).

Eight Walkup Drive, Westborough, MA 01581-1019
508-898-9220 (Fax) 508-898-9193 800-624-9220 - www.alphalab.com

**Project Name:** RWM
**Project Number:** 21010103

**Lab Number:** L2453048
**Report Date:** 10/01/24

| Alpha Sample ID | Client ID | Matrix | Sample Location | Collection Date/Time | Receive Date |
|---|---|---|---|---|---|
| L2453048-01 | RW12-MWS | WATER | A3 | 09/16/24 10:05 | 09/16/24 |
| L2453048-02 | RW12-MWI | WATER | A3 | 09/16/24 10:45 | 09/16/24 |
| L2453048-03 | RW23-MWS | WATER | A3 | 09/16/24 12:20 | 09/16/24 |
| L2453048-04 | RW23-MWI | WATER | A3 | 09/16/24 12:50 | 09/16/24 |
| L2453048-05 | RWM-MWI | WATER | A3 | 09/16/24 14:36 | 09/16/24 |
| L2453048-06 | RWL-MWI | WATER | A3 | 09/16/24 15:15 | 09/16/24 |

| | | | |
|---|---|---|---|
| **Project Name:** | RWM | **Lab Number:** | L2453048 |
| **Project Number:** | 21010103 | **Report Date:** | 10/01/24 |

## Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet NELAP requirements for all NELAP accredited parameters unless otherwise noted in the following narrative. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. Tentatively Identified Compounds (TICs), if requested, are reported for compounds identified to be present and are not part of the method/program Target Compound List, even if only a subset of the TCL are being reported. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively.

When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances, the specific failure is not narrated but noted in the associated QC Outlier Summary Report, located directly after the Case Narrative. QC information is also incorporated in the Data Usability Assessment table (Format 11) of our Data Merger tool, where it can be reviewed in conjunction with the sample result, associated regulatory criteria and any associated data usability implications.

Soil/sediments and solids are reported on a dry weight basis unless otherwise noted. Tissues are reported "as received" or on a wet weight basis, unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

HOLD POLICY - For samples submitted on hold, Alpha's policy is to hold samples (with the exception of Air canisters) free of charge for 21 calendar days from the date the project is completed. After 21 calendar days, we will dispose of all samples submitted including those put on hold unless you have contacted your Alpha Project Manager and made arrangements for Alpha to continue to hold the samples. Air canisters will be disposed after 3 business days from the date the project is completed.

Please contact Project Management at 800-624-9220 with any questions.

| | | | |
|---|---|---|---|
| **Project Name:** | RWM | **Lab Number:** | L2453048 |
| **Project Number:** | 21010103 | **Report Date:** | 10/01/24 |

**Case Narrative (continued)**

Report Submission

All non-detect (ND) or estimated concentrations (J-qualified) have been quantitated to the limit noted in the MDL column.

Sample Receipt

The samples were field filtered for Dissolved Metals.

L2453048-05: The collection date and time on the chain of custody was 16-SEP-24 14:36; however, the collection date/time on the container label was 16-SEP-24 14:30. At the client's request, the collection date/time is reported as 16-SEP-24 14:36.

Dissolved Metals

The WG1974179-3 MS recovery for zinc (148%), performed on L2453048-01, does not apply because the sample concentration is greater than four times the spike amount added.

The WG1974179-4 Laboratory Duplicate RPD for cadmium (106%), performed on L2453048-01, is outside the acceptance criteria. The elevated RPD has been attributed to the non-homogeneous nature of the native sample.

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature: Melissa Sturgis Melissa Sturgis

Title: Technical Director/Representative Date: 10/01/24

# METALS

**Project Name:** RWM
**Project Number:** 21010103
**Lab Number:** L2453048
**Report Date:** 10/01/24

## SAMPLE RESULTS

Lab ID: L2453048-01
Client ID: RW12-MWS
Sample Location: A3
Sample Depth:
Matrix: Water

Date Collected: 09/16/24 10:05
Date Received: 09/16/24
Field Prep: Refer to COC

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dissolved Metals - Mansfield Lab** | | | | | | | | | | | |
| Cadmium, Dissolved | 2.800 | | ug/l | 0.2000 | 0.0599 | 1 | 09/20/24 11:37 | 10/01/24 10:22 | EPA 3005A | 1,6020B | NTB |
| Zinc, Dissolved | 5627. | | ug/l | 10.00 | 3.410 | 1 | 09/20/24 11:37 | 09/30/24 17:14 | EPA 3005A | 1,6020B | NTB |

**Project Name:** RWM
**Project Number:** 21010103
**Lab Number:** L2453048
**Report Date:** 10/01/24

## SAMPLE RESULTS

Lab ID: L2453048-02
Client ID: RW12-MWI
Sample Location: A3
Sample Depth:
Matrix: Water

Date Collected: 09/16/24 10:45
Date Received: 09/16/24
Field Prep: Refer to COC

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dissolved Metals - Mansfield Lab** | | | | | | | | | | | |
| Cadmium, Dissolved | 1128. | | ug/l | 2.000 | 0.5990 | 10 | 09/20/24 11:37 | 09/30/24 19:43 | EPA 3005A | 1,6020B | NTB |
| Zinc, Dissolved | 87040 | | ug/l | 100.0 | 34.10 | 10 | 09/20/24 11:37 | 09/30/24 20:52 | EPA 3005A | 1,6020B | NTB |

**Project Name:** RWM
**Project Number:** 21010103
**Lab Number:** L2453048
**Report Date:** 10/01/24

## SAMPLE RESULTS

Lab ID: L2453048-03
Client ID: RW23-MWS
Sample Location: A3
Sample Depth:
Matrix: Water

Date Collected: 09/16/24 12:20
Date Received: 09/16/24
Field Prep: Refer to COC

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dissolved Metals - Mansfield Lab** | | | | | | | | | | | |
| Cadmium, Dissolved | 8.464 | | ug/l | 0.2000 | 0.0599 | 1 | 09/20/24 11:37 | 09/30/24 19:25 | EPA 3005A | 1,6020B | NTB |
| Zinc, Dissolved | 538.7 | | ug/l | 10.00 | 3.410 | 1 | 09/20/24 11:37 | 10/01/24 09:43 | EPA 3005A | 1,6020B | NTB |

**Project Name:** RWM
**Project Number:** 21010103
**Lab Number:** L2453048
**Report Date:** 10/01/24

## SAMPLE RESULTS

Lab ID: L2453048-04
Client ID: RW23-MWI
Sample Location: A3
Sample Depth:
Matrix: Water

Date Collected: 09/16/24 12:50
Date Received: 09/16/24
Field Prep: Refer to COC

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dissolved Metals - Mansfield Lab** | | | | | | | | | | | |
| Cadmium, Dissolved | 3342. | | ug/l | 10.00 | 2.995 | 50 | 09/20/24 11:37 | 09/30/24 19:48 | EPA 3005A | 1,6020B | NTB |
| Zinc, Dissolved | 144200 | | ug/l | 500.0 | 170.5 | 50 | 09/20/24 11:37 | 09/30/24 20:56 | EPA 3005A | 1,6020B | NTB |

**Project Name:** RWM **Lab Number:** L2453048

**Project Number:** 21010103 **Report Date:** 10/01/24

## SAMPLE RESULTS

Lab ID: L2453048-05 Date Collected: 09/16/24 14:36

Client ID: RWM-MWI Date Received: 09/16/24

Sample Location: A3 Field Prep: Refer to COC

Sample Depth:

Matrix: Water

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dissolved Metals - Mansfield Lab** | | | | | | | | | | | |
| Cadmium, Dissolved | 1353. | | ug/l | 4.000 | 1.198 | 20 | 09/20/24 11:37 | 09/30/24 21:01 | EPA 3005A | 1,6020B | NTB |
| Zinc, Dissolved | 84760 | | ug/l | 200.0 | 68.20 | 20 | 09/20/24 11:37 | 09/30/24 21:01 | EPA 3005A | 1,6020B | NTB |

**Project Name:** RWM
**Project Number:** 21010103
**Lab Number:** L2453048
**Report Date:** 10/01/24

## SAMPLE RESULTS

Lab ID: L2453048-06
Client ID: RWL-MWI
Sample Location: A3
Sample Depth:
Matrix: Water

Date Collected: 09/16/24 15:15
Date Received: 09/16/24
Field Prep: Refer to COC

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dissolved Metals - Mansfield Lab** | | | | | | | | | | | |
| Cadmium, Dissolved | 1114. | | ug/l | 4.000 | 1.198 | 20 | 09/20/24 11:37 | 09/30/24 21:05 | EPA 3005A | 1,6020B | NTB |
| Zinc, Dissolved | 101000 | | ug/l | 200.0 | 68.20 | 20 | 09/20/24 11:37 | 09/30/24 21:05 | EPA 3005A | 1,6020B | NTB |

**Project Name:** RWM
**Project Number:** 21010103
**Lab Number:** L2453048
**Report Date:** 10/01/24

# Method Blank Analysis
# Batch Quality Control

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|
| Dissolved Metals - Mansfield Lab for sample(s): 01-06 Batch: WG1974179-1 | | | | | | | | | | |
| Cadmium, Dissolved | ND | | ug/l | 0.2000 | 0.0599 | 1 | 09/20/24 11:37 | 09/30/24 16:50 | 1,6020B | NTB |
| Zinc, Dissolved | ND | | ug/l | 10.00 | 3.410 | 1 | 09/20/24 11:37 | 09/30/24 16:50 | 1,6020B | NTB |

**Prep Information**

Digestion Method: EPA 3005A

# Lab Control Sample Analysis

## Batch Quality Control

**Project Name:** RWM
**Project Number:** 21010103

**Lab Number:** L2453048
**Report Date:** 10/01/24

| Parameter | LCS %Recovery | Qual | LCSD %Recovery | Qual | %Recovery Limits | RPD | Qual | RPD Limits |
|---|---|---|---|---|---|---|---|---|
| Dissolved Metals - Mansfield Lab Associated sample(s): 01-06 Batch: WG1974179-2 | | | | | | | | |
| Cadmium, Dissolved | 108 | | - | | 80-120 | - | | |
| Zinc, Dissolved | 109 | | - | | 80-120 | - | | |

# Matrix Spike Analysis
## Batch Quality Control

**Project Name:** RWM
**Project Number:** 21010103

**Lab Number:** L2453048
**Report Date:** 10/01/24

| Parameter | Native Sample | MS Added | MS Found | MS %Recovery | Qual | MSD Found | MSD %Recovery | Qual | Recovery Limits | RPD | Qual | RPD Limits |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Dissolved Metals - Mansfield Lab Associated sample(s): 01-06 QC Batch ID: WG1974179-3 QC Sample: L2453048-01 Client ID: RW12-MWS | | | | | | | | | | | | |
| Cadmium, Dissolved | 2.800 | 53 | 56.22 | 101 | | - | - | | 75-125 | - | | 20 |
| Zinc, Dissolved | 5627. | 500 | 6366 | **148** | Q | - | - | | 75-125 | - | | 20 |

# Lab Duplicate Analysis

***Batch Quality Control***

**Project Name:** RWM
**Project Number:** 21010103

***Lab Number:*** L2453048
***Report Date:*** 10/01/24

| Parameter | Native Sample | Duplicate Sample | Units | RPD | Qual | RPD Limits |
|---|---|---|---|---|---|---|
| Dissolved Metals - Mansfield Lab Associated sample(s): 01-06 QC Batch ID: WG1974179-4 QC Sample: L2453048-01 Client ID: RW12-MWS | | | | | | |
| Zinc, Dissolved | 5627. | 5157 | ug/l | 9 | | 20 |
| Dissolved Metals - Mansfield Lab Associated sample(s): 01-06 QC Batch ID: WG1974179-4 QC Sample: L2453048-01 Client ID: RW12-MWS | | | | | | |
| Cadmium, Dissolved | 2.800 | 0.8615 | ug/l | **106** | Q | 20 |

**Project Name:** RWM
**Project Number:** 21010103

# Lab Serial Dilution Analysis
**Batch Quality Control**

**Lab Number:** L2453048
**Report Date:** 10/01/24

| Parameter | Native Sample | Serial Dilution | Units | % D | Qual | RPD Limits |
|---|---|---|---|---|---|---|
| Dissolved Metals - Mansfield Lab Associated sample(s): 01-06 QC Batch ID: WG1974179-6 QC Sample: L2453048-01 Client ID: RW12-MWS | | | | | | |
| Zinc, Dissolved | 5627. | 6086. | ug/l | 8 | | 20 |

**Project Name:** RWM
**Project Number:** 21010103

**Lab Number:** L2453048
**Report Date:** 10/01/24

## Sample Receipt and Container Information

Were project specific reporting limits specified? YES

### Cooler Information

| Cooler | Custody Seal |
|---|---|
| A | Absent |

### Container Information

| Container ID | Container Type | Cooler | Initial pH | Final pH | Temp deg C | Pres | Seal | Frozen Date/Time | Analysis(*) |
|---|---|---|---|---|---|---|---|---|---|
| L2453048-01A | Plastic 250ml HNO3 preserved | A | <2 | <2 | 3.4 | Y | Absent | | ZN-6020S-PPB(180),CD-6020S-PPB(180) |
| L2453048-02A | Plastic 250ml HNO3 preserved | A | <2 | <2 | 3.4 | Y | Absent | | ZN-6020S-PPB(180),CD-6020S-PPB(180) |
| L2453048-03A | Plastic 250ml HNO3 preserved | A | <2 | <2 | 3.4 | Y | Absent | | ZN-6020S-PPB(180),CD-6020S-PPB(180) |
| L2453048-04A | Plastic 250ml HNO3 preserved | A | <2 | <2 | 3.4 | Y | Absent | | ZN-6020S-PPB(180),CD-6020S-PPB(180) |
| L2453048-05A | Plastic 250ml HNO3 preserved | A | <2 | <2 | 3.4 | Y | Absent | | ZN-6020S-PPB(180),CD-6020S-PPB(180) |
| L2453048-06A | Plastic 250ml HNO3 preserved | A | <2 | <2 | 3.4 | Y | Absent | | ZN-6020S-PPB(180),CD-6020S-PPB(180) |



*Values in parentheses indicate holding time in days

| | | | |
|---|---|---|---|
| **Project Name:** | RWM | **Lab Number:** | L2453048 |
| **Project Number:** | 21010103 | **Report Date:** | 10/01/24 |

## GLOSSARY

***Acronyms***

DL - Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the limit of quantitation (LOQ). The DL includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)

EDL - Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME).

EMPC - Estimated Maximum Possible Concentration: The concentration that results from the signal present at the retention time of an analyte when the ions meet all of the identification criteria except the ion abundance ratio criteria. An EMPC is a worst-case estimate of the concentration.

EPA - Environmental Protection Agency.

LCS - Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.

LCSD - Laboratory Control Sample Duplicate: Refer to LCS.

LFB - Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.

LOD - Limit of Detection: This value represents the level to which a target analyte can reliably be detected for a specific analyte in a specific matrix by a specific method. The LOD includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)

LOQ - Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)

Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)

MDL - Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.

MS - Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available. For Method 332.0, the spike recovery is calculated using the native concentration, including estimated values.

MSD - Matrix Spike Sample Duplicate: Refer to MS.

NA - Not Applicable.

NC - Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.

NDPA/DPA - N-Nitrosodiphenylamine/Diphenylamine.

NI - Not Ignitable.

NP - Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil.

NR - No Results: Term is utilized when 'No Target Compounds Requested' is reported for the analysis of Volatile or Semivolatile Organic TIC only requests.

RL - Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.

RPD - Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report.

SRM - Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples.

STLP - Semi-dynamic Tank Leaching Procedure per EPA Method 1315.

TEF - Toxic Equivalency Factors: The values assigned to each dioxin and furan to evaluate their toxicity relative to 2,3,7,8-TCDD.

TEQ - Toxic Equivalent: The measure of a sample's toxicity derived by multiplying each dioxin and furan by its corresponding TEF and then summing the resulting values.

TIC - Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations.

*Report Format: DU Report with 'J' Qualifiers*

| | | | |
|---|---|---|---|
| **Project Name:** | RWM | **Lab Number:** | L2453048 |
| **Project Number:** | 21010103 | **Report Date:** | 10/01/24 |

***Footnotes***

1 - The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

***Terms***

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Chlordane: The target compound Chlordane (CAS No. 57-74-9) is reported for GC ECD analyses. Per EPA,this compound "refers to a mixture of chlordane isomers, other chlorinated hydrocarbons and numerous other components." (Reference: USEPA Toxicological Review of Chlordane, In Support of Summary Information on the Integrated Risk Information System (IRIS), December 1997.)

Difference: With respect to Total Oxidizable Precursor (TOP) Assay analysis, the difference is defined as the Post-Treatment value minus the Pre-Treatment value.

Final pH: As it pertains to Sample Receipt & Container Information section of the report, Final pH reflects pH of container determined after adjustment at the laboratory, if applicable. If no adjustment required, value reflects Initial pH.

Frozen Date/Time: With respect to Volatile Organics in soil, Frozen Date/Time reflects the date/time at which associated Reagent Water-preserved vials were initially frozen. Note: If frozen date/time is beyond 48 hours from sample collection, value will be reflected in 'bold'.

Gasoline Range Organics (GRO): Gasoline Range Organics (GRO) results include all chromatographic peaks eluting from Methyl tert butyl ether through Naphthalene, with the exception of GRO analysis in support of State of Ohio programs, which includes all chromatographic peaks eluting from Hexane through Dodecane.

Initial pH: As it pertains to Sample Receipt & Container Information section of the report, Initial pH reflects pH of container determined upon receipt, if applicable.

PAH Total: With respect to Alkylated PAH analyses, the 'PAHs, Total' result is defined as the summation of results for all or a subset of the following compounds: Naphthalene, C1-C4 Naphthalenes, 2-Methylnaphthalene, 1-Methylnaphthalene, Biphenyl, Acenaphthylene, Acenaphthene, Fluorene, C1-C3 Fluorenes, Phenanthrene, C1-C4 Phenanthrenes/Anthracenes, Anthracene, Fluoranthene, Pyrene, C1-C4 Fluoranthenes/Pyrenes, Benz(a)anthracene, Chrysene, C1-C4 Chrysenes, Benzo(b)fluoranthene, Benzo(j)+(k)fluoranthene, Benzo(e)pyrene, Benzo(a)pyrene, Perylene, Indeno(1,2,3-cd)pyrene, Dibenz(ah)+(ac)anthracene, Benzo(g,h,i)perylene. If a 'Total' result is requested, the results of its individual components will also be reported.

PFAS Total: With respect to PFAS analyses, the 'PFAS, Total (5)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA and PFOS. In addition, the 'PFAS, Total (6)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA, PFDA and PFOS. For MassDEP DW compliance analysis only, the 'PFAS, Total (6)' result is defined as the summation of results at or above the RL. Note: If a 'Total' result is requested, the results of its individual components will also be reported.

Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

***Data Qualifiers***

**A** - Spectra identified as "Aldol Condensates" are byproducts of the extraction/concentration procedures when acetone is introduced in the process.

**B** - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).

**C** - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.

**D** - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.

**E** - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.

**F** - The ratio of quantifier ion response to qualifier ion response falls outside of the laboratory criteria. Results are considered to be an estimated maximum concentration.

**G** - The concentration may be biased high due to matrix interferences (i.e, co-elution) with non-target compound(s). The result should be considered estimated.

**H** - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.

**I** - The lower value for the two columns has been reported due to obvious interference.

**J** - Estimated value. The Target analyte concentration is below the quantitation limit (RL), but above the Method Detection Limit (MDL) or Estimated Detection Limit (EDL) for SPME-related analyses. This represents an estimated concentration for Tentatively

*Report Format: DU Report with 'J' Qualifiers*

| | | | |
|---|---|---|---|
| **Project Name:** | RWM | **Lab Number:** | L2453048 |
| **Project Number:** | 21010103 | **Report Date:** | 10/01/24 |

***Data Qualifiers***

Identified Compounds (TICs). For calculated parameters, this represents that one or more values used in the calculation were estimated.

**M** - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.

**ND** - Not detected at the method detection limit (MDL) for the sample, or estimated detection limit (EDL) for SPME-related analyses.

**NJ** - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where the identification is based on a mass spectral library search.

**P** - The RPD between the results for the two columns exceeds the method-specified criteria.

**Q** - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)

**R** - Analytical results are from sample re-analysis.

**RE** - Analytical results are from sample re-extraction.

**S** - Analytical results are from modified screening analysis.

**V** - The surrogate associated with this target analyte has a recovery outside the QC acceptance limits. (Applicable to MassDEP DW Compliance samples only.)

**Z** - The batch matrix spike and/or duplicate associated with this target analyte has a recovery/RPD outside the QC acceptance limits. (Applicable to MassDEP DW Compliance samples only.)

| | | | |
|---|---|---|---|
| **Project Name:** | RWM | **Lab Number:** | L2453048 |
| **Project Number:** | 21010103 | **Report Date:** | 10/01/24 |

## REFERENCES

1 Test Methods for Evaluating Solid Waste: Physical/Chemical Methods. EPA SW-846. Third Edition. Updates I - VI, 2018.

## LIMITATION OF LIABILITIES

Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Analytical shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Alpha Analytical.

We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.

# Certification Information

**The following analytes are not included in our Primary NELAP Scope of Accreditation:**

**Westborough Facility**
**EPA 624.1:** m/p-xylene, o-xylene, Naphthalene
**EPA 625.1:** alpha-Terpineol
**EPA 8260D:** NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene; SCM: Iodomethane (methyl iodide), 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.
**EPA 8270E:** NPW: Dimethylnaphthalene,1,4-Diphenylhydrazine, alpha-Terpineol, Azobenzene; SCM: Dimethylnaphthalene,1,4-Diphenylhydrazine.
**SM4500**: NPW: Amenable Cyanide; SCM: Total Phosphorus, TKN, NO2, NO3.

**Mansfield Facility**
**SM 2540D:** TSS.
**EPA TO-15:** Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene, 3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene.
**Nonpotable Water: EPA RSK-175 Dissolved Gases**
**Biological Tissue Matrix:** EPA 3050B

**The following analytes are included in our Massachusetts DEP Scope of Accreditation**

**Westborough Facility:**

***Drinking Water***
**EPA 300.0**: Chloride, Nitrate-N, Fluoride, Sulfate; **EPA 353.2**: Nitrate-N, Nitrite-N; **SM4500NO3-F**: Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE, EPA 180.1, SM2130B, SM4500Cl-D, SM2320B, SM2540C, SM4500H-B, SM4500NO2-B**
**EPA 524.2:** THMs and VOCs; **EPA 504.1:** EDB, DBCP.
**Microbiology**: **SM9215B; SM9223-P/A, SM9223B-Colilert-QT,SM9222D**.

***Non-Potable Water***
**SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2320B, SM4500CL-E, SM4500F-BC, SM4500NH3-BH:** Ammonia-N and Kjeldahl-N, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **EPA 351.1, SM4500NO3-F, EPA 353.2**: Nitrate-N**, SM4500P-E, SM4500P-B, E, SM4500SO4-E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, EPA 420.1, SM4500-CN-CE, SM2540D, EPA 300: Chloride, Sulfate, Nitrate.**
**EPA 624.1**: Volatile Halocarbons & Aromatics,
**EPA 608.3**: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs
**EPA 625.1**: SVOC (Acid/Base/Neutral Extractables).
**Microbiology**: **SM9223B-Colilert-QT; Enterolert-QT, EPA 1600, EPA 1603, SM9222D.**

**Mansfield Facility:**

***Drinking Water***
**EPA 200.7:** Al, Ba, Cd, Cr, Cu, Fe, Mn, Ni, Na, Ag, Ca, Zn. **EPA 200.8:** Al, Sb, As, Ba, Be, Cd, Cr, Cu, Pb, Mn, Ni, Se, Ag, TL, Zn. **EPA 245.1** Hg.
**EPA 522, EPA 537.1.**

***Non-Potable Water***
**EPA 200.7:** Al, Sb, As, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, K, Se, Ag, Na, Sr, TL, Ti, V, Zn.
**EPA 200.8:** Al, Sb**,** As, Be, Cd, Cr, Cu, Fe, Pb, Mn, Ni, K, Se, Ag, Na, TL, Zn.
**EPA 245.1** Hg.
**SM2340B**

For a complete listing of analytes and methods, please contact your Alpha Project Manager.

# NEW JERSEY CHAIN OF CUSTODY

ALPHA ANALYTICAL

Westborough, MA 01581 — 8 Walkup Dr. — TEL: 508-898-9220 — FAX: 508-898-9193

Mansfield, MA 02048 — 320 Forbes Blvd — TEL: 508-822-9300 — FAX: 508-822-3288

**Service Centers**
Mahwah, NJ 07430: 35 Whitney Rd, Suite 5
Albany, NY 12205: 14 Walker Way
Tonawanda, NY 14150: 275 Cooper Ave, Suite 105

Page of

**Date Rec'd in Lab:** 9/17/24

**ALPHA Job #:** L2453048

## Client Information

Client: Tradepoint Atlantic
Address: 6995 Bethlehem Blvd
Sparrows Point MD
Phone:
Fax:
Email: JBarna@armgroup.net
KSwilley@armgroup.net

## Project Information

Project Name: RWM
Project Location: A3
Project #: 21010103
(Use Project name as Project #)
Project Manager:
ALPHAQuote #:

## Turn-Around Time

Standard [X] Due Date:
Rush (only if pre approved) [ ] # of Days:

## Deliverables

- [ ] NJ Full / Reduced
- [ ] EQuIS (1 File) [ ] EQuIS (4 File)
- [ ] Other

## Regulatory Requirement

- [ ] SRS Residential/Non Residential
- [ ] SRS Impact to Groundwater
- [ ] NJ Ground Water Quality Standards
- [ ] NJ IGW SPLP Leachate Criteria
- [ ] Other

## Billing Information

- [ ] Same as Client Info

PO #

## Site Information

Is this site impacted by Petroleum? Yes [ ]

Petroleum Product:

These samples have been previously analyzed by Alpha [ ]

**For EPH, selection is REQUIRED:**
- [ ] Category 1
- [ ] Category 2

**For VOC, selection is REQUIRED:**
- [ ] 1,4-Dioxane
- [ ] 8011

**Other project specific requirements/comments:**

**Please specify Metals or TAL.**

**Sample Filtration**
- [ ] Done
- [ ] Lab to do

**Preservation**
- [ ] Lab to do

*(Please Specify below)*

| ALPHA Lab ID (Lab Use Only) | Sample ID | Collection Date | Collection Time | Sample Matrix | Sampler's Initials | Dissolved Cadmium | Dissolved Zinc | Total Bottle | Sample Specific Comments |
|---|---|---|---|---|---|---|---|---|---|
| 53048-01 | RW12-MW5 | 9/16/24 | 1005 | GW | NM | X | X | | |
| -02 | RW12-MW1 | 9/16/24 | 1045 | GW | NM | X | X | | |
| -03 | RW23-MW5 | 9/16/24 | 1270 | GW | NM | X | X | | |
| -04 | RW23-MW1 | 9/16/24 | 1250 | GW | NM | X | X | | |
| -05 | RWM-MW1 | 9/16/24 | 1436 | GW | NM | X | X | | |
| -06 | RWL-MW1 | 9/16/24 | 1515 | GW | NM | X | X | | |
| | | | | | NM | | | | |

Preservative Code:
A = None
B = HCl
C = $HNO_3$
D = $H_2SO_4$
E = NaOH
F = MeOH
G = $NaHSO_4$
H = $Na_2S_2O_3$
K/E = Zn Ac/NaOH
O = Other

Container Code:
P = Plastic
A = Amber Glass
V = Vial
G = Glass
B = Bacteria Cup
C = Cube
O = Other
E = Encore
D = BOD Bottle

Westboro: Certification No: MA935
Mansfield: Certification No: MA015

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Container Type | | | | | | | | | |
| Preservative | | | | | | | | | |

| Relinquished By: | Date/Time | Received By: | Date/Time |
|---|---|---|---|
| | 9/16/24 1520 | DUNCAN PACE | 9/16/24 1527 |
| DUNCAN PACE | 9/16/24 1800 | | 9/16/24 1800 |
| | 9/16/24 2100 | Anthony Green | SEP 16 2024 2100 |
| Anthony Green | 9/17/24 0025 | | 9/17/24 0025 |
| | 9/17/24 0220 | | 9/17/24 2:20 |

Please print clearly, legibly and completely. Samples can not be logged in and turnaround time clock will not start until any ambiguities are resolved. BY EXECUTING THIS COC, THE CLIENT HAS READ AND AGREES TO BE BOUND BY ALPHA'S TERMS & CONDITIONS. (See reverse side.)

Form No: 01-14 HC (rev. 30-Sept-2013)

# ANALYTICAL REPORT

| | |
|---|---|
| Lab Number: | L2453352 |
| Client: | Tradepoint Atlantic<br>1600 Sparrows Point Boulevard<br>Baltimore, MD 21219 |
| ATTN: | Robert Tworkowski |
| Phone: | (443) 649-5073 |
| Project Name: | RWM |
| Project Number: | 21010103 |
| Report Date: | 10/02/24 |

The original project report/data package is held by Alpha Analytical. This report/data package is paginated and should be reproduced only in its entirety. Alpha Analytical holds no responsibility for results and/or data that are not consistent with the original.

Certifications & Approvals: MA (M-MA086), NH NELAP (2064), CT (PH-0826), IL (200077), IN (C-MA-03), KY (KY98045), ME (MA00086), MD (348), NJ (MA935), NY (11148), NC (25700/666), OR (MA-1316), PA (68-03671), RI (LAO00065), TX (T104704476), VT (VT-0935), VA (460195), USDA (Permit #525-23-122-91930A1).

Eight Walkup Drive, Westborough, MA 01581-1019
508-898-9220 (Fax) 508-898-9193 800-624-9220 - www.alphalab.com

**Project Name:** RWM
**Project Number:** 21010103

**Lab Number:** L2453352
**Report Date:** 10/02/24

| Alpha Sample ID | Client ID | Matrix | Sample Location | Collection Date/Time | Receive Date |
|---|---|---|---|---|---|
| L2453352-01 | RW24-MWI | WATER | A3 | 09/17/24 09:55 | 09/17/24 |
| L2453352-02 | RW25-MWI | WATER | A3 | 09/17/24 10:35 | 09/17/24 |
| L2453352-03 | RWR-MWS | WATER | A3 | 09/17/24 11:50 | 09/17/24 |
| L2453352-04 | RWR-MWI | WATER | A3 | 09/17/24 12:25 | 09/17/24 |
| L2453352-05 | RW03R-MWS | WATER | A3 | 09/17/24 14:45 | 09/17/24 |
| L2453352-06 | RW03R-MWI | WATER | A3 | 09/17/24 15:05 | 09/17/24 |

| | | | |
|---|---|---|---|
| **Project Name:** | RWM | **Lab Number:** | L2453352 |
| **Project Number:** | 21010103 | **Report Date:** | 10/02/24 |

## Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet NELAP requirements for all NELAP accredited parameters unless otherwise noted in the following narrative. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. Tentatively Identified Compounds (TICs), if requested, are reported for compounds identified to be present and are not part of the method/program Target Compound List, even if only a subset of the TCL are being reported. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively.

When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances, the specific failure is not narrated but noted in the associated QC Outlier Summary Report, located directly after the Case Narrative. QC information is also incorporated in the Data Usability Assessment table (Format 11) of our Data Merger tool, where it can be reviewed in conjunction with the sample result, associated regulatory criteria and any associated data usability implications.

Soil/sediments and solids are reported on a dry weight basis unless otherwise noted. Tissues are reported "as received" or on a wet weight basis, unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

HOLD POLICY - For samples submitted on hold, Alpha's policy is to hold samples (with the exception of Air canisters) free of charge for 21 calendar days from the date the project is completed. After 21 calendar days, we will dispose of all samples submitted including those put on hold unless you have contacted your Alpha Project Manager and made arrangements for Alpha to continue to hold the samples. Air canisters will be disposed after 3 business days from the date the project is completed.

Please contact Project Management at 800-624-9220 with any questions.

| | | | |
|---|---|---|---|
| **Project Name:** | RWM | **Lab Number:** | L2453352 |
| **Project Number:** | 21010103 | **Report Date:** | 10/02/24 |

**Case Narrative (continued)**

Report Submission

All non-detect (ND) or estimated concentrations (J-qualified) have been quantitated to the limit noted in the MDL column.

Sample Receipt

The samples were field filtered for Dissolved Metals.

Dissolved Metals

L2453352-01 through -06: The sample has elevated detection limits due to the dilution required by matrix interferences encountered during analysis.

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature: Melissa Sturgis Melissa Sturgis

Title: Technical Director/Representative Date: 10/02/24

# METALS

**Project Name:** RWM
**Project Number:** 21010103
**Lab Number:** L2453352
**Report Date:** 10/02/24

## SAMPLE RESULTS

Lab ID: L2453352-01
Client ID: RW24-MWI
Sample Location: A3
Sample Depth:
Matrix: Water

Date Collected: 09/17/24 09:55
Date Received: 09/17/24
Field Prep: Refer to COC

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dissolved Metals - Mansfield Lab** | | | | | | | | | | | |
| Cadmium, Dissolved | 2122. | | ug/l | 10.00 | 2.995 | 50 | 09/23/24 12:36 | 10/01/24 22:51 | EPA 3005A | 1,6020B | WKP |
| Zinc, Dissolved | 651300 | | ug/l | 5000. | 1705. | 500 | 09/23/24 12:36 | 10/02/24 10:23 | EPA 3005A | 1,6020B | NTB |

**Project Name:** RWM
**Project Number:** 21010103
**Lab Number:** L2453352
**Report Date:** 10/02/24

## SAMPLE RESULTS

Lab ID: L2453352-02
Client ID: RW25-MWI
Sample Location: A3
Sample Depth:
Matrix: Water

Date Collected: 09/17/24 10:35
Date Received: 09/17/24
Field Prep: Refer to COC

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dissolved Metals - Mansfield Lab** | | | | | | | | | | | |
| Cadmium, Dissolved | 1156. | | ug/l | 10.00 | 2.995 | 50 | 09/23/24 12:36 | 10/01/24 22:55 | EPA 3005A | 1,6020B | WKP |
| Zinc, Dissolved | 773300 | | ug/l | 5000. | 1705. | 500 | 09/23/24 12:36 | 10/02/24 10:27 | EPA 3005A | 1,6020B | NTB |

**Project Name:** RWM
**Project Number:** 21010103
**Lab Number:** L2453352
**Report Date:** 10/02/24

## SAMPLE RESULTS

Lab ID: L2453352-03
Client ID: RWR-MWS
Sample Location: A3
Sample Depth:
Matrix: Water

Date Collected: 09/17/24 11:50
Date Received: 09/17/24
Field Prep: Refer to COC

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dissolved Metals - Mansfield Lab** | | | | | | | | | | | |
| Cadmium, Dissolved | 36.18 | | ug/l | 10.00 | 2.995 | 50 | 09/23/24 12:36 | 10/01/24 23:00 | EPA 3005A | 1,6020B | WKP |
| Zinc, Dissolved | 455600 | | ug/l | 500.0 | 170.5 | 50 | 09/23/24 12:36 | 10/01/24 23:00 | EPA 3005A | 1,6020B | WKP |

**Project Name:** RWM
**Project Number:** 21010103
**Lab Number:** L2453352
**Report Date:** 10/02/24

## SAMPLE RESULTS

Lab ID: L2453352-04
Client ID: RWR-MWI
Sample Location: A3
Sample Depth:
Matrix: Water

Date Collected: 09/17/24 12:25
Date Received: 09/17/24
Field Prep: Refer to COC

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dissolved Metals - Mansfield Lab** | | | | | | | | | | | |
| Cadmium, Dissolved | 1203. | | ug/l | 10.00 | 2.995 | 50 | 09/23/24 12:36 | 10/01/24 23:04 | EPA 3005A | 1,6020B | WKP |
| Zinc, Dissolved | 4833000 | | ug/l | 5000. | 1705. | 500 | 09/23/24 12:36 | 10/02/24 10:32 | EPA 3005A | 1,6020B | NTB |

**Project Name:** RWM
**Project Number:** 21010103
**Lab Number:** L2453352
**Report Date:** 10/02/24

## SAMPLE RESULTS

Lab ID: L2453352-05
Client ID: RW03R-MWS
Sample Location: A3
Sample Depth:
Matrix: Water

Date Collected: 09/17/24 14:45
Date Received: 09/17/24
Field Prep: Refer to COC

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dissolved Metals - Mansfield Lab** | | | | | | | | | | | |
| Cadmium, Dissolved | ND | | ug/l | 10.00 | 2.995 | 50 | 09/23/24 12:36 | 10/01/24 23:08 | EPA 3005A | 1,6020B | WKP |
| Zinc, Dissolved | ND | | ug/l | 500.0 | 170.5 | 50 | 09/23/24 12:36 | 10/01/24 23:08 | EPA 3005A | 1,6020B | WKP |

**Project Name:** RWM
**Project Number:** 21010103
**Lab Number:** L2453352
**Report Date:** 10/02/24

## SAMPLE RESULTS

Lab ID: L2453352-06
Client ID: RW03R-MWI
Sample Location: A3
Sample Depth:
Matrix: Water

Date Collected: 09/17/24 15:05
Date Received: 09/17/24
Field Prep: Refer to COC

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dissolved Metals - Mansfield Lab** | | | | | | | | | | | |
| Cadmium, Dissolved | ND | | ug/l | 10.00 | 2.995 | 50 | 09/23/24 12:36 | 10/01/24 23:22 | EPA 3005A | 1,6020B | WKP |
| Zinc, Dissolved | ND | | ug/l | 500.0 | 170.5 | 50 | 09/23/24 12:36 | 10/01/24 23:22 | EPA 3005A | 1,6020B | WKP |

**Project Name:** RWM **Lab Number:** L2453352

**Project Number:** 21010103 **Report Date:** 10/02/24

# Method Blank Analysis
# Batch Quality Control

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|
| Dissolved Metals - Mansfield Lab for sample(s): 01-06 Batch: WG1975067-1 | | | | | | | | | | |
| Cadmium, Dissolved | ND | | ug/l | 0.2000 | 0.0599 | 1 | 09/23/24 12:36 | 09/26/24 09:52 | 1,6020B | NTB |
| Zinc, Dissolved | ND | | ug/l | 10.00 | 3.410 | 1 | 09/23/24 12:36 | 09/26/24 09:52 | 1,6020B | NTB |

**Prep Information**

Digestion Method: EPA 3005A

# Lab Control Sample Analysis

## Batch Quality Control

**Project Name:** RWM

**Project Number:** 21010103

**Lab Number:** L2453352

**Report Date:** 10/02/24

| Parameter | LCS %Recovery | Qual | LCSD %Recovery | Qual | %Recovery Limits | RPD | Qual | RPD Limits |
|---|---|---|---|---|---|---|---|---|
| Dissolved Metals - Mansfield Lab Associated sample(s): 01-06 Batch: WG1975067-2 | | | | | | | | |
| Cadmium, Dissolved | 104 | | - | | 80-120 | - | | |
| Zinc, Dissolved | 107 | | - | | 80-120 | - | | |

# Matrix Spike Analysis
## Batch Quality Control

**Project Name:** RWM
**Project Number:** 21010103

**Lab Number:** L2453352
**Report Date:** 10/02/24

| Parameter | Native Sample | MS Added | MS Found | MS %Recovery | Qual | MSD Found | MSD %Recovery | Qual | Recovery Limits | RPD | Qual | RPD Limits |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Dissolved Metals - Mansfield Lab Associated sample(s): 01-06 QC Batch ID: WG1975067-3 WG1975067-4 QC Sample: L2454036-05 Client ID: MS Sample | | | | | | | | | | | | |
| Cadmium, Dissolved | ND | 53 | 53.88 | 102 | | 53.66 | 101 | | 75-125 | 0 | | 20 |
| Zinc, Dissolved | ND | 500 | 519.0 | 104 | | 758.4 | **152** | Q | 75-125 | **37** | Q | 20 |

**Project Name:** RWM
**Project Number:** 21010103

**Lab Number:** L2453352
**Report Date:** 10/02/24

## Sample Receipt and Container Information

Were project specific reporting limits specified? YES

### Cooler Information

| Cooler | Custody Seal |
|---|---|
| A | Absent |

### Container Information

| Container ID | Container Type | Cooler | Initial pH | Final pH | Temp deg C | Pres | Seal | Frozen Date/Time | Analysis(*) |
|---|---|---|---|---|---|---|---|---|---|
| L2453352-01A | Plastic 250ml HNO3 preserved | A | <2 | <2 | 3.7 | Y | Absent | | ZN-6020S-PPB(180),CD-6020S-PPB(180) |
| L2453352-02A | Plastic 250ml HNO3 preserved | A | <2 | <2 | 3.7 | Y | Absent | | ZN-6020S-PPB(180),CD-6020S-PPB(180) |
| L2453352-03A | Plastic 250ml HNO3 preserved | A | <2 | <2 | 3.7 | Y | Absent | | ZN-6020S-PPB(180),CD-6020S-PPB(180) |
| L2453352-04A | Plastic 250ml HNO3 preserved | A | <2 | <2 | 3.7 | Y | Absent | | ZN-6020S-PPB(180),CD-6020S-PPB(180) |
| L2453352-05A | Plastic 250ml HNO3 preserved | A | <2 | <2 | 3.7 | Y | Absent | | ZN-6020S-PPB(180),CD-6020S-PPB(180) |
| L2453352-06A | Plastic 250ml HNO3 preserved | A | <2 | <2 | 3.7 | Y | Absent | | ZN-6020S-PPB(180),CD-6020S-PPB(180) |



*Values in parentheses indicate holding time in days

| | | | |
|---|---|---|---|
| **Project Name:** | RWM | **Lab Number:** | L2453352 |
| **Project Number:** | 21010103 | **Report Date:** | 10/02/24 |

## GLOSSARY

***Acronyms***

DL - Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the limit of quantitation (LOQ). The DL includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)

EDL - Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME).

EMPC - Estimated Maximum Possible Concentration: The concentration that results from the signal present at the retention time of an analyte when the ions meet all of the identification criteria except the ion abundance ratio criteria. An EMPC is a worst-case estimate of the concentration.

EPA - Environmental Protection Agency.

LCS - Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.

LCSD - Laboratory Control Sample Duplicate: Refer to LCS.

LFB - Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.

LOD - Limit of Detection: This value represents the level to which a target analyte can reliably be detected for a specific analyte in a specific matrix by a specific method. The LOD includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)

LOQ - Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)

Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)

MDL - Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.

MS - Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available. For Method 332.0, the spike recovery is calculated using the native concentration, including estimated values.

MSD - Matrix Spike Sample Duplicate: Refer to MS.

NA - Not Applicable.

NC - Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.

NDPA/DPA - N-Nitrosodiphenylamine/Diphenylamine.

NI - Not Ignitable.

NP - Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil.

NR - No Results: Term is utilized when 'No Target Compounds Requested' is reported for the analysis of Volatile or Semivolatile Organic TIC only requests.

RL - Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.

RPD - Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report.

SRM - Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples.

STLP - Semi-dynamic Tank Leaching Procedure per EPA Method 1315.

TEF - Toxic Equivalency Factors: The values assigned to each dioxin and furan to evaluate their toxicity relative to 2,3,7,8-TCDD.

TEQ - Toxic Equivalent: The measure of a sample's toxicity derived by multiplying each dioxin and furan by its corresponding TEF and then summing the resulting values.

TIC - Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations.

*Report Format: DU Report with 'J' Qualifiers*

| | | | |
|---|---|---|---|
| **Project Name:** | RWM | **Lab Number:** | L2453352 |
| **Project Number:** | 21010103 | **Report Date:** | 10/02/24 |

***Footnotes***

1 - The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

***Terms***

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Chlordane: The target compound Chlordane (CAS No. 57-74-9) is reported for GC ECD analyses. Per EPA,this compound "refers to a mixture of chlordane isomers, other chlorinated hydrocarbons and numerous other components." (Reference: USEPA Toxicological Review of Chlordane, In Support of Summary Information on the Integrated Risk Information System (IRIS), December 1997.)

Difference: With respect to Total Oxidizable Precursor (TOP) Assay analysis, the difference is defined as the Post-Treatment value minus the Pre-Treatment value.

Final pH: As it pertains to Sample Receipt & Container Information section of the report, Final pH reflects pH of container determined after adjustment at the laboratory, if applicable. If no adjustment required, value reflects Initial pH.

Frozen Date/Time: With respect to Volatile Organics in soil, Frozen Date/Time reflects the date/time at which associated Reagent Water-preserved vials were initially frozen. Note: If frozen date/time is beyond 48 hours from sample collection, value will be reflected in 'bold'.

Gasoline Range Organics (GRO): Gasoline Range Organics (GRO) results include all chromatographic peaks eluting from Methyl tert butyl ether through Naphthalene, with the exception of GRO analysis in support of State of Ohio programs, which includes all chromatographic peaks eluting from Hexane through Dodecane.

Initial pH: As it pertains to Sample Receipt & Container Information section of the report, Initial pH reflects pH of container determined upon receipt, if applicable.

PAH Total: With respect to Alkylated PAH analyses, the 'PAHs, Total' result is defined as the summation of results for all or a subset of the following compounds: Naphthalene, C1-C4 Naphthalenes, 2-Methylnaphthalene, 1-Methylnaphthalene, Biphenyl, Acenaphthylene, Acenaphthene, Fluorene, C1-C3 Fluorenes, Phenanthrene, C1-C4 Phenanthrenes/Anthracenes, Anthracene, Fluoranthene, Pyrene, C1-C4 Fluoranthenes/Pyrenes, Benz(a)anthracene, Chrysene, C1-C4 Chrysenes, Benzo(b)fluoranthene, Benzo(j)+(k)fluoranthene, Benzo(e)pyrene, Benzo(a)pyrene, Perylene, Indeno(1,2,3-cd)pyrene, Dibenz(ah)+(ac)anthracene, Benzo(g,h,i)perylene. If a 'Total' result is requested, the results of its individual components will also be reported.

PFAS Total: With respect to PFAS analyses, the 'PFAS, Total (5)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA and PFOS. In addition, the 'PFAS, Total (6)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA, PFDA and PFOS. For MassDEP DW compliance analysis only, the 'PFAS, Total (6)' result is defined as the summation of results at or above the RL. Note: If a 'Total' result is requested, the results of its individual components will also be reported.

Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

***Data Qualifiers***

**A** - Spectra identified as "Aldol Condensates" are byproducts of the extraction/concentration procedures when acetone is introduced in the process.

**B** - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).

**C** - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.

**D** - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.

**E** - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.

**F** - The ratio of quantifier ion response to qualifier ion response falls outside of the laboratory criteria. Results are considered to be an estimated maximum concentration.

**G** - The concentration may be biased high due to matrix interferences (i.e, co-elution) with non-target compound(s). The result should be considered estimated.

**H** - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.

**I** - The lower value for the two columns has been reported due to obvious interference.

**J** - Estimated value. The Target analyte concentration is below the quantitation limit (RL), but above the Method Detection Limit (MDL) or Estimated Detection Limit (EDL) for SPME-related analyses. This represents an estimated concentration for Tentatively

*Report Format: DU Report with 'J' Qualifiers*

| | | | |
|---|---|---|---|
| **Project Name:** | RWM | **Lab Number:** | L2453352 |
| **Project Number:** | 21010103 | **Report Date:** | 10/02/24 |

***Data Qualifiers***

Identified Compounds (TICs). For calculated parameters, this represents that one or more values used in the calculation were estimated.

**M** - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.

**ND** - Not detected at the method detection limit (MDL) for the sample, or estimated detection limit (EDL) for SPME-related analyses.

**NJ** - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where the identification is based on a mass spectral library search.

**P** - The RPD between the results for the two columns exceeds the method-specified criteria.

**Q** - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)

**R** - Analytical results are from sample re-analysis.

**RE** - Analytical results are from sample re-extraction.

**S** - Analytical results are from modified screening analysis.

**V** - The surrogate associated with this target analyte has a recovery outside the QC acceptance limits. (Applicable to MassDEP DW Compliance samples only.)

**Z** - The batch matrix spike and/or duplicate associated with this target analyte has a recovery/RPD outside the QC acceptance limits. (Applicable to MassDEP DW Compliance samples only.)

| | | | |
|---|---|---|---|
| **Project Name:** | RWM | **Lab Number:** | L2453352 |
| **Project Number:** | 21010103 | **Report Date:** | 10/02/24 |

## REFERENCES

1 Test Methods for Evaluating Solid Waste: Physical/Chemical Methods. EPA SW-846. Third Edition. Updates I - VI, 2018.

## LIMITATION OF LIABILITIES

Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Analytical shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Alpha Analytical.

We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.

# Certification Information

**The following analytes are not included in our Primary NELAP Scope of Accreditation:**

**Westborough Facility**
**EPA 624.1:** m/p-xylene, o-xylene, Naphthalene
**EPA 625.1:** alpha-Terpineol
**EPA 8260D:** NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene; SCM: Iodomethane (methyl iodide), 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.
**EPA 8270E:** NPW: Dimethylnaphthalene,1,4-Diphenylhydrazine, alpha-Terpineol, Azobenzene; SCM: Dimethylnaphthalene,1,4-Diphenylhydrazine.
**SM4500**: NPW: Amenable Cyanide; SCM: Total Phosphorus, TKN, NO2, NO3.

**Mansfield Facility**
**SM 2540D:** TSS.
**EPA TO-15:** Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene, 3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene.
**Nonpotable Water: EPA RSK-175 Dissolved Gases**
**Biological Tissue Matrix:** EPA 3050B

**The following analytes are included in our Massachusetts DEP Scope of Accreditation**

**Westborough Facility:**

***Drinking Water***
**EPA 300.0**: Chloride, Nitrate-N, Fluoride, Sulfate; **EPA 353.2**: Nitrate-N, Nitrite-N; **SM4500NO3-F**: Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE, EPA 180.1, SM2130B, SM4500Cl-D, SM2320B, SM2540C, SM4500H-B, SM4500NO2-B**
**EPA 524.2:** THMs and VOCs; **EPA 504.1:** EDB, DBCP.
**Microbiology**: **SM9215B; SM9223-P/A, SM9223B-Colilert-QT,SM9222D**.

***Non-Potable Water***
**SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2320B, SM4500CL-E, SM4500F-BC, SM4500NH3-BH:** Ammonia-N and Kjeldahl-N, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **EPA 351.1, SM4500NO3-F, EPA 353.2**: Nitrate-N**, SM4500P-E, SM4500P-B, E, SM4500SO4-E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, EPA 420.1, SM4500-CN-CE, SM2540D, EPA 300: Chloride, Sulfate, Nitrate.**
**EPA 624.1**: Volatile Halocarbons & Aromatics,
**EPA 608.3**: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs
**EPA 625.1**: SVOC (Acid/Base/Neutral Extractables).
**Microbiology**: **SM9223B-Colilert-QT; Enterolert-QT, EPA 1600, EPA 1603, SM9222D.**

**Mansfield Facility:**

***Drinking Water***
**EPA 200.7:** Al, Ba, Cd, Cr, Cu, Fe, Mn, Ni, Na, Ag, Ca, Zn. **EPA 200.8:** Al, Sb, As, Ba, Be, Cd, Cr, Cu, Pb, Mn, Ni, Se, Ag, TL, Zn. **EPA 245.1** Hg.
**EPA 522, EPA 537.1.**

***Non-Potable Water***
**EPA 200.7:** Al, Sb, As, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, K, Se, Ag, Na, Sr, TL, Ti, V, Zn.
**EPA 200.8:** Al, Sb**,** As, Be, Cd, Cr, Cu, Fe, Pb, Mn, Ni, K, Se, Ag, Na, TL, Zn.
**EPA 245.1** Hg.
**SM2340B**

For a complete listing of analytes and methods, please contact your Alpha Project Manager.

Serial No:10022412:07

# NEW JERSEY CHAIN OF CUSTODY

L2453352 24SEP24
TRADEPOINT

ALPHA ANALYTICAL

Westborough, MA 01581
8 Walkup Dr.
TEL: 508-898-9220
FAX: 508-898-9193

Mansfield, MA 02048
320 Forbes Blvd
TEL: 508-822-9300
FAX: 508-822-3288

**Service Centers**
Mahwah, NJ 07430: 35 Whitney Rd, Suite 5
Albany, NY 12205: 14 Walker Way
Tonawanda, NY 14150: 275 Cooper Ave, Suite 105

Page of

Date Rec'd in Lab 9/18/24

**Project Information**
Project Name: AWM
Project Location: A3
Project # 21010103
(Use Project name as Project #) ☐
Project Manager:
ALPHAQuote #:

**Turn-Around Time**
Standard ☒ Due Date:
Rush (only if pre approved) ☐ # of Days:

**Deliverables**
☐ NJ Full / Reduced
☐ EQuIS (1 File) ☐ EQuIS (4 File)
☐ Other

**Billing Information**
☐ Same as Client Info
PO #

**Regulatory Requirement**
☐ SRS Residential/Non Residential
☐ SRS Impact to Groundwater
☐ NJ Ground Water Quality Standards
☐ NJ IGW SPLP Leachate Criteria
☐ Other

**Site Information**
Is this site impacted by Petroleum? Yes ☐
Petroleum Product:

**Client Information**
Client: Tradepoint Atlantic
Address: 6995 Bethlehem Blvd
Phone:
Fax:
Email: JBarna@barmotorgroup.net KGulls@barmotorgroup.net

These samples have been previously analyzed by Alpha ☐

**For EPH, selection is REQUIRED:**
☐ Category 1
☐ Category 2

**For VOC, selection is REQUIRED:**
☐ 1,4-Dioxane
☐ 8011

**Other project specific requirements/comments:**
Please specify Metals or TAL.

**ANALYSIS**

**Sample Filtration**
☐ Done
☐ Lab to do
*Preservation*
☐ Lab to do
*(Please Specify below)*

| ALPHA Lab ID (Lab Use Only) | Sample ID | Collection Date | Collection Time | Sample Matrix | Sampler's Initials | Dissolved Cadmium | Dissolved Zinc | Total Bottle | Sample Specific Comments |
|---|---|---|---|---|---|---|---|---|---|
| 53352 - 01 | RW24-MWI | 9/17/24 | 955 | GW | VM | X | X | | |
| 02 | RW25-MWI | 9/17/24 | 1035 | GW | NM | X | X | | |
| 03 | RWR-MWS | 9/17/24 | 1150 | GW | NM | X | X | | |
| 04 | AWA-MWI | 9/17/24 | 1225 | GW | NM | X | X | | |
| 05 | RW03R-MWS | 9/17/24 | 1445 | GW | NM | X | X | | |
| 06 | RW03R-MWI | 9/17/24 | 1505 | GW | MM | X | X | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

Preservative Code:
A = None
B = HCl
C = $HNO_3$
D = $H_2SO_4$
E = NaOH
F = MeOH
G = $NaHSO_4$
H = $Na_2S_2O_3$
K/E = Zn Ac/NaOH
O = Other

Container Code
P = Plastic
A = Amber Glass
V = Vial
G = Glass
B = Bacteria Cup
C = Cube
O = Other
E = Encore
D = BOD Bottle

Westboro: Certification No: MA935
Mansfield: Certification No: MA015

| Container Type | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Preservative | | | | | | | | |

Please print clearly, legibly and completely. Samples can not be logged in and turnaround time clock will not start until any ambiguities are resolved. BY EXECUTING THIS COC, THE CLIENT HAS READ AND AGREES TO BE BOUND BY ALPHA'S TERMS & CONDITIONS. (See reverse side.)

| Relinquished By: | Date/Time | Received By: | Date/Time |
|---|---|---|---|
| | 9/17 1518 | | 9/17 1518 |
| | 9/17 1800 | | 9/17/24 1800 |
| | 9/18/24 2200 | Anthony Green | SEP 17 2024 2240 |
| Anthony Green | 9/18/24 0800 | | 9/18/24 0800 |

Form No: 01-14 HC (rev. 30-Sept-2013)

9/15/24 0100 0255

09181240200 0255 9/18

ANALYTICAL REPORT

| | |
|---|---|
| Lab Number: | L2453633 |
| Client: | Tradepoint Atlantic<br>1600 Sparrows Point Boulevard<br>Baltimore, MD 21219 |
| ATTN: | Robert Tworkowski |
| Phone: | (443) 649-5073 |
| Project Name: | RWM |
| Project Number: | 21010103 |
| Report Date: | 10/01/24 |

The original project report/data package is held by Alpha Analytical. This report/data package is paginated and should be reproduced only in its entirety. Alpha Analytical holds no responsibility for results and/or data that are not consistent with the original.

Certifications & Approvals: MA (M-MA086), NH NELAP (2064), CT (PH-0826), IL (200077), IN (C-MA-03), KY (KY98045), ME (MA00086), MD (348), NJ (MA935), NY (11148), NC (25700/666), OR (MA-1316), PA (68-03671), RI (LAO00065), TX (T104704476), VT (VT-0935), VA (460195), USDA (Permit #525-23-122-91930A1).

Eight Walkup Drive, Westborough, MA 01581-1019
508-898-9220 (Fax) 508-898-9193 800-624-9220 - www.alphalab.com

**Project Name:** RWM
**Project Number:** 21010103

**Lab Number:** L2453633
**Report Date:** 10/01/24

| Alpha Sample ID | Client ID | Matrix | Sample Location | Collection Date/Time | Receive Date |
|---|---|---|---|---|---|
| L2453633-01 | RWS-MWS | WATER | A3 | 09/18/24 10:25 | 09/18/24 |
| L2453633-02 | RWS-MWI | WATER | A3 | 09/18/24 10:50 | 09/18/24 |
| L2453633-03 | RWQ-MWS | WATER | A3 | 09/18/24 12:10 | 09/18/24 |
| L2453633-04 | RWQ-MWI | WATER | A3 | 09/18/24 12:40 | 09/18/24 |
| L2453633-05 | RWP-MWI | WATER | A3 | 09/18/24 14:20 | 09/18/24 |

| | | | |
|---|---|---|---|
| **Project Name:** | RWM | **Lab Number:** | L2453633 |
| **Project Number:** | 21010103 | **Report Date:** | 10/01/24 |

## Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet NELAP requirements for all NELAP accredited parameters unless otherwise noted in the following narrative. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. Tentatively Identified Compounds (TICs), if requested, are reported for compounds identified to be present and are not part of the method/program Target Compound List, even if only a subset of the TCL are being reported. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively.

When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances, the specific failure is not narrated but noted in the associated QC Outlier Summary Report, located directly after the Case Narrative. QC information is also incorporated in the Data Usability Assessment table (Format 11) of our Data Merger tool, where it can be reviewed in conjunction with the sample result, associated regulatory criteria and any associated data usability implications.

Soil/sediments and solids are reported on a dry weight basis unless otherwise noted. Tissues are reported "as received" or on a wet weight basis, unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

HOLD POLICY - For samples submitted on hold, Alpha's policy is to hold samples (with the exception of Air canisters) free of charge for 21 calendar days from the date the project is completed. After 21 calendar days, we will dispose of all samples submitted including those put on hold unless you have contacted your Alpha Project Manager and made arrangements for Alpha to continue to hold the samples. Air canisters will be disposed after 3 business days from the date the project is completed.

Please contact Project Management at 800-624-9220 with any questions.

**Project Name:** RWM
**Project Number:** 21010103

**Lab Number:** L2453633
**Report Date:** 10/01/24

**Case Narrative (continued)**

Report Submission

All non-detect (ND) or estimated concentrations (J-qualified) have been quantitated to the limit noted in the MDL column.

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature: Kelly O'Neill

Title: Technical Director/Representative

Date: 10/01/24

# METALS

**Project Name:** RWM
**Project Number:** 21010103
**Lab Number:** L2453633
**Report Date:** 10/01/24

## SAMPLE RESULTS

Lab ID: L2453633-01
Client ID: RWS-MWS
Sample Location: A3
Sample Depth:
Matrix: Water

Date Collected: 09/18/24 10:25
Date Received: 09/18/24
Field Prep: Refer to COC

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dissolved Metals - Mansfield Lab** | | | | | | | | | | | |
| Cadmium, Dissolved | 1.430 | | ug/l | 0.2000 | 0.0599 | 1 | 09/20/24 11:37 | 09/30/24 18:57 | EPA 3005A | 1,6020B | NTB |
| Zinc, Dissolved | 166800 | | ug/l | 200.0 | 68.20 | 20 | 09/20/24 11:37 | 09/30/24 21:10 | EPA 3005A | 1,6020B | NTB |

**Project Name:** RWM
**Project Number:** 21010103
**Lab Number:** L2453633
**Report Date:** 10/01/24

## SAMPLE RESULTS

Lab ID: L2453633-02
Client ID: RWS-MWI
Sample Location: A3
Sample Depth:
Matrix: Water

Date Collected: 09/18/24 10:50
Date Received: 09/18/24
Field Prep: Refer to COC

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dissolved Metals - Mansfield Lab** | | | | | | | | | | | |
| Cadmium, Dissolved | 0.1143 | J | ug/l | 0.2000 | 0.0599 | 1 | 09/20/24 11:37 | 09/30/24 19:02 | EPA 3005A | 1,6020B | NTB |
| Zinc, Dissolved | 742600 | | ug/l | 1000. | 341.0 | 100 | 09/20/24 11:37 | 09/30/24 21:14 | EPA 3005A | 1,6020B | NTB |

**Project Name:** RWM
**Project Number:** 21010103
**Lab Number:** L2453633
**Report Date:** 10/01/24

## SAMPLE RESULTS

Lab ID: L2453633-03
Client ID: RWQ-MWS
Sample Location: A3
Sample Depth:
Matrix: Water

Date Collected: 09/18/24 12:10
Date Received: 09/18/24
Field Prep: Refer to COC

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dissolved Metals - Mansfield Lab** | | | | | | | | | | | |
| Cadmium, Dissolved | 3.007 | | ug/l | 0.2000 | 0.0599 | 1 | 09/20/24 11:37 | 09/30/24 19:07 | EPA 3005A | 1,6020B | NTB |
| Zinc, Dissolved | 211.7 | | ug/l | 10.00 | 3.410 | 1 | 09/20/24 11:37 | 10/01/24 09:48 | EPA 3005A | 1,6020B | NTB |

**Project Name:** RWM
**Project Number:** 21010103
**Lab Number:** L2453633
**Report Date:** 10/01/24

## SAMPLE RESULTS

Lab ID: L2453633-04
Client ID: RWQ-MWI
Sample Location: A3
Sample Depth:
Matrix: Water

Date Collected: 09/18/24 12:40
Date Received: 09/18/24
Field Prep: Refer to COC

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dissolved Metals - Mansfield Lab** | | | | | | | | | | | |
| Cadmium, Dissolved | 89.56 | | ug/l | 0.2000 | 0.0599 | 1 | 09/20/24 11:37 | 09/30/24 18:43 | EPA 3005A | 1,6020B | NTB |
| Zinc, Dissolved | 315500 | | ug/l | 500.0 | 170.5 | 50 | 09/20/24 11:37 | 09/30/24 21:19 | EPA 3005A | 1,6020B | NTB |

**Project Name:** RWM
**Project Number:** 21010103
**Lab Number:** L2453633
**Report Date:** 10/01/24

## SAMPLE RESULTS

Lab ID: L2453633-05
Client ID: RWP-MWI
Sample Location: A3
Sample Depth:
Matrix: Water

Date Collected: 09/18/24 14:20
Date Received: 09/18/24
Field Prep: Refer to COC

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dissolved Metals - Mansfield Lab** | | | | | | | | | | | |
| Cadmium, Dissolved | 6930. | | ug/l | 200.0 | 59.90 | 1000 | 09/20/24 11:37 | 09/30/24 21:23 | EPA 3005A | 1,6020B | NTB |
| Zinc, Dissolved | 3227000 | | ug/l | 10000 | 3410. | 1000 | 09/20/24 11:37 | 09/30/24 21:23 | EPA 3005A | 1,6020B | NTB |

**Project Name:** RWM
**Project Number:** 21010103
**Lab Number:** L2453633
**Report Date:** 10/01/24

# Method Blank Analysis
# Batch Quality Control

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|
| Dissolved Metals - Mansfield Lab for sample(s): 01-05 Batch: WG1974179-1 | | | | | | | | | | |
| Cadmium, Dissolved | ND | | ug/l | 0.2000 | 0.0599 | 1 | 09/20/24 11:37 | 09/30/24 16:50 | 1,6020B | NTB |
| Zinc, Dissolved | ND | | ug/l | 10.00 | 3.410 | 1 | 09/20/24 11:37 | 09/30/24 16:50 | 1,6020B | NTB |

**Prep Information**

Digestion Method: EPA 3005A

# Lab Control Sample Analysis

## Batch Quality Control

**Project Name:** RWM
**Project Number:** 21010103

**Lab Number:** L2453633
**Report Date:** 10/01/24

| Parameter | LCS %Recovery | Qual | LCSD %Recovery | Qual | %Recovery Limits | RPD | Qual | RPD Limits |
|---|---|---|---|---|---|---|---|---|
| Dissolved Metals - Mansfield Lab Associated sample(s): 01-05 Batch: WG1974179-2 | | | | | | | | |
| Cadmium, Dissolved | 108 | | - | | 80-120 | - | | |
| Zinc, Dissolved | 109 | | - | | 80-120 | - | | |

# Matrix Spike Analysis
## Batch Quality Control

**Project Name:** RWM
**Project Number:** 21010103

**Lab Number:** L2453633
**Report Date:** 10/01/24

| Parameter | Native Sample | MS Added | MS Found | MS %Recovery | Qual | MSD Found | MSD %Recovery | Qual | Recovery Limits | RPD | Qual | RPD Limits |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Dissolved Metals - Mansfield Lab Associated sample(s): 01-05 QC Batch ID: WG1974179-3 QC Sample: L2453048-01 Client ID: MS Sample | | | | | | | | | | | | |
| Cadmium, Dissolved | 2.800 | 53 | 56.22 | 101 | | - | - | | 75-125 | - | | 20 |
| Zinc, Dissolved | 5627. | 500 | 6366 | **148** | Q | - | - | | 75-125 | - | | 20 |

# Lab Duplicate Analysis

***Batch Quality Control***

**Project Name:** RWM
**Project Number:** 21010103

***Lab Number:*** L2453633
***Report Date:*** 10/01/24

| Parameter | Native Sample | Duplicate Sample | Units | RPD | Qual | RPD Limits |
|---|---|---|---|---|---|---|
| Dissolved Metals - Mansfield Lab Associated sample(s): 01-05 QC Batch ID: WG1974179-4 QC Sample: L2453048-01 Client ID: DUP Sample | | | | | | |
| Zinc, Dissolved | 5627. | 5157 | ug/l | 9 | | 20 |
| Dissolved Metals - Mansfield Lab Associated sample(s): 01-05 QC Batch ID: WG1974179-4 QC Sample: L2453048-01 Client ID: DUP Sample | | | | | | |
| Cadmium, Dissolved | 2.800 | 0.8615 | ug/l | **106** | Q | 20 |

**Project Name:** RWM
**Project Number:** 21010103

# Lab Serial Dilution Analysis
## Batch Quality Control

**Lab Number:** L2453633
**Report Date:** 10/01/24

| Parameter | Native Sample | Serial Dilution | Units | % D | Qual | RPD Limits |
|---|---|---|---|---|---|---|
| Dissolved Metals - Mansfield Lab Associated sample(s): 01-05 QC Batch ID: WG1974179-6 QC Sample: L2453048-01 Client ID: DUP Sample | | | | | | |
| Zinc, Dissolved | 5627. | 6086. | ug/l | 8 | | 20 |

**Project Name:** RWM
**Project Number:** 21010103

**Lab Number:** L2453633
**Report Date:** 10/01/24

## Sample Receipt and Container Information

Were project specific reporting limits specified? YES

### Cooler Information

| Cooler | Custody Seal |
|---|---|
| A | Absent |

### Container Information

| Container ID | Container Type | Cooler | Initial pH | Final pH | Temp deg C | Pres | Seal | Frozen Date/Time | Analysis(*) |
|---|---|---|---|---|---|---|---|---|---|
| L2453633-01A | Plastic 250ml HNO3 preserved | A | <2 | <2 | 3.1 | Y | Absent | | ZN-6020S-PPB(180),CD-6020S-PPB(180) |
| L2453633-02A | Plastic 250ml HNO3 preserved | A | <2 | <2 | 3.1 | Y | Absent | | ZN-6020S-PPB(180),CD-6020S-PPB(180) |
| L2453633-03A | Plastic 250ml HNO3 preserved | A | <2 | <2 | 3.1 | Y | Absent | | ZN-6020S-PPB(180),CD-6020S-PPB(180) |
| L2453633-04A | Plastic 250ml HNO3 preserved | A | <2 | <2 | 3.1 | Y | Absent | | ZN-6020S-PPB(180),CD-6020S-PPB(180) |
| L2453633-05A | Plastic 250ml HNO3 preserved | A | <2 | <2 | 3.1 | Y | Absent | | ZN-6020S-PPB(180),CD-6020S-PPB(180) |



*Values in parentheses indicate holding time in days

| | | | |
|---|---|---|---|
| **Project Name:** | RWM | **Lab Number:** | L2453633 |
| **Project Number:** | 21010103 | **Report Date:** | 10/01/24 |

## GLOSSARY

***Acronyms***

DL - Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the limit of quantitation (LOQ). The DL includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)

EDL - Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME).

EMPC - Estimated Maximum Possible Concentration: The concentration that results from the signal present at the retention time of an analyte when the ions meet all of the identification criteria except the ion abundance ratio criteria. An EMPC is a worst-case estimate of the concentration.

EPA - Environmental Protection Agency.

LCS - Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.

LCSD - Laboratory Control Sample Duplicate: Refer to LCS.

LFB - Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.

LOD - Limit of Detection: This value represents the level to which a target analyte can reliably be detected for a specific analyte in a specific matrix by a specific method. The LOD includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)

LOQ - Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)

Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)

MDL - Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.

MS - Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available. For Method 332.0, the spike recovery is calculated using the native concentration, including estimated values.

MSD - Matrix Spike Sample Duplicate: Refer to MS.

NA - Not Applicable.

NC - Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.

NDPA/DPA - N-Nitrosodiphenylamine/Diphenylamine.

NI - Not Ignitable.

NP - Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil.

NR - No Results: Term is utilized when 'No Target Compounds Requested' is reported for the analysis of Volatile or Semivolatile Organic TIC only requests.

RL - Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.

RPD - Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report.

SRM - Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples.

STLP - Semi-dynamic Tank Leaching Procedure per EPA Method 1315.

TEF - Toxic Equivalency Factors: The values assigned to each dioxin and furan to evaluate their toxicity relative to 2,3,7,8-TCDD.

TEQ - Toxic Equivalent: The measure of a sample's toxicity derived by multiplying each dioxin and furan by its corresponding TEF and then summing the resulting values.

TIC - Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations.

*Report Format: DU Report with 'J' Qualifiers*

| | | | |
|---|---|---|---|
| **Project Name:** | RWM | **Lab Number:** | L2453633 |
| **Project Number:** | 21010103 | **Report Date:** | 10/01/24 |

***Footnotes***

1 - The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

***Terms***

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Chlordane: The target compound Chlordane (CAS No. 57-74-9) is reported for GC ECD analyses. Per EPA,this compound "refers to a mixture of chlordane isomers, other chlorinated hydrocarbons and numerous other components." (Reference: USEPA Toxicological Review of Chlordane, In Support of Summary Information on the Integrated Risk Information System (IRIS), December 1997.)

Difference: With respect to Total Oxidizable Precursor (TOP) Assay analysis, the difference is defined as the Post-Treatment value minus the Pre-Treatment value.

Final pH: As it pertains to Sample Receipt & Container Information section of the report, Final pH reflects pH of container determined after adjustment at the laboratory, if applicable. If no adjustment required, value reflects Initial pH.

Frozen Date/Time: With respect to Volatile Organics in soil, Frozen Date/Time reflects the date/time at which associated Reagent Water-preserved vials were initially frozen. Note: If frozen date/time is beyond 48 hours from sample collection, value will be reflected in 'bold'.

Gasoline Range Organics (GRO): Gasoline Range Organics (GRO) results include all chromatographic peaks eluting from Methyl tert butyl ether through Naphthalene, with the exception of GRO analysis in support of State of Ohio programs, which includes all chromatographic peaks eluting from Hexane through Dodecane.

Initial pH: As it pertains to Sample Receipt & Container Information section of the report, Initial pH reflects pH of container determined upon receipt, if applicable.

PAH Total: With respect to Alkylated PAH analyses, the 'PAHs, Total' result is defined as the summation of results for all or a subset of the following compounds: Naphthalene, C1-C4 Naphthalenes, 2-Methylnaphthalene, 1-Methylnaphthalene, Biphenyl, Acenaphthylene, Acenaphthene, Fluorene, C1-C3 Fluorenes, Phenanthrene, C1-C4 Phenanthrenes/Anthracenes, Anthracene, Fluoranthene, Pyrene, C1-C4 Fluoranthenes/Pyrenes, Benz(a)anthracene, Chrysene, C1-C4 Chrysenes, Benzo(b)fluoranthene, Benzo(j)+(k)fluoranthene, Benzo(e)pyrene, Benzo(a)pyrene, Perylene, Indeno(1,2,3-cd)pyrene, Dibenz(ah)+(ac)anthracene, Benzo(g,h,i)perylene. If a 'Total' result is requested, the results of its individual components will also be reported.

PFAS Total: With respect to PFAS analyses, the 'PFAS, Total (5)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA and PFOS. In addition, the 'PFAS, Total (6)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA, PFDA and PFOS. For MassDEP DW compliance analysis only, the 'PFAS, Total (6)' result is defined as the summation of results at or above the RL. Note: If a 'Total' result is requested, the results of its individual components will also be reported.

Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

***Data Qualifiers***

**A** - Spectra identified as "Aldol Condensates" are byproducts of the extraction/concentration procedures when acetone is introduced in the process.

**B** - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).

**C** - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.

**D** - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.

**E** - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.

**F** - The ratio of quantifier ion response to qualifier ion response falls outside of the laboratory criteria. Results are considered to be an estimated maximum concentration.

**G** - The concentration may be biased high due to matrix interferences (i.e, co-elution) with non-target compound(s). The result should be considered estimated.

**H** - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.

**I** - The lower value for the two columns has been reported due to obvious interference.

**J** - Estimated value. The Target analyte concentration is below the quantitation limit (RL), but above the Method Detection Limit (MDL) or Estimated Detection Limit (EDL) for SPME-related analyses. This represents an estimated concentration for Tentatively

*Report Format: DU Report with 'J' Qualifiers*

| | | | |
|---|---|---|---|
| **Project Name:** | RWM | **Lab Number:** | L2453633 |
| **Project Number:** | 21010103 | **Report Date:** | 10/01/24 |

***Data Qualifiers***

Identified Compounds (TICs). For calculated parameters, this represents that one or more values used in the calculation were estimated.

**M** - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.

**ND** - Not detected at the method detection limit (MDL) for the sample, or estimated detection limit (EDL) for SPME-related analyses.

**NJ** - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where the identification is based on a mass spectral library search.

**P** - The RPD between the results for the two columns exceeds the method-specified criteria.

**Q** - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)

**R** - Analytical results are from sample re-analysis.

**RE** - Analytical results are from sample re-extraction.

**S** - Analytical results are from modified screening analysis.

**V** - The surrogate associated with this target analyte has a recovery outside the QC acceptance limits. (Applicable to MassDEP DW Compliance samples only.)

**Z** - The batch matrix spike and/or duplicate associated with this target analyte has a recovery/RPD outside the QC acceptance limits. (Applicable to MassDEP DW Compliance samples only.)

| | | | |
|---|---|---|---|
| **Project Name:** | RWM | **Lab Number:** | L2453633 |
| **Project Number:** | 21010103 | **Report Date:** | 10/01/24 |

## REFERENCES

1 Test Methods for Evaluating Solid Waste: Physical/Chemical Methods. EPA SW-846. Third Edition. Updates I - VI, 2018.

## LIMITATION OF LIABILITIES

Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Analytical shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Alpha Analytical.

We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.

# Certification Information

**The following analytes are not included in our Primary NELAP Scope of Accreditation:**

**Westborough Facility**
**EPA 624.1:** m/p-xylene, o-xylene, Naphthalene
**EPA 625.1:** alpha-Terpineol
**EPA 8260D:** NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene; SCM: Iodomethane (methyl iodide), 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.
**EPA 8270E:** NPW: Dimethylnaphthalene,1,4-Diphenylhydrazine, alpha-Terpineol, Azobenzene; SCM: Dimethylnaphthalene,1,4-Diphenylhydrazine.
**SM4500**: NPW: Amenable Cyanide; SCM: Total Phosphorus, TKN, NO2, NO3.

**Mansfield Facility**
**SM 2540D:** TSS.
**EPA TO-15:** Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene, 3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene.
**Nonpotable Water: EPA RSK-175 Dissolved Gases**
**Biological Tissue Matrix:** EPA 3050B

**The following analytes are included in our Massachusetts DEP Scope of Accreditation**

**Westborough Facility:**

***Drinking Water***
**EPA 300.0**: Chloride, Nitrate-N, Fluoride, Sulfate; **EPA 353.2**: Nitrate-N, Nitrite-N; **SM4500NO3-F**: Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE, EPA 180.1, SM2130B, SM4500Cl-D, SM2320B, SM2540C, SM4500H-B, SM4500NO2-B**
**EPA 524.2:** THMs and VOCs; **EPA 504.1:** EDB, DBCP.
**Microbiology**: **SM9215B; SM9223-P/A, SM9223B-Colilert-QT,SM9222D**.

***Non-Potable Water***
**SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2320B, SM4500CL-E, SM4500F-BC, SM4500NH3-BH:** Ammonia-N and Kjeldahl-N, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **EPA 351.1, SM4500NO3-F, EPA 353.2**: Nitrate-N**, SM4500P-E, SM4500P-B, E, SM4500SO4-E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, EPA 420.1, SM4500-CN-CE, SM2540D, EPA 300: Chloride, Sulfate, Nitrate.**
**EPA 624.1**: Volatile Halocarbons & Aromatics,
**EPA 608.3**: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs
**EPA 625.1**: SVOC (Acid/Base/Neutral Extractables).
**Microbiology**: **SM9223B-Colilert-QT; Enterolert-QT, EPA 1600, EPA 1603, SM9222D.**

**Mansfield Facility:**

***Drinking Water***
**EPA 200.7:** Al, Ba, Cd, Cr, Cu, Fe, Mn, Ni, Na, Ag, Ca, Zn. **EPA 200.8:** Al, Sb, As, Ba, Be, Cd, Cr, Cu, Pb, Mn, Ni, Se, Ag, TL, Zn. **EPA 245.1** Hg.
**EPA 522, EPA 537.1.**

***Non-Potable Water***
**EPA 200.7:** Al, Sb, As, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, K, Se, Ag, Na, Sr, TL, Ti, V, Zn.
**EPA 200.8:** Al, Sb**,** As, Be, Cd, Cr, Cu, Fe, Pb, Mn, Ni, K, Se, Ag, Na, TL, Zn.
**EPA 245.1** Hg.
**SM2340B**

For a complete listing of analytes and methods, please contact your Alpha Project Manager.

# NEW JERSEY CHAIN OF CUSTODY

ALPHA

Westborough, MA 01581
8 Walkup Dr.
TEL: 508-898-9220
FAX: 508-898-9193

Mansfield, MA 02048
320 Forbes Blvd
TEL: 508-822-9300
FAX: 508-822-3288

**Service Centers**
Mahwah, NJ 07430: 35 Whitney Rd, Suite 5
Albany, NY 12205: 14 Walker Way
Tonawanda, NY 14150: 275 Cooper Ave, Suite 105

Page of

**Date Rec'd in Lab:** 9/19/24

**ALPHA Job #:** L2453633

## Project Information
Project Name: RWM
Project Location: AS
Project #: 21010103
(Use Project name as Project #) ☐
Project Manager:
ALPHAQuote #:

## Client Information
Client: Tradepoint Atlantic
Address: 6995 Bethlehem Blvd Sparrows Point MD
Phone:
Fax:
Email: JBerra@tradepointatlantic.com RGuile@tradepointatlantic.com

## Turn-Around Time
Standard ☒ Due Date:
Rush (only if pre approved) ☐ # of Days:

## Deliverables
☐ NJ Full / Reduced
☐ EQuIS (1 File) ☐ EQuIS (4 File)
☐ Other

## Billing Information
☐ Same as Client Info
PO #

## Regulatory Requirement
☐ SRS Residential/Non Residential
☐ SRS Impact to Groundwater
☐ NJ Ground Water Quality Standards
☐ NJ IGW SPLP Leachate Criteria
☐ Other

## Site Information
Is this site impacted by Petroleum? Yes ☐
Petroleum Product:

These samples have been previously analyzed by Alpha ☐

**For EPH, selection is REQUIRED:**
☐ Category 1
☐ Category 2

**For VOC, selection is REQUIRED:**
☐ 1,4-Dioxane
☐ 8011

**Other project specific requirements/comments:**

**Please specify Metals or TAL.**

## ANALYSIS

**Sample Filtration**
☑ Done
☐ Lab to do
***Preservation***
☐ Lab to do
***(Please Specify below)***

**Sample Specific Comments**

| ALPHA Lab ID (Lab Use Only) | Sample ID | Collection Date | Collection Time | Sample Matrix | Sampler's Initials | Dissolved Cadmium | Dissolved Zinc | Total Bottle |
|---|---|---|---|---|---|---|---|---|
| 53633-01 | RWS-MWS | 9/18/24 | 1025 | GW | NM | X | X | |
| -02 | RWS-MWI | 9/18/24 | 1050 | GW | NM | X | X | |
| -03 | RWQ-MWS | 9/18/24 | 1210 | GW | NM | X | X | |
| -04 | RWQ-MWI | 9/18/24 | 1240 | GW | NM | X | X | |
| -05 | RWP-MWI | 9/18/24 | 1420 | GW | NM | X | X | |

Preservative Code:
A = None
B = HCl
C = $HNO_3$
D = $H_2SO_4$
E = NaOH
F = MeOH
G = $NaHSO_4$
H = $Na_2S_2O_3$
K/E = Zn Ac/NaOH
O = Other

Container Code:
P = Plastic
A = Amber Glass
V = Vial
G = Glass
B = Bacteria Cup
C = Cube
O = Other
E = Encore
D = BOD Bottle

Westboro: Certification No: MA935
Mansfield: Certification No: MA015

Container Type
Preservative

| Relinquished By: | Date/Time | Received By: | Date/Time |
|---|---|---|---|
| | 9/18/24 1515 | | 9/18/24 1515 |
| | 9/18/24 1800 | | 9/18/24 1800 |
| | 9/18/24 2100 | Anthony Green | SEP 18 2024 2215 |
| Anthony Green | 9/19/24 0105 | | 9/19/24 0105 |
| | 9/19/24 0305 | | 9/19 0305 |

Please print clearly, legibly and completely. Samples can not be logged in and turnaround time clock will not start until any ambiguities are resolved. BY EXECUTING THIS COC, THE CLIENT HAS READ AND AGREES TO BE BOUND BY ALPHA'S TERMS & CONDITIONS. (See reverse side.)

Form No: 01-14 HC (rev. 30-Sept-2013)

# ANALYTICAL REPORT

| | |
|---|---|
| Lab Number: | L2454033 |
| Client: | Tradepoint Atlantic<br>1600 Sparrows Point Boulevard<br>Baltimore, MD 21219 |
| ATTN: | Robert Tworkowski |
| Phone: | (443) 649-5073 |
| Project Name: | RWM |
| Project Number: | 21010103 |
| Report Date: | 10/02/24 |

The original project report/data package is held by Alpha Analytical. This report/data package is paginated and should be reproduced only in its entirety. Alpha Analytical holds no responsibility for results and/or data that are not consistent with the original.

Certifications & Approvals: MA (M-MA086), NH NELAP (2064), CT (PH-0826), IL (200077), IN (C-MA-03), KY (KY98045), ME (MA00086), MD (348), NJ (MA935), NY (11148), NC (25700/666), OR (MA-1316), PA (68-03671), RI (LAO00065), TX (T104704476), VT (VT-0935), VA (460195), USDA (Permit #525-23-122-91930A1).

Eight Walkup Drive, Westborough, MA 01581-1019
508-898-9220 (Fax) 508-898-9193 800-624-9220 - www.alphalab.com

**Project Name:** RWM
**Project Number:** 21010103

**Lab Number:** L2454033
**Report Date:** 10/02/24

| Alpha Sample ID | Client ID | Matrix | Sample Location | Collection Date/Time | Receive Date |
|---|---|---|---|---|---|
| L2454033-01 | RWH-MWS | WATER | A3 | 09/19/24 10:45 | 09/19/24 |
| L2454033-02 | RWH-MWI | WATER | A3 | 09/19/24 11:10 | 09/19/24 |
| L2454033-03 | RWO-MWS | WATER | A3 | 09/19/24 12:30 | 09/19/24 |
| L2454033-04 | RWO-MWI | WATER | A3 | 09/19/24 13:25 | 09/19/24 |

| | | | |
|---|---|---|---|
| **Project Name:** | RWM | **Lab Number:** | L2454033 |
| **Project Number:** | 21010103 | **Report Date:** | 10/02/24 |

## Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet NELAP requirements for all NELAP accredited parameters unless otherwise noted in the following narrative. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. Tentatively Identified Compounds (TICs), if requested, are reported for compounds identified to be present and are not part of the method/program Target Compound List, even if only a subset of the TCL are being reported. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively.

When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances, the specific failure is not narrated but noted in the associated QC Outlier Summary Report, located directly after the Case Narrative. QC information is also incorporated in the Data Usability Assessment table (Format 11) of our Data Merger tool, where it can be reviewed in conjunction with the sample result, associated regulatory criteria and any associated data usability implications.

Soil/sediments and solids are reported on a dry weight basis unless otherwise noted. Tissues are reported "as received" or on a wet weight basis, unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

HOLD POLICY - For samples submitted on hold, Alpha's policy is to hold samples (with the exception of Air canisters) free of charge for 21 calendar days from the date the project is completed. After 21 calendar days, we will dispose of all samples submitted including those put on hold unless you have contacted your Alpha Project Manager and made arrangements for Alpha to continue to hold the samples. Air canisters will be disposed after 3 business days from the date the project is completed.

Please contact Project Management at 800-624-9220 with any questions.

| | | | |
|---|---|---|---|
| **Project Name:** | RWM | **Lab Number:** | L2454033 |
| **Project Number:** | 21010103 | **Report Date:** | 10/02/24 |

**Case Narrative (continued)**

Report Submission

All non-detect (ND) or estimated concentrations (J-qualified) have been quantitated to the limit noted in the MDL column.

Dissolved Metals

L2454033-01 through -04: The sample has elevated detection limits due to the dilution required by matrix interferences encountered during analysis.

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature: Melissa Sturgis Melissa Sturgis

Title: Technical Director/Representative Date: 10/02/24

# METALS

**Project Name:** RWM
**Project Number:** 21010103
**Lab Number:** L2454033
**Report Date:** 10/02/24

## SAMPLE RESULTS

Lab ID: L2454033-01
Client ID: RWH-MWS
Sample Location: A3
Sample Depth:
Matrix: Water

Date Collected: 09/19/24 10:45
Date Received: 09/19/24
Field Prep: Refer to COC

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dissolved Metals - Mansfield Lab** | | | | | | | | | | | |
| Cadmium, Dissolved | 2316. | | ug/l | 10.00 | 2.995 | 50 | 09/23/24 12:36 | 10/01/24 23:26 | EPA 3005A | 1,6020B | WKP |
| Zinc, Dissolved | 153900 | | ug/l | 500.0 | 170.5 | 50 | 09/23/24 12:36 | 10/01/24 23:26 | EPA 3005A | 1,6020B | WKP |

**Project Name:** RWM
**Project Number:** 21010103
**Lab Number:** L2454033
**Report Date:** 10/02/24

## SAMPLE RESULTS

Lab ID: L2454033-02
Client ID: RWH-MWI
Sample Location: A3
Sample Depth:
Matrix: Water

Date Collected: 09/19/24 11:10
Date Received: 09/19/24
Field Prep: Refer to COC

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dissolved Metals - Mansfield Lab** | | | | | | | | | | | |
| Cadmium, Dissolved | 4904. | | ug/l | 10.00 | 2.995 | 50 | 09/23/24 12:36 | 10/01/24 23:31 | EPA 3005A | 1,6020B | WKP |
| Zinc, Dissolved | 638300 | | ug/l | 5000. | 1705. | 500 | 09/23/24 12:36 | 10/02/24 10:36 | EPA 3005A | 1,6020B | NTB |

**Project Name:** RWM
**Project Number:** 21010103
**Lab Number:** L2454033
**Report Date:** 10/02/24

## SAMPLE RESULTS

Lab ID: L2454033-03
Client ID: RWO-MWS
Sample Location: A3
Sample Depth:
Matrix: Water

Date Collected: 09/19/24 12:30
Date Received: 09/19/24
Field Prep: Refer to COC

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dissolved Metals - Mansfield Lab** | | | | | | | | | | | |
| Cadmium, Dissolved | ND | | ug/l | 10.00 | 2.995 | 50 | 09/23/24 12:36 | 10/01/24 23:35 | EPA 3005A | 1,6020B | WKP |
| Zinc, Dissolved | ND | | ug/l | 500.0 | 170.5 | 50 | 09/23/24 12:36 | 10/01/24 23:35 | EPA 3005A | 1,6020B | WKP |

**Project Name:** RWM
**Project Number:** 21010103
**Lab Number:** L2454033
**Report Date:** 10/02/24

## SAMPLE RESULTS

Lab ID: L2454033-04
Client ID: RWO-MWI
Sample Location: A3
Sample Depth:
Matrix: Water

Date Collected: 09/19/24 13:25
Date Received: 09/19/24
Field Prep: Refer to COC

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dissolved Metals - Mansfield Lab** | | | | | | | | | | | |
| Cadmium, Dissolved | 64.04 | | ug/l | 10.00 | 2.995 | 50 | 09/23/24 12:36 | 10/01/24 23:40 | EPA 3005A | 1,6020B | WKP |
| Zinc, Dissolved | 318800 | | ug/l | 500.0 | 170.5 | 50 | 09/23/24 12:36 | 10/01/24 23:40 | EPA 3005A | 1,6020B | WKP |

**Project Name:** RWM
**Project Number:** 21010103
**Lab Number:** L2454033
**Report Date:** 10/02/24

# Method Blank Analysis
# Batch Quality Control

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|
| Dissolved Metals - Mansfield Lab for sample(s): 01-04 Batch: WG1975067-1 | | | | | | | | | | |
| Cadmium, Dissolved | ND | | ug/l | 0.2000 | 0.0599 | 1 | 09/23/24 12:36 | 09/26/24 09:52 | 1,6020B | NTB |
| Zinc, Dissolved | ND | | ug/l | 10.00 | 3.410 | 1 | 09/23/24 12:36 | 09/26/24 09:52 | 1,6020B | NTB |

**Prep Information**

Digestion Method: EPA 3005A

# Lab Control Sample Analysis

## Batch Quality Control

**Project Name:** RWM

**Project Number:** 21010103

**Lab Number:** L2454033

**Report Date:** 10/02/24

| Parameter | LCS %Recovery | Qual | LCSD %Recovery | Qual | %Recovery Limits | RPD | Qual | RPD Limits |
|---|---|---|---|---|---|---|---|---|
| Dissolved Metals - Mansfield Lab Associated sample(s): 01-04 Batch: WG1975067-2 | | | | | | | | |
| Cadmium, Dissolved | 104 | | - | | 80-120 | - | | |
| Zinc, Dissolved | 107 | | - | | 80-120 | - | | |

# Matrix Spike Analysis
## Batch Quality Control

**Project Name:** RWM
**Project Number:** 21010103

**Lab Number:** L2454033
**Report Date:** 10/02/24

| Parameter | Native Sample | MS Added | MS Found | MS %Recovery | Qual | MSD Found | MSD %Recovery | Qual | Recovery Limits | RPD | Qual | RPD Limits |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Dissolved Metals - Mansfield Lab Associated sample(s): 01-04 QC Batch ID: WG1975067-3 WG1975067-4 QC Sample: L2454036-05 Client ID: MS Sample | | | | | | | | | | | | |
| Cadmium, Dissolved | ND | 53 | 53.88 | 102 | | 53.66 | 101 | | 75-125 | 0 | | 20 |
| Zinc, Dissolved | ND | 500 | 519.0 | 104 | | 758.4 | **152** | Q | 75-125 | **37** | Q | 20 |

***Project Name:*** RWM
***Project Number:*** 21010103

***Lab Number:*** L2454033
***Report Date:*** 10/02/24

## *Sample Receipt and Container Information*

Were project specific reporting limits specified? YES

### *Cooler Information*

| *Cooler* | *Custody Seal* |
|---|---|
| A | Absent |

### *Container Information*

| *Container ID* | *Container Type* | *Cooler* | *Initial pH* | *Final pH* | *Temp deg C* | *Pres* | *Seal* | *Frozen Date/Time* | *Analysis(*)* |
|---|---|---|---|---|---|---|---|---|---|
| L2454033-01A | Plastic 250ml HNO3 preserved | A | <2 | <2 | 2.6 | Y | Absent | | ZN-6020S-PPB(180),CD-6020S-PPB(180) |
| L2454033-02A | Plastic 250ml HNO3 preserved | A | <2 | <2 | 2.6 | Y | Absent | | ZN-6020S-PPB(180),CD-6020S-PPB(180) |
| L2454033-03A | Plastic 250ml HNO3 preserved | A | <2 | <2 | 2.6 | Y | Absent | | ZN-6020S-PPB(180),CD-6020S-PPB(180) |
| L2454033-04A | Plastic 250ml HNO3 preserved | A | <2 | <2 | 2.6 | Y | Absent | | ZN-6020S-PPB(180),CD-6020S-PPB(180) |



*Values in parentheses indicate holding time in days

| | | | |
|---|---|---|---|
| **Project Name:** | RWM | **Lab Number:** | L2454033 |
| **Project Number:** | 21010103 | **Report Date:** | 10/02/24 |

## GLOSSARY

***Acronyms***

DL - Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the limit of quantitation (LOQ). The DL includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)

EDL - Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME).

EMPC - Estimated Maximum Possible Concentration: The concentration that results from the signal present at the retention time of an analyte when the ions meet all of the identification criteria except the ion abundance ratio criteria. An EMPC is a worst-case estimate of the concentration.

EPA - Environmental Protection Agency.

LCS - Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.

LCSD - Laboratory Control Sample Duplicate: Refer to LCS.

LFB - Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.

LOD - Limit of Detection: This value represents the level to which a target analyte can reliably be detected for a specific analyte in a specific matrix by a specific method. The LOD includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)

LOQ - Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)

Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)

MDL - Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.

MS - Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available. For Method 332.0, the spike recovery is calculated using the native concentration, including estimated values.

MSD - Matrix Spike Sample Duplicate: Refer to MS.

NA - Not Applicable.

NC - Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.

NDPA/DPA - N-Nitrosodiphenylamine/Diphenylamine.

NI - Not Ignitable.

NP - Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil.

NR - No Results: Term is utilized when 'No Target Compounds Requested' is reported for the analysis of Volatile or Semivolatile Organic TIC only requests.

RL - Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.

RPD - Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report.

SRM - Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples.

STLP - Semi-dynamic Tank Leaching Procedure per EPA Method 1315.

TEF - Toxic Equivalency Factors: The values assigned to each dioxin and furan to evaluate their toxicity relative to 2,3,7,8-TCDD.

TEQ - Toxic Equivalent: The measure of a sample's toxicity derived by multiplying each dioxin and furan by its corresponding TEF and then summing the resulting values.

TIC - Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations.

*Report Format: DU Report with 'J' Qualifiers*

| | | | |
|---|---|---|---|
| **Project Name:** | RWM | **Lab Number:** | L2454033 |
| **Project Number:** | 21010103 | **Report Date:** | 10/02/24 |

***Footnotes***

1 - The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

***Terms***

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Chlordane: The target compound Chlordane (CAS No. 57-74-9) is reported for GC ECD analyses. Per EPA,this compound "refers to a mixture of chlordane isomers, other chlorinated hydrocarbons and numerous other components." (Reference: USEPA Toxicological Review of Chlordane, In Support of Summary Information on the Integrated Risk Information System (IRIS), December 1997.)

Difference: With respect to Total Oxidizable Precursor (TOP) Assay analysis, the difference is defined as the Post-Treatment value minus the Pre-Treatment value.

Final pH: As it pertains to Sample Receipt & Container Information section of the report, Final pH reflects pH of container determined after adjustment at the laboratory, if applicable. If no adjustment required, value reflects Initial pH.

Frozen Date/Time: With respect to Volatile Organics in soil, Frozen Date/Time reflects the date/time at which associated Reagent Water-preserved vials were initially frozen. Note: If frozen date/time is beyond 48 hours from sample collection, value will be reflected in 'bold'.

Gasoline Range Organics (GRO): Gasoline Range Organics (GRO) results include all chromatographic peaks eluting from Methyl tert butyl ether through Naphthalene, with the exception of GRO analysis in support of State of Ohio programs, which includes all chromatographic peaks eluting from Hexane through Dodecane.

Initial pH: As it pertains to Sample Receipt & Container Information section of the report, Initial pH reflects pH of container determined upon receipt, if applicable.

PAH Total: With respect to Alkylated PAH analyses, the 'PAHs, Total' result is defined as the summation of results for all or a subset of the following compounds: Naphthalene, C1-C4 Naphthalenes, 2-Methylnaphthalene, 1-Methylnaphthalene, Biphenyl, Acenaphthylene, Acenaphthene, Fluorene, C1-C3 Fluorenes, Phenanthrene, C1-C4 Phenanthrenes/Anthracenes, Anthracene, Fluoranthene, Pyrene, C1-C4 Fluoranthenes/Pyrenes, Benz(a)anthracene, Chrysene, C1-C4 Chrysenes, Benzo(b)fluoranthene, Benzo(j)+(k)fluoranthene, Benzo(e)pyrene, Benzo(a)pyrene, Perylene, Indeno(1,2,3-cd)pyrene, Dibenz(ah)+(ac)anthracene, Benzo(g,h,i)perylene. If a 'Total' result is requested, the results of its individual components will also be reported.

PFAS Total: With respect to PFAS analyses, the 'PFAS, Total (5)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA and PFOS. In addition, the 'PFAS, Total (6)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA, PFDA and PFOS. For MassDEP DW compliance analysis only, the 'PFAS, Total (6)' result is defined as the summation of results at or above the RL. Note: If a 'Total' result is requested, the results of its individual components will also be reported.

Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

***Data Qualifiers***

**A** - Spectra identified as "Aldol Condensates" are byproducts of the extraction/concentration procedures when acetone is introduced in the process.

**B** - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).

**C** - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.

**D** - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.

**E** - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.

**F** - The ratio of quantifier ion response to qualifier ion response falls outside of the laboratory criteria. Results are considered to be an estimated maximum concentration.

**G** - The concentration may be biased high due to matrix interferences (i.e, co-elution) with non-target compound(s). The result should be considered estimated.

**H** - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.

**I** - The lower value for the two columns has been reported due to obvious interference.

**J** - Estimated value. The Target analyte concentration is below the quantitation limit (RL), but above the Method Detection Limit (MDL) or Estimated Detection Limit (EDL) for SPME-related analyses. This represents an estimated concentration for Tentatively

*Report Format: DU Report with 'J' Qualifiers*

| | | | |
|---|---|---|---|
| **Project Name:** | RWM | **Lab Number:** | L2454033 |
| **Project Number:** | 21010103 | **Report Date:** | 10/02/24 |

***Data Qualifiers***

Identified Compounds (TICs). For calculated parameters, this represents that one or more values used in the calculation were estimated.

**M** - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.

**ND** - Not detected at the method detection limit (MDL) for the sample, or estimated detection limit (EDL) for SPME-related analyses.

**NJ** - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where the identification is based on a mass spectral library search.

**P** - The RPD between the results for the two columns exceeds the method-specified criteria.

**Q** - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)

**R** - Analytical results are from sample re-analysis.

**RE** - Analytical results are from sample re-extraction.

**S** - Analytical results are from modified screening analysis.

**V** - The surrogate associated with this target analyte has a recovery outside the QC acceptance limits. (Applicable to MassDEP DW Compliance samples only.)

**Z** - The batch matrix spike and/or duplicate associated with this target analyte has a recovery/RPD outside the QC acceptance limits. (Applicable to MassDEP DW Compliance samples only.)

| | | | |
|---|---|---|---|
| **Project Name:** | RWM | **Lab Number:** | L2454033 |
| **Project Number:** | 21010103 | **Report Date:** | 10/02/24 |

## REFERENCES

1 Test Methods for Evaluating Solid Waste: Physical/Chemical Methods. EPA SW-846. Third Edition. Updates I - VI, 2018.

## LIMITATION OF LIABILITIES

Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Analytical shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Alpha Analytical.

We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.

# Certification Information

**The following analytes are not included in our Primary NELAP Scope of Accreditation:**

**Westborough Facility**
**EPA 624.1:** m/p-xylene, o-xylene, Naphthalene
**EPA 625.1:** alpha-Terpineol
**EPA 8260D:** NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene; SCM: Iodomethane (methyl iodide), 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.
**EPA 8270E:** NPW: Dimethylnaphthalene,1,4-Diphenylhydrazine, alpha-Terpineol, Azobenzene; SCM: Dimethylnaphthalene,1,4-Diphenylhydrazine.
**SM4500**: NPW: Amenable Cyanide; SCM: Total Phosphorus, TKN, NO2, NO3.

**Mansfield Facility**
**SM 2540D:** TSS.
**EPA TO-15:** Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene, 3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene.
**Nonpotable Water: EPA RSK-175 Dissolved Gases**
**Biological Tissue Matrix:** EPA 3050B

**The following analytes are included in our Massachusetts DEP Scope of Accreditation**

**Westborough Facility:**

***Drinking Water***
**EPA 300.0**: Chloride, Nitrate-N, Fluoride, Sulfate; **EPA 353.2**: Nitrate-N, Nitrite-N; **SM4500NO3-F**: Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE, EPA 180.1, SM2130B, SM4500Cl-D, SM2320B, SM2540C, SM4500H-B, SM4500NO2-B**
**EPA 524.2:** THMs and VOCs; **EPA 504.1:** EDB, DBCP.
**Microbiology**: **SM9215B; SM9223-P/A, SM9223B-Colilert-QT,SM9222D**.

***Non-Potable Water***
**SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2320B, SM4500CL-E, SM4500F-BC, SM4500NH3-BH:** Ammonia-N and Kjeldahl-N, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **EPA 351.1, SM4500NO3-F, EPA 353.2**: Nitrate-N**, SM4500P-E, SM4500P-B, E, SM4500SO4-E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, EPA 420.1, SM4500-CN-CE, SM2540D, EPA 300: Chloride, Sulfate, Nitrate.**
**EPA 624.1**: Volatile Halocarbons & Aromatics,
**EPA 608.3**: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs
**EPA 625.1**: SVOC (Acid/Base/Neutral Extractables).
**Microbiology**: **SM9223B-Colilert-QT; Enterolert-QT, EPA 1600, EPA 1603, SM9222D.**

**Mansfield Facility:**

***Drinking Water***
**EPA 200.7:** Al, Ba, Cd, Cr, Cu, Fe, Mn, Ni, Na, Ag, Ca, Zn. **EPA 200.8:** Al, Sb, As, Ba, Be, Cd, Cr, Cu, Pb, Mn, Ni, Se, Ag, TL, Zn. **EPA 245.1** Hg.
**EPA 522, EPA 537.1.**

***Non-Potable Water***
**EPA 200.7:** Al, Sb, As, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, K, Se, Ag, Na, Sr, TL, Ti, V, Zn.
**EPA 200.8:** Al, Sb**,** As, Be, Cd, Cr, Cu, Fe, Pb, Mn, Ni, K, Se, Ag, Na, TL, Zn.
**EPA 245.1** Hg.
**SM2340B**

For a complete listing of analytes and methods, please contact your Alpha Project Manager.

# NEW JERSEY CHAIN OF CUSTODY

ALPHA ANALYTICAL

Westborough, MA 01581 — 8 Walkup Dr. — TEL: 508-898-9220 — FAX: 508-898-9193
Mansfield, MA 02048 — 320 Forbes Blvd — TEL: 508-822-9300 — FAX: 508-822-3288

**Service Centers**
Mahwah, NJ 07430: 35 Whitney Rd, Suite 5
Albany, NY 12205: 14 Walker Way
Tonawanda, NY 14150: 275 Cooper Ave, Suite 105

Page of

Date Rec'd in Lab: 09/20/24

ALPHA Job #: L2454033

**Client Information**
Client: Tradepoint Atlantic
Address: 6995 Bethlehem Blvd
Sparrows Point, MD
Phone:
Fax:
Email: JBarna@armgroup.net KGuille@armgroup.net

**Project Information**
Project Name: RWM
Project Location: A3
Project #: 21010103
(Use Project name as Project #) ☐
Project Manager:
ALPHAQuote #:

**Turn-Around Time**
Standard ☑ Due Date:
Rush (only if pre approved) ☐ # of Days:

**Deliverables**
☐ NJ Full / Reduced
☐ EQuIS (1 File) ☐ EQuIS (4 File)
☐ Other

**Regulatory Requirement**
☐ SRS Residential/Non Residential
☐ SRS Impact to Groundwater
☐ NJ Ground Water Quality Standards
☐ NJ IGW SPLP Leachate Criteria
☐ Other

**Billing Information**
☐ Same as Client Info
PO #

**Site Information**
Is this site impacted by Petroleum? Yes ☐
Petroleum Product:

These samples have been previously analyzed by Alpha ☐

**For EPH, selection is REQUIRED:**
☐ Category 1
☐ Category 2

**For VOC, selection is REQUIRED:**
☐ 1,4-Dioxane
☐ 8011

**Other project specific requirements/comments:**
**Please specify Metals or TAL.**

**ANALYSIS**

**Sample Filtration**
☑ Done
☐ Lab to do
*Preservation*
☐ Lab to do
*(Please Specify below)*

| ALPHA Lab ID (Lab Use Only) | Sample ID | Collection Date | Collection Time | Sample Matrix | Sampler's Initials | Dissolved Cadmium | Dissolved Zinc | Total Bottle | Sample Specific Comments |
|---|---|---|---|---|---|---|---|---|---|
| 54033-01 | RWH - MWS | 9/19/24 | 1045 | GW | NM | X | X | | |
| -02 | RWH - MWI | 9/19/24 | 1110 | GW | NM | X | X | | |
| -03 | RWO - MWS | 9/19/24 | 1280 | GW | NM | X | X | | |
| -04 | RWO - MWI | 9/19/24 | 1325 | GW | NM | X | X | | |

Preservative Code:
A = None
B = HCl
C = $HNO_3$
D = $H_2SO_4$
E = NaOH
F = MeOH
G = $NaHSO_4$
H = $Na_2S_2O_3$
K/E = Zn Ac/NaOH
O = Other

Container Code
P = Plastic
A = Amber Glass
V = Vial
G = Glass
B = Bacteria Cup
C = Cube
O = Other
E = Encore
D = BOD Bottle

Westboro: Certification No: MA935
Mansfield: Certification No: MA015

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Container Type | | | | | | | | | |
| Preservative | | | | | | | | | |

| Relinquished By: | Date/Time | Received By: | Date/Time |
|---|---|---|---|
| [signature] | 9/19/24 1550 | [signature] | 9/19/24 15:50 |
| [signature] | 9/19/24 1800 | [signature] | 9/19/24 1800 |
| [signature] | 9/19/24 2100 | Anthony Green | SEP 19 2024 2221 |
| Anthony Green | 9/20/24 0145 | [signature] | 9/20/24 0145 |
| [signature] | 9/20/24 0345 | [signature] | 9/20/24 05:45 |

Please print clearly, legibly and completely. Samples can not be logged in and turnaround time clock will not start until any ambiguities are resolved. BY EXECUTING THIS COC, THE CLIENT HAS READ AND AGREES TO BE BOUND BY ALPHA'S TERMS & CONSTITUTIONS. (See reverse side.)

Form No: 01-14 HC (rev. 30-Sept-2013)

ANALYTICAL REPORT

| | |
|---|---|
| Lab Number: | L2509486 |
| Client: | Tradepoint Atlantic<br>1600 Sparrows Point Boulevard<br>Baltimore, MD 21219 |
| ATTN: | Matthew Newman |
| Phone: | (443) 649-5073 |
| Project Name: | RWM RESAMPLE |
| Project Number: | 21010210 |
| Report Date: | 02/26/25 |

The original project report/data package is held by Pace Analytical Services. This report/data package is paginated and should be reproduced only in its entirety. Pace Analytical Services holds no responsibility for results and/or data that are not consistent with the original.

Certifications & Approvals: MA (M-MA086), NH NELAP (2064), CT (PH-0826), IL (200077), IN (C-MA-03), KY (KY98045), ME (MA00086), MD (348), NJ (MA935), NY (11148), NC (25700/666), OR (MA-1316), PA (68-03671), RI (LAO00065), TX (T104704476), VT (VT-0935), VA (460195), USDA (Permit #525-23-122-91930A1).

Eight Walkup Drive, Westborough, MA 01581-1019
508-898-9220 (Fax) 508-898-9193 800-624-9220 - www.alphalab.com

**Project Name:** RWM RESAMPLE
**Project Number:** 21010210

**Lab Number:** L2509486
**Report Date:** 02/26/25

| Lab Sample ID | Client ID | Matrix | Sample Location | Collection Date/Time | Receive Date |
|---|---|---|---|---|---|
| L2509486-01 | RWH-MWS | WATER | Not Specified | 02/20/25 10:45 | 02/20/25 |
| L2509486-02 | RW23-MWS | WATER | Not Specified | 02/20/25 11:50 | 02/20/25 |

| | | | |
|---|---|---|---|
| **Project Name:** | RWM RESAMPLE | **Lab Number:** | L2509486 |
| **Project Number:** | 21010210 | **Report Date:** | 02/26/25 |

## Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Pace Lab Number and meet NELAP requirements for all NELAP accredited parameters unless otherwise noted in the following narrative. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. Tentatively Identified Compounds (TICs), if requested, are reported for compounds identified to be present and are not part of the method/program Target Compound List, even if only a subset of the TCL are being reported. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively.

When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances, the specific failure is not narrated but noted in the associated QC Outlier Summary Report, located directly after the Case Narrative. QC information is also incorporated in the Data Usability Assessment table (Format 11) of our Data Merger tool, where it can be reviewed in conjunction with the sample result, associated regulatory criteria and any associated data usability implications.

Soil/sediments and solids are reported on a dry weight basis unless otherwise noted. Tissues are reported "as received" or on a wet weight basis, unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

HOLD POLICY - For samples submitted on hold, Pace's policy is to hold samples (with the exception of Air canisters) free of charge for 21 calendar days from the date the project is completed. After 21 calendar days, we will dispose of all samples submitted including those put on hold unless you have contacted your Pace Project Manager and made arrangements for Pace to continue to hold the samples. Air canisters will be disposed after 3 business days from the date the project is completed.

Please contact Project Management at 800-624-9220 with any questions.

| | | | |
|---|---|---|---|
| **Project Name:** | RWM RESAMPLE | **Lab Number:** | L2509486 |
| **Project Number:** | 21010210 | **Report Date:** | 02/26/25 |

**Case Narrative (continued)**

Report Submission

All non-detect (ND) or estimated concentrations (J-qualified) have been quantitated to the limit noted in the MDL column.

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature: Jay Simonian

Title: Technical Director/Representative Date: 02/26/25

# METALS

**Project Name:** RWM RESAMPLE
**Project Number:** 21010210
**Lab Number:** L2509486
**Report Date:** 02/26/25

## SAMPLE RESULTS

Lab ID: L2509486-01
Client ID: RWH-MWS
Sample Location: Not Specified
Sample Depth:
Matrix: Water

Date Collected: 02/20/25 10:45
Date Received: 02/20/25
Field Prep: Refer to COC

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dissolved Metals - Mansfield Lab** | | | | | | | | | | | |
| Cadmium, Dissolved | 189.0 | | ug/l | 2.000 | 0.5990 | 10 | 02/24/25 16:00 | 02/26/25 07:49 | EPA 3005A | 1,6020B | NTB |
| Zinc, Dissolved | 9659. | | ug/l | 10.00 | 3.410 | 1 | 02/24/25 16:00 | 02/25/25 21:21 | EPA 3005A | 1,6020B | NTB |

**Project Name:** RWM RESAMPLE
**Lab Number:** L2509486
**Project Number:** 21010210
**Report Date:** 02/26/25

## SAMPLE RESULTS

Lab ID: L2509486-02
Client ID: RW23-MWS
Sample Location: Not Specified
Date Collected: 02/20/25 11:50
Date Received: 02/20/25
Field Prep: Refer to COC

Sample Depth:
Matrix: Water

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Prep Method | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Dissolved Metals - Mansfield Lab** | | | | | | | | | | | |
| Cadmium, Dissolved | 0.0766 | J | ug/l | 0.2000 | 0.0599 | 1 | 02/24/25 16:00 | 02/25/25 21:26 | EPA 3005A | 1,6020B | NTB |
| Zinc, Dissolved | ND | | ug/l | 10.00 | 3.410 | 1 | 02/24/25 16:00 | 02/25/25 21:26 | EPA 3005A | 1,6020B | NTB |

**Project Name:** RWM RESAMPLE
**Project Number:** 21010210
**Lab Number:** L2509486
**Report Date:** 02/26/25

# Method Blank Analysis
# Batch Quality Control

| Parameter | Result | Qualifier | Units | RL | MDL | Dilution Factor | Date Prepared | Date Analyzed | Analytical Method | Analyst |
|---|---|---|---|---|---|---|---|---|---|---|
| Dissolved Metals - Mansfield Lab for sample(s): 01-02 Batch: WG2033497-1 | | | | | | | | | | |
| Cadmium, Dissolved | ND | | ug/l | 0.2000 | 0.0599 | 1 | 02/24/25 16:00 | 02/25/25 21:45 | 1,6020B | NTB |
| Zinc, Dissolved | ND | | ug/l | 10.00 | 3.410 | 1 | 02/24/25 16:00 | 02/25/25 21:45 | 1,6020B | NTB |

**Prep Information**

Digestion Method: EPA 3005A

# Lab Control Sample Analysis
## Batch Quality Control

**Project Name:** RWM RESAMPLE
**Project Number:** 21010210

**Lab Number:** L2509486
**Report Date:** 02/26/25

| Parameter | LCS %Recovery | Qual | LCSD %Recovery | Qual | %Recovery Limits | RPD | Qual | RPD Limits |
|---|---|---|---|---|---|---|---|---|
| Dissolved Metals - Mansfield Lab Associated sample(s): 01-02 Batch: WG2033497-2 | | | | | | | | |
| Cadmium, Dissolved | 98 | | - | | 80-120 | - | | |
| Zinc, Dissolved | 104 | | - | | 80-120 | - | | |

# Matrix Spike Analysis
## Batch Quality Control

**Project Name:** RWM RESAMPLE
**Project Number:** 21010210

**Lab Number:** L2509486
**Report Date:** 02/26/25

| Parameter | Native Sample | MS Added | MS Found | MS %Recovery | Qual | MSD Found | MSD %Recovery | Qual | Recovery Limits | RPD | Qual | RPD Limits |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Dissolved Metals - Mansfield Lab Associated sample(s): 01-02 QC Batch ID: WG2033497-3 QC Sample: L2509627-01 Client ID: MS Sample | | | | | | | | | | | | |
| Cadmium, Dissolved | 0.9061 | 53 | 50.83 | 94 | | - | - | | 75-125 | - | | 20 |
| Zinc, Dissolved | 28.63 | 500 | 515.8 | 97 | | - | - | | 75-125 | - | | 20 |

**Project Name:** RWM RESAMPLE
**Project Number:** 21010210

**Lab Number:** L2509486
**Report Date:** 02/26/25

## Sample Receipt and Container Information

Were project specific reporting limits specified? YES

### Cooler Information

| Cooler | Custody Seal |
|---|---|
| A | Absent |

### Container Information

| Container ID | Container Type | Cooler | Initial pH | Final pH | Temp deg C | Pres | Seal | Frozen Date/Time | Analysis(*) |
|---|---|---|---|---|---|---|---|---|---|
| L2509486-01A | Plastic 250ml HNO3 preserved | A | <2 | <2 | 2.0 | Y | Absent | | ZN-6020S-PPB(180),CD-6020S-PPB(180) |
| L2509486-02A | Plastic 250ml HNO3 preserved | A | <2 | <2 | 2.0 | Y | Absent | | ZN-6020S-PPB(180),CD-6020S-PPB(180) |



*Values in parentheses indicate holding time in days

| | | | |
|---|---|---|---|
| **Project Name:** | RWM RESAMPLE | **Lab Number:** | L2509486 |
| **Project Number:** | 21010210 | **Report Date:** | 02/26/25 |

## GLOSSARY

***Acronyms***

| | |
|---|---|
| DL | - Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the limit of quantitation (LOQ). The DL includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.) |
| EDL | - Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME). |
| EMPC | - Estimated Maximum Possible Concentration: The concentration that results from the signal present at the retention time of an analyte when the ions meet all of the identification criteria except the ion abundance ratio criteria. An EMPC is a worst-case estimate of the concentration. |
| EPA | - Environmental Protection Agency. |
| LCS | - Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes. |
| LCSD | - Laboratory Control Sample Duplicate: Refer to LCS. |
| LFB | - Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes. |
| LOD | - Limit of Detection: This value represents the level to which a target analyte can reliably be detected for a specific analyte in a specific matrix by a specific method. The LOD includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.) |
| LOQ | - Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.)<br><br>Limit of Quantitation: The value at which an instrument can accurately measure an analyte at a specific concentration. The LOQ includes any adjustments from dilutions, concentrations or moisture content, where applicable. (DoD report formats only.) |
| MDL | - Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. |
| MS | - Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available. For Method 332.0, the spike recovery is calculated using the native concentration, including estimated values. |
| MSD | - Matrix Spike Sample Duplicate: Refer to MS. |
| NA | - Not Applicable. |
| NC | - Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit. |
| NDPA/DPA | - N-Nitrosodiphenylamine/Diphenylamine. |
| NI | - Not Ignitable. |
| NP | - Non-Plastic: Term is utilized for the analysis of Atterberg Limits in soil. |
| NR | - No Results: Term is utilized when 'No Target Compounds Requested' is reported for the analysis of Volatile or Semivolatile Organic TIC only requests. |
| RL | - Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable. |
| RPD | - Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report. |
| SRM | - Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples. |
| STLP | - Semi-dynamic Tank Leaching Procedure per EPA Method 1315. |
| TEF | - Toxic Equivalency Factors: The values assigned to each dioxin and furan to evaluate their toxicity relative to 2,3,7,8-TCDD. |
| TEQ | - Toxic Equivalent: The measure of a sample's toxicity derived by multiplying each dioxin and furan by its corresponding TEF and then summing the resulting values. |
| TIC | - Tentatively Identified Compound: A compound that has been identified to be present and is not part of the target compound list (TCL) for the method and/or program. All TICs are qualitatively identified and reported as estimated concentrations. |

*Report Format: DU Report with 'J' Qualifiers*

| | | | |
|---|---|---|---|
| **Project Name:** | RWM RESAMPLE | **Lab Number:** | L2509486 |
| **Project Number:** | 21010210 | **Report Date:** | 02/26/25 |

***Footnotes***

1 - The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

***Terms***

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Chlordane: The target compound Chlordane (CAS No. 57-74-9) is reported for GC ECD analyses. Per EPA,this compound "refers to a mixture of chlordane isomers, other chlorinated hydrocarbons and numerous other components." (Reference: USEPA Toxicological Review of Chlordane, In Support of Summary Information on the Integrated Risk Information System (IRIS), December 1997.)

Difference: With respect to Total Oxidizable Precursor (TOP) Assay analysis, the difference is defined as the Post-Treatment value minus the Pre-Treatment value.

Final pH: As it pertains to Sample Receipt & Container Information section of the report, Final pH reflects pH of container determined after adjustment at the laboratory, if applicable. If no adjustment required, value reflects Initial pH.

Frozen Date/Time: With respect to Volatile Organics in soil, Frozen Date/Time reflects the date/time at which associated Reagent Water-preserved vials were initially frozen. Note: If frozen date/time is beyond 48 hours from sample collection, value will be reflected in 'bold'.

Gasoline Range Organics (GRO): Gasoline Range Organics (GRO) results include all chromatographic peaks eluting from Methyl tert butyl ether through Naphthalene, with the exception of GRO analysis in support of State of Ohio programs, which includes all chromatographic peaks eluting from Hexane through Dodecane.

Initial pH: As it pertains to Sample Receipt & Container Information section of the report, Initial pH reflects pH of container determined upon receipt, if applicable.

PAH Total: With respect to Alkylated PAH analyses, the 'PAHs, Total' result is defined as the summation of results for all or a subset of the following compounds: Naphthalene, C1-C4 Naphthalenes, 2-Methylnaphthalene, 1-Methylnaphthalene, Biphenyl, Acenaphthylene, Acenaphthene, Fluorene, C1-C3 Fluorenes, Phenanthrene, C1-C4 Phenanthrenes/Anthracenes, Anthracene, Fluoranthene, Pyrene, C1-C4 Fluoranthenes/Pyrenes, Benz(a)anthracene, Chrysene, C1-C4 Chrysenes, Benzo(b)fluoranthene, Benzo(j)+(k)fluoranthene, Benzo(e)pyrene, Benzo(a)pyrene, Perylene, Indeno(1,2,3-cd)pyrene, Dibenz(ah)+(ac)anthracene, Benzo(g,h,i)perylene. If a 'Total' result is requested, the results of its individual components will also be reported.

PFAS Total: With respect to PFAS analyses, the 'PFAS, Total (5)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA and PFOS. In addition, the 'PFAS, Total (6)' result is defined as the summation of results for: PFHpA, PFHxS, PFOA, PFNA, PFDA and PFOS. For MassDEP DW compliance analysis only, the 'PFAS, Total (6)' result is defined as the summation of results at or above the RL. Note: If a 'Total' result is requested, the results of its individual components will also be reported.

Total: With respect to Organic analyses, a 'Total' result is defined as the summation of results for individual isomers or Aroclors. If a 'Total' result is requested, the results of its individual components will also be reported. This is applicable to 'Total' results for methods 8260, 8081 and 8082.

***Data Qualifiers***

**A** - Spectra identified as "Aldol Condensates" are byproducts of the extraction/concentration procedures when acetone is introduced in the process.

**B** - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit. For NJ-related projects (excluding Air), flag only applies to associated field samples that have detectable concentrations of the analyte, which was detected above the reporting limit in the associated method blank or above five times the reporting limit for common lab contaminants (Phthalates, Acetone, Methylene Chloride, 2-Butanone).

**C** - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.

**D** - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.

**E** - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.

**F** - The ratio of quantifier ion response to qualifier ion response falls outside of the laboratory criteria. Results are considered to be an estimated maximum concentration.

**G** - The concentration may be biased high due to matrix interferences (i.e, co-elution) with non-target compound(s). The result should be considered estimated.

**H** - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.

**I** - The lower value for the two columns has been reported due to obvious interference.

**J** - Estimated value. The Target analyte concentration is below the quantitation limit (RL), but above the Method Detection Limit (MDL) or Estimated Detection Limit (EDL) for SPME-related analyses. This represents an estimated concentration for Tentatively

*Report Format: DU Report with 'J' Qualifiers*

| | | | |
|---|---|---|---|
| **Project Name:** | RWM RESAMPLE | **Lab Number:** | L2509486 |
| **Project Number:** | 21010210 | **Report Date:** | 02/26/25 |

***Data Qualifiers***

Identified Compounds (TICs). For calculated parameters, this represents that one or more values used in the calculation were estimated.

**M** - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.

**ND** - Not detected at the method detection limit (MDL) for the sample, or estimated detection limit (EDL) for SPME-related analyses.

**NJ** - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where the identification is based on a mass spectral library search.

**P** - The RPD between the results for the two columns exceeds the method-specified criteria.

**Q** - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)

**R** - Analytical results are from sample re-analysis.

**RE** - Analytical results are from sample re-extraction.

**S** - Analytical results are from modified screening analysis.

**V** - The surrogate associated with this target analyte has a recovery outside the QC acceptance limits. (Applicable to MassDEP DW Compliance samples only.)

**Z** - The batch matrix spike and/or duplicate associated with this target analyte has a recovery/RPD outside the QC acceptance limits. (Applicable to MassDEP DW Compliance samples only.)

**Project Name:** RWM RESAMPLE
**Project Number:** 21010210
**Lab Number:** L2509486
**Report Date:** 02/26/25

## REFERENCES

1 Test Methods for Evaluating Solid Waste: Physical/Chemical Methods. EPA SW-846. Third Edition. Updates I - VI, 2018.

## LIMITATION OF LIABILITIES

Pace Analytical Services performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Pace Analytical Services shall be to re-perform the work at it's own expense. In no event shall Pace Analytical Services be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Pace Analytical Services.

We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.

# Certification Information

**The following analytes are not included in our Primary NELAP Scope of Accreditation:**

**Westborough Facility – 8 Walkup Dr. Westborough, MA 01581**
**EPA 624.1:** m/p-xylene, o-xylene, Naphthalene
**EPA 625.1:** alpha-Terpineol
**EPA 8260D:** NPW: 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene; SCM: Iodomethane (methyl iodide), 1,2,4,5-Tetramethylbenzene; 4-Ethyltoluene.
**EPA 8270E:** NPW: Dimethylnaphthalene,1,4-Diphenylhydrazine, alpha-Terpineol, Azobenzene; SCM: Dimethylnaphthalene,1,4-Diphenylhydrazine.
**SM4500**: NPW: Amenable Cyanide; SCM: Total Phosphorus, TKN, NO2, NO3.

**Mansfield Facility – 320 Forbes Blvd. Mansfield, MA 02048**
**SM 2540D:** TSS.
**EPA TO-15:** Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene, 3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene.
**MADEP-APH.**
**Nonpotable Water: EPA RSK-175 Dissolved Gases**
**Biological Tissue Matrix:** EPA 3050B

**Mansfield Facility – 120 Forbes Blvd. Mansfield, MA 02048**
**EPA TO-15:** Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene, 3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 1-Methylnaphthalene.
**Nonpotable Water: EPA RSK-175 Dissolved Gases**

**The following test method is not included in our New Jersey Secondary NELAP Scope of Accreditation:**

**Mansfield Facility – 320 Forbes Blvd. Mansfield, MA 02048**
**Determination of Selected Perfluorinated Alkyl Substances by Solid Phase Extraction and Liquid Chromatography/Tandem Mass Spectrometry Isotope Dilution (via Alpha SOP 23528)**

**The following analytes are included in our Massachusetts DEP Scope of Accreditation**

**Westborough Facility – 8 Walkup Dr. Westborough, MA 01581**

***Drinking Water***
**EPA 300.0**: Chloride, Nitrate-N, Fluoride, Sulfate; **EPA 353.2**: Nitrate-N, Nitrite-N; **SM4500NO3-F**: Nitrate-N, Nitrite-N; **SM4500F-C, SM4500CN-CE, EPA 180.1, SM2130B, SM4500Cl-D, SM2320B, SM2540C, SM4500H-B, SM4500NO2-B**
**EPA 524.2:** THMs and VOCs; **EPA 504.1:** EDB, DBCP.
**Microbiology**: **SM9215B; SM9223-P/A, SM9223B-Colilert-QT,SM9222D**.

***Non-Potable Water***
**SM4500H,B, EPA 120.1, SM2510B, SM2540C, SM2320B, SM4500CL-E, SM4500F-BC, SM4500NH3-BH:** Ammonia-N and Kjeldahl-N, **EPA 350.1**: Ammonia-N, **LACHAT 10-107-06-1-B**: Ammonia-N, **EPA 351.1, SM4500NO3-F, EPA 353.2**: Nitrate-N**, SM4500P-E, SM4500P-B, E, SM4500SO4-E, SM5220D, EPA 410.4, SM5210B, SM5310C, SM4500CL-D, EPA 1664, EPA 420.1, SM4500-CN-CE, SM2540D, EPA 300: Chloride, Sulfate, Nitrate.**
**EPA 624.1**: Volatile Halocarbons & Aromatics,
**EPA 608.3**: Chlordane, Toxaphene, Aldrin, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, Dieldrin, DDD, DDE, DDT, Endosulfan I, Endosulfan II, Endosulfan sulfate, Endrin, Endrin Aldehyde, Heptachlor, Heptachlor Epoxide, PCBs
**EPA 625.1**: SVOC (Acid/Base/Neutral Extractables).
**Microbiology**: **SM9223B-Colilert-QT; Enterolert-QT, EPA 1600, EPA 1603, SM9222D.**

**Mansfield Facility – 320 Forbes Blvd. Mansfield, MA 02048**

***Drinking Water***
**EPA 200.7:** Al, Ba, Cd, Cr, Cu, Fe, Mn, Ni, Na, Ag, Ca, Zn. **EPA 200.8:** Al, Sb, As, Ba, Be, Cd, Cr, Cu, Pb, Mn, Ni, Se, Ag, TL, Zn. **EPA 245.1** Hg.
**EPA 522, EPA 537.1.**

***Non-Potable Water***
**EPA 200.7:** Al, Sb, As, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Mo, Ni, K, Se, Ag, Na, Sr, TL, Ti, V, Zn.
**EPA 200.8:** Al, Sb**,** As, Be, Cd, Cr, Cu, Fe, Pb, Mn, Ni, K, Se, Ag, Na, TL, Zn.
**EPA 245.1** Hg.
**SM2340B**

**Certification IDs:**

**Westborough Facility – 8 Walkup Dr. Westborough, MA 01581**
CT PH-0826, IL 200077, IN C-MA-03, KY JY98045, ME MA00086, MD 348, MA M-MA086, NH 2064, NJ MA935, NY 11148, NC (DW) 25700, NC (NPW/SCM) 666, OR MA-1316, PA 68-03671, RI LAO00065, TX T104704476, VT VT-0935, VA 460195

**Mansfield Facility – 320 Forbes Blvd. Mansfield, MA 02048**
CT PH-0825, ANAB/DoD L2474, IL 200081, IN C-MA-04, KY KY98046, LA 3090, ME MA00030, MI 9110, MN 025-999-495, NH 2062, NJ MA015, NY 11627, NC (NPW/SCM) 685, OR MA-0262, PA 68-02089, RI LAO00299, TX T-104704419, VT VT-0015, VA 460194, WA C954

**Mansfield Facility – 120 Forbes Blvd. Mansfield, MA 02048**
ANAB/DoD L2474, ME MA01156, MN 025-999-498, NH 2249, NJ MA025, NY 12191, OR 4203, TX T104704583, VA 460311, WA C1104.

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For a complete listing of analytes and methods, please contact your Project Manager.

# CHAIN OF CUSTODY

PAGE 1 OF 1

L2509486 27FEB25
TRADEPOINT

ALPHA ANALYTICAL
WESTBORO, MA TEL: 508-898-9220 FAX: 508-898-9193
MANSFIELD, MA TEL: 508-822-9300 FAX: 508-822-3288

Date Rec'd in Lab: 2/21/25

**Client Information**

Client: Tradepoint Atlantic
Address: 6995 Bethlehem Blvd
Sparrows Point, MD
Phone:
Fax:
Email: JBarna@armgroup.net
KGuille@armgroup.net
☐ These samples have been previously analyzed by Alpha

**Project Information**

Project Name: RWM Resample
Project Location: 21010210
Project #:
Project Manager: Kaye Guille
ALPHA Quote #:

**Turn-Around Time**

☒ Standard ☐ RUSH (only confirmed if pre-approved)
Date Due: (5-day) Time:

**Report Information - Data Deliverables**

☐ FAX ☐ EMAIL
☐ ADEx ☐ Add'l Deliverables

☐ Same as Client info PO #:

**Regulatory Requirements/Report Limits**

| State /Fed Program | Criteria |
|---|---|
| | |

Other Project Specific Requirements/Comments/Detection Limits:

**SAMPLE HANDLING**

Filtration
☒ Done
☐ Not needed
☐ Lab to do
Preservation
☐ Lab to do
(Please specify below)

| ALPHA Lab ID (Lab Use Only) | Sample ID | Collection Date | Collection Time | Sample Matrix | Sampler's Initials | ANALYSIS: Dissolved Zinc | Sample Specific Comments | TOTAL # BOTTLES |
|---|---|---|---|---|---|---|---|---|
| 09486-01 | RW11-MWS | 2/20 | 1045 | GW | CN | X | pH<2 | 1 |
| 02 | RW23-MWS | 2/20 | 1150 | GW | CN | X | | 1 |

| | |
|---|---|
| Container Type | P |
| Preservative | C |

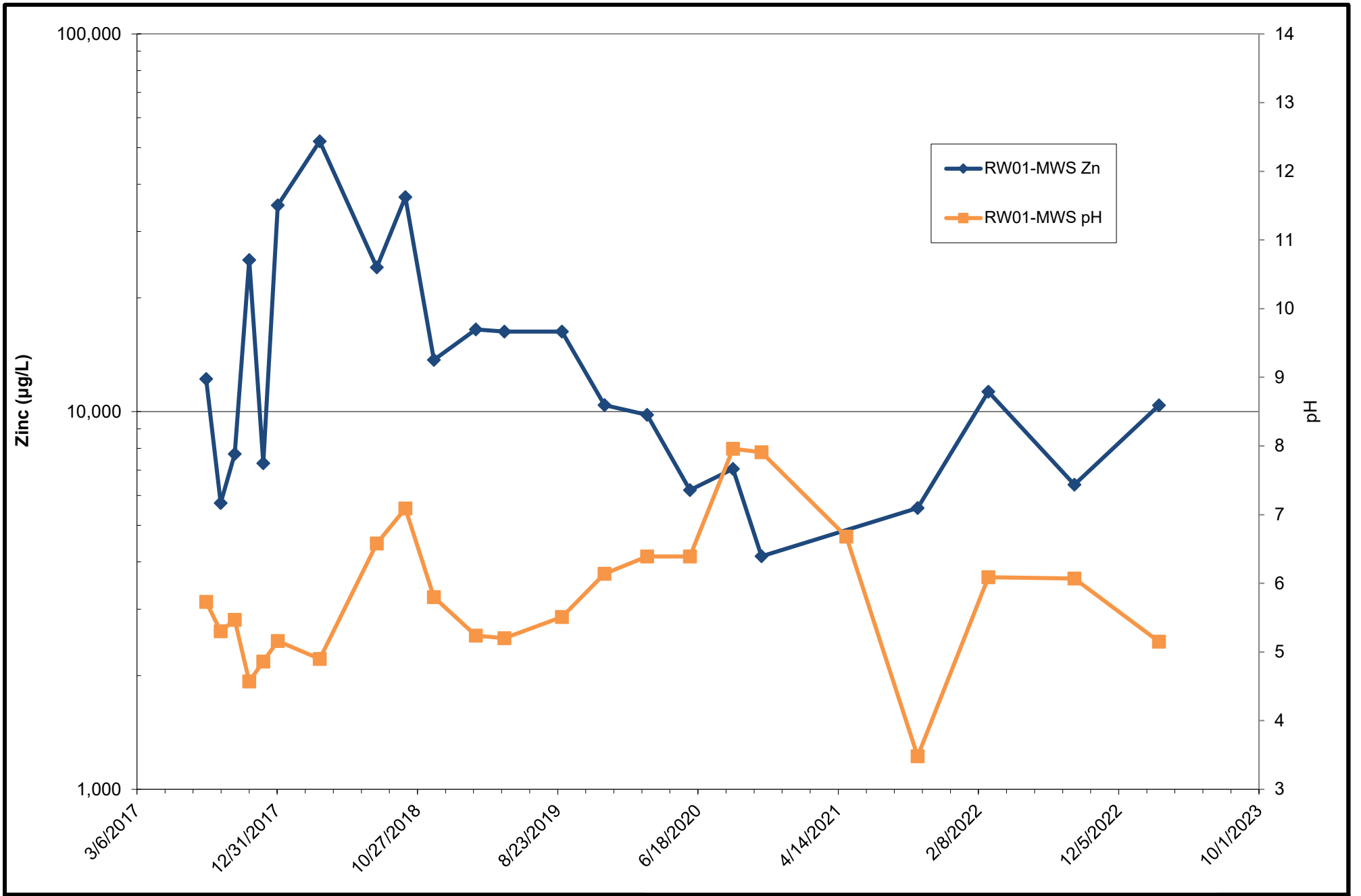
| Relinquished By: | Date/Time | Received By: | Date/Time |
|---|---|---|---|
| Charlotte Norris ARM | 2/20/25 1600 | | |
| | 2.20.25 1816 | | 2.20 1816 |
| Anthony Green | 2/21/25 0105 | Anthony Green FEB 20 2025 2345 | 2/21/25 0105 |

Please print clearly, legibly and completely. Samples can not be logged in and turnaround time clock will not start until any ambiguities are resolved. All samples submitted are subject to Alpha's Terms and Conditions. See reverse side.

2/21/25 0315

2/21 0315

# APPENDIX B




ARM Group LLC
Engineers and Scientists

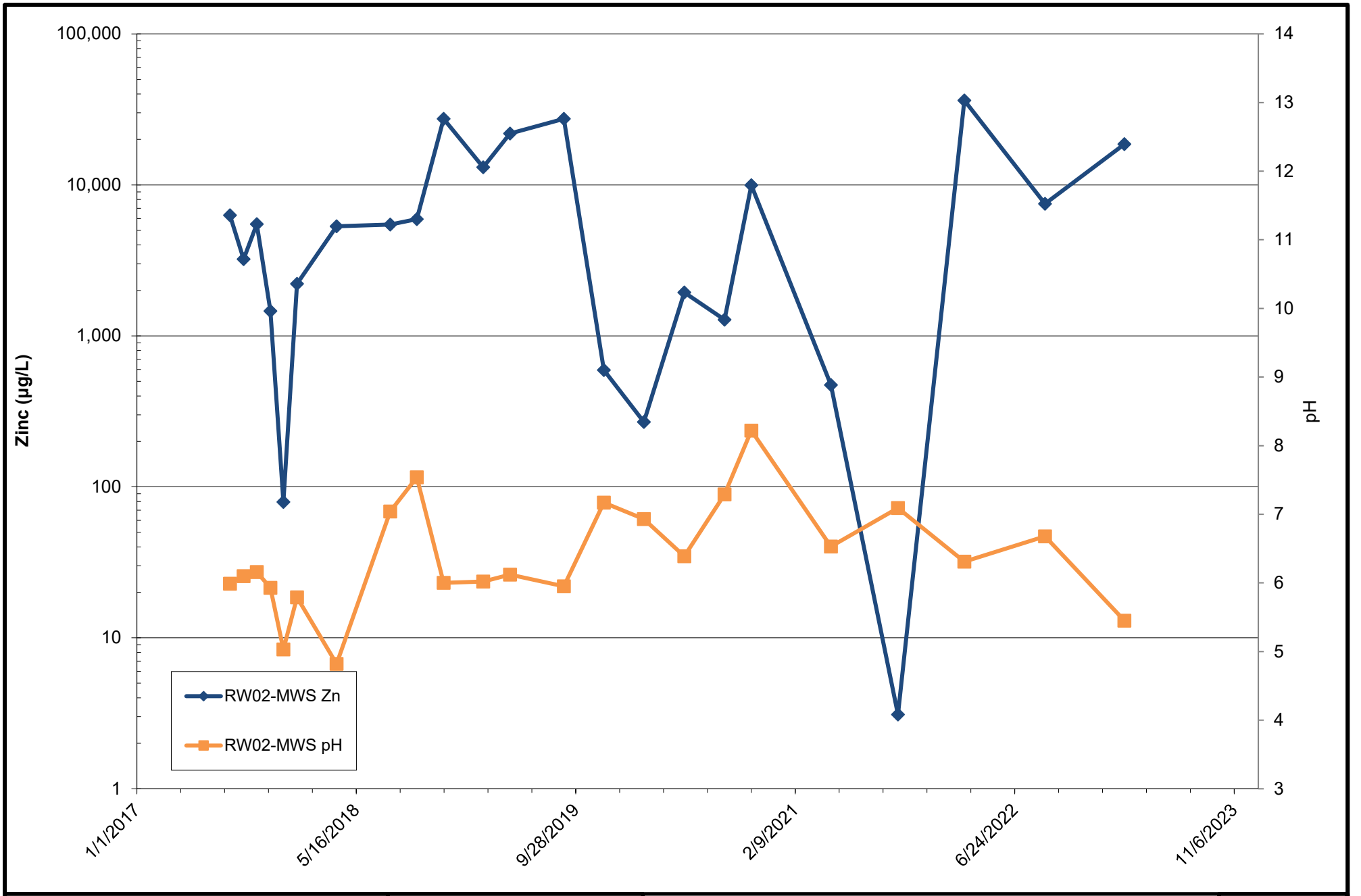
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RW01-MWS pH and Zinc Concentrations

January 2025

**Appx B**




ARM Group LLC
Engineers and Scientists

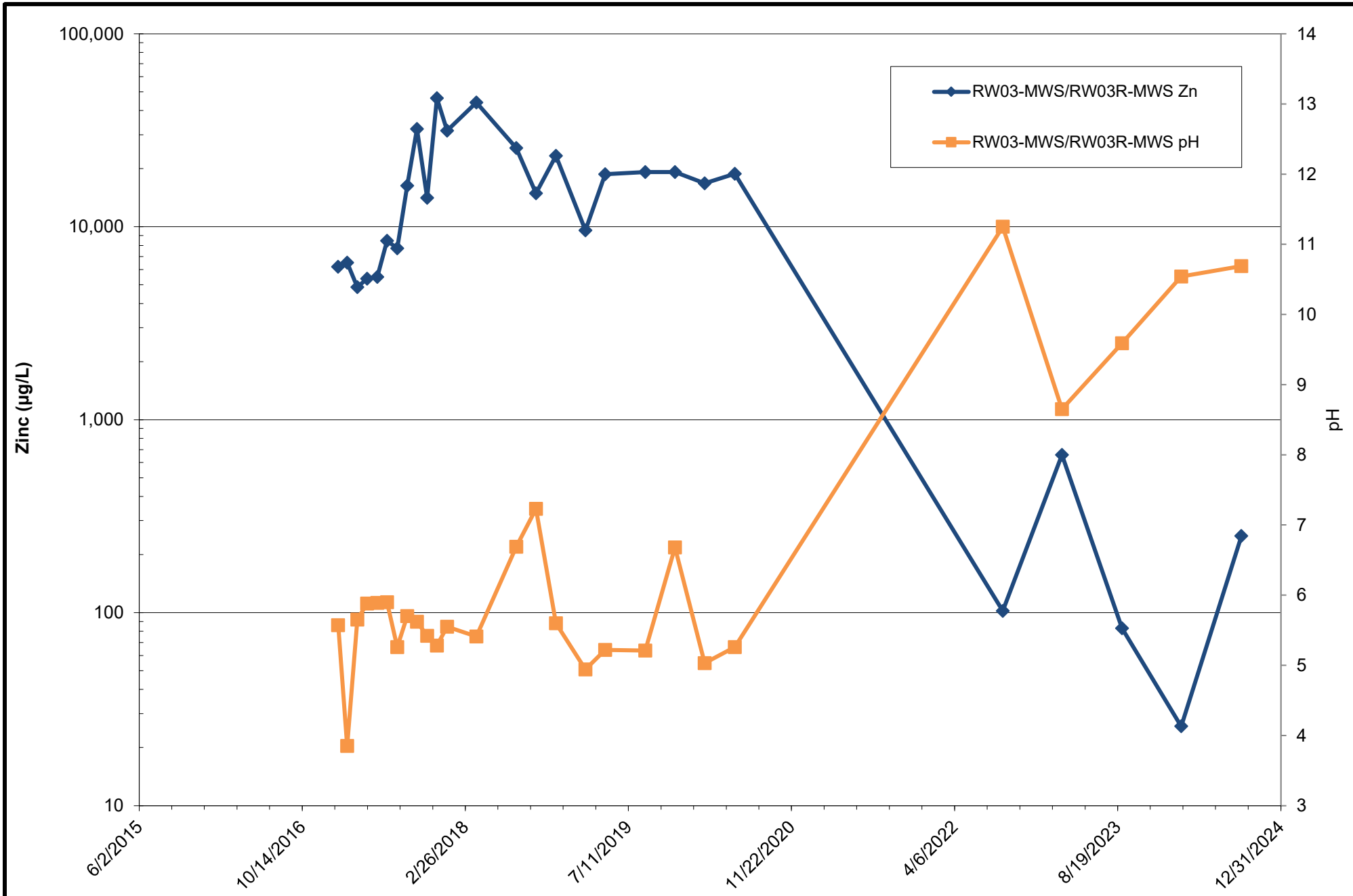
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RW02-MWS pH and Zinc Concentrations

January 2025

**Appx B**




ARM Group LLC
Engineers and Scientists

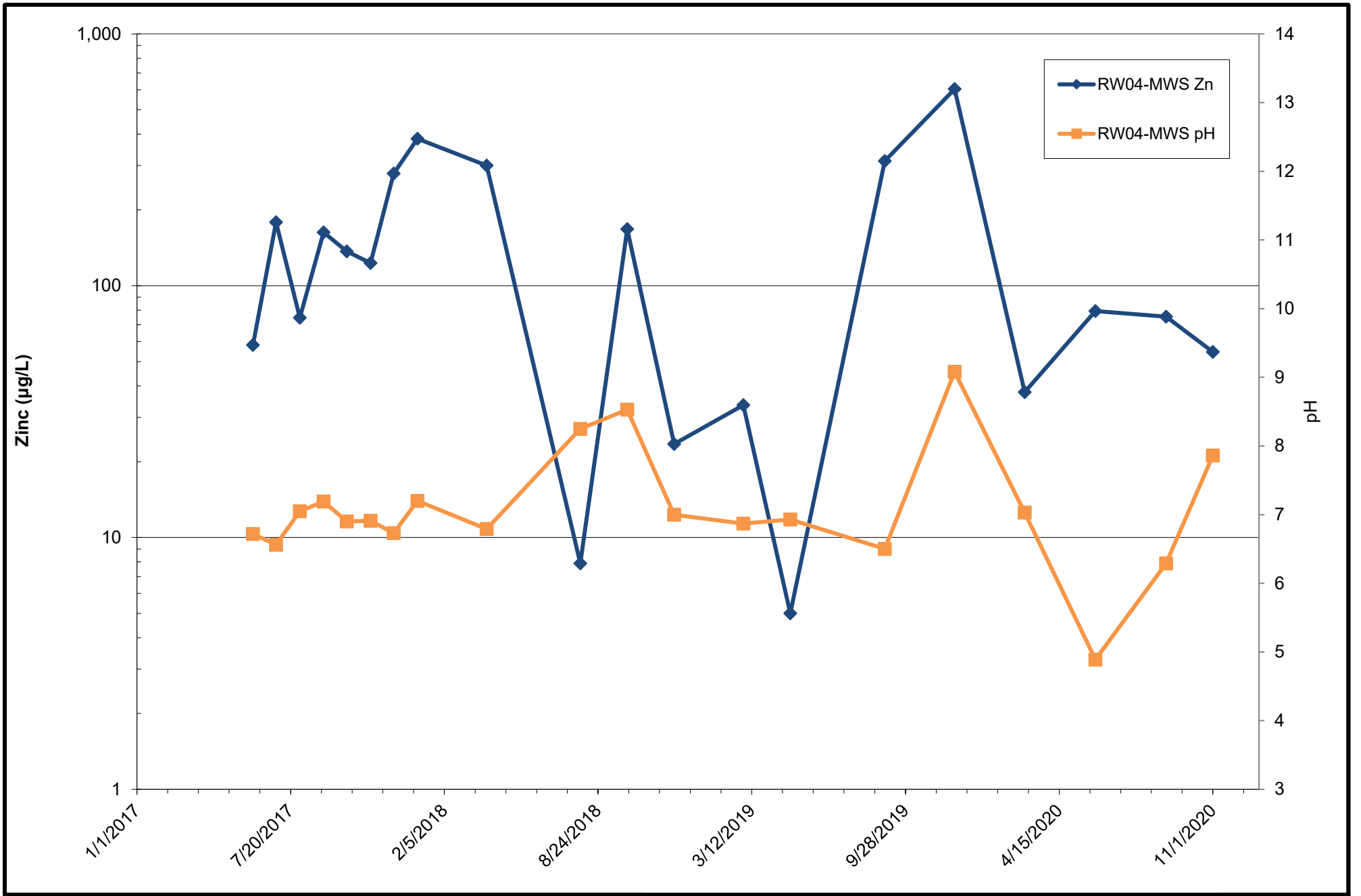
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RW03-MWS/RW03R-MWS pH and Zinc Concentrations

March 2025

**Appx B**




ARM Group LLC
Engineers and Scientists

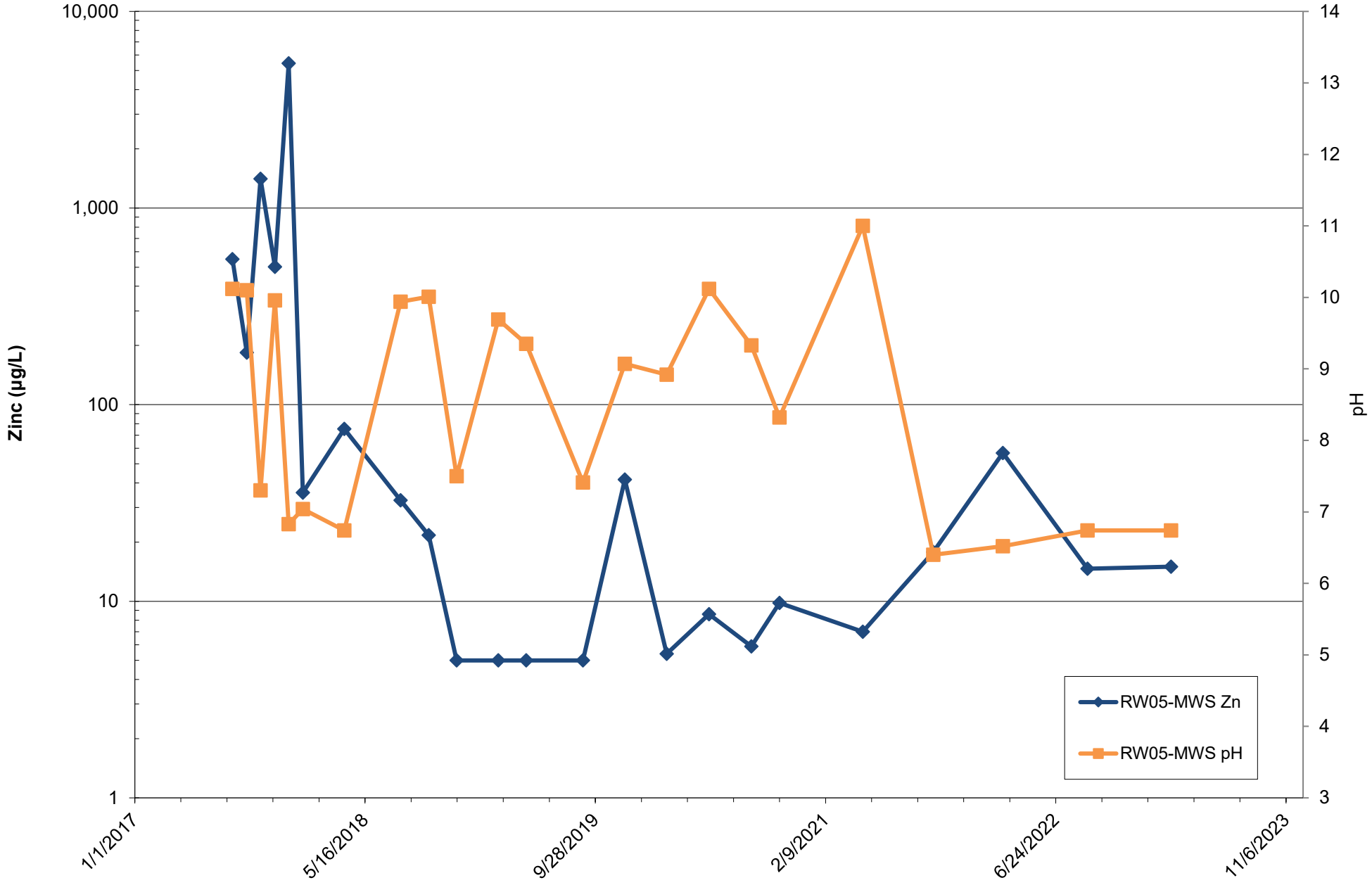
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RW04-MWS pH and Zinc Concentrations

January 2025

**Appx B**




ARM Group LLC
Engineers and Scientists

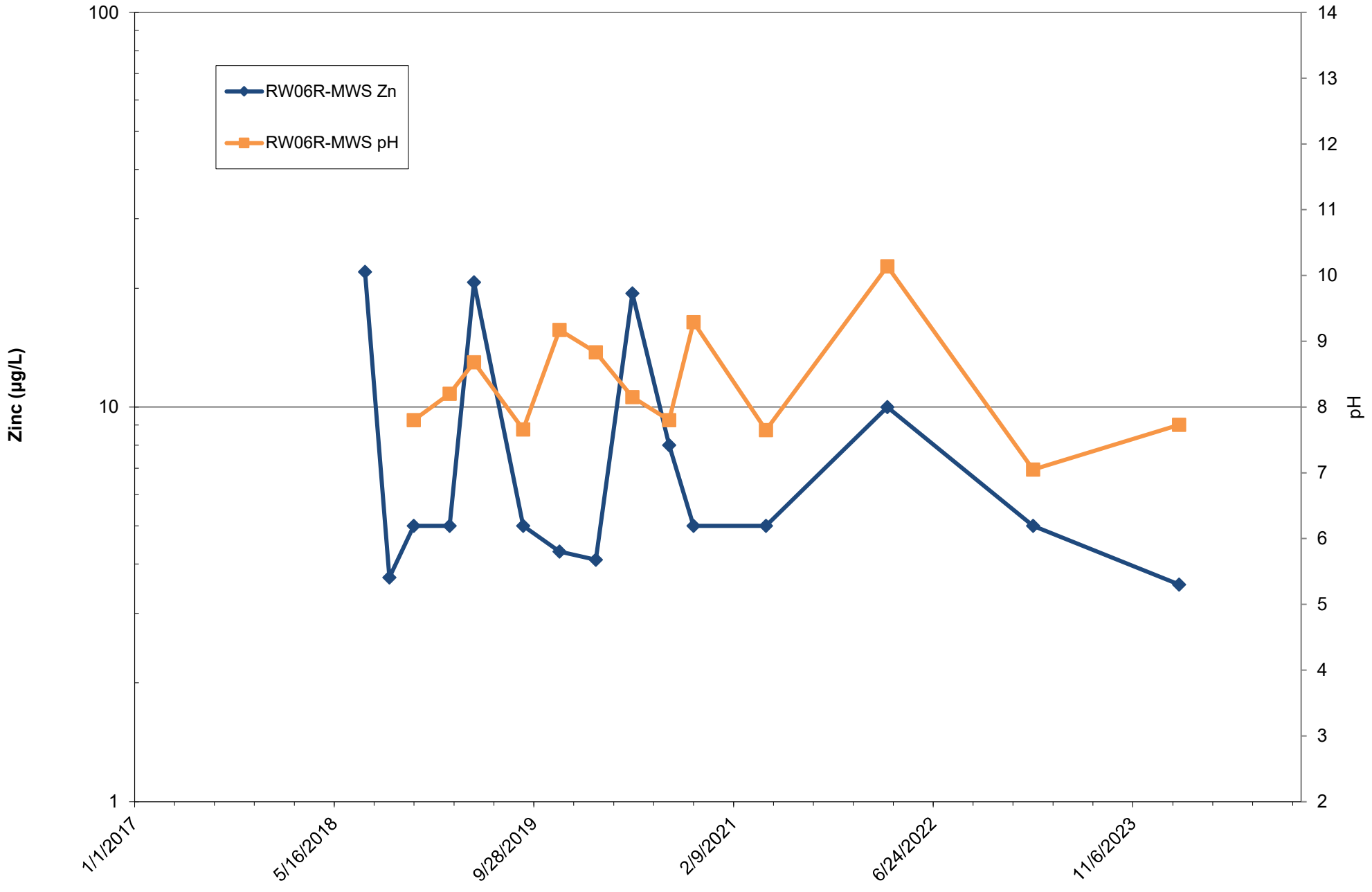
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RW05-MWS pH and Zinc Concentrations

January 2025

**Appx B**




ARM Group LLC
Engineers and Scientists

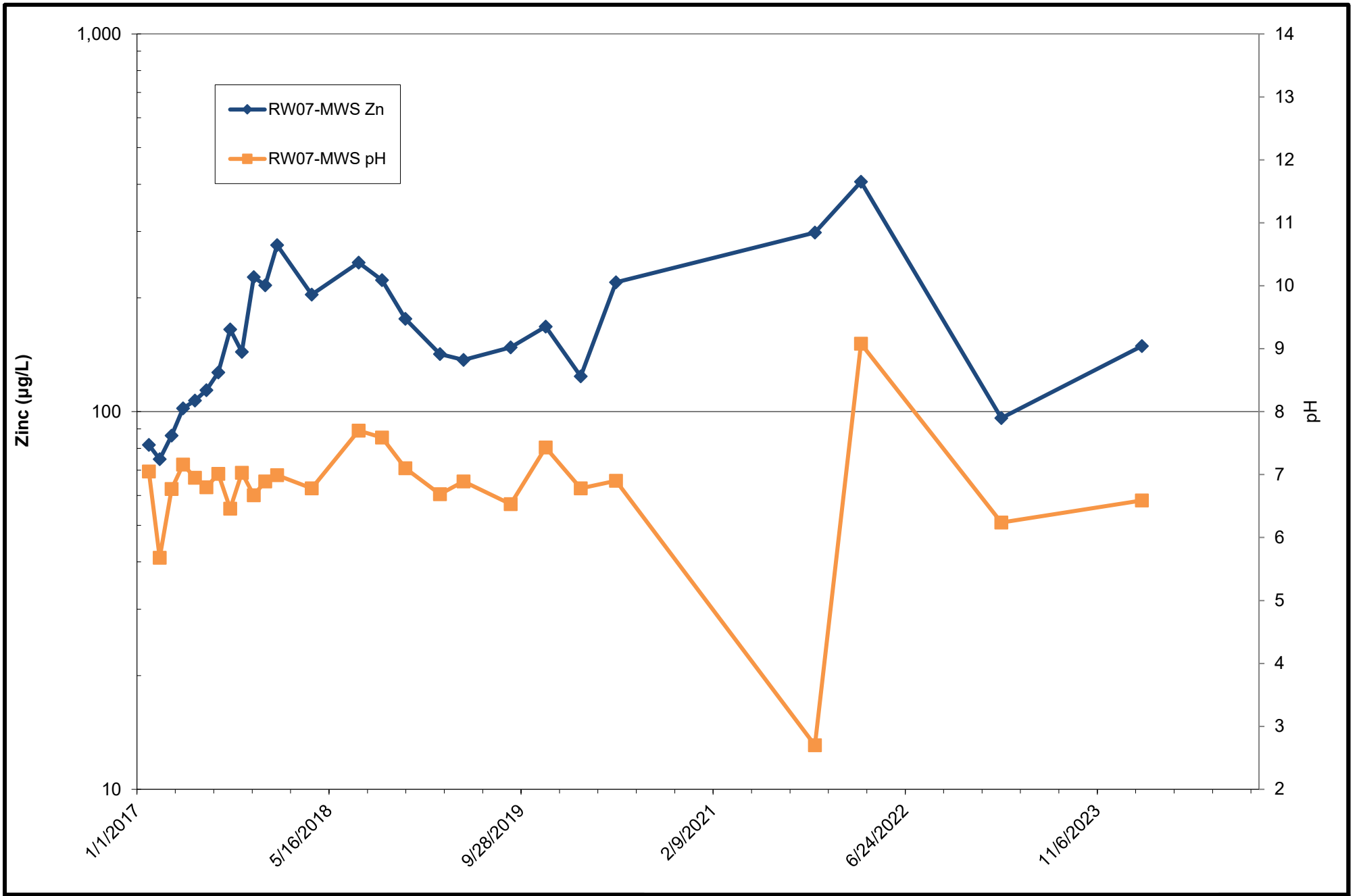
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RW06R-MWS pH and Zinc Concentrations

March 2025

**Appx B**




ARM Group LLC
Engineers and Scientists

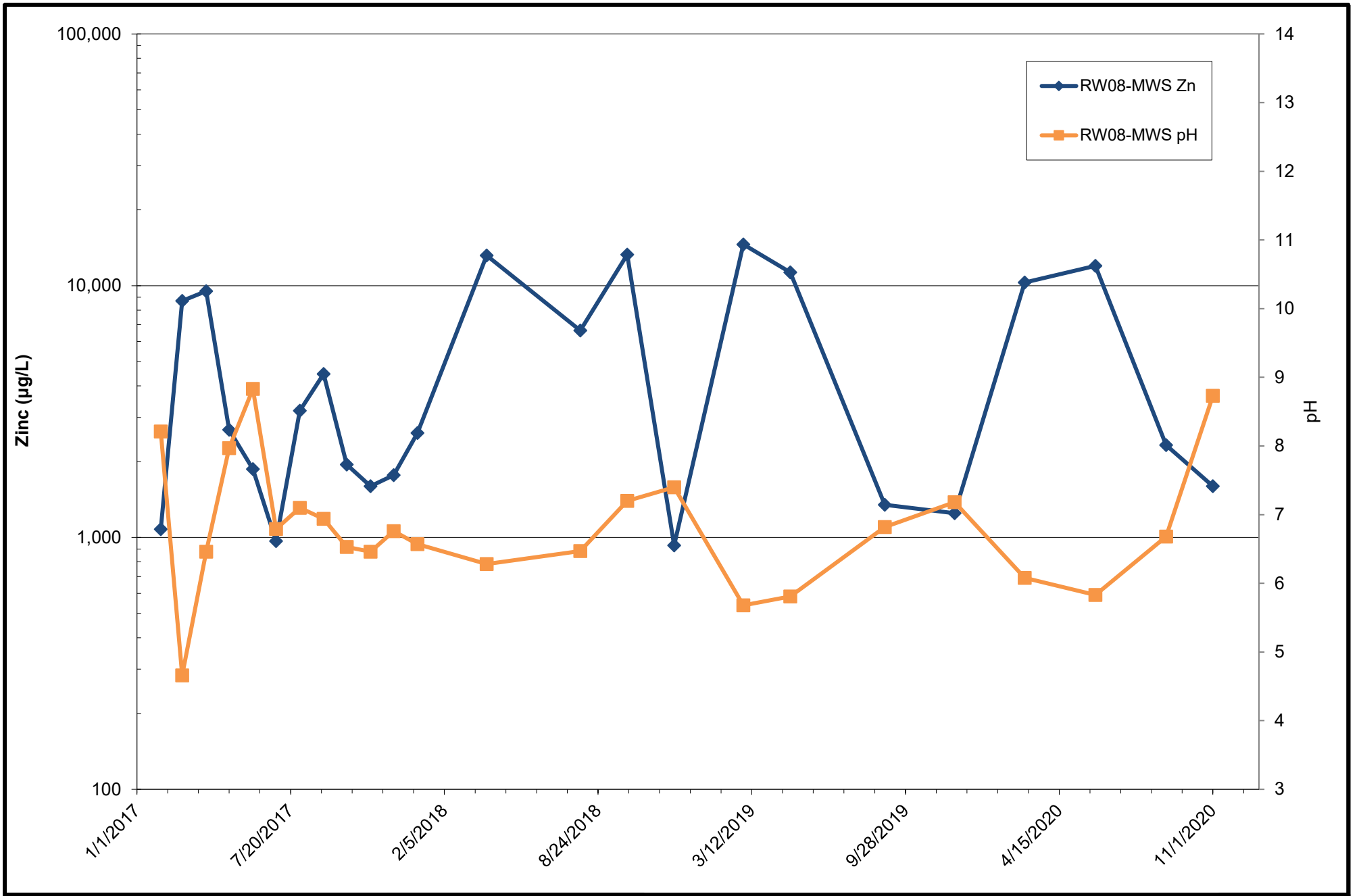
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RW07-MWS pH and Zinc Concentrations

January 2025

**Appx B**




ARM Group LLC
Engineers and Scientists

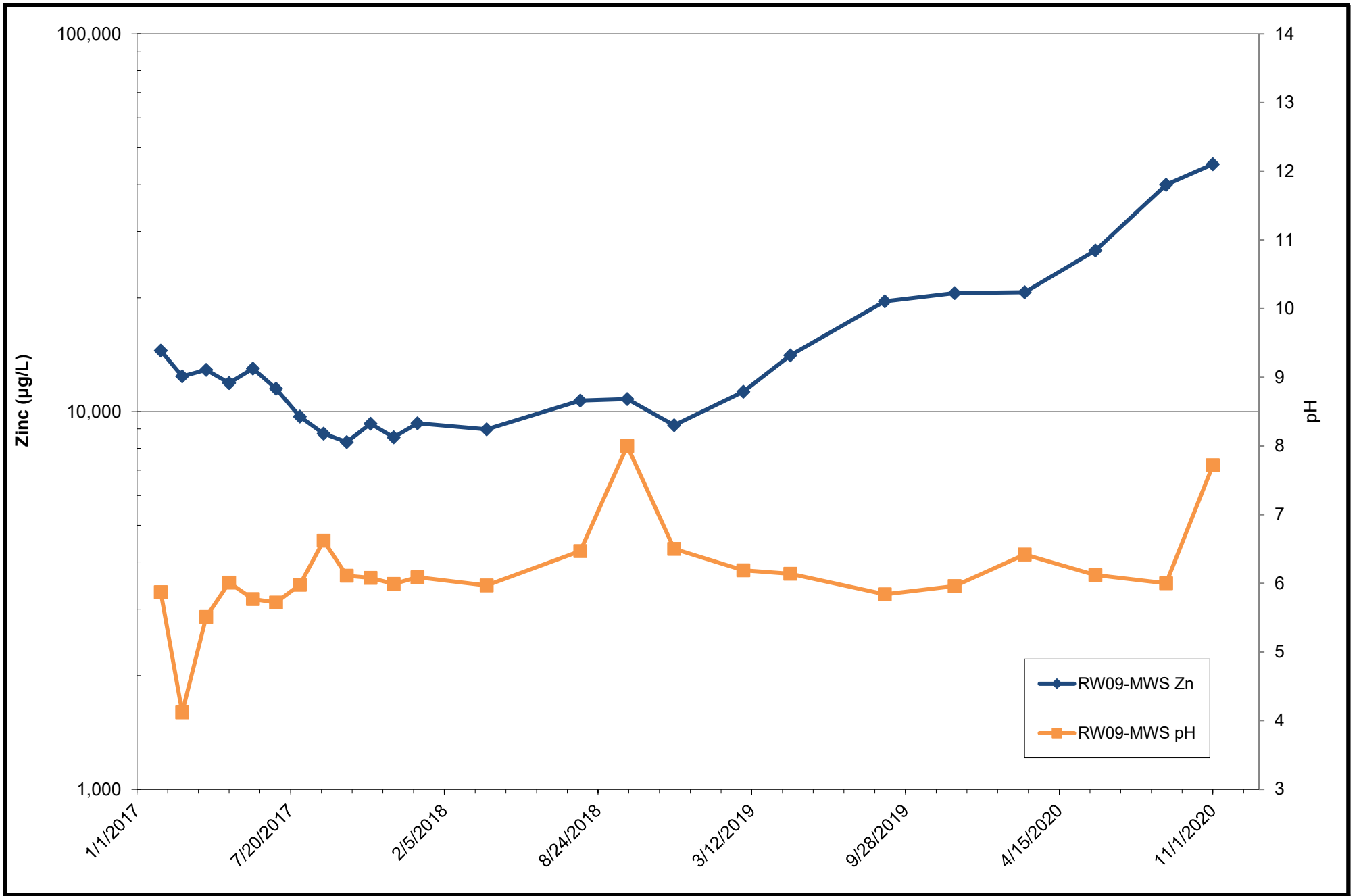
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RW08-MWS pH and Zinc Concentrations

January 2025

**Appx B**




ARM Group LLC
Engineers and Scientists

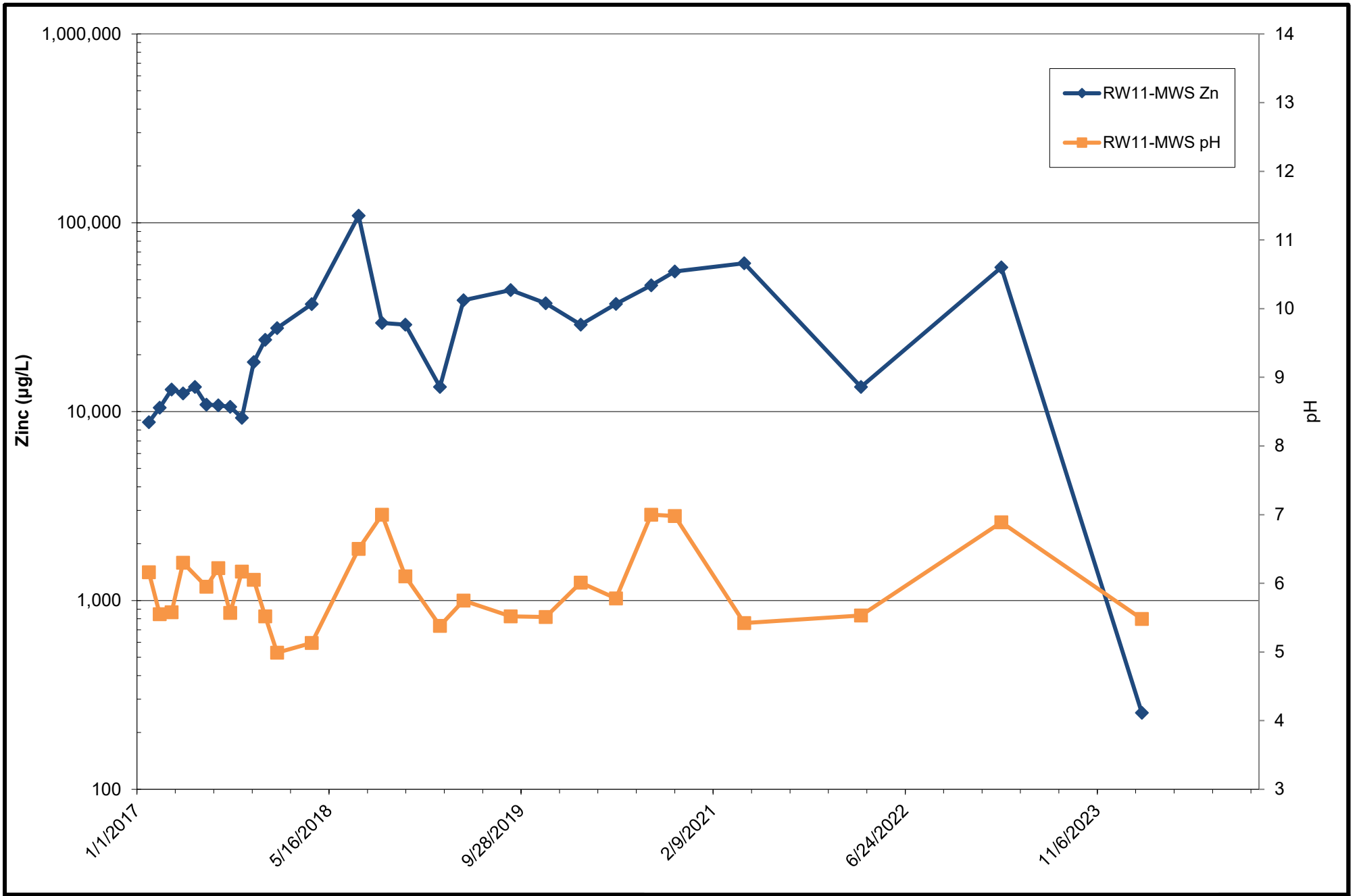
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RW09-MWS pH and Zinc Concentrations

January 2025

**Appx B**




ARM Group LLC
Engineers and Scientists

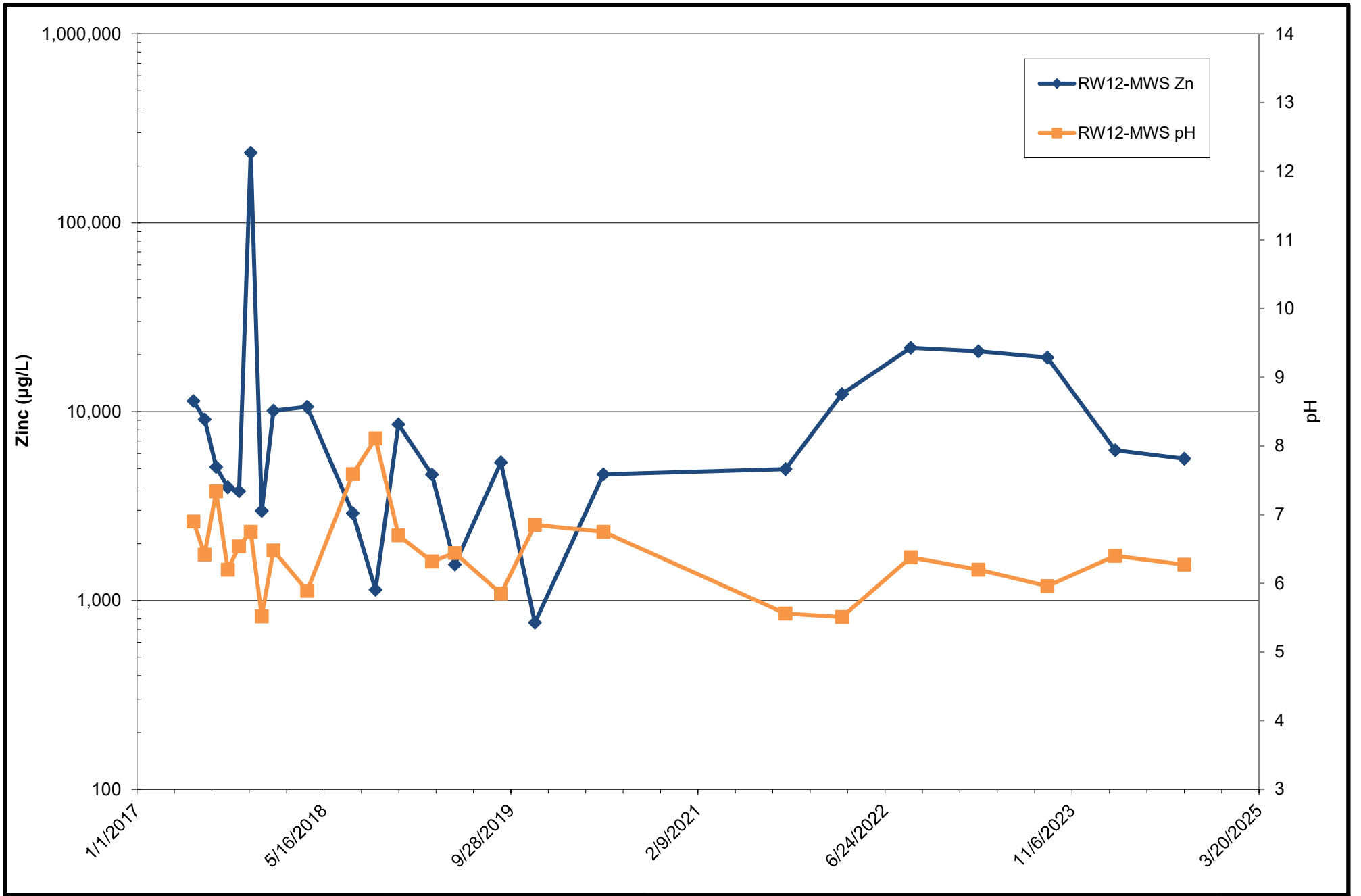
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RW11-MWS pH and Zinc Concentrations

January 2025

**Appx B**




ARM Group LLC
Engineers and Scientists

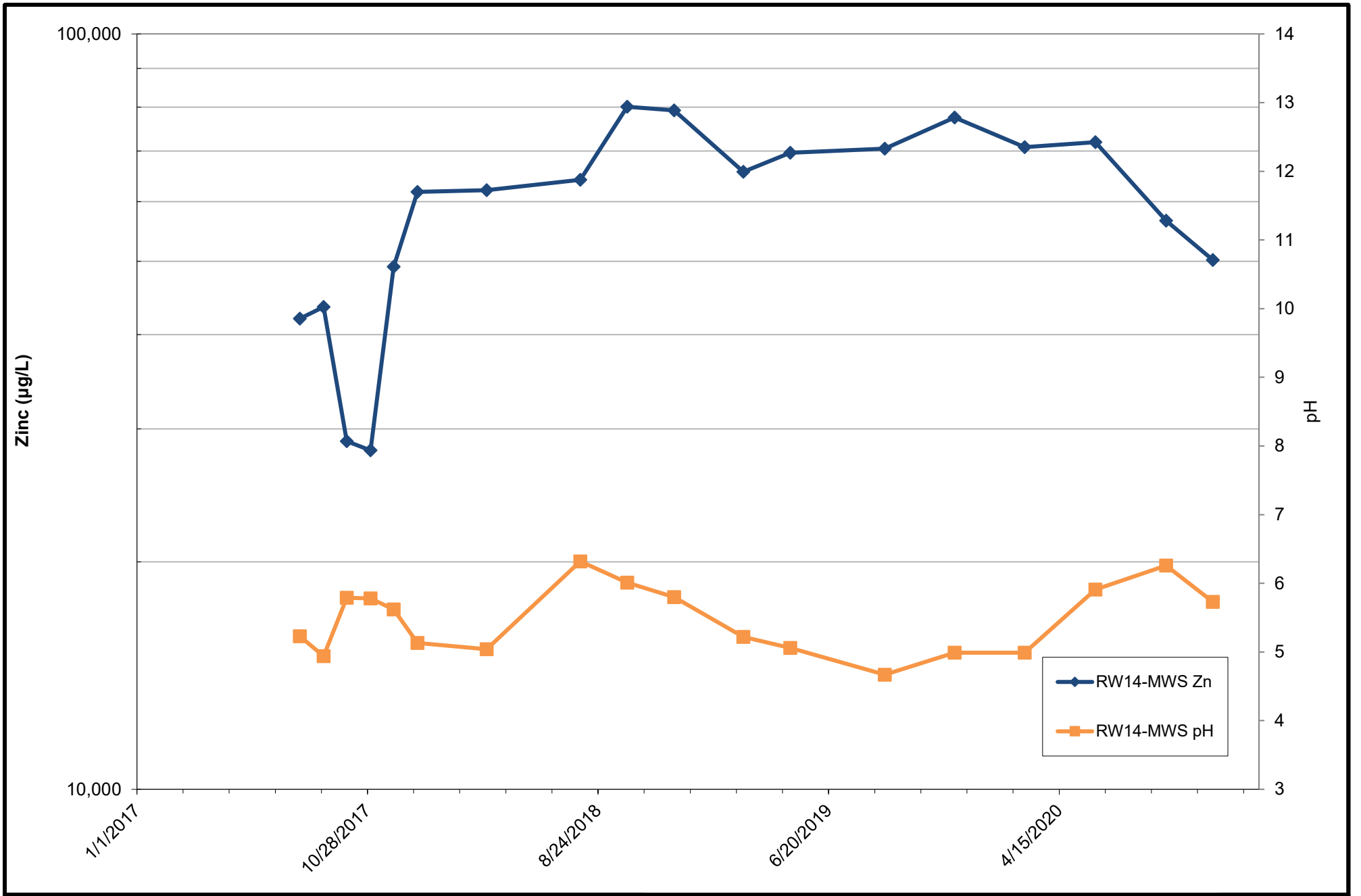
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RW12-MWS pH and Zinc Concentrations

January 2025

**Appx B**




ARM Group LLC
Engineers and Scientists

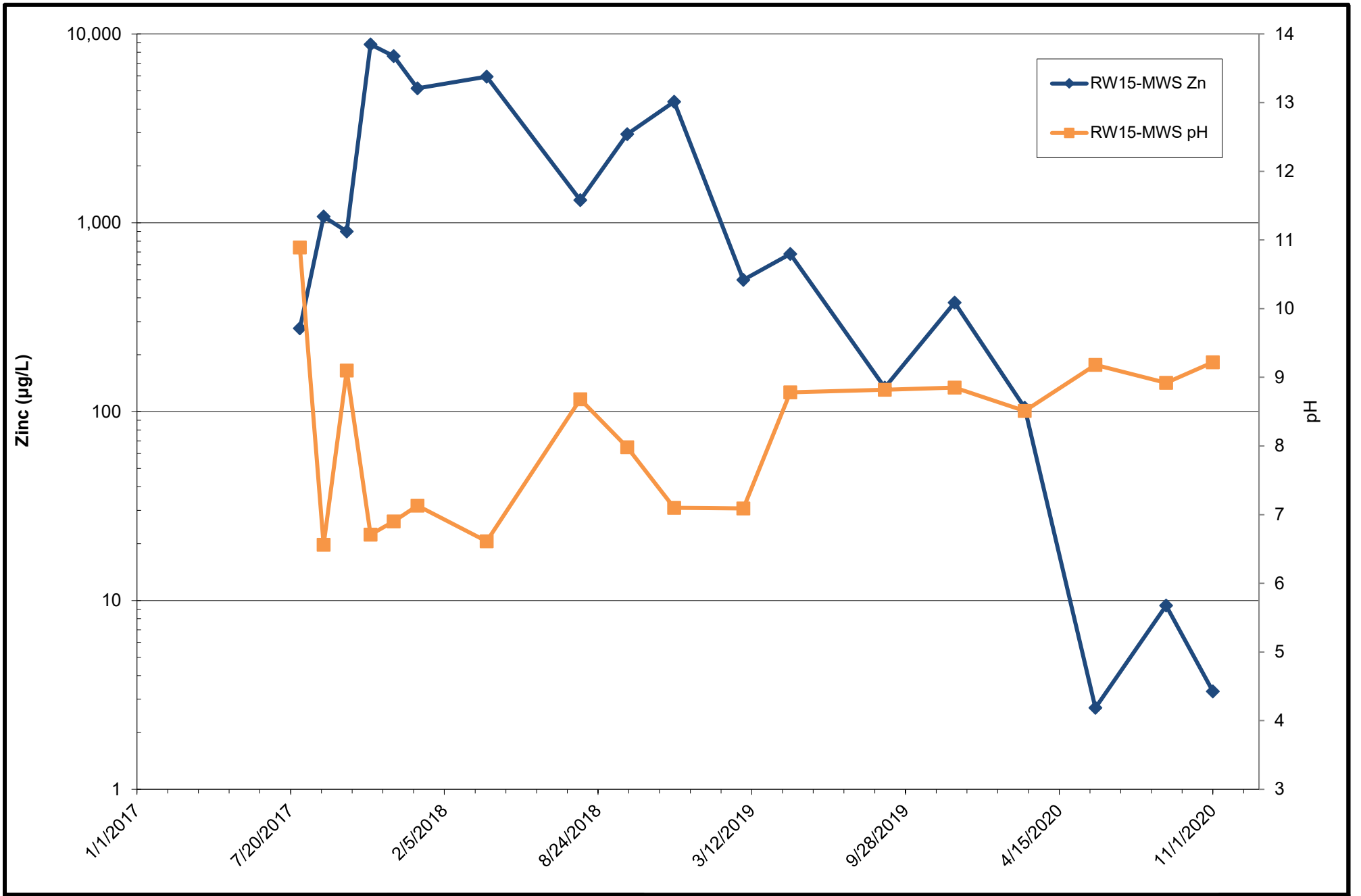
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RW14-MWS pH and Zinc Concentrations

January 2025

**Appx B**




ARM Group LLC
Engineers and Scientists

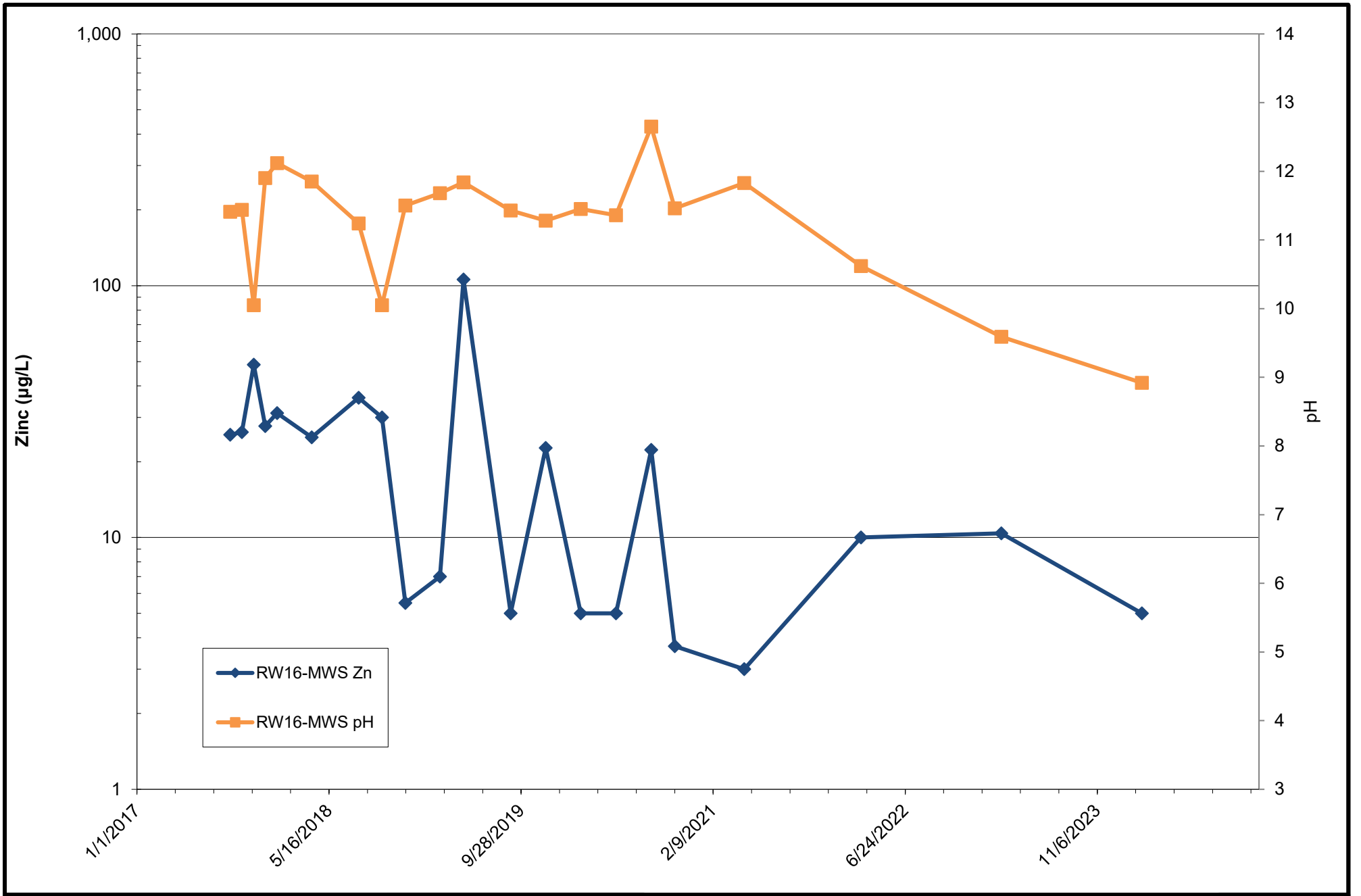
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RW15-MWS pH and Zinc Concentrations

January 2025

**Appx B**




ARM Group LLC
Engineers and Scientists

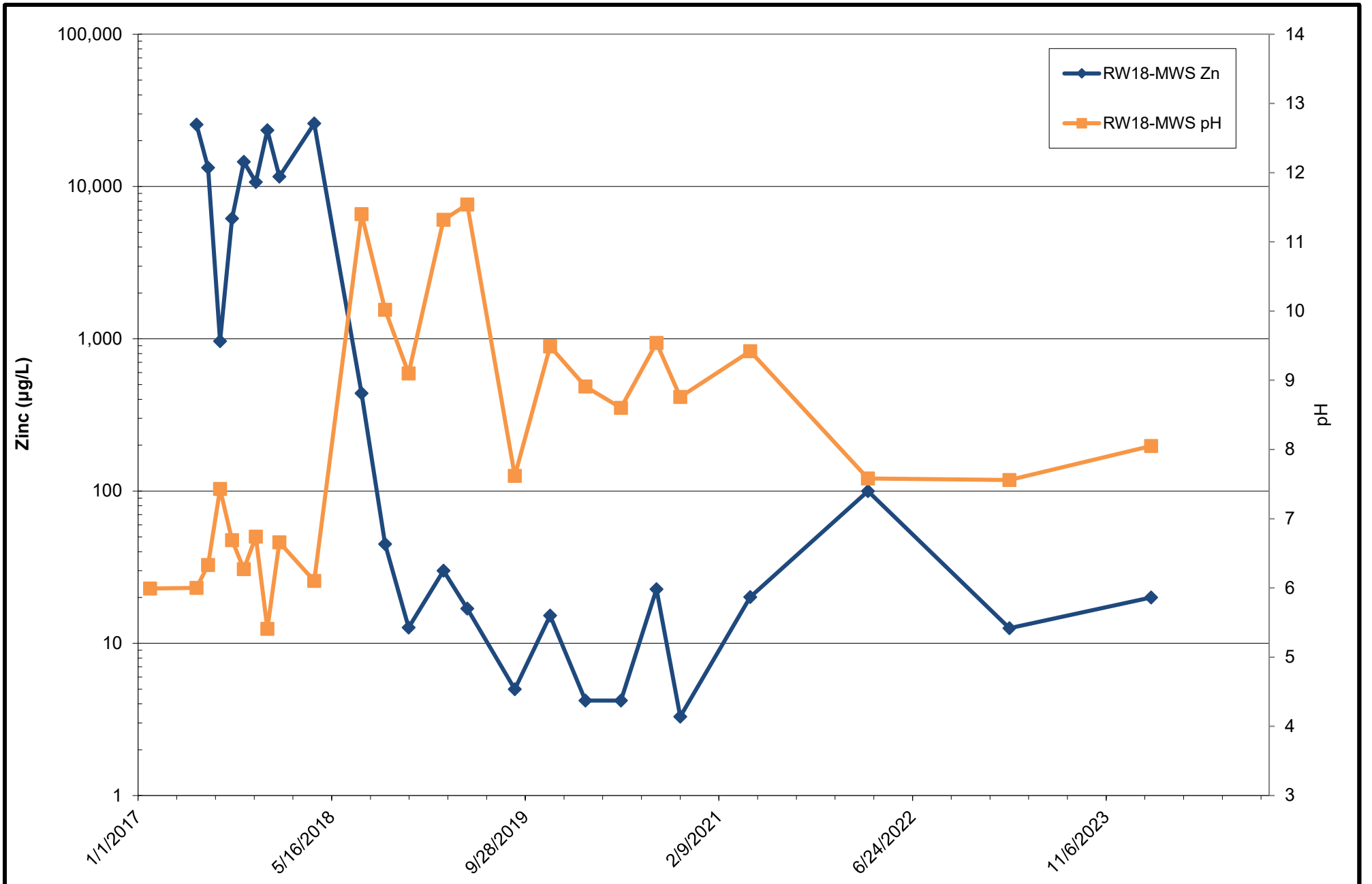
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RW16-MWS pH and Zinc Concentrations

January 2025

**Appx B**




ARM Group LLC
Engineers and Scientists

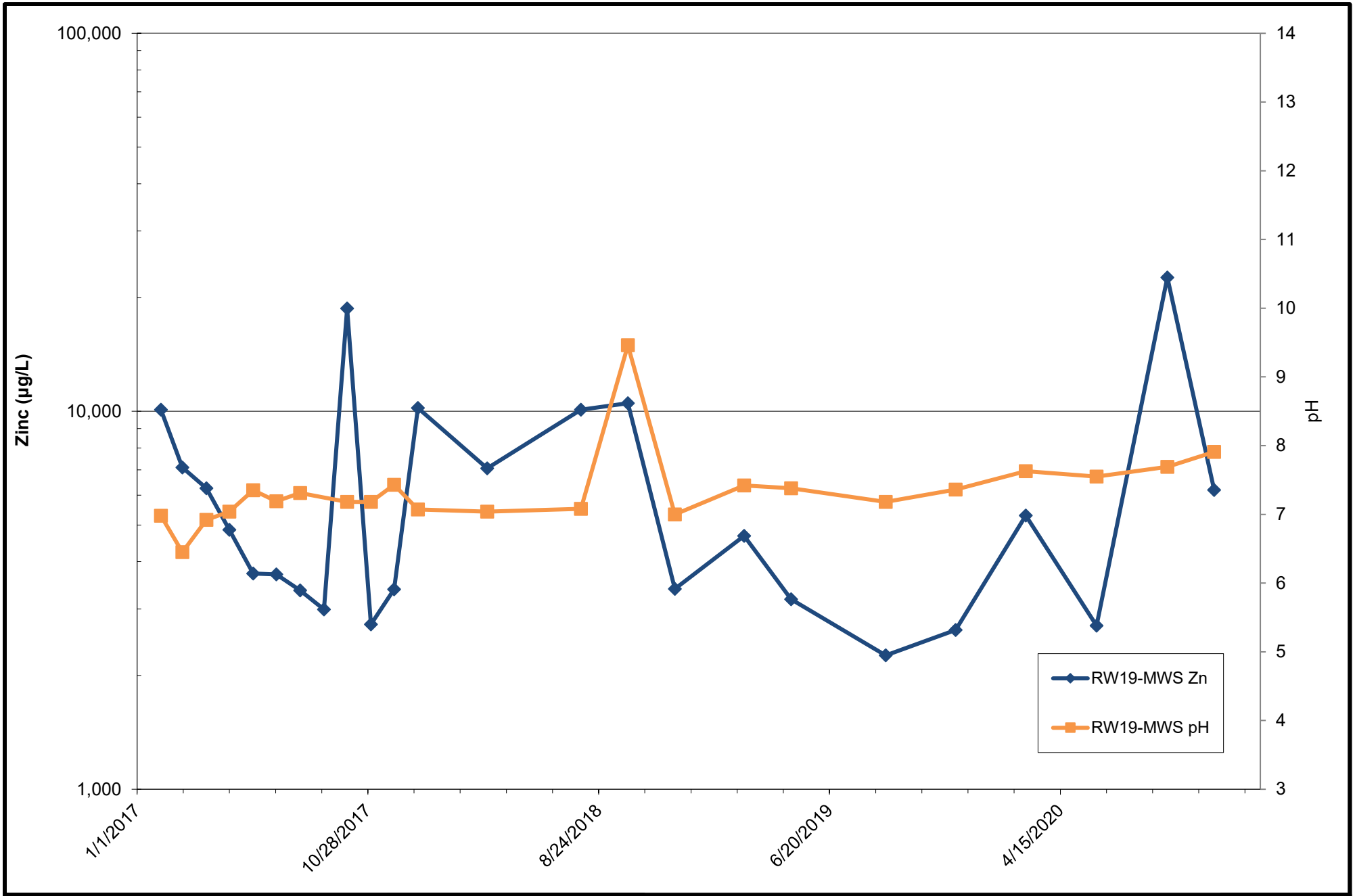
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RW18-MWS pH and Zinc Concentrations

January 2025

**Appx B**




ARM Group LLC
Engineers and Scientists

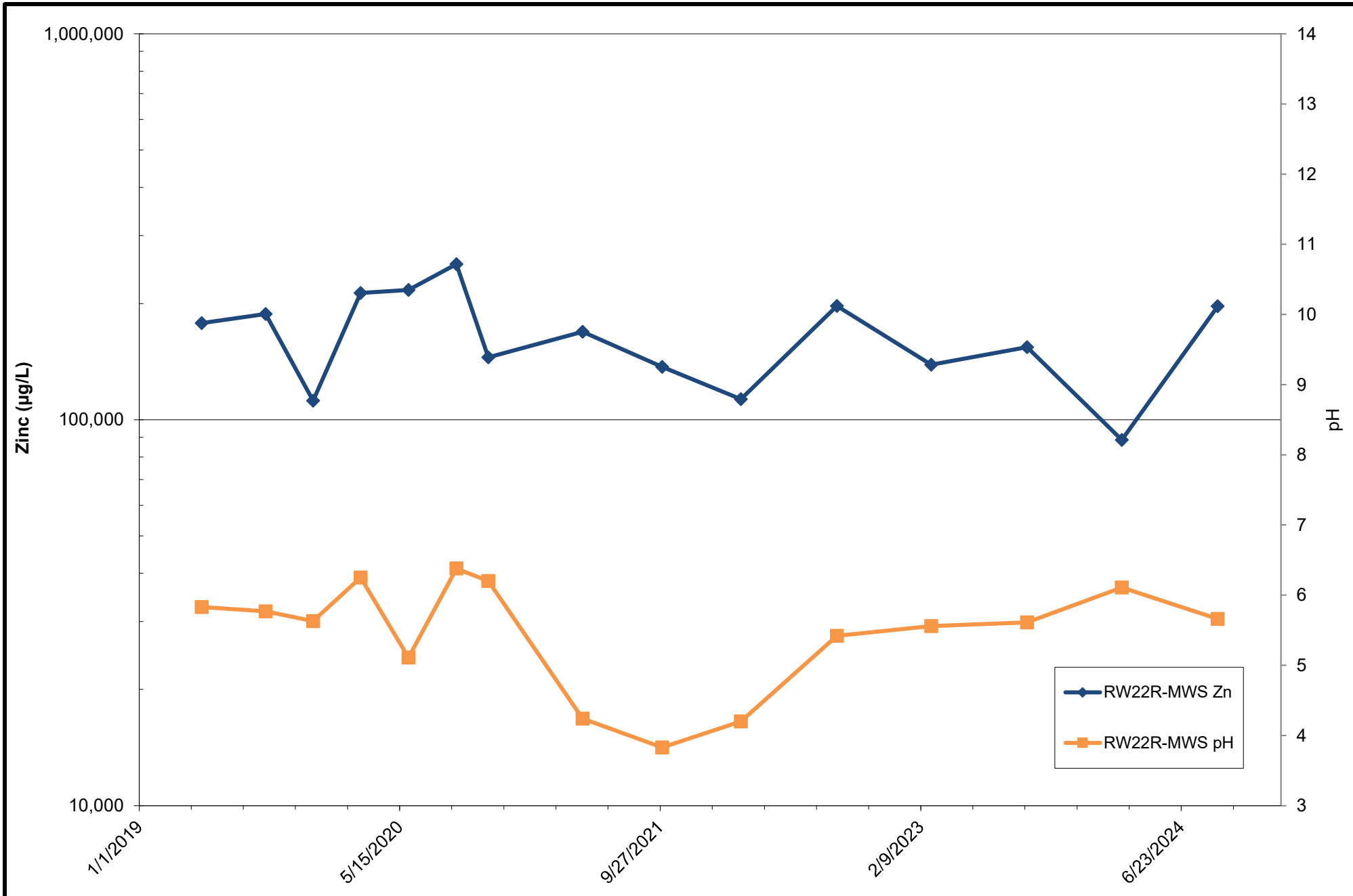
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RW19-MWS pH and Zinc Concentrations

January 2025

**Appx B**




ARM Group LLC
Engineers and Scientists

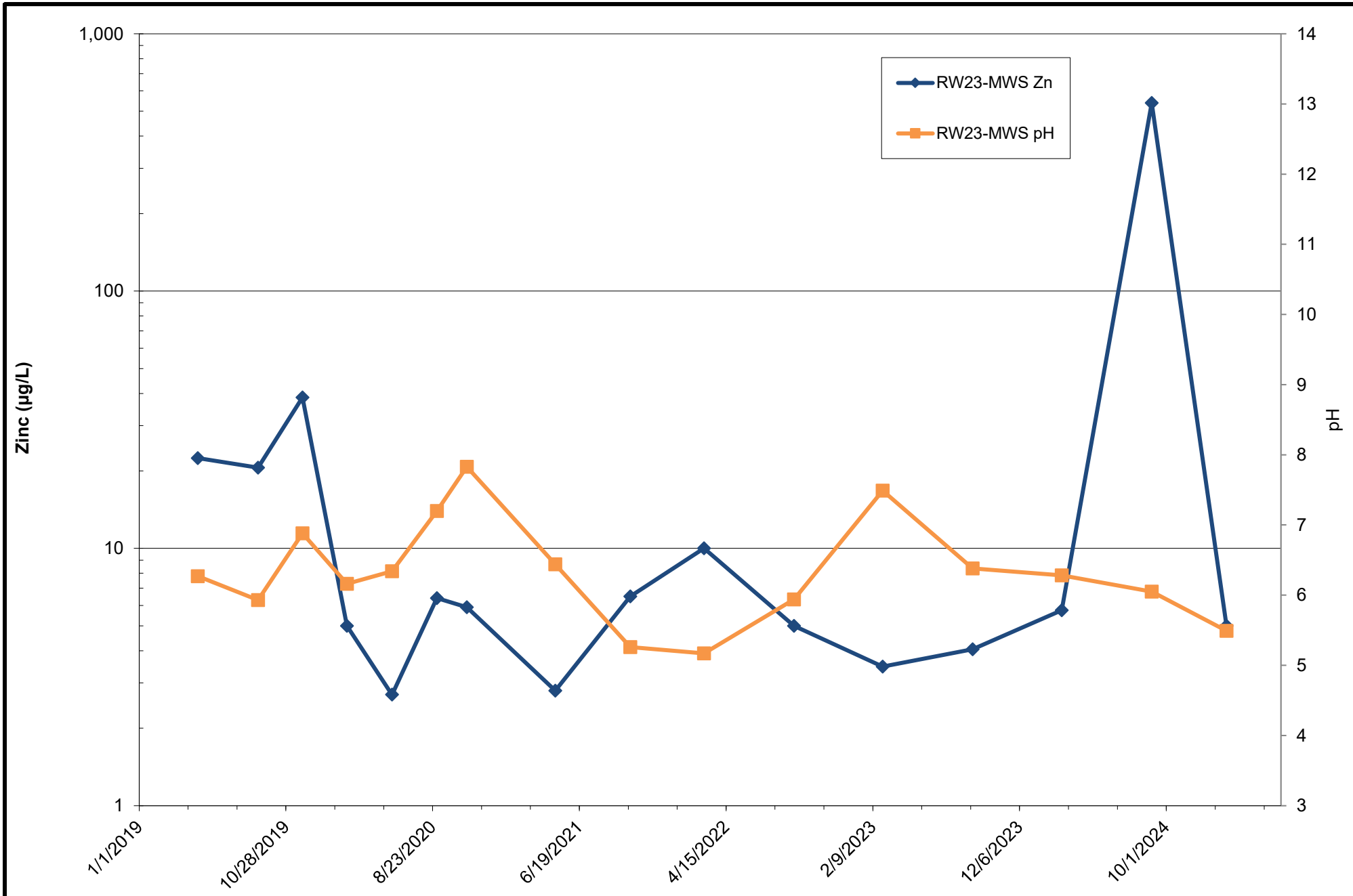
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RW22R-MWS pH and Zinc Concentrations

March 2025

**Appx B**




ARM Group LLC
Engineers and Scientists

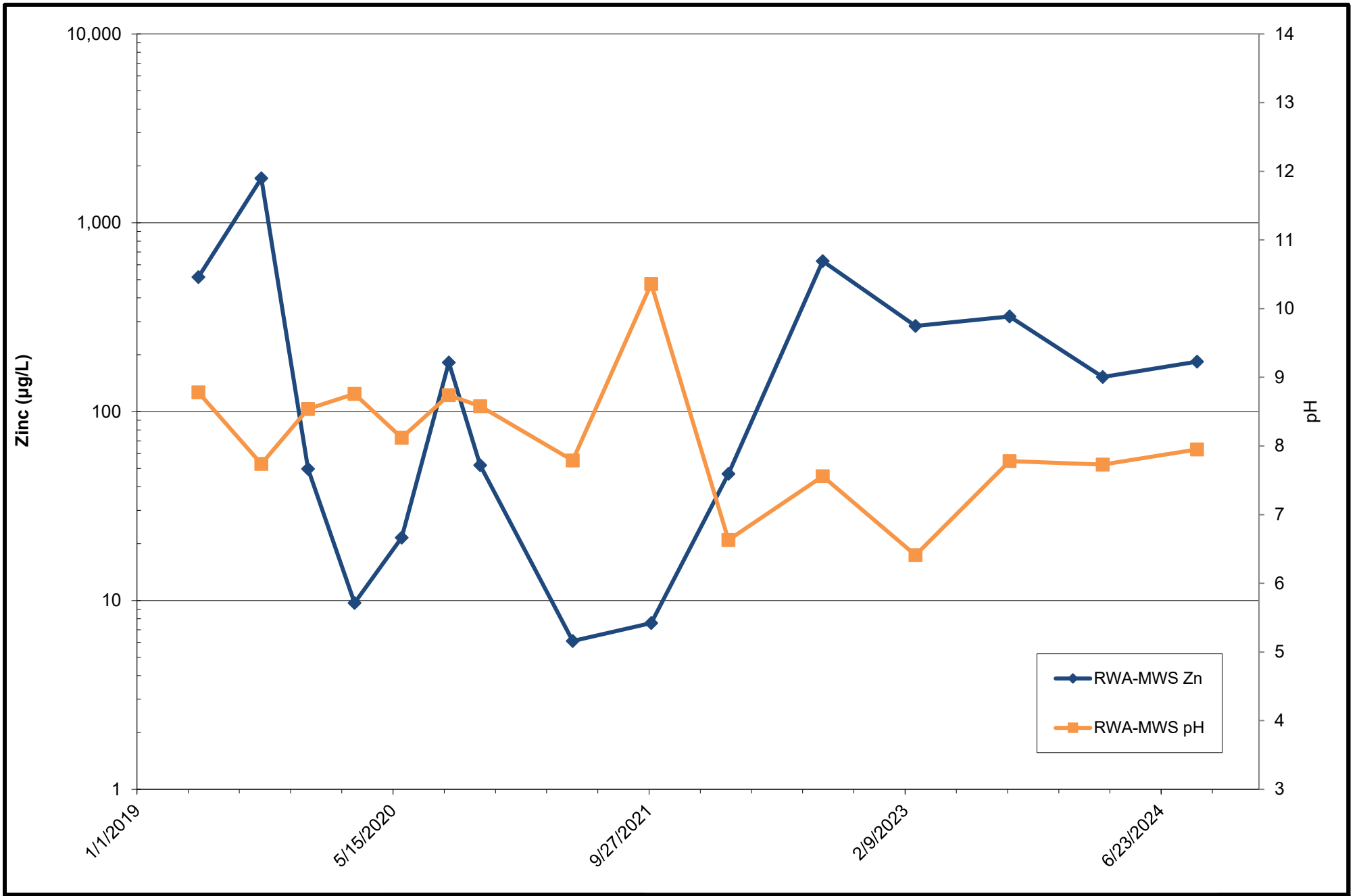
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RW23-MWS pH and Zinc Concentrations

March 2025

**Appx B**




ARM Group LLC
Engineers and Scientists

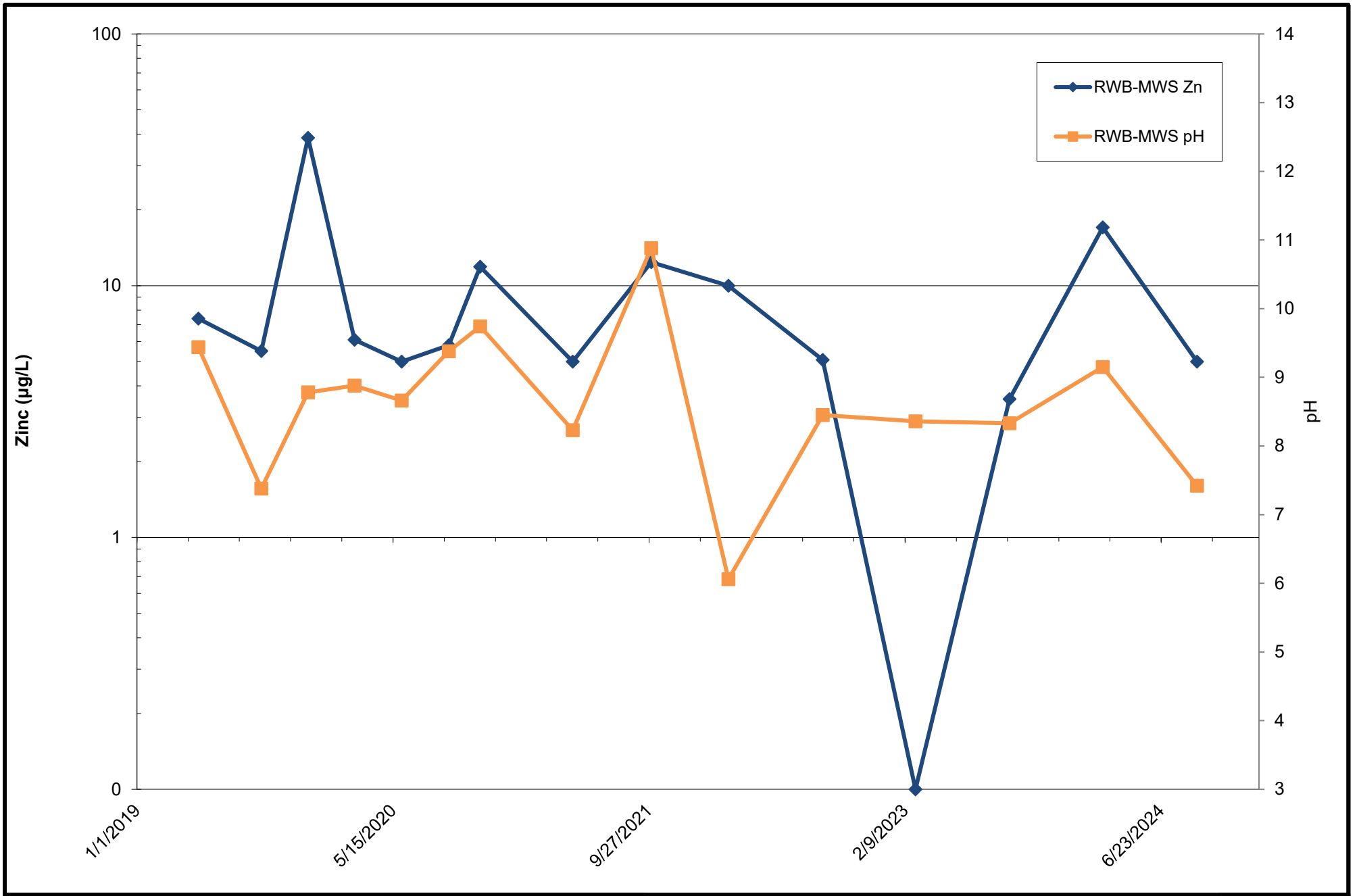
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RWA-MWS pH and Zinc Concentrations

January 2025

**Appx B**




ARM Group LLC
Engineers and Scientists

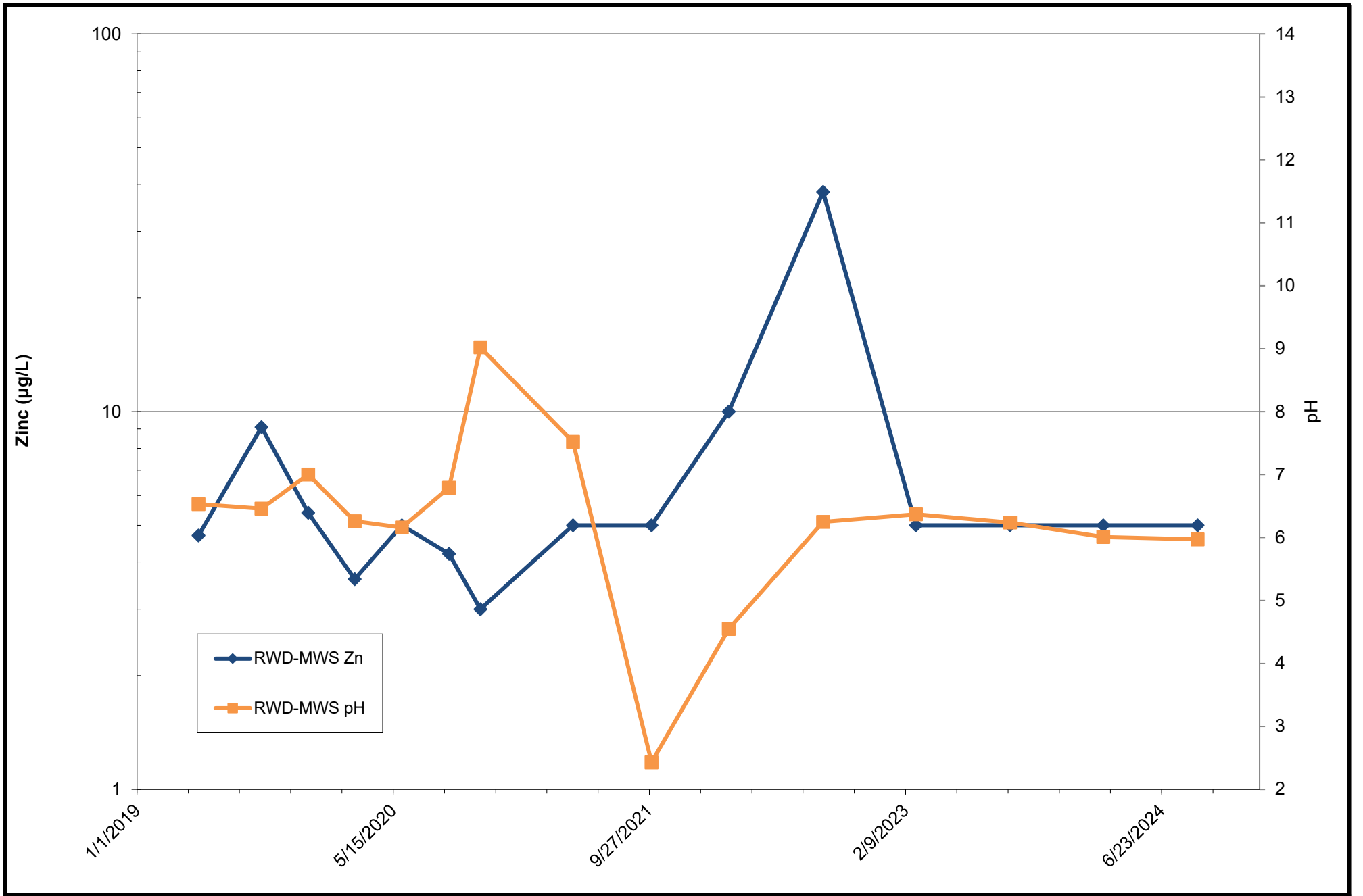
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RWB-MWS pH and Zinc Concentrations

January 2025

**Appx B**




ARM Group LLC
Engineers and Scientists

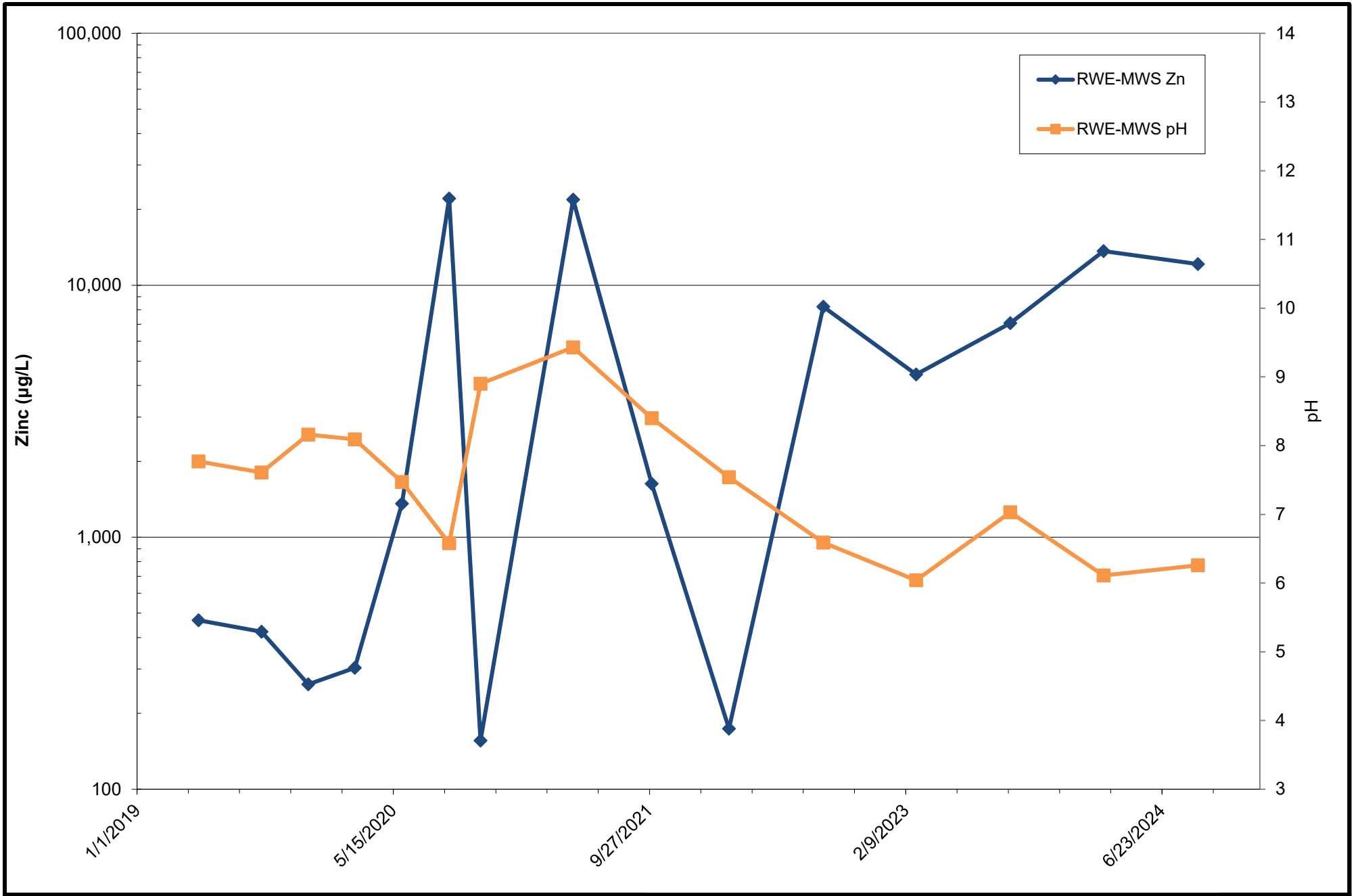
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RWD-MWS pH and Zinc Concentrations

January 2025

**Appx B**




ARM Group LLC
Engineers and Scientists

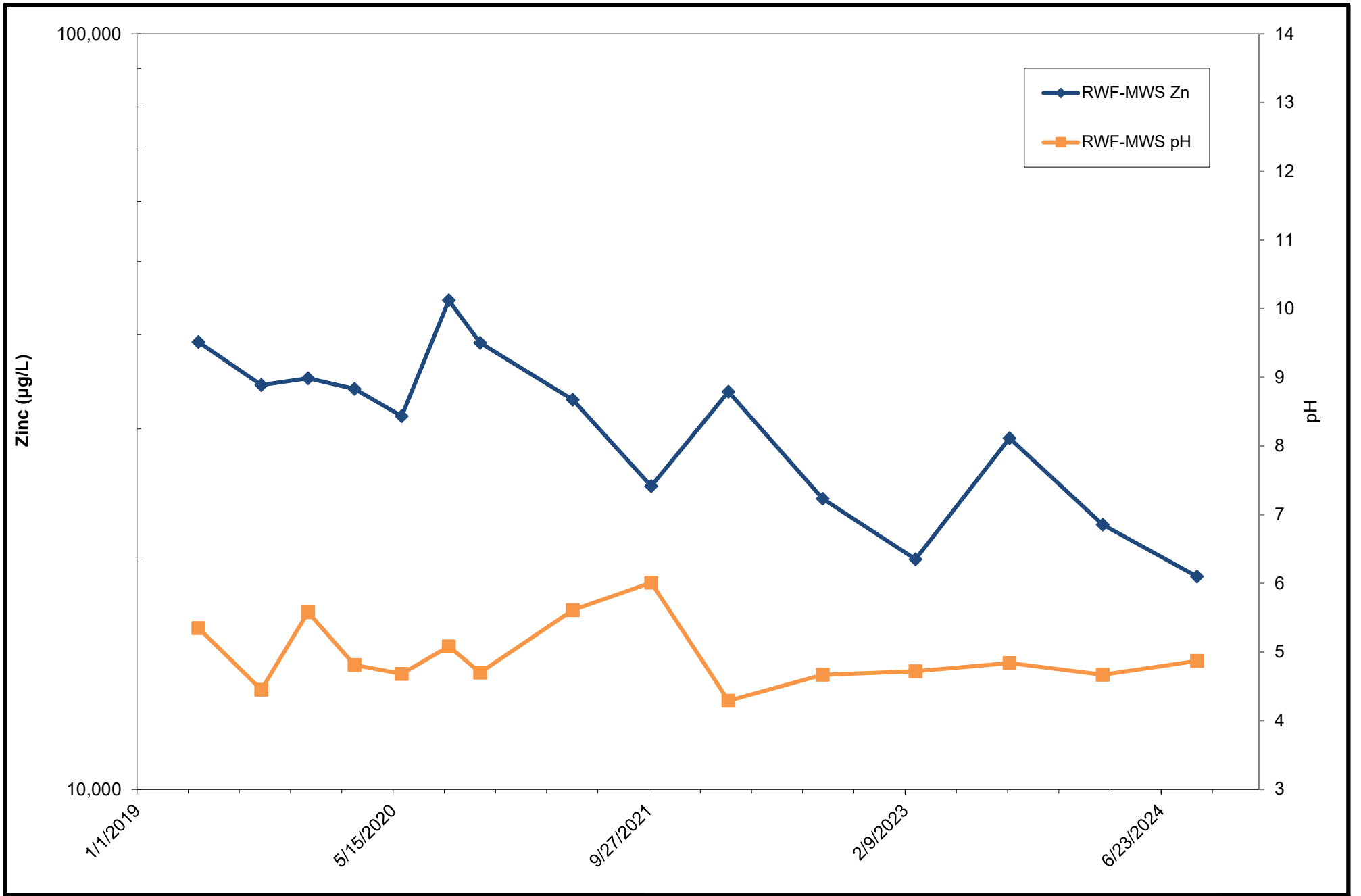
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RWE-MWS pH and Zinc Concentrations

January 2025

**Appx B**




ARM Group LLC
Engineers and Scientists

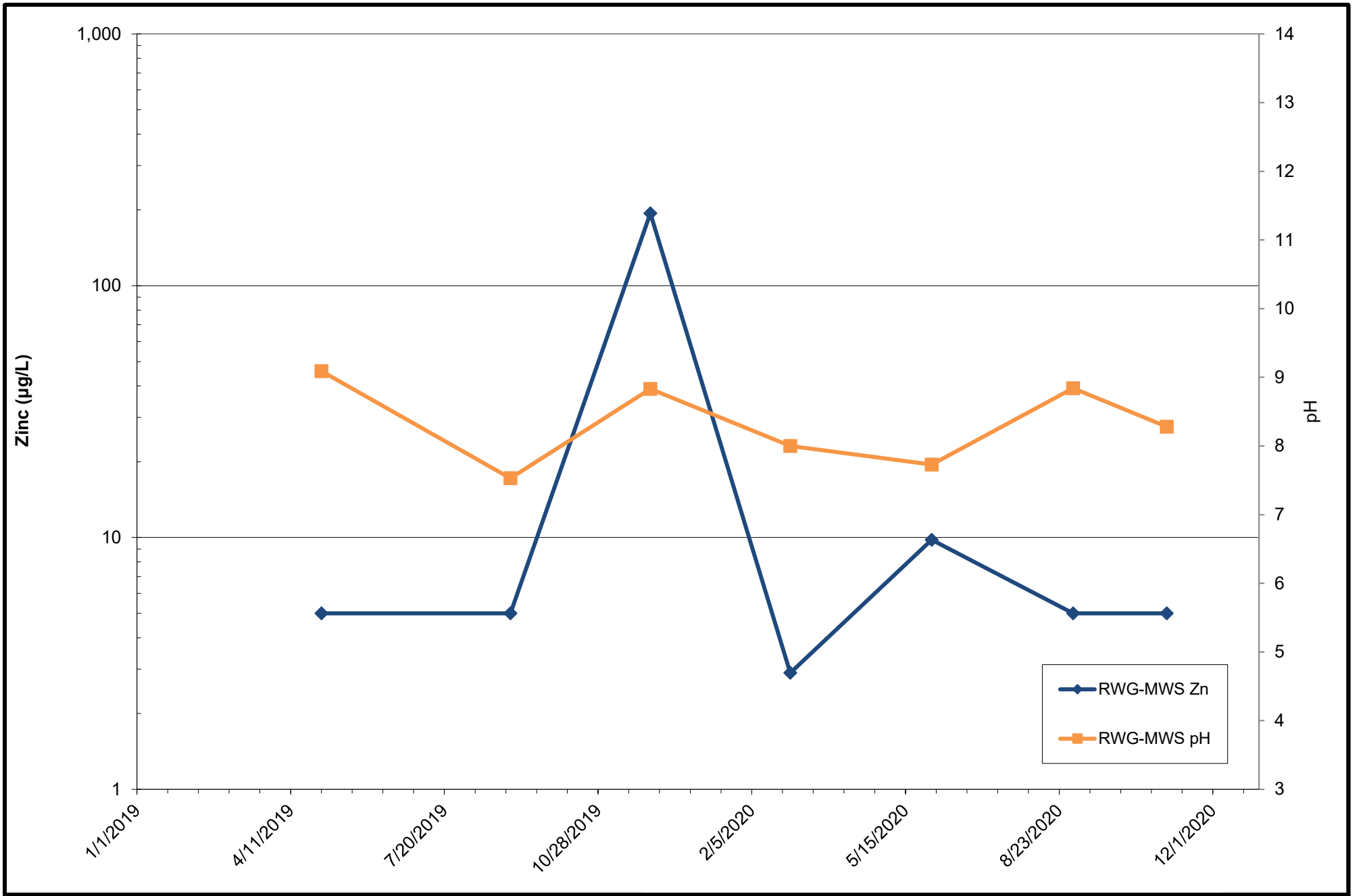
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RWF-MWS pH and Zinc Concentrations

January 2025

**Appx B**




ARM Group LLC
Engineers and Scientists

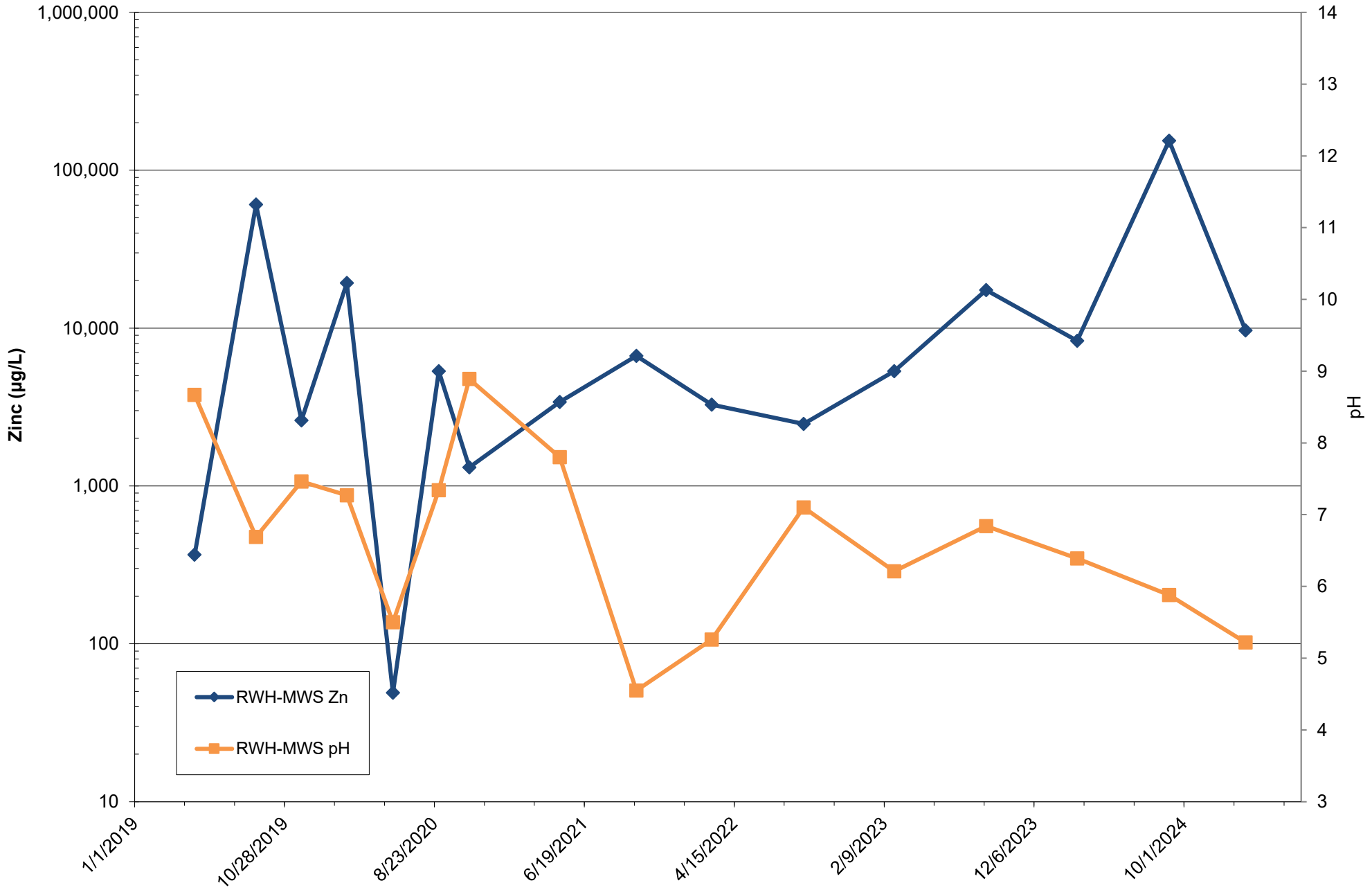
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RWG-MWS pH and Zinc Concentrations

January 2025

**Appx B**




ARM Group LLC
Engineers and Scientists

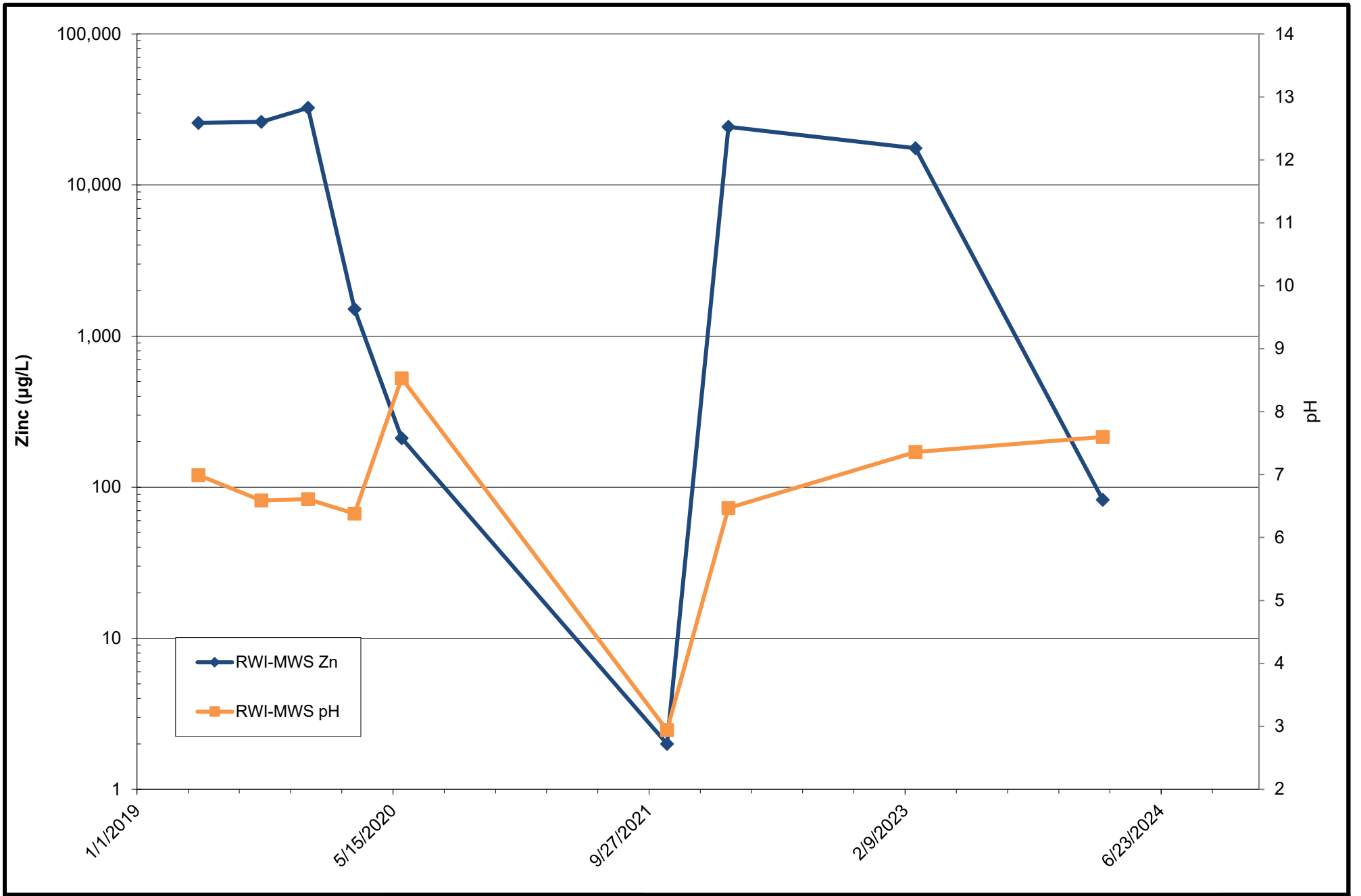
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RWH-MWS pH and Zinc Concentrations

March 2025

**Appx B**




ARM Group LLC
Engineers and Scientists

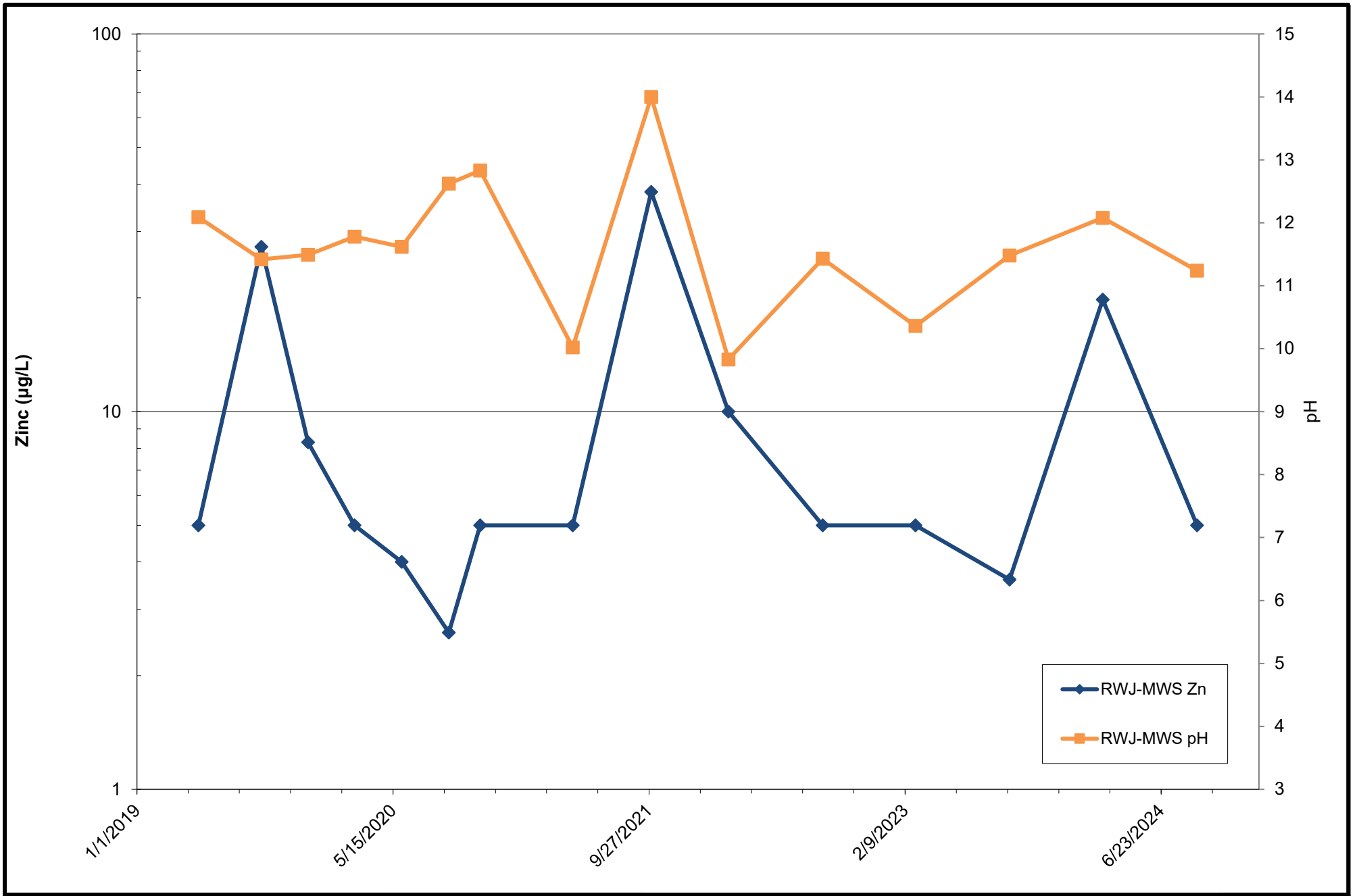
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RWI-MWS pH and Zinc Concentrations

January 2025

**Appx B**




ARM Group LLC
Engineers and Scientists

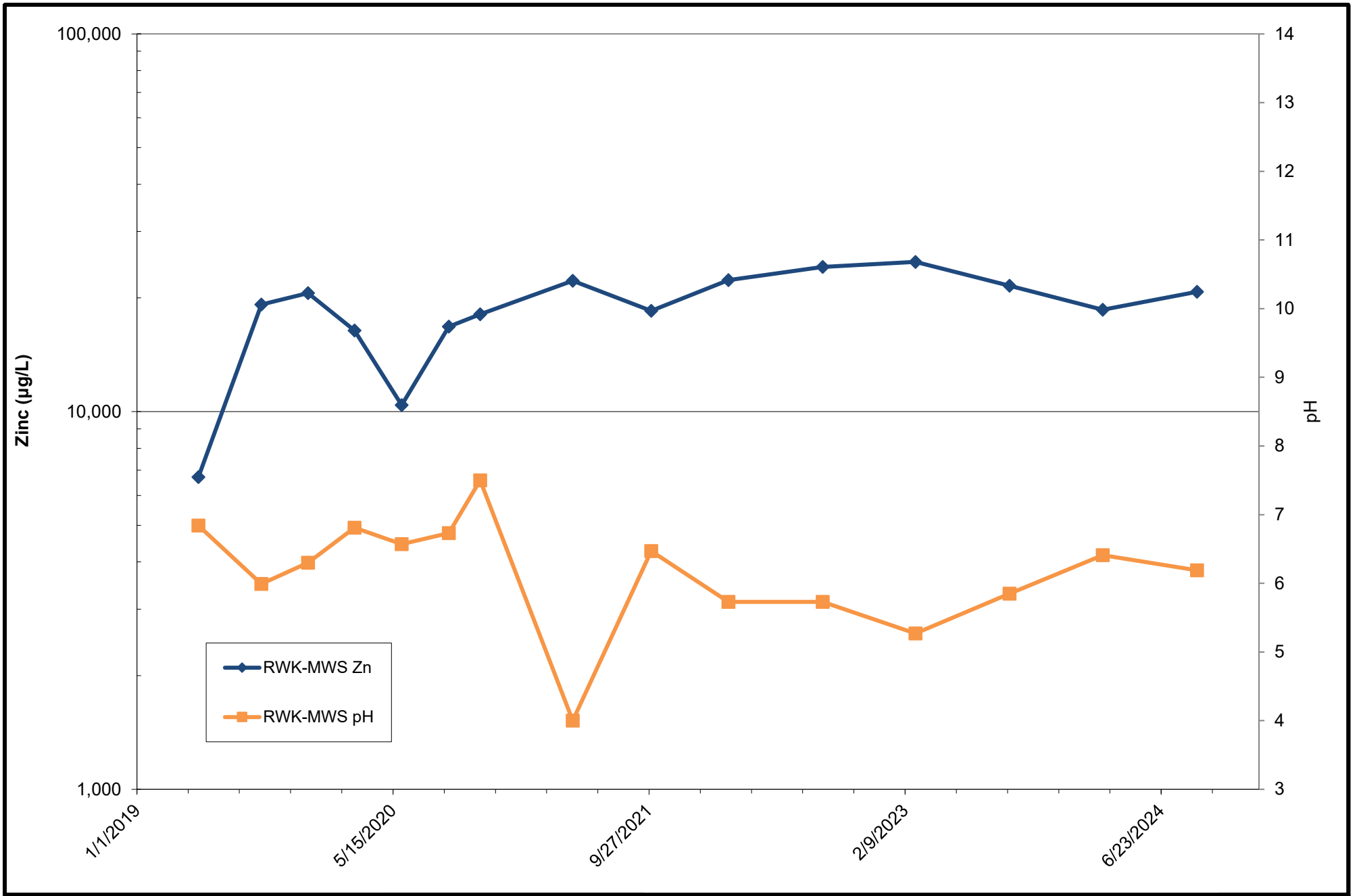
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RWJ-MWS pH and Zinc Concentrations

January 2025

**Appx B**




ARM Group LLC
Engineers and Scientists

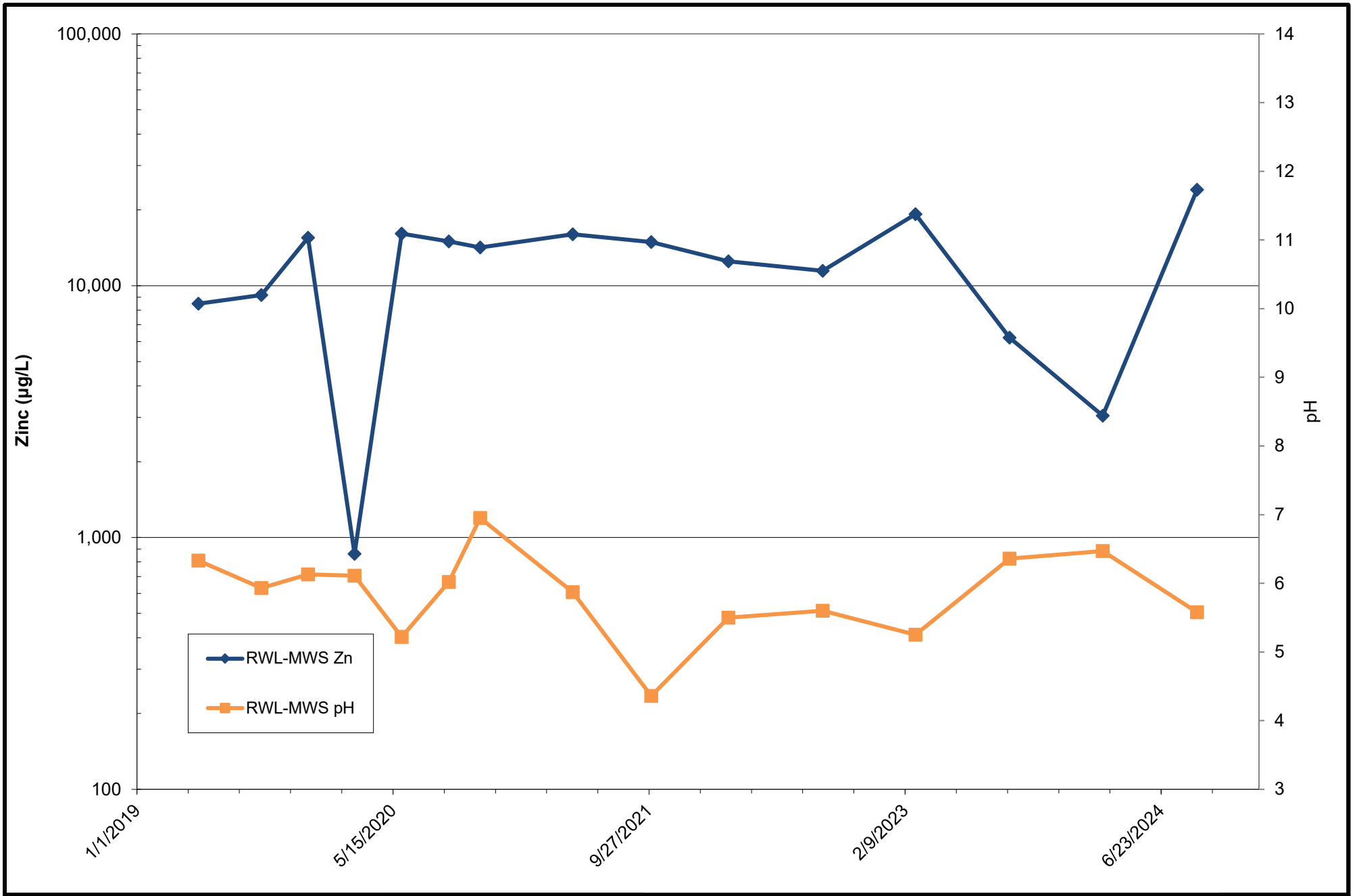
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RWK-MWS pH and Zinc Concentrations

January 2025

**Appx B**




ARM Group LLC
Engineers and Scientists

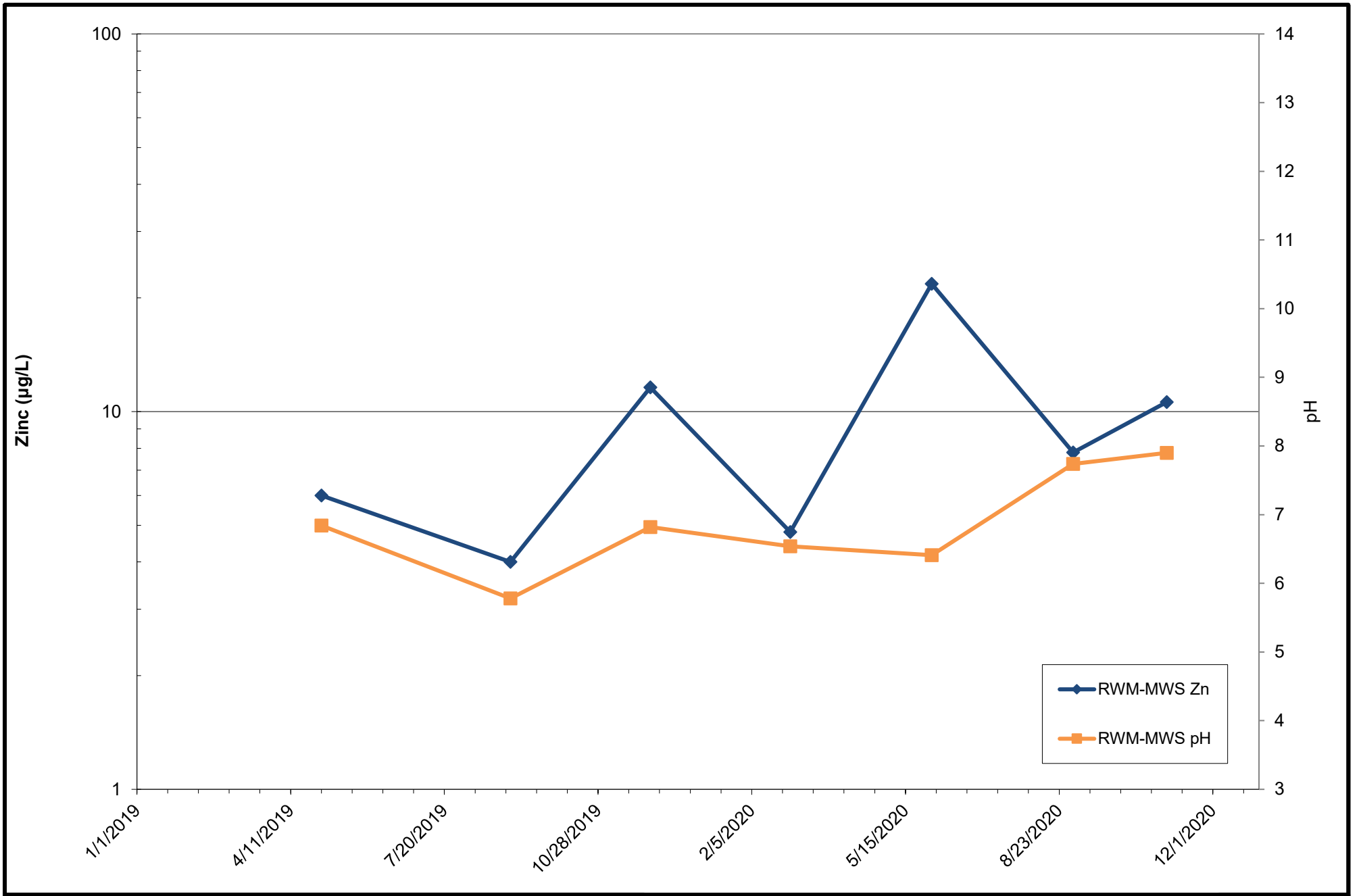
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RWL-MWS pH and Zinc Concentrations

January 2025

**Appx B**




ARM Group LLC
Engineers and Scientists

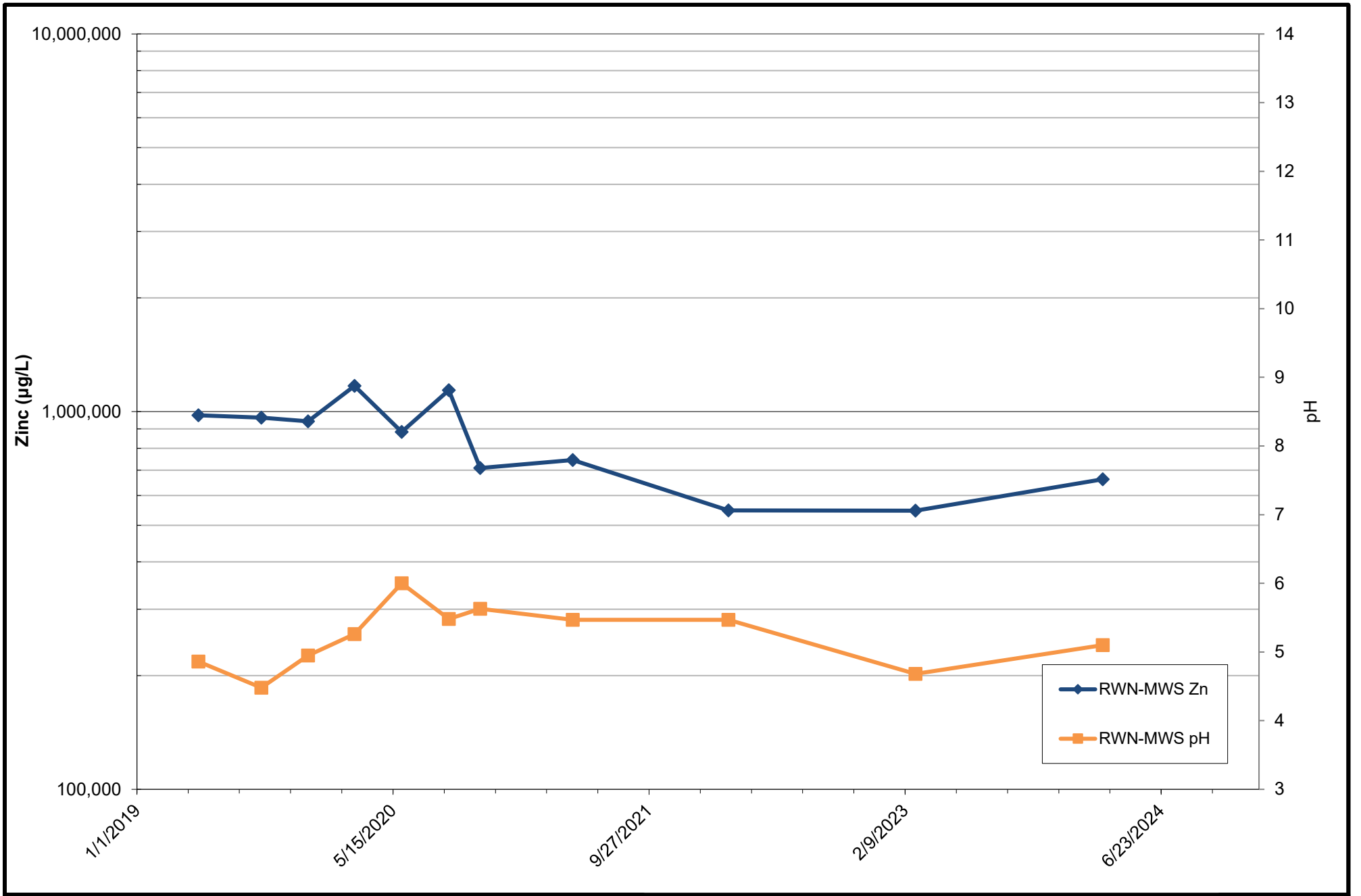
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RWM-MWS pH and Zinc Concentrations

January 2025

**Appx B**




ARM Group LLC
Engineers and Scientists

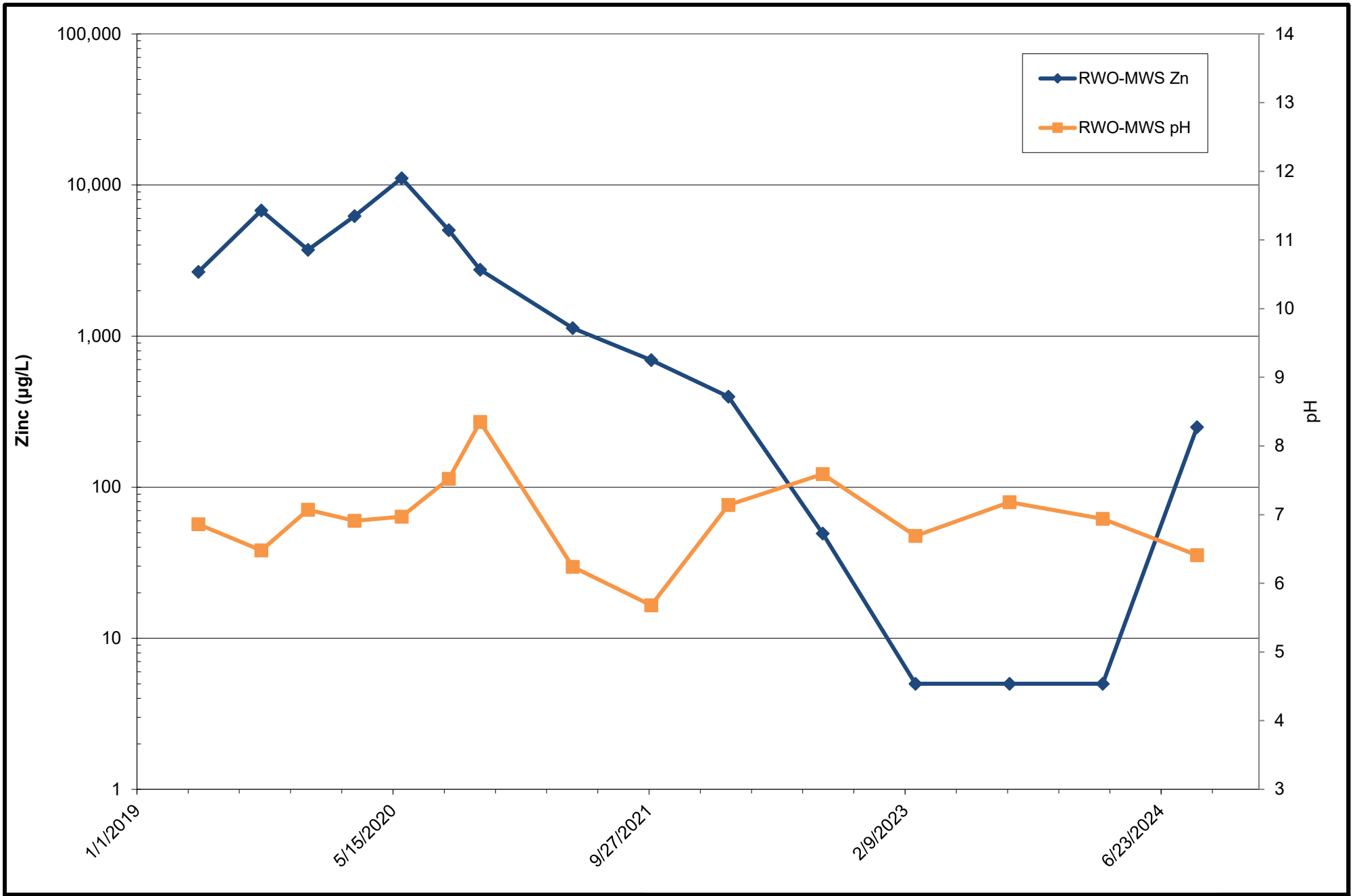
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RWN-MWS pH and Zinc Concentrations

January 2025

**Appx B**




ARM Group LLC
Engineers and Scientists

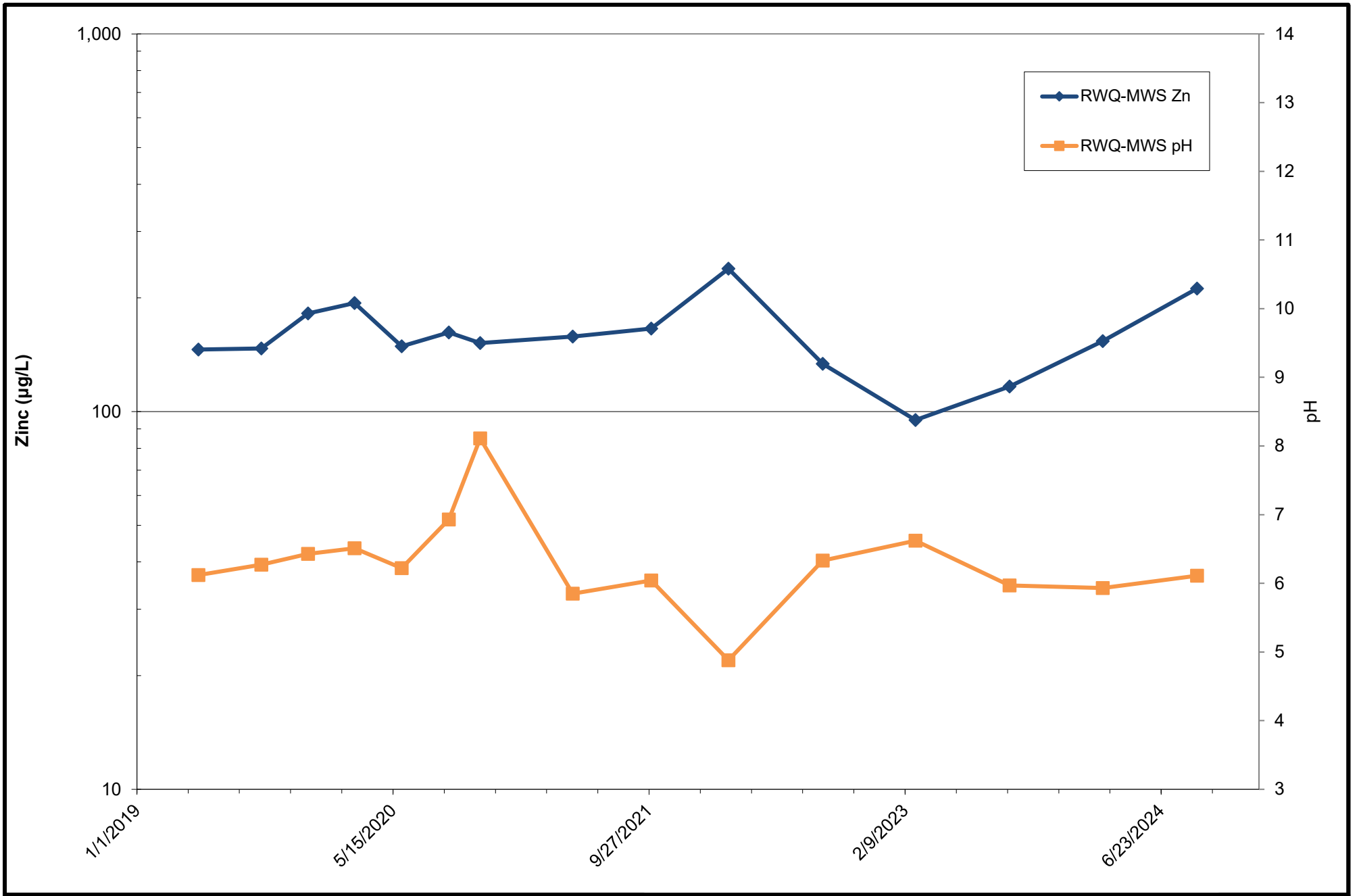
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RWO-MWS pH and Zinc Concentrations

January 2025

**Appx B**




ARM Group LLC
Engineers and Scientists

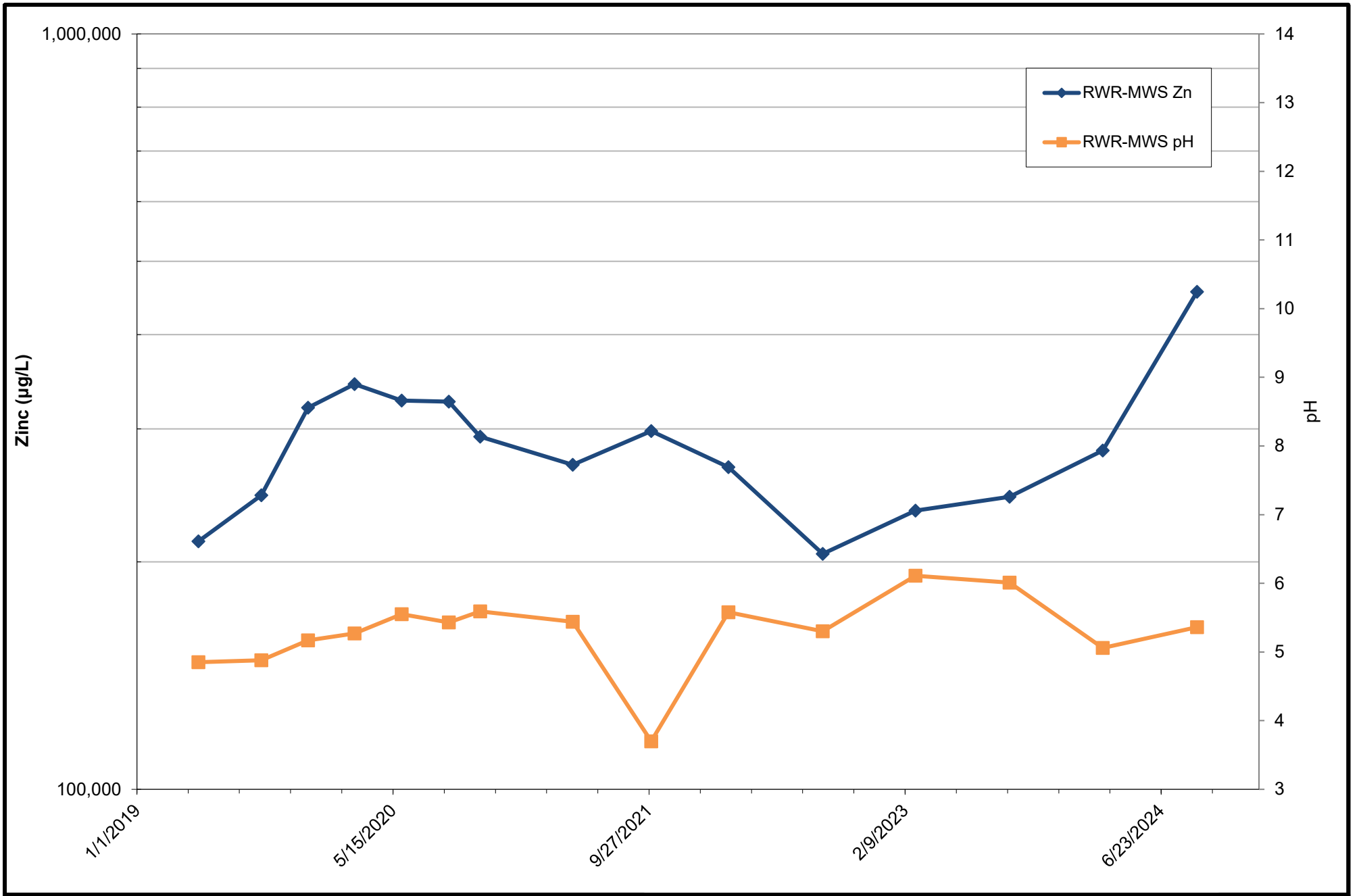
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RWQ-MWS pH and Zinc Concentrations

January 2025

**Appx B**




ARM Group LLC
Engineers and Scientists

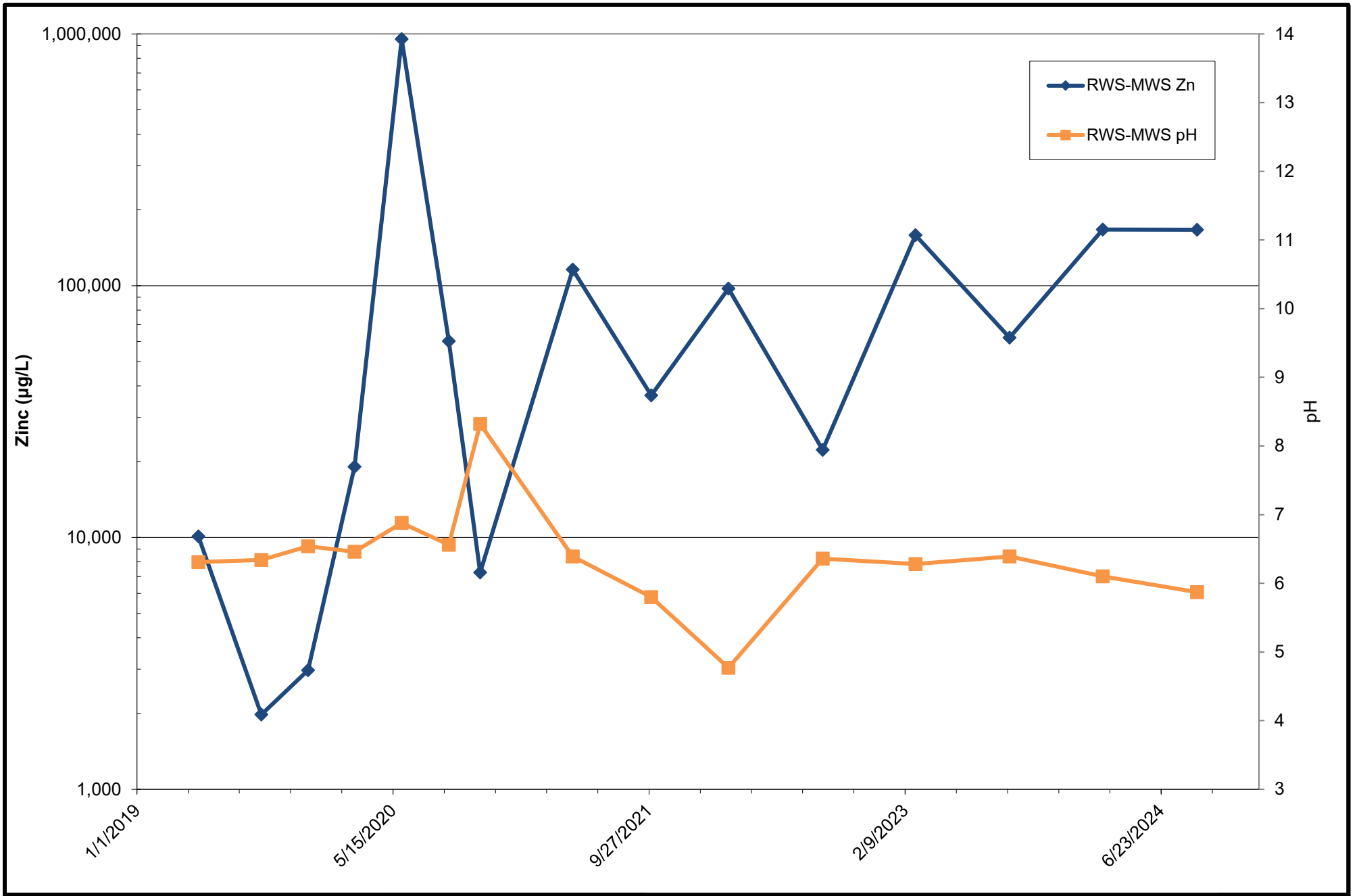
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RWR-MWS pH and Zinc Concentrations

January 2025

**Appx B**




ARM Group LLC
Engineers and Scientists

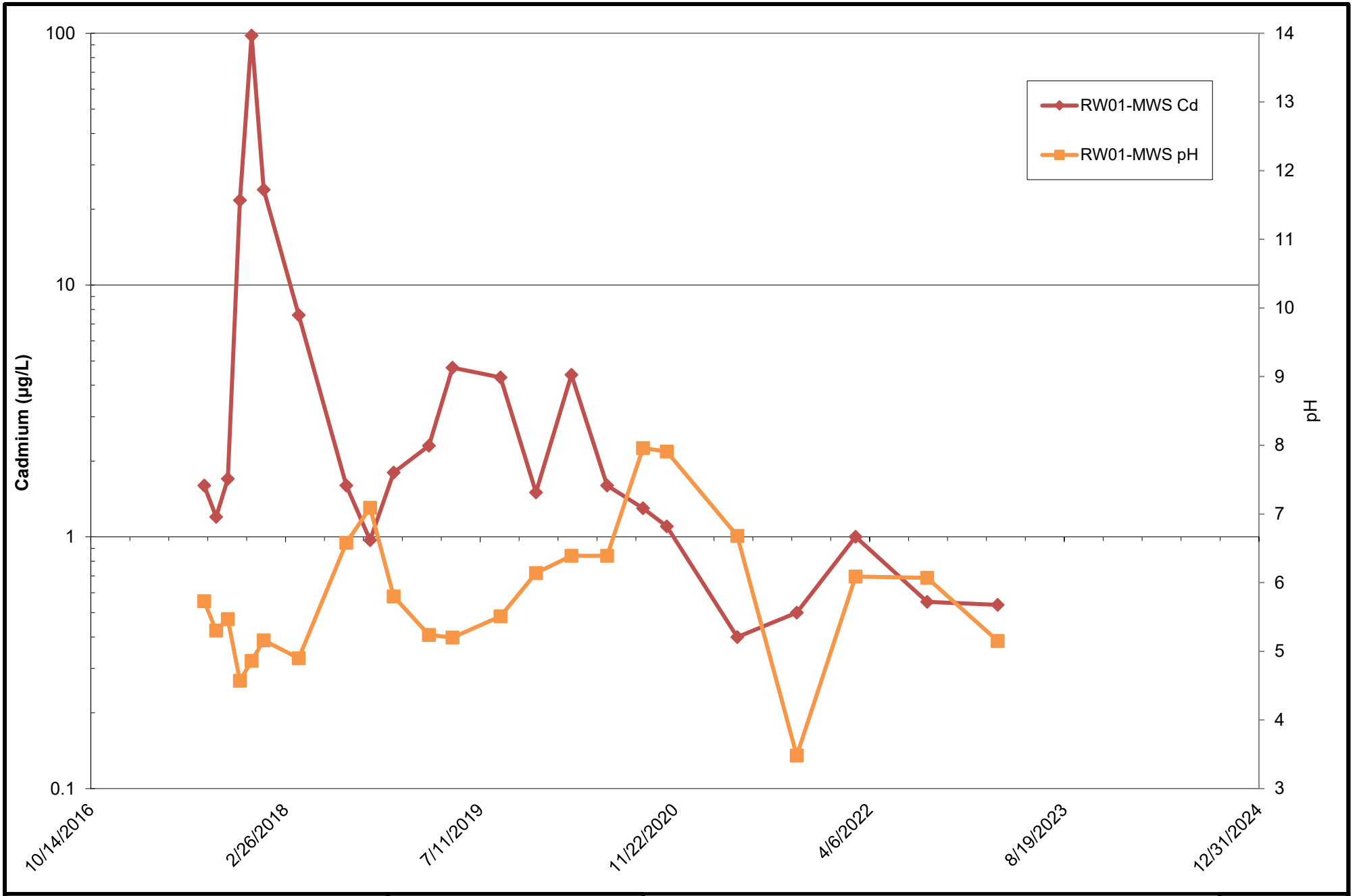
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RWS-MWS pH and Zinc Concentrations

January 2025

**Appx B**




ARM Group LLC
Engineers and Scientists

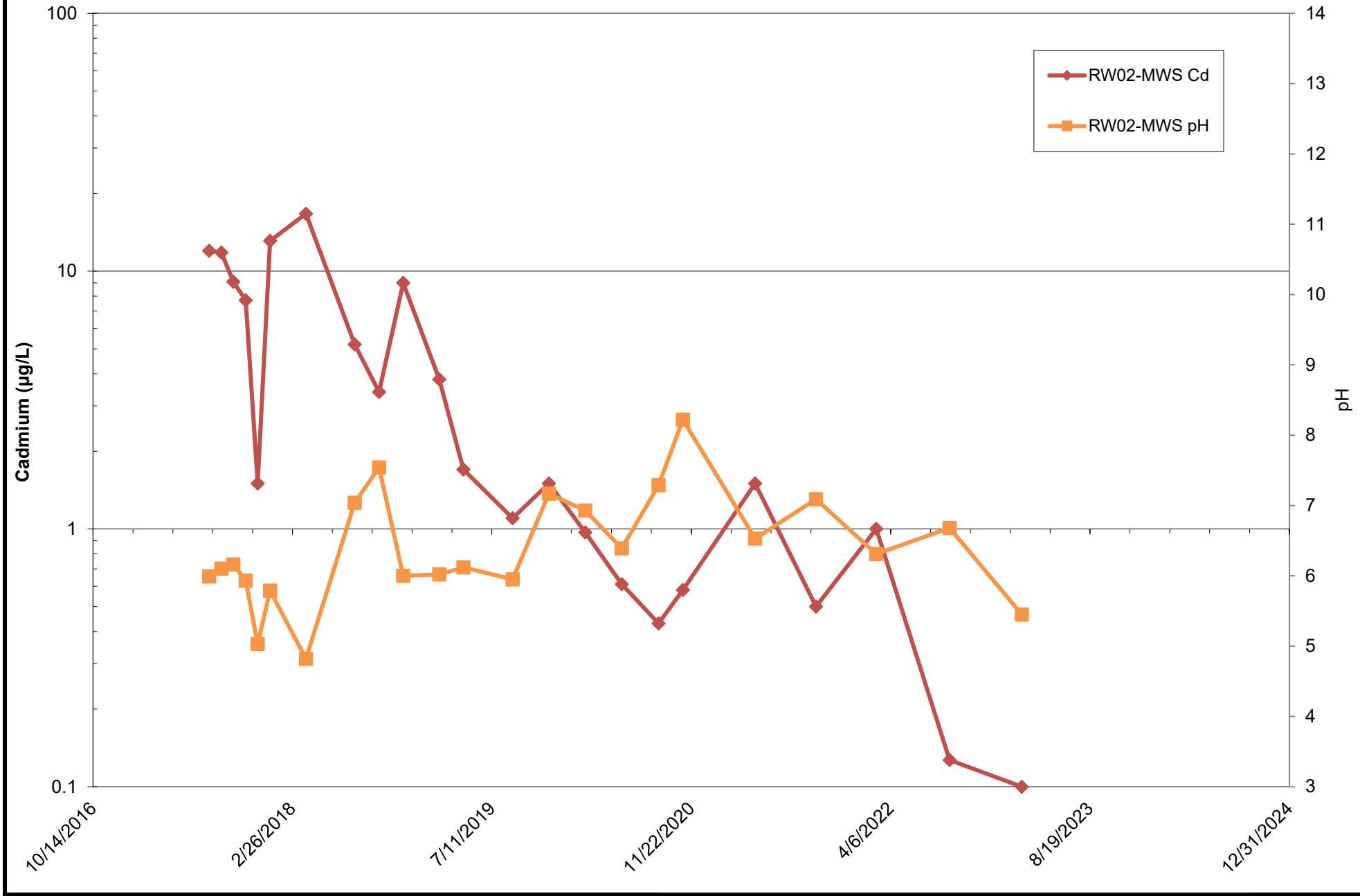
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RW01-MWS pH and Cadmium Concentrations

January 2025

**Appx B**




ARM Group LLC
Engineers and Scientists

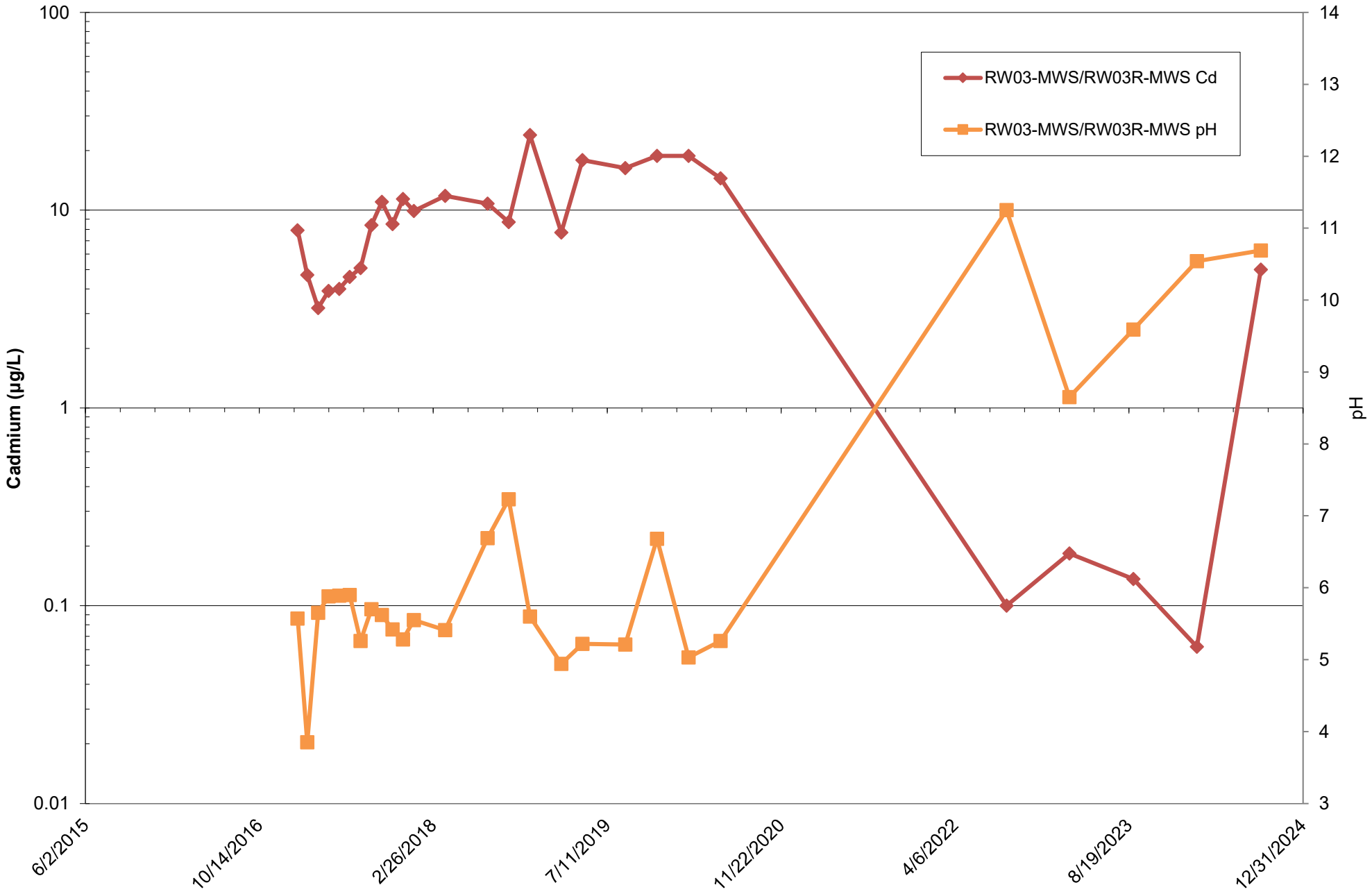
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RW02-MWS pH and Cadmium Concentrations

January 2025

**Appx B**




ARM Group LLC
Engineers and Scientists

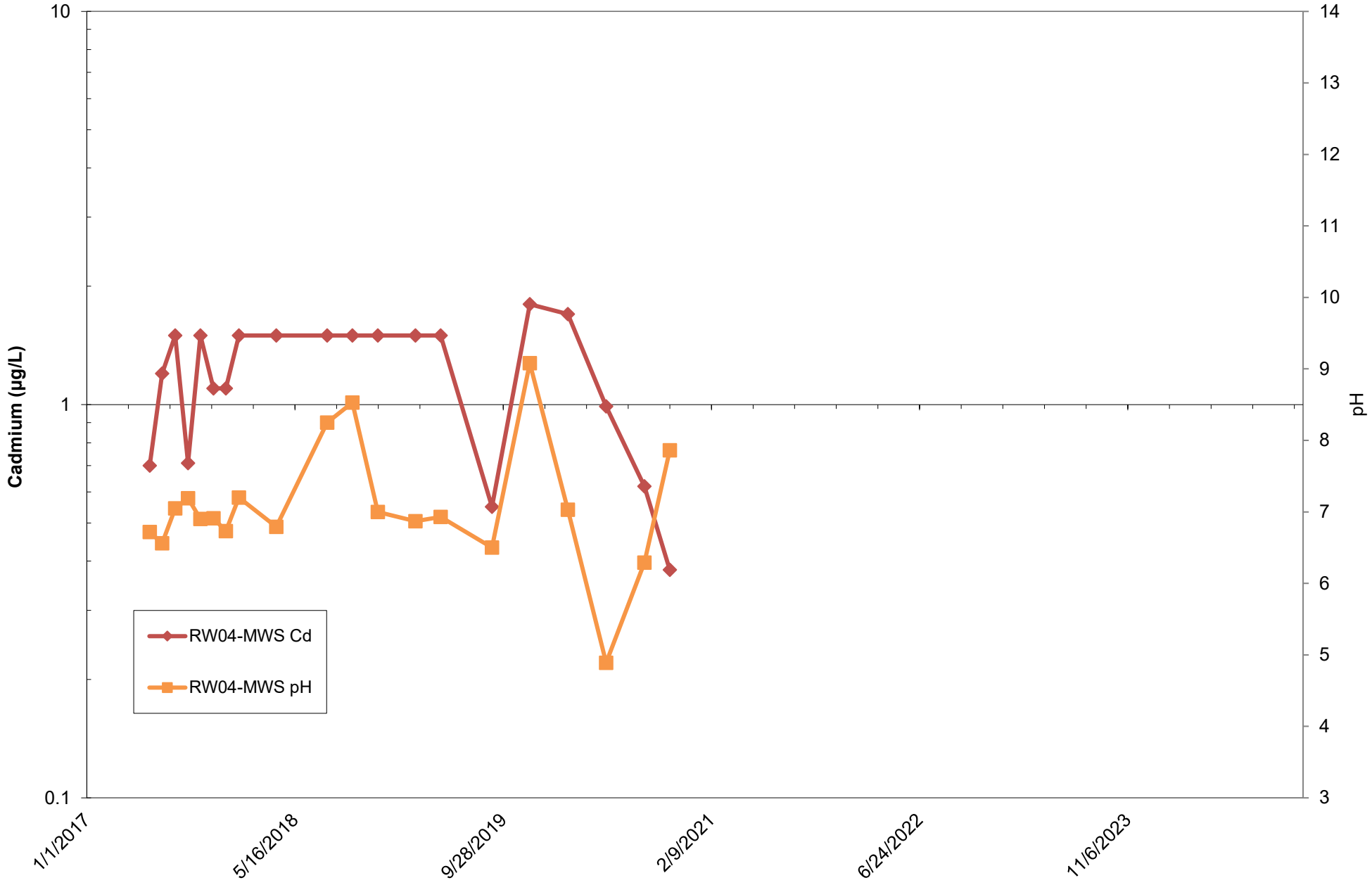
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RW03-MWS/RW03R-MWS pH and Cadmium Concentrations

March 2025

**Appx B**




ARM Group LLC
Engineers and Scientists

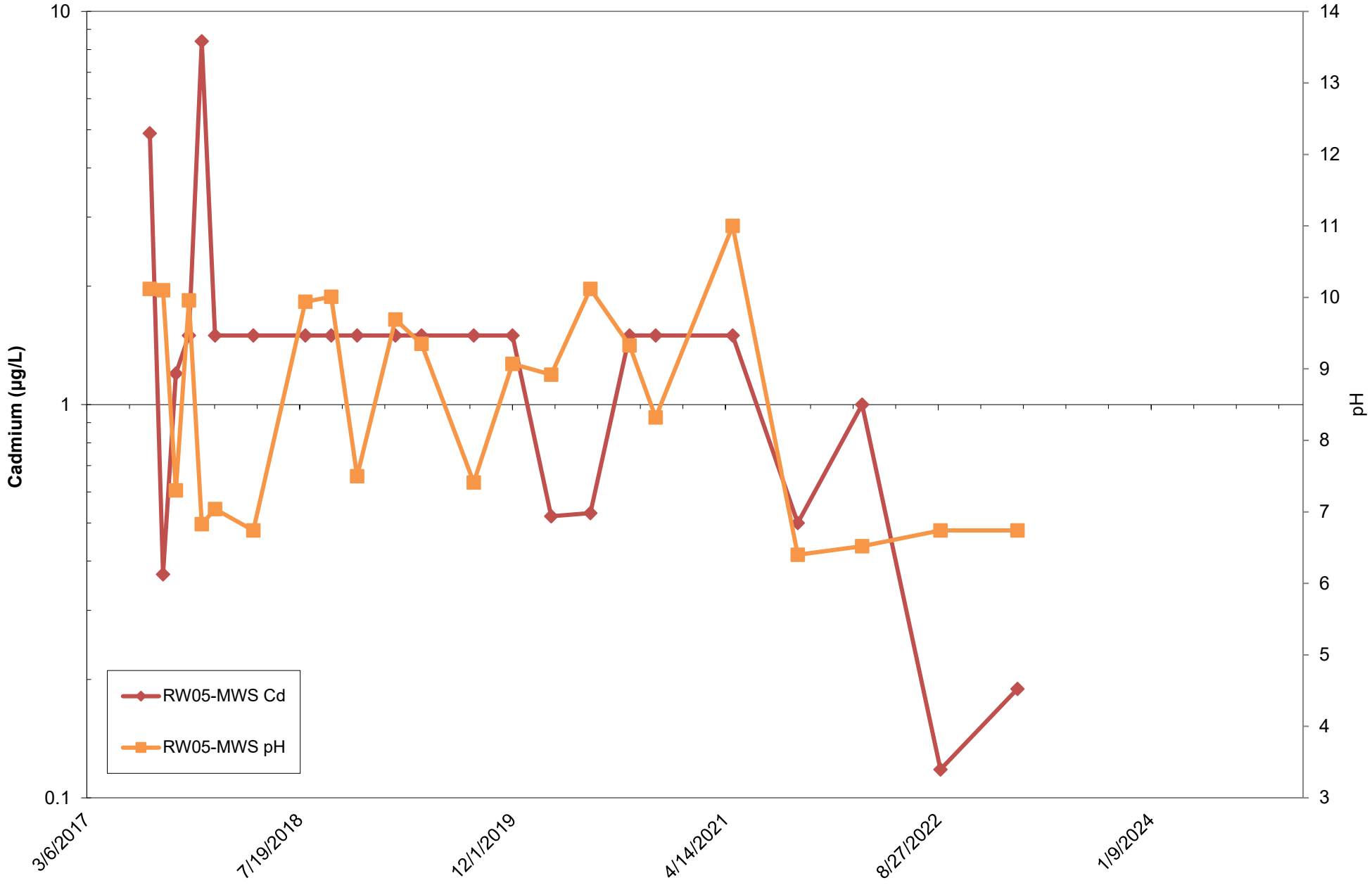
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RW04-MWS pH and Cadmium Concentrations

January 2025

**Appx B**




ARM Group LLC
Engineers and Scientists

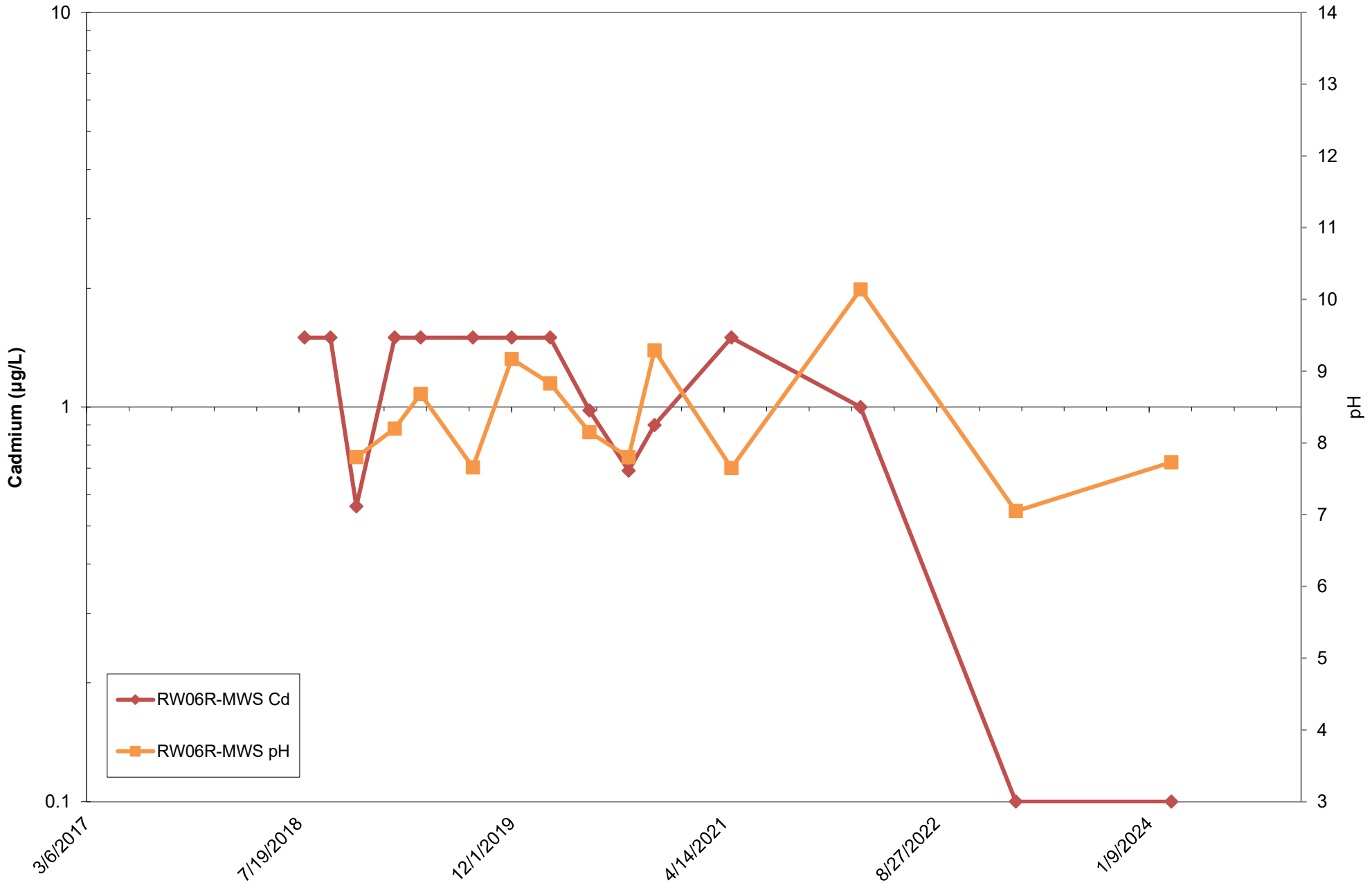
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RW05-MWS pH and Cadmium Concentrations

January 2025

**Appx B**




ARM Group LLC
Engineers and Scientists

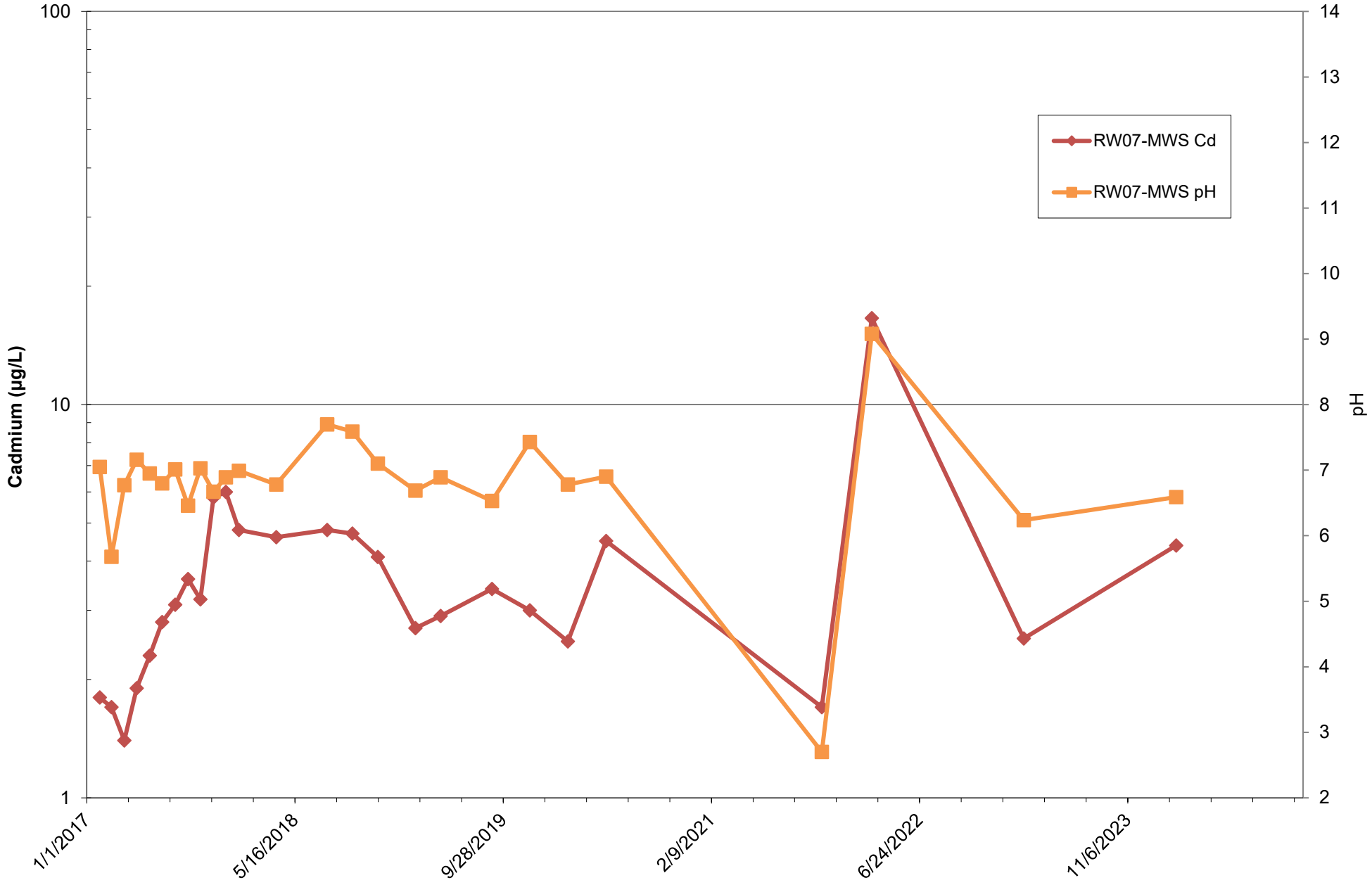
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RW06R-MWS pH and Cadmium Concentrations

March 2025

**Appx B**




ARM Group LLC
Engineers and Scientists

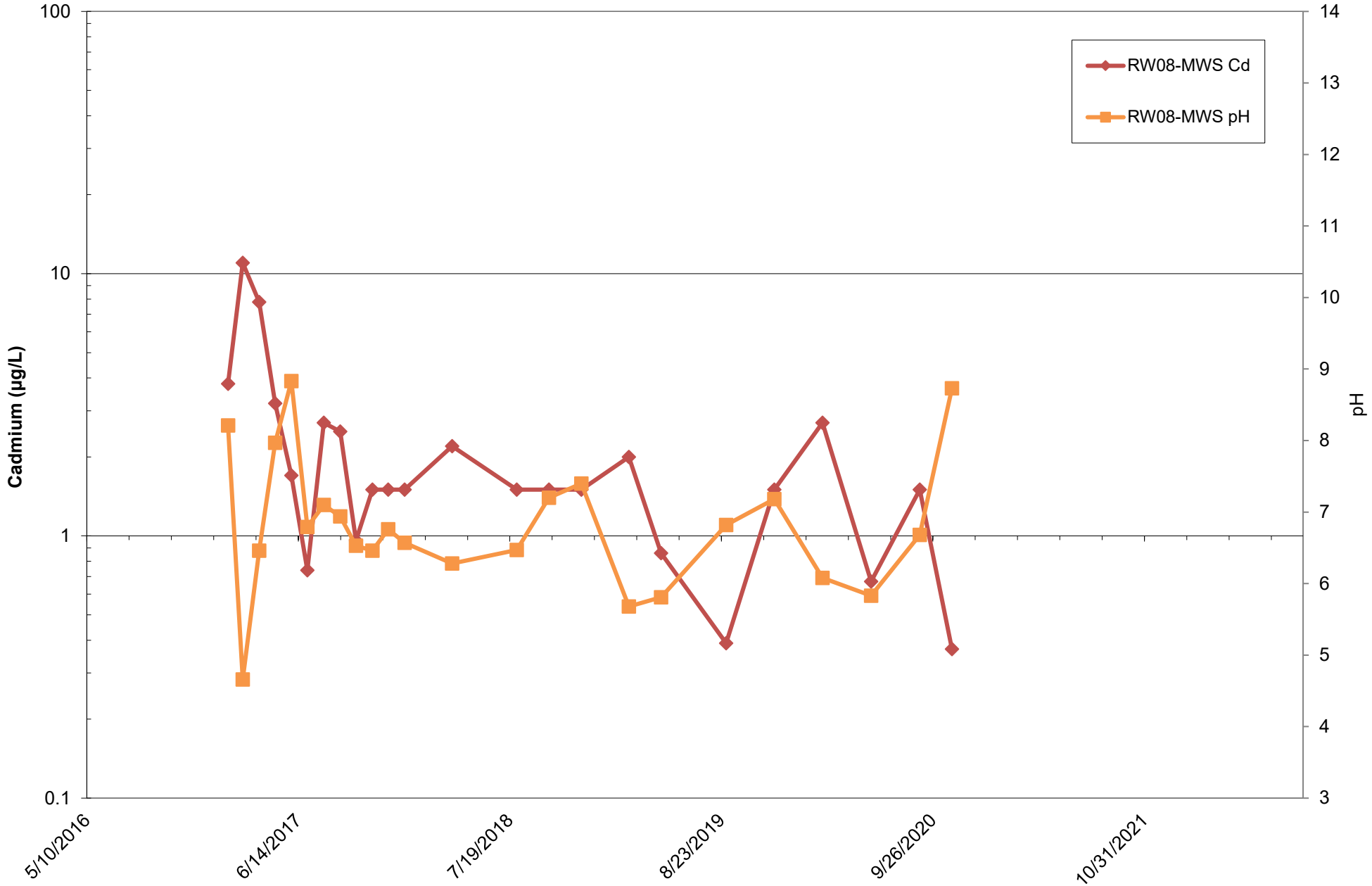
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RW07-MWS pH and Cadmium Concentrations

January 2025

**Appx B**




ARM Group LLC
Engineers and Scientists

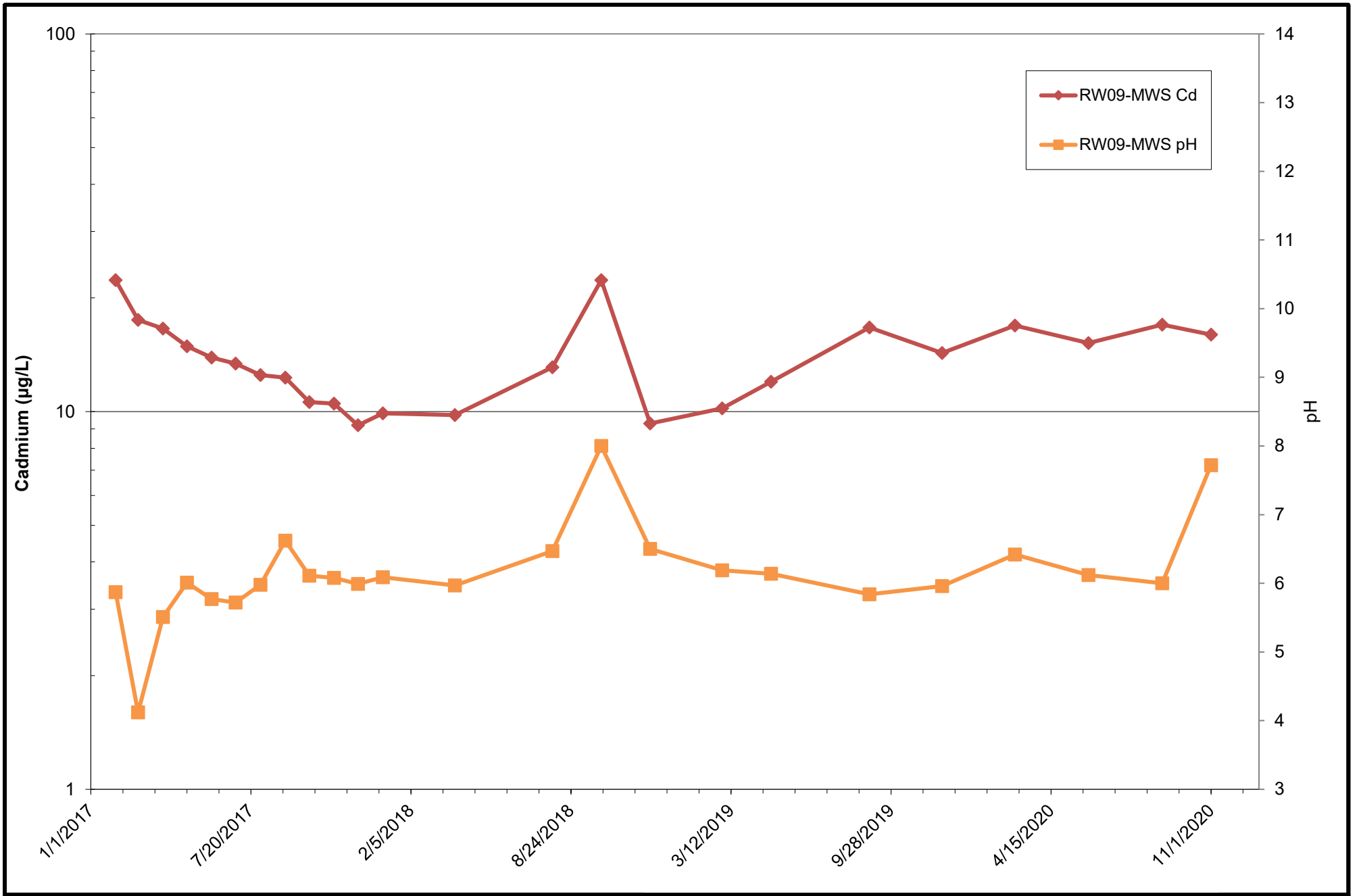
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RW08-MWS pH and Cadmium Concentrations

January 2025

**Appx B**




ARM Group LLC
Engineers and Scientists

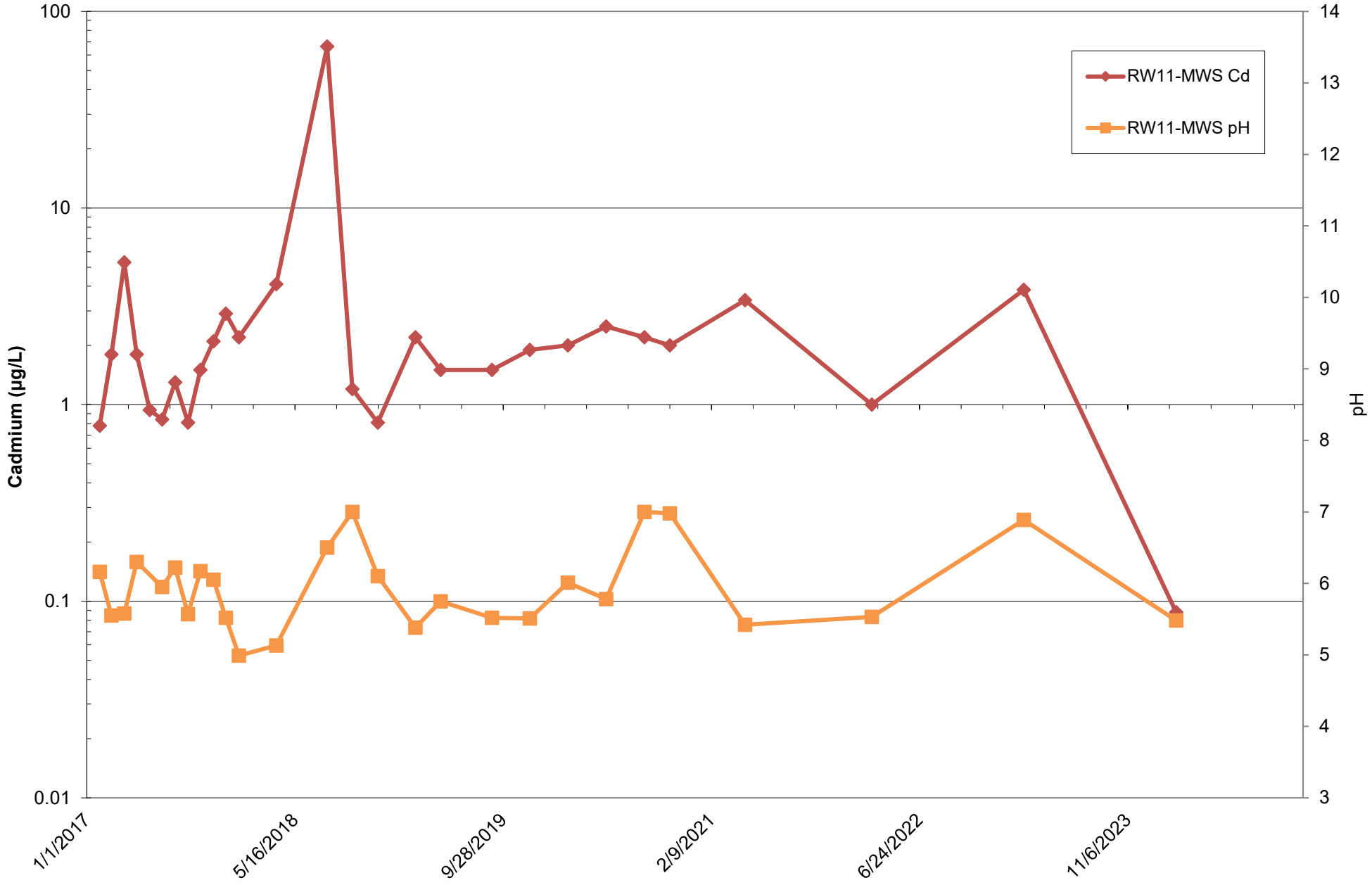
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RW09-MWS pH and Cadmium Concentrations

January 2025

**Appx B**




ARM Group LLC
Engineers and Scientists

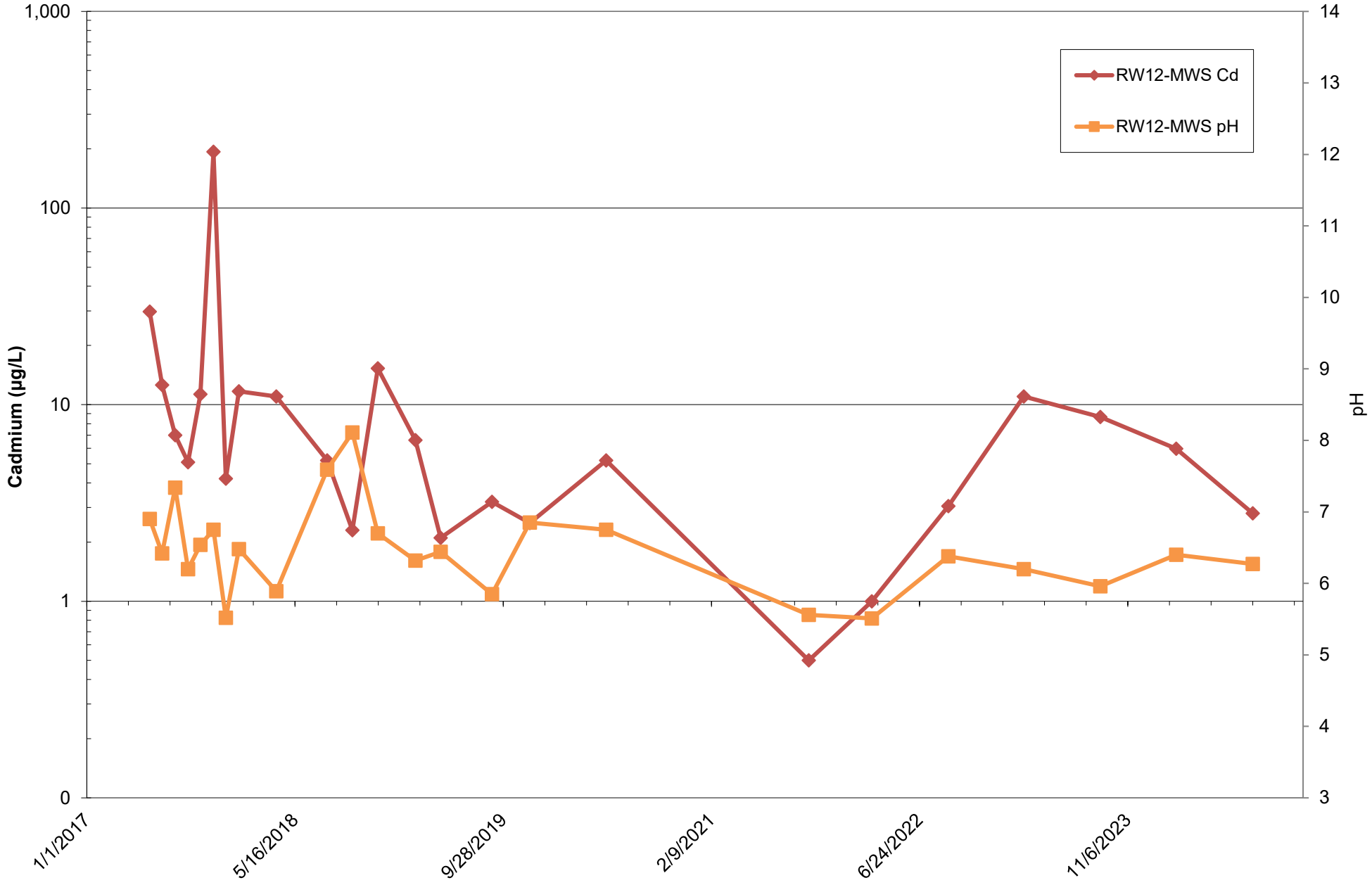
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RW11-MWS pH and Cadmium Concentrations

January 2025

**Appx B**




ARM Group LLC
Engineers and Scientists

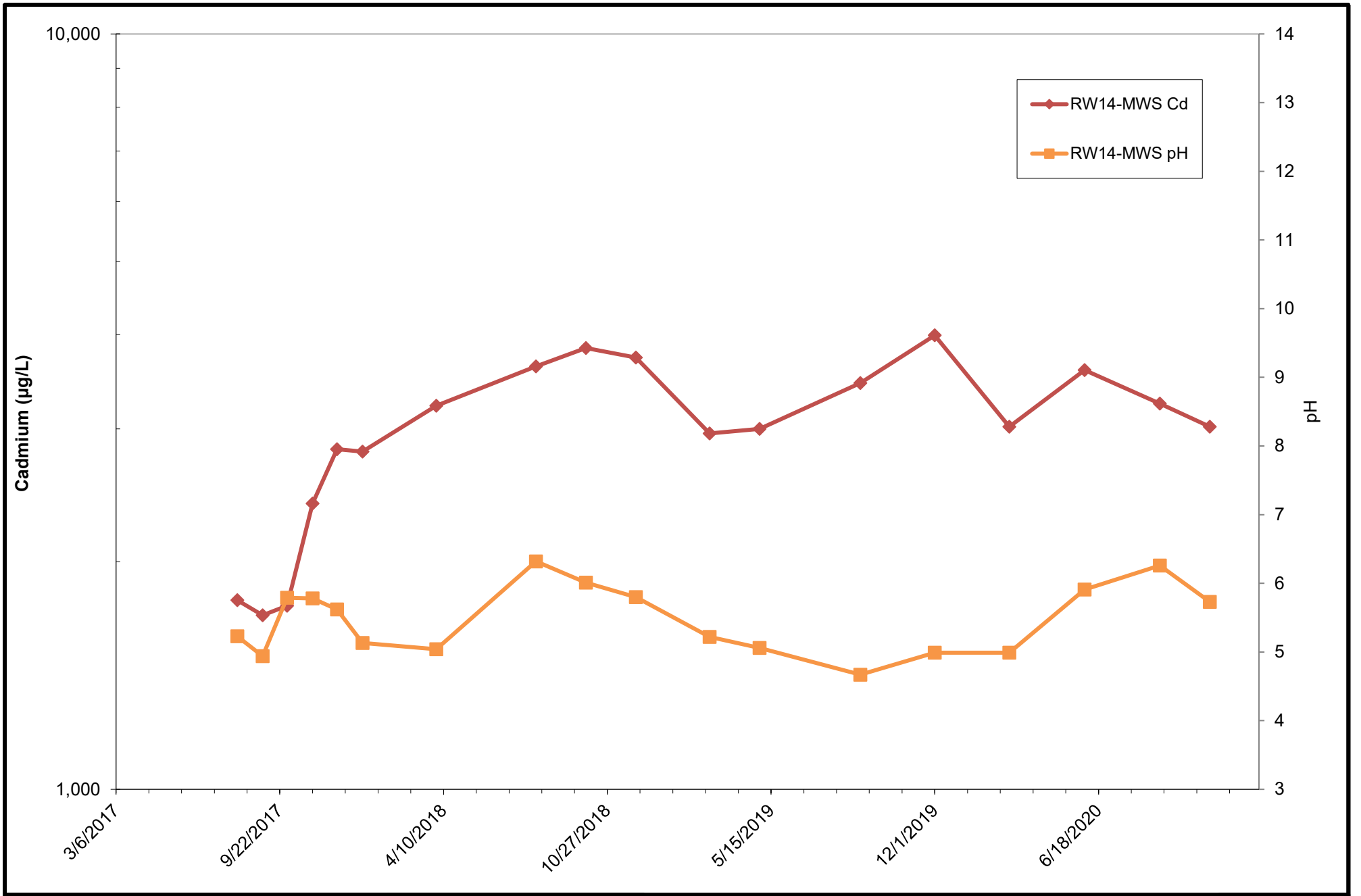
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RW12-MWS pH and Cadmium Concentrations

January 2025

**Appx B**




ARM Group LLC
Engineers and Scientists

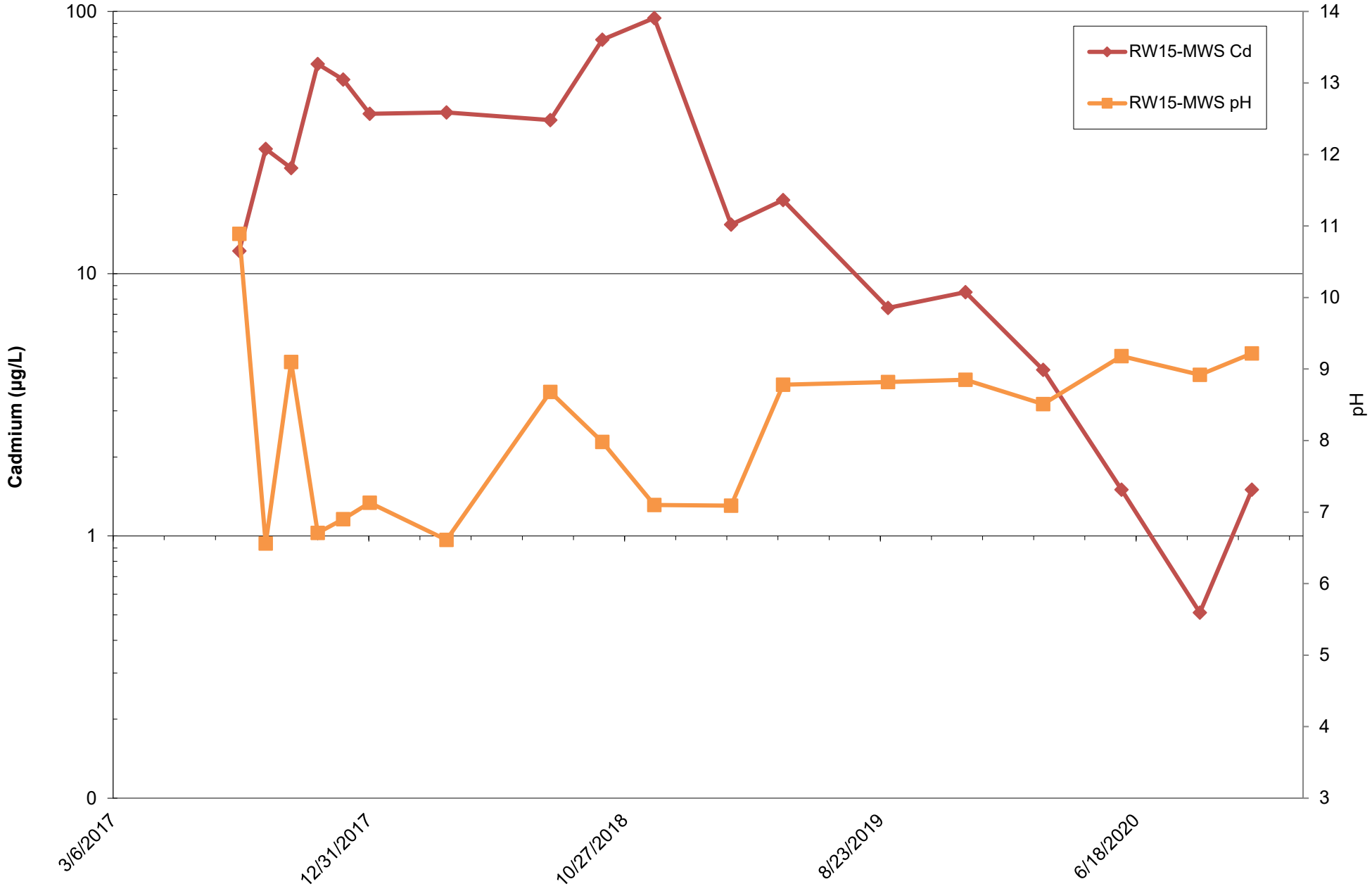
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RW14-MWS pH and Cadmium Concentrations

January 2025

**Appx B**




ARM Group LLC
Engineers and Scientists

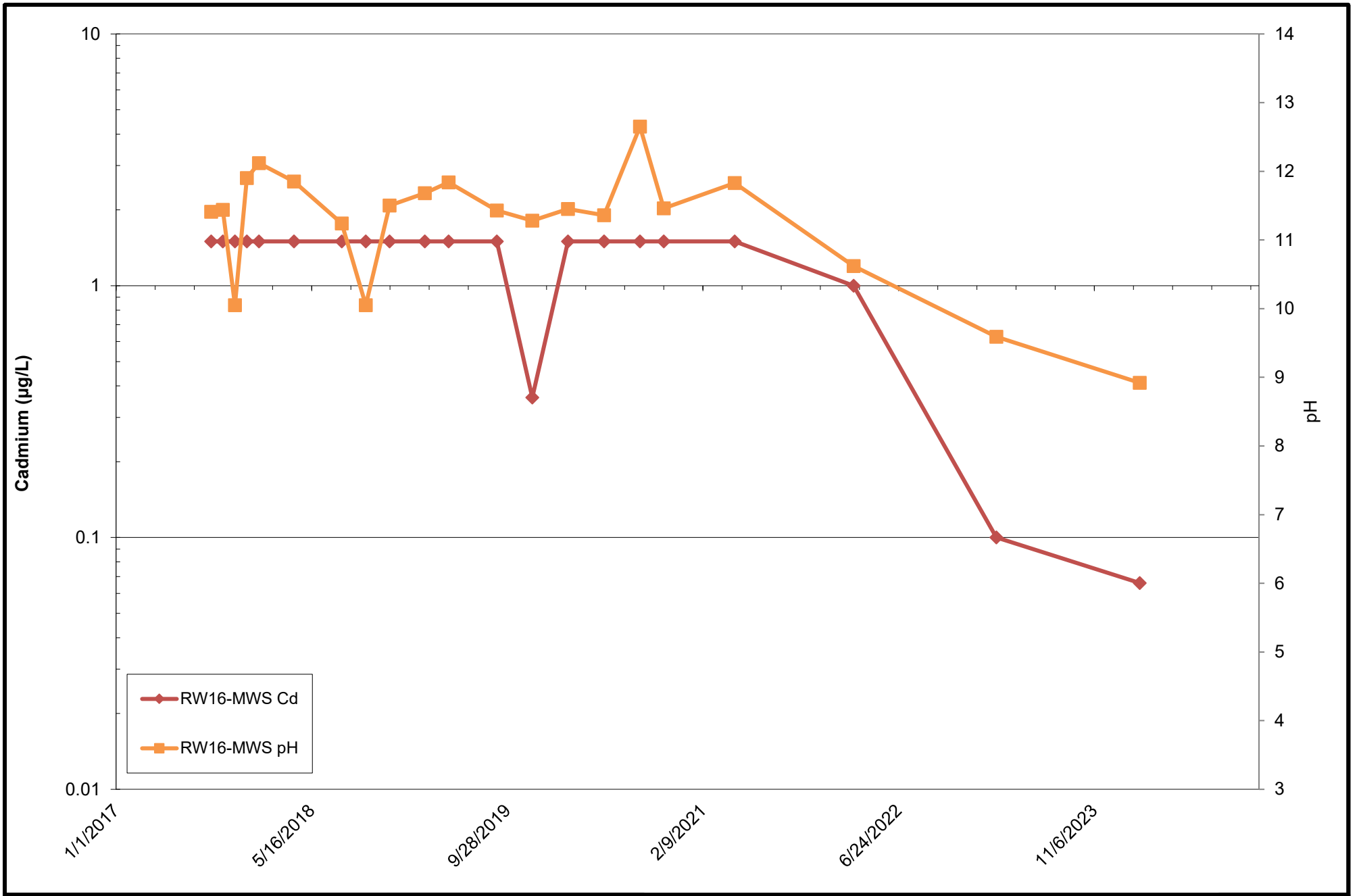
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RW15-MWS pH and Cadmium Concentrations

January 2025

**Appx B**




ARM Group LLC
Engineers and Scientists

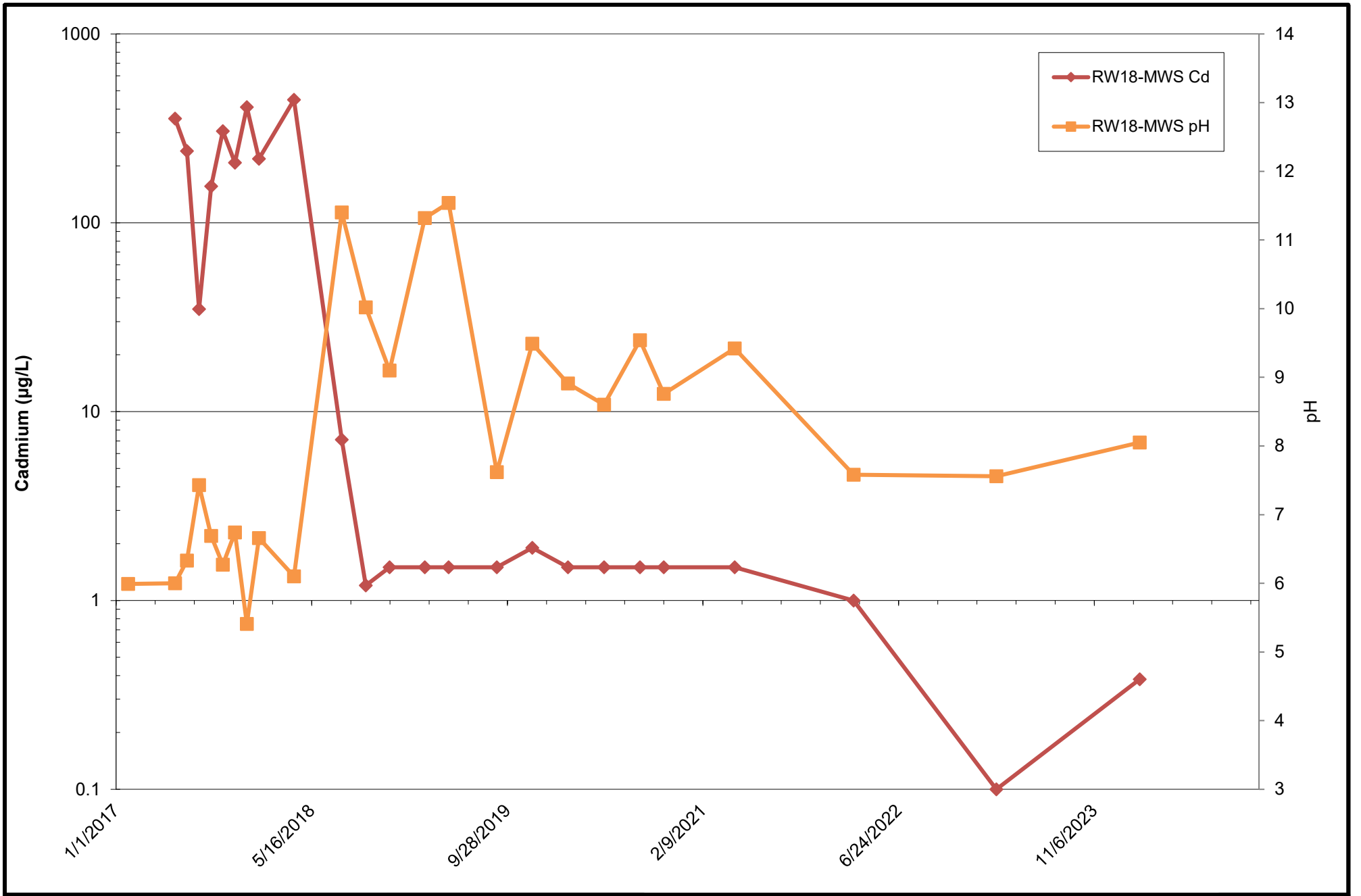
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RW16-MWS pH and Cadmium Concentrations

January 2025

**Appx B**




ARM Group LLC
Engineers and Scientists

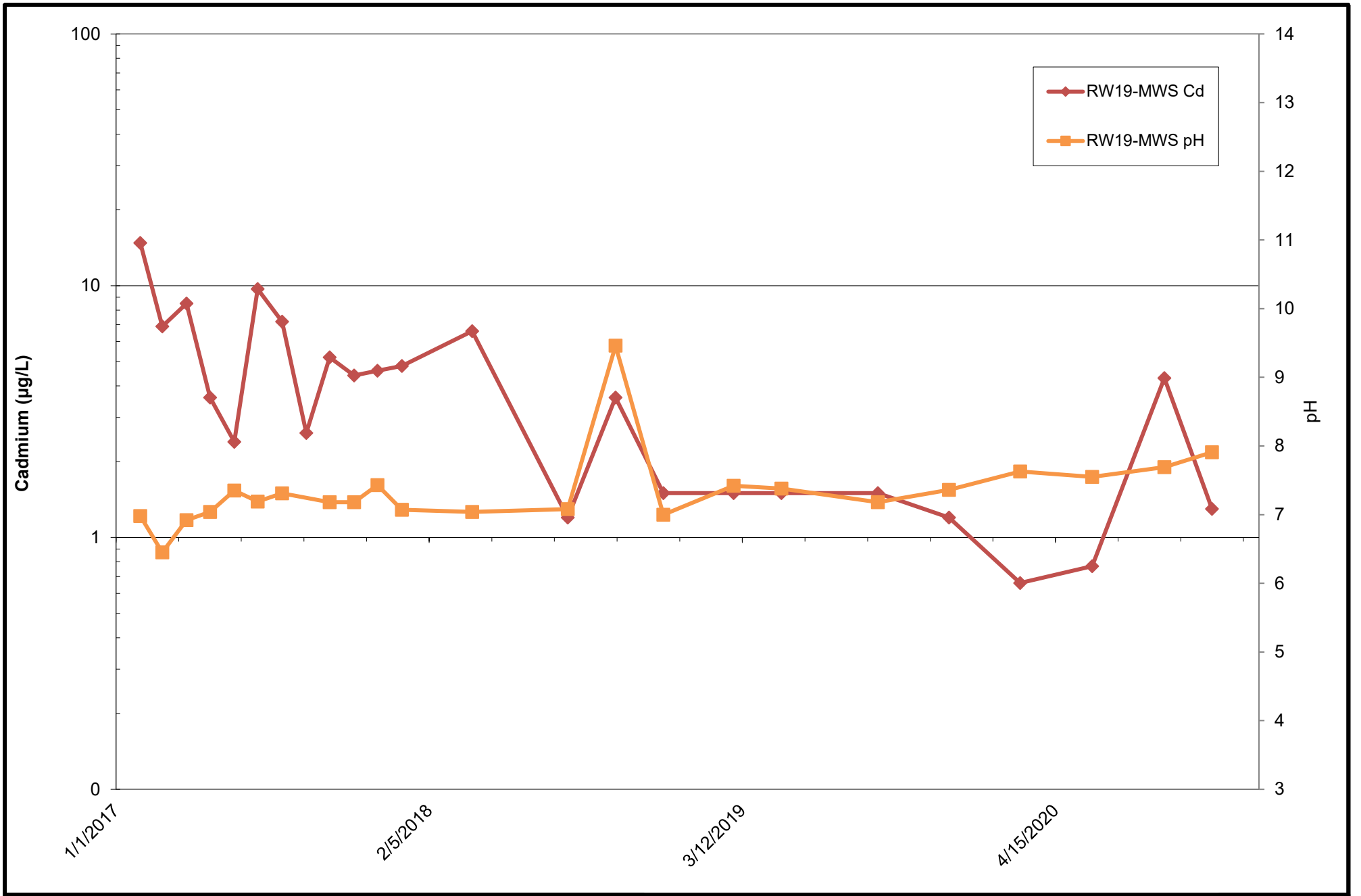
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RW18-MWS pH and Cadmium Concentrations

January 2025

**Appx B**




ARM Group LLC
Engineers and Scientists

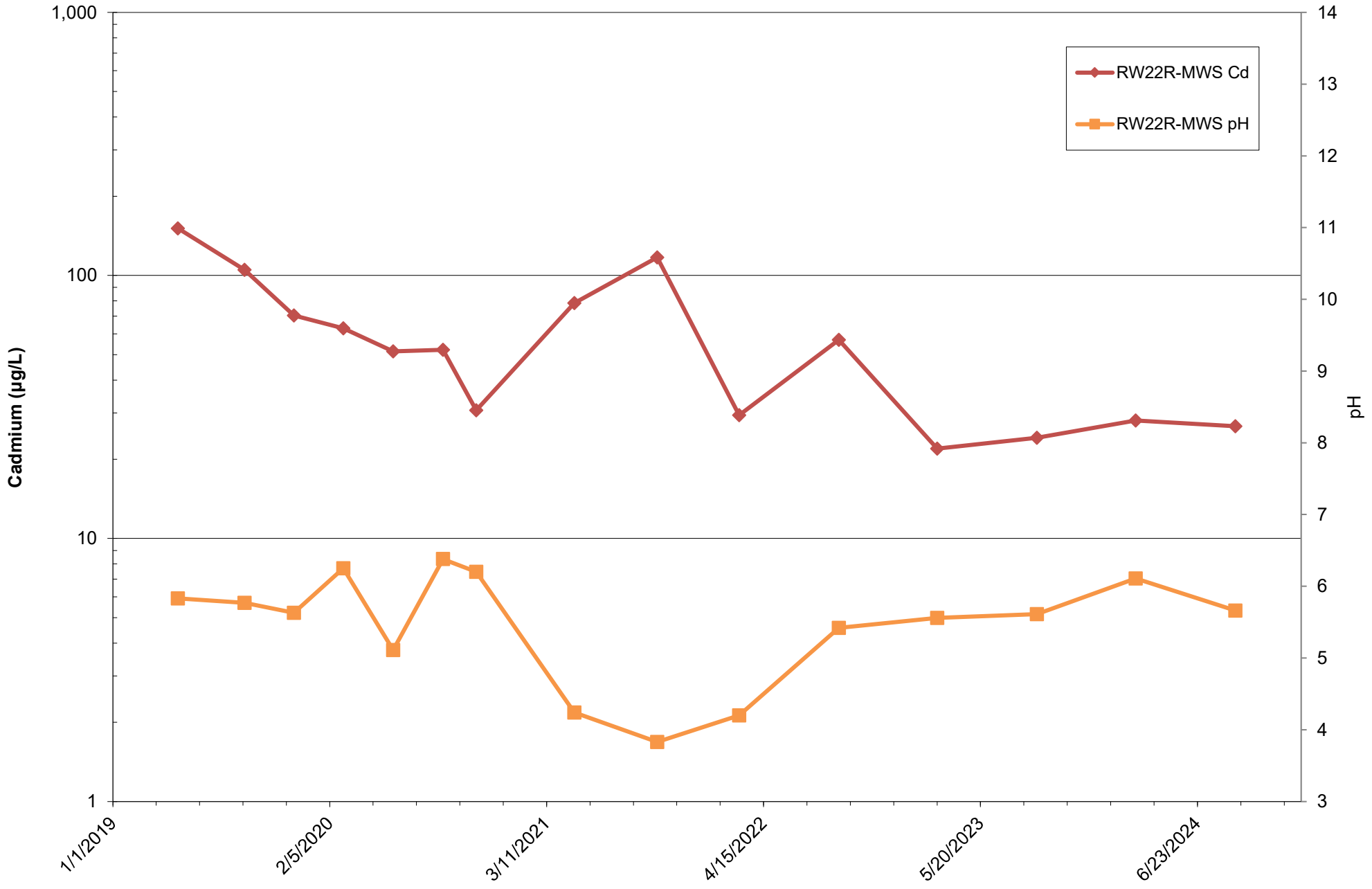
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RW19-MWS pH and Cadmium Concentrations

January 2025

**Appx B**




ARM Group LLC
Engineers and Scientists

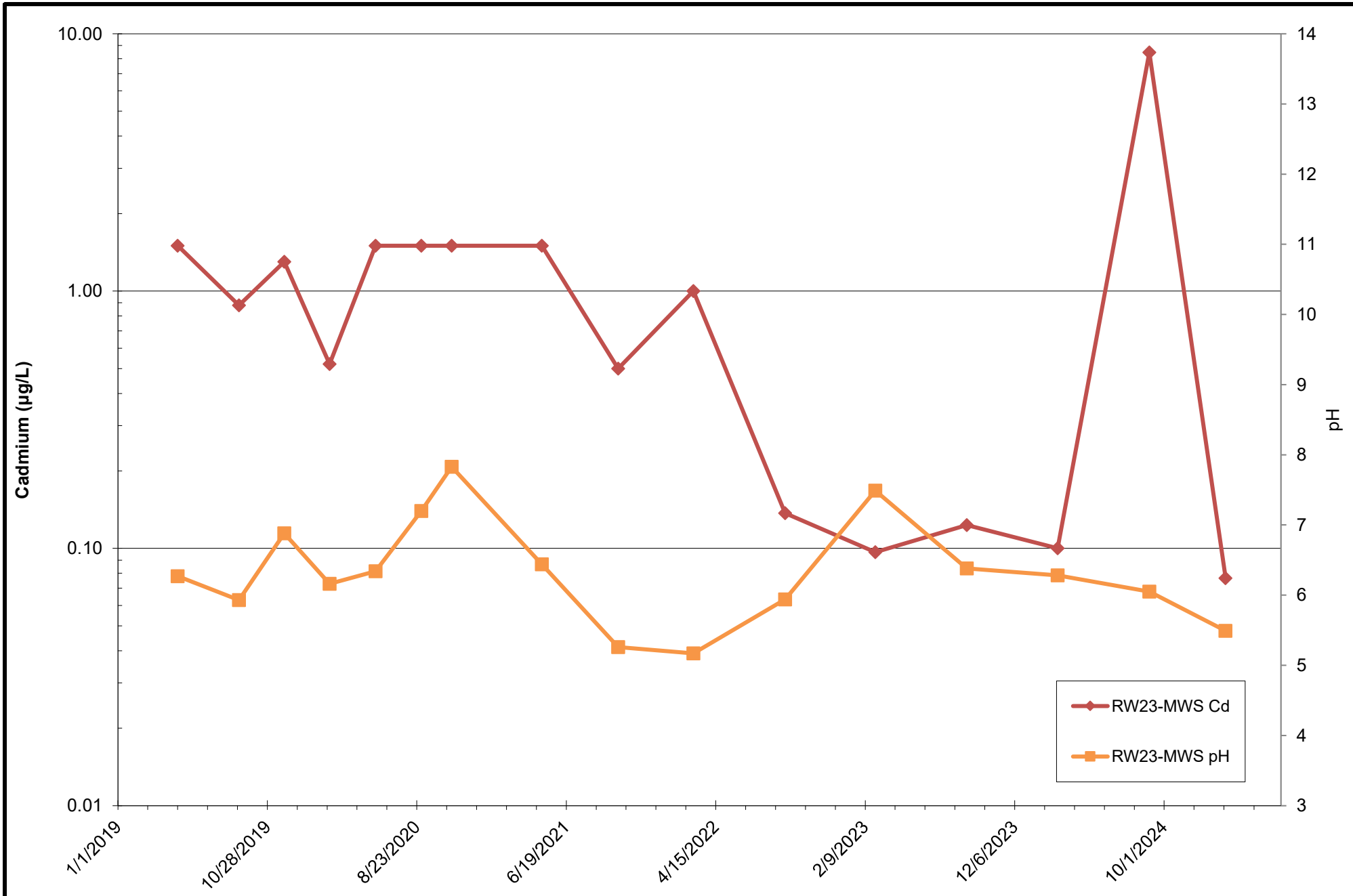
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RW22R-MWS pH and Cadmium Concentrations

March 2025

**Appx B**




ARM Group LLC
Engineers and Scientists

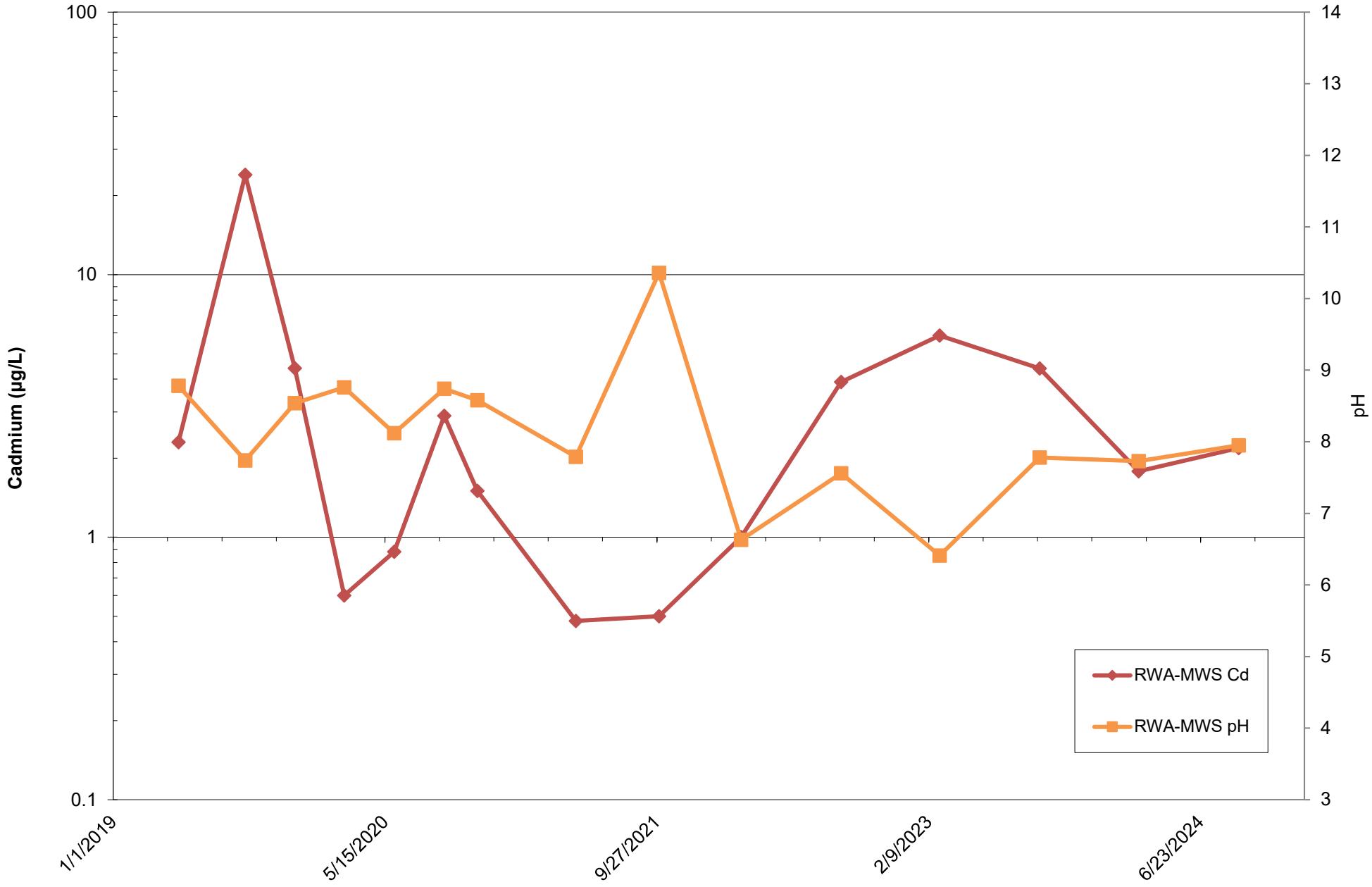
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RW23-MWS pH and Cadmium Concentrations

March 2025

**Appx B**




ARM Group LLC
Engineers and Scientists

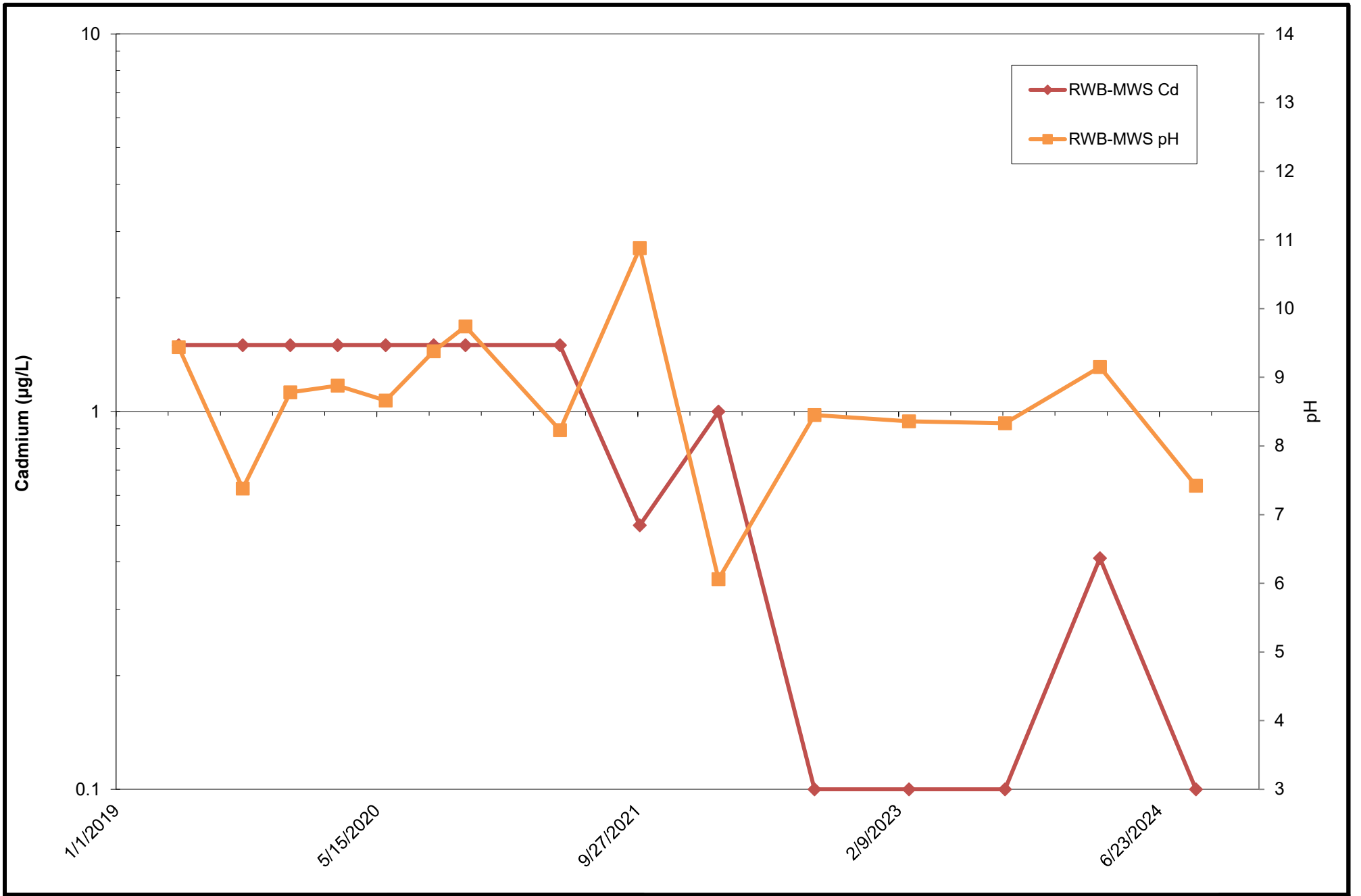
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RWA-MWS pH and Cadmium Concentrations

January 2025

**Appx B**




ARM Group LLC
Engineers and Scientists

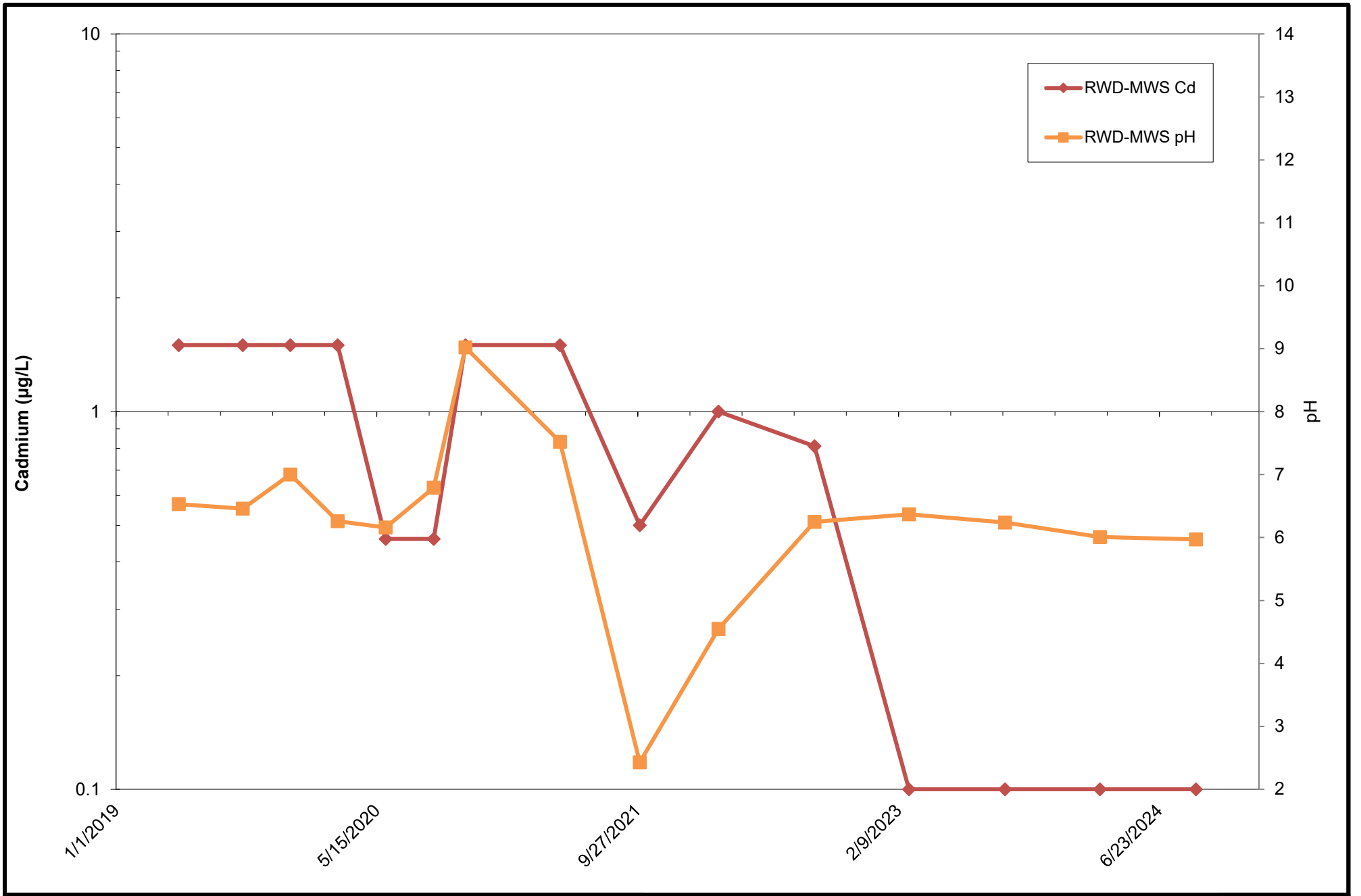
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RWB-MWS pH and Cadmium Concentrations

January 2025

**Appx B**




ARM Group LLC
Engineers and Scientists

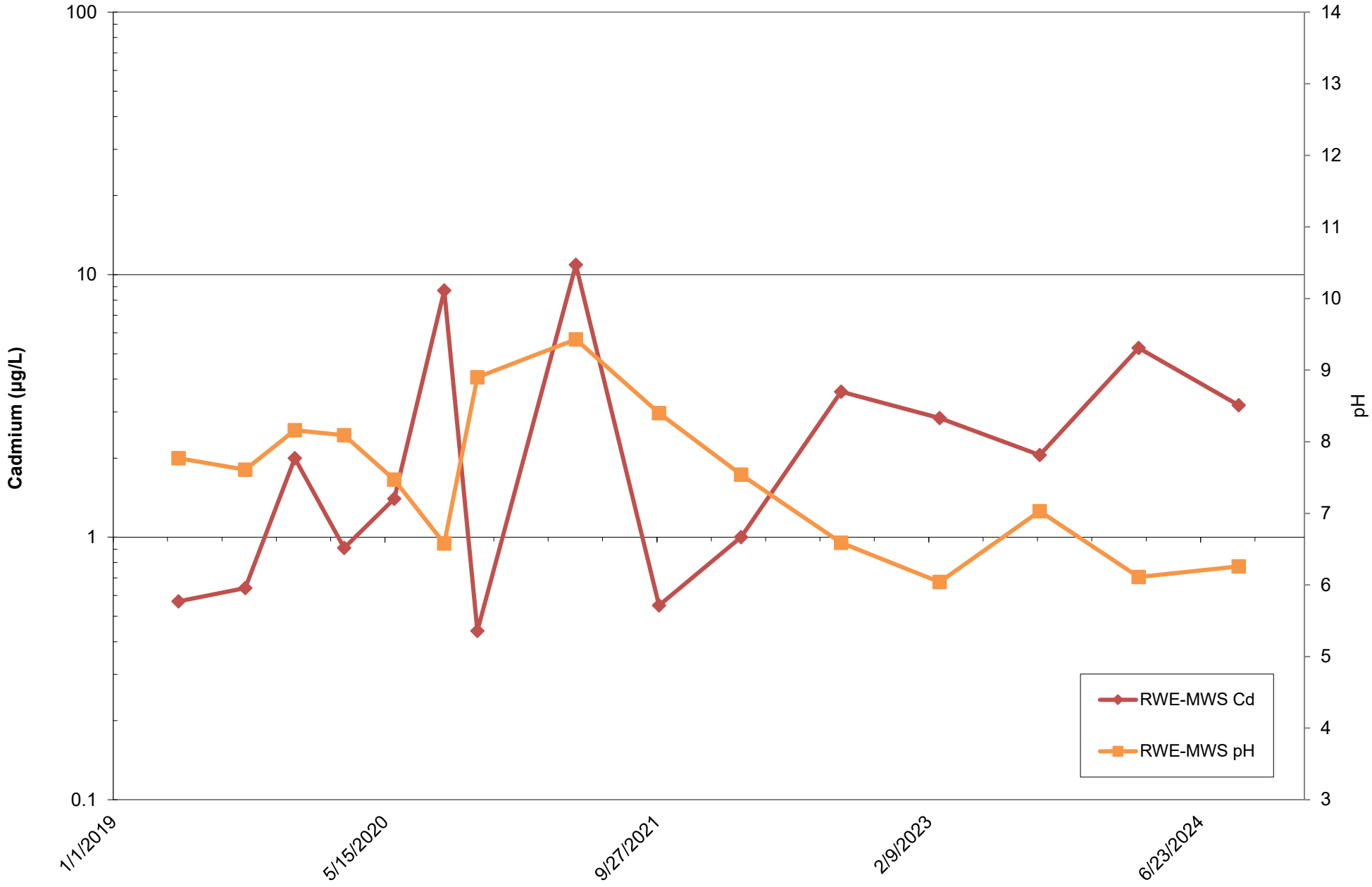
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RWD-MWS pH and Cadmium Concentrations

January 2025

**Appx B**




ARM Group LLC
Engineers and Scientists

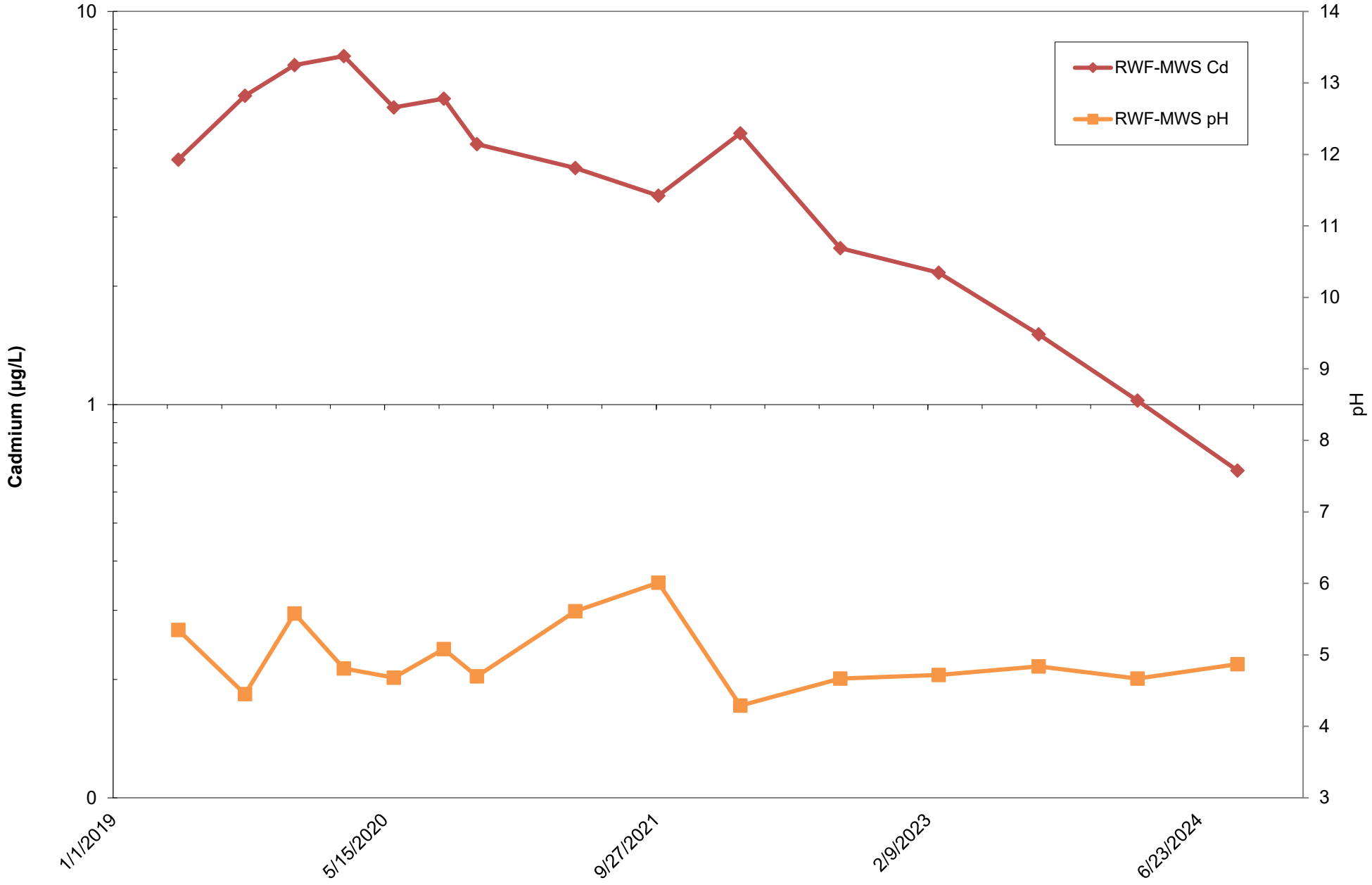
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RWE-MWS pH and Cadmium Concentrations

January 2025

**Appx B**




ARM Group LLC
Engineers and Scientists

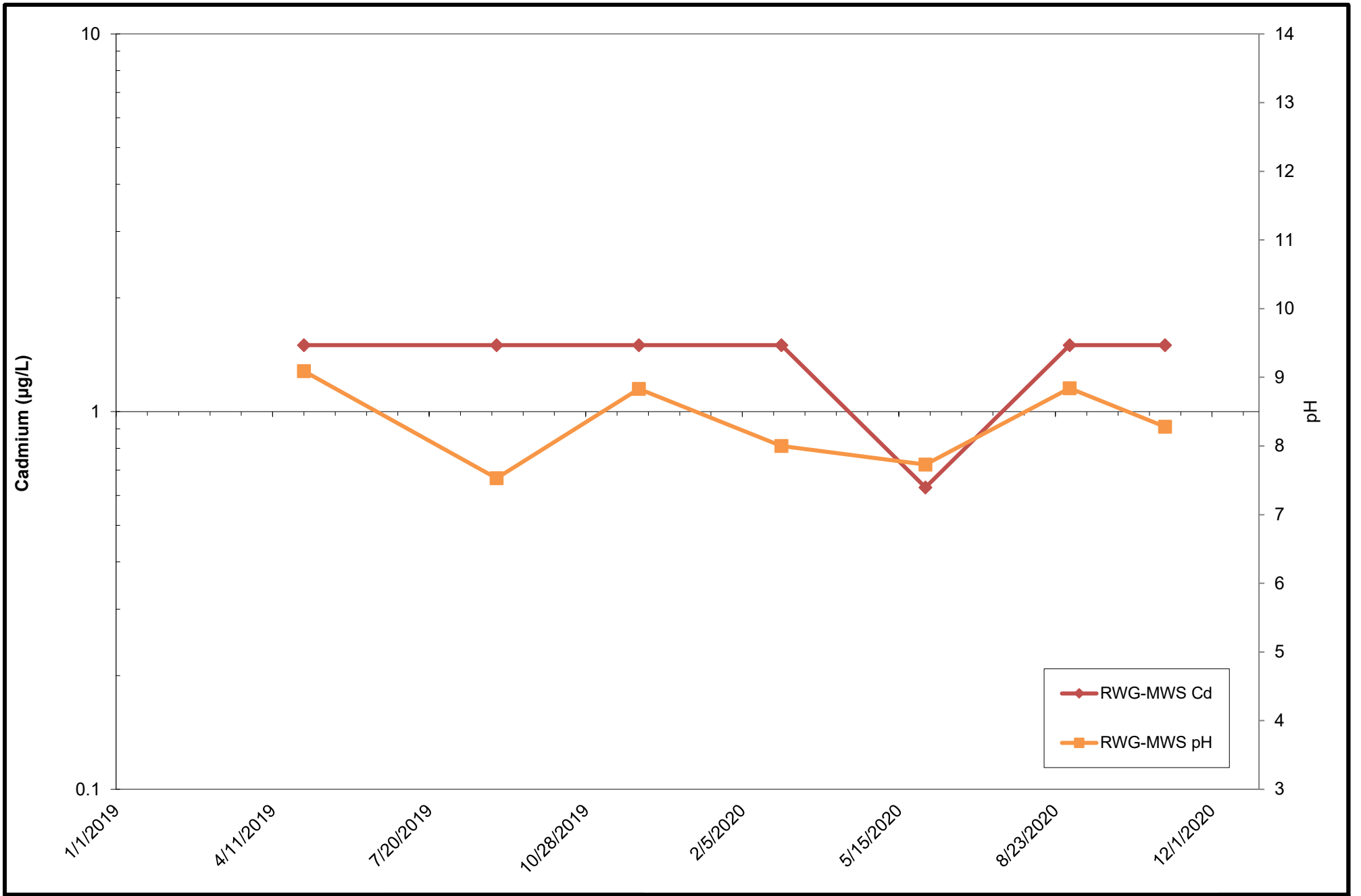
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RWF-MWS pH and Cadmium Concentrations

January 2025

**Appx B**




ARM Group LLC
Engineers and Scientists

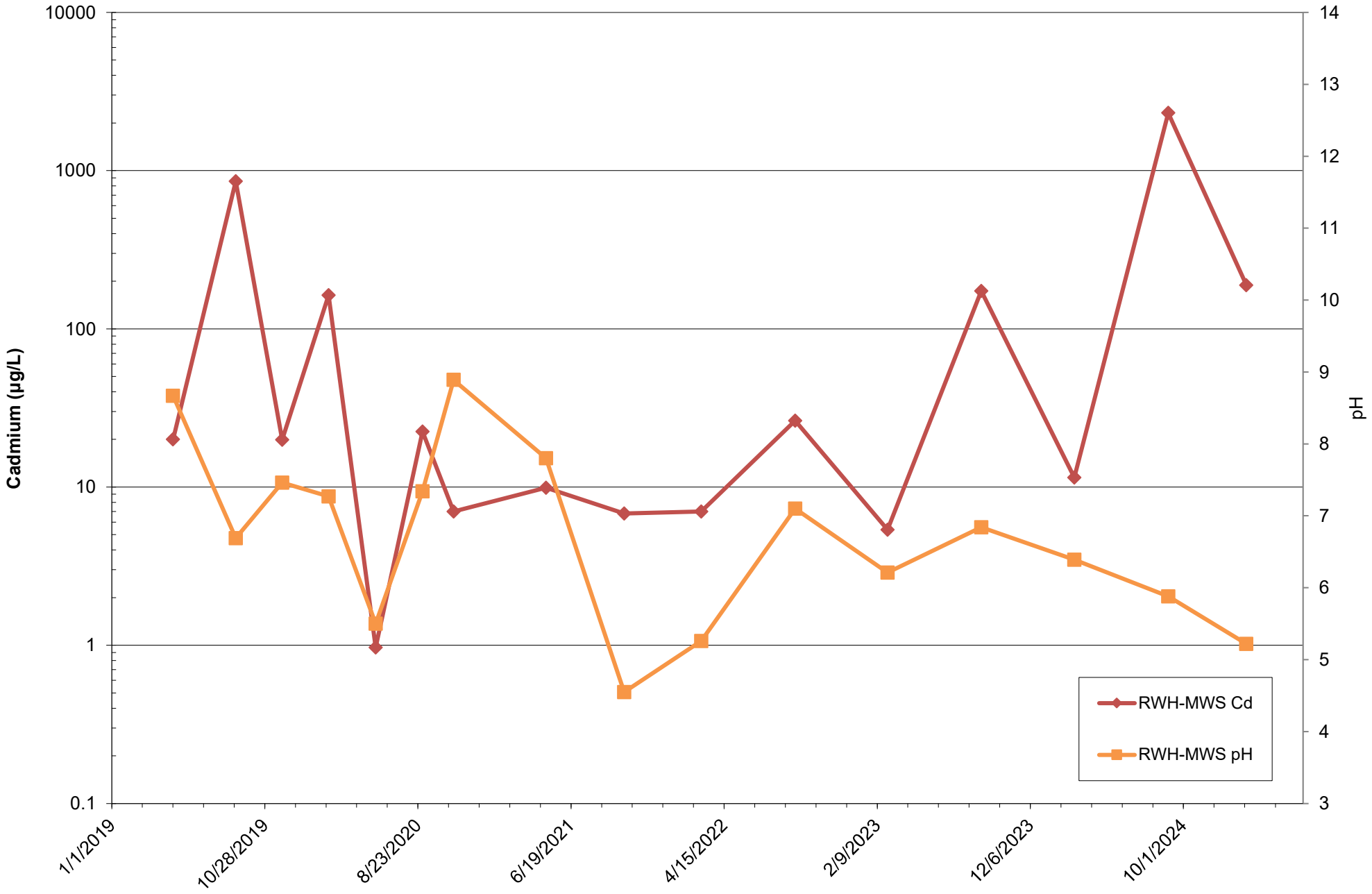
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RWG-MWS pH and Cadmium Concentrations

January 2025

**Appx B**




ARM Group LLC
Engineers and Scientists

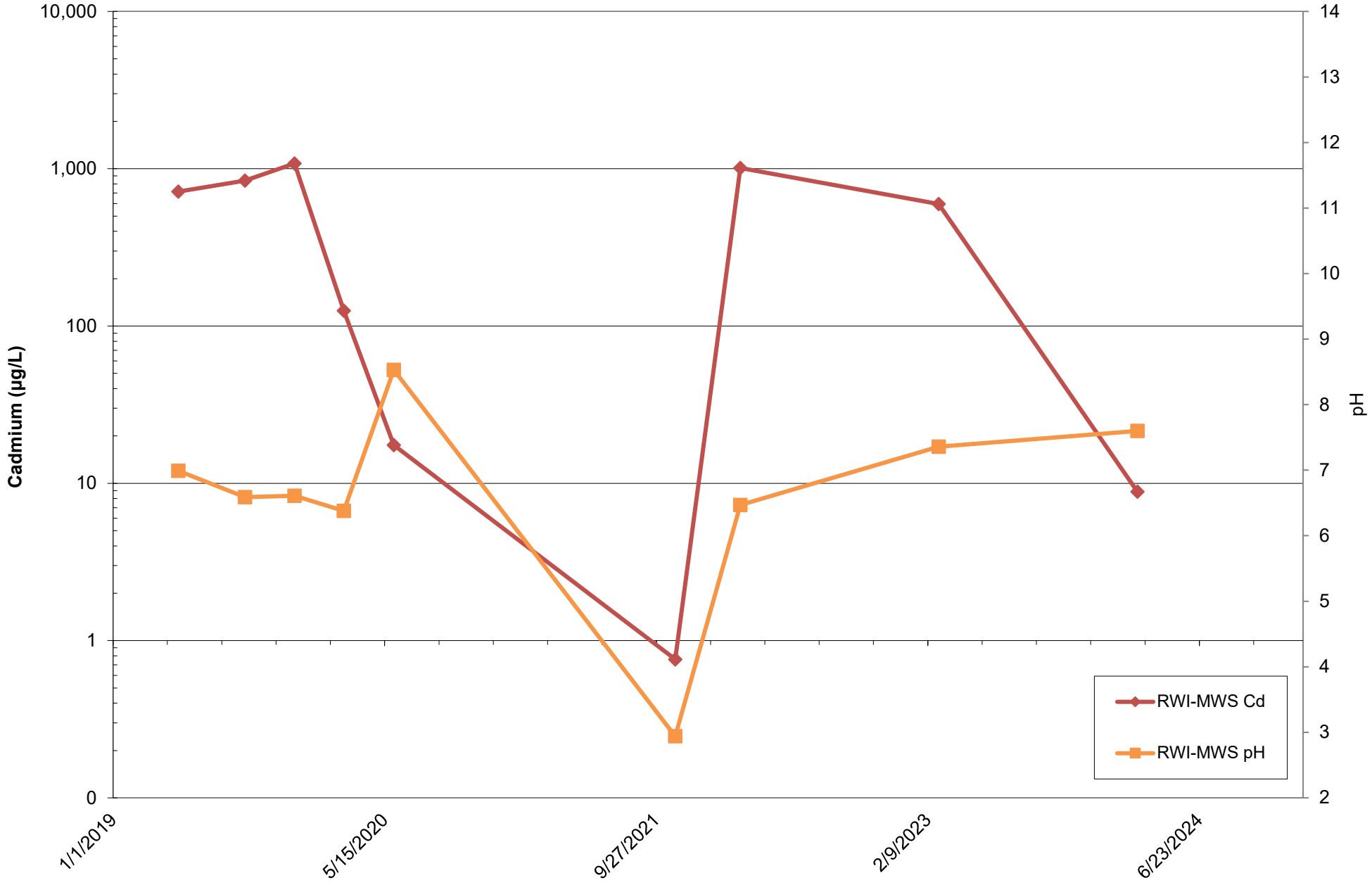
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RWH-MWS pH and Cadmium Concentrations

March 2025

**Appx B**




ARM Group LLC
Engineers and Scientists

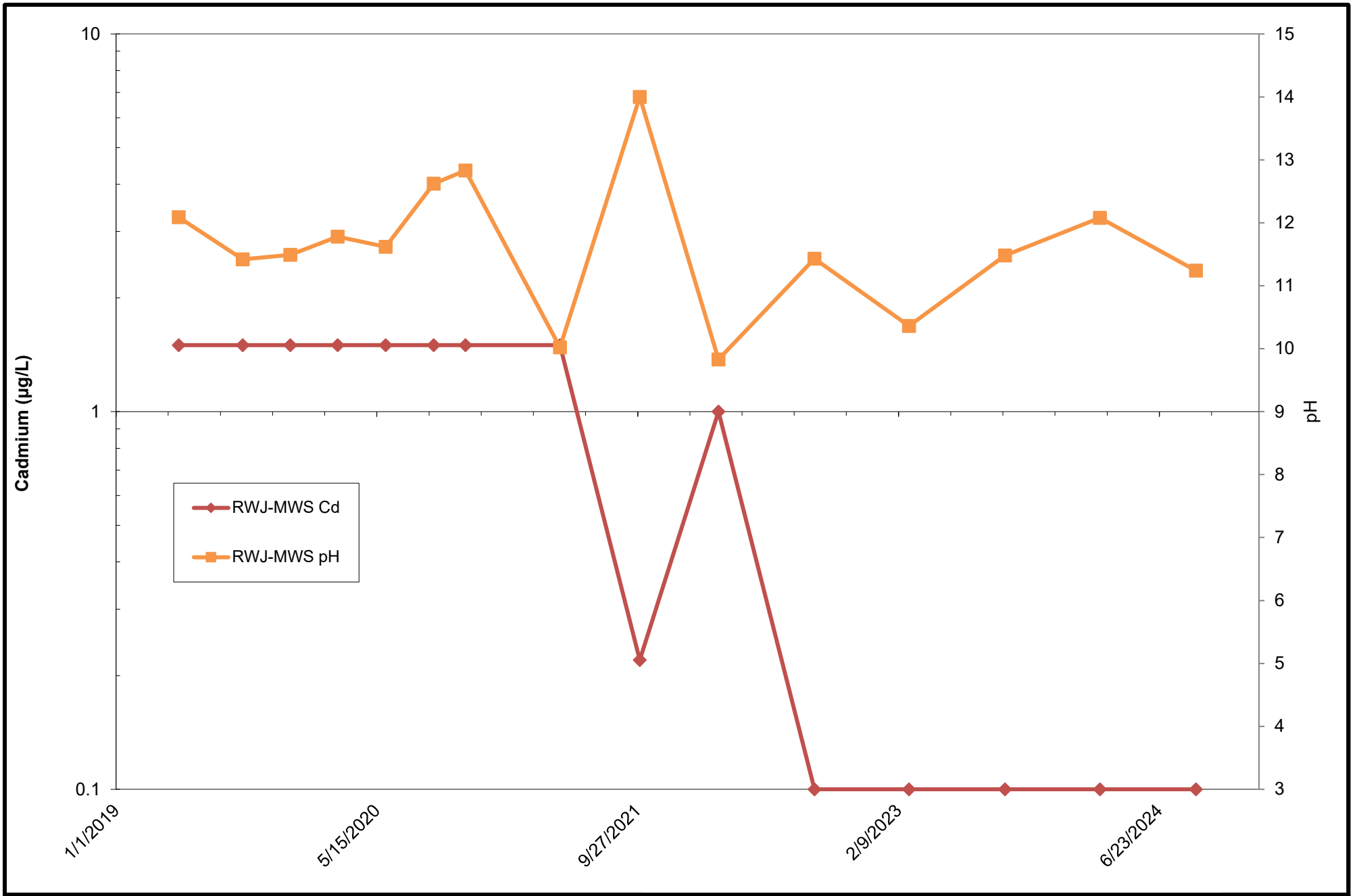
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RWI-MWS pH and Cadmium Concentrations

January 2025

**Appx B**




ARM Group LLC
Engineers and Scientists

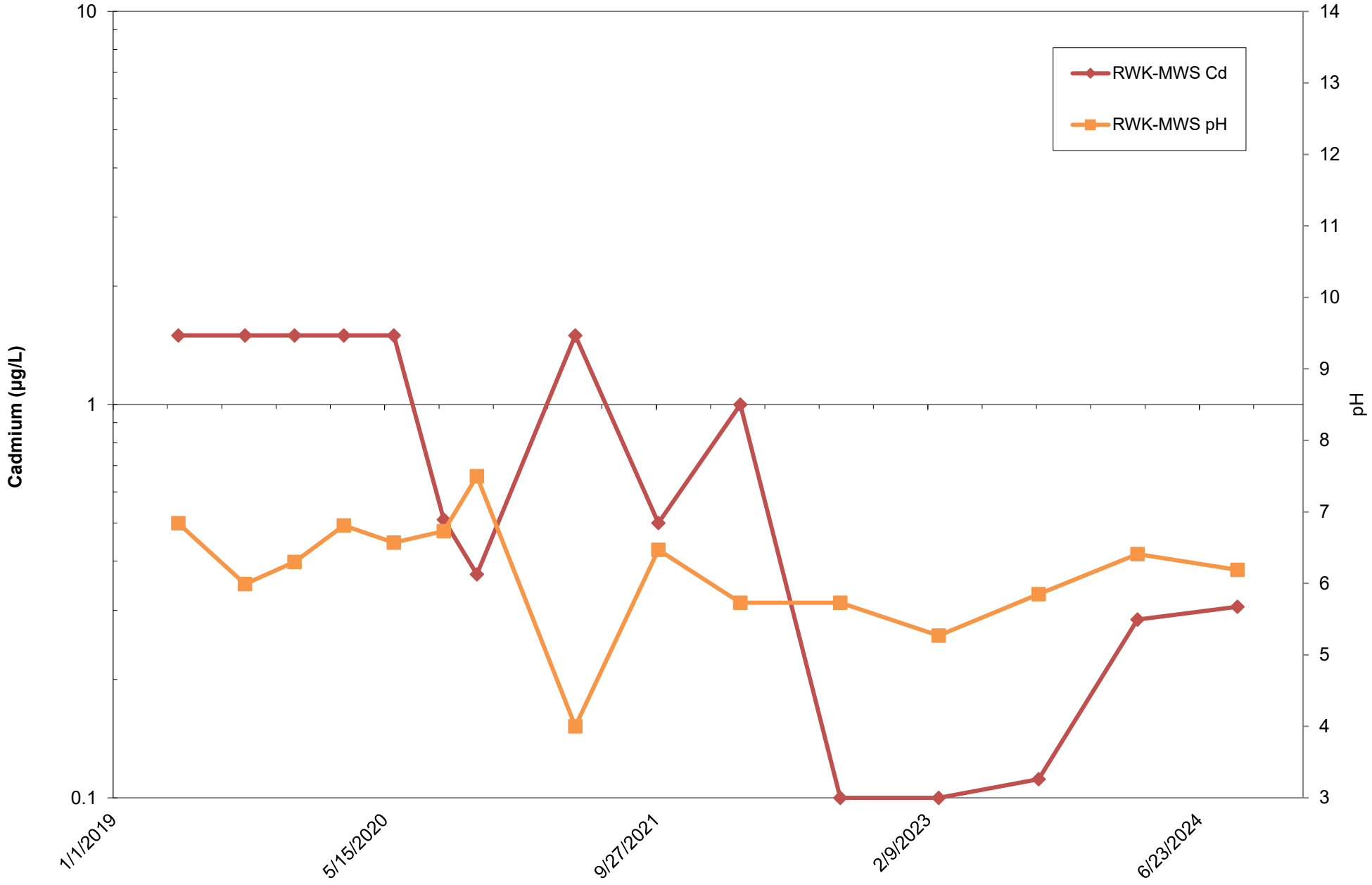
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RWJ-MWS pH and Cadmium Concentrations

January 2025

**Appx B**




ARM Group LLC
Engineers and Scientists

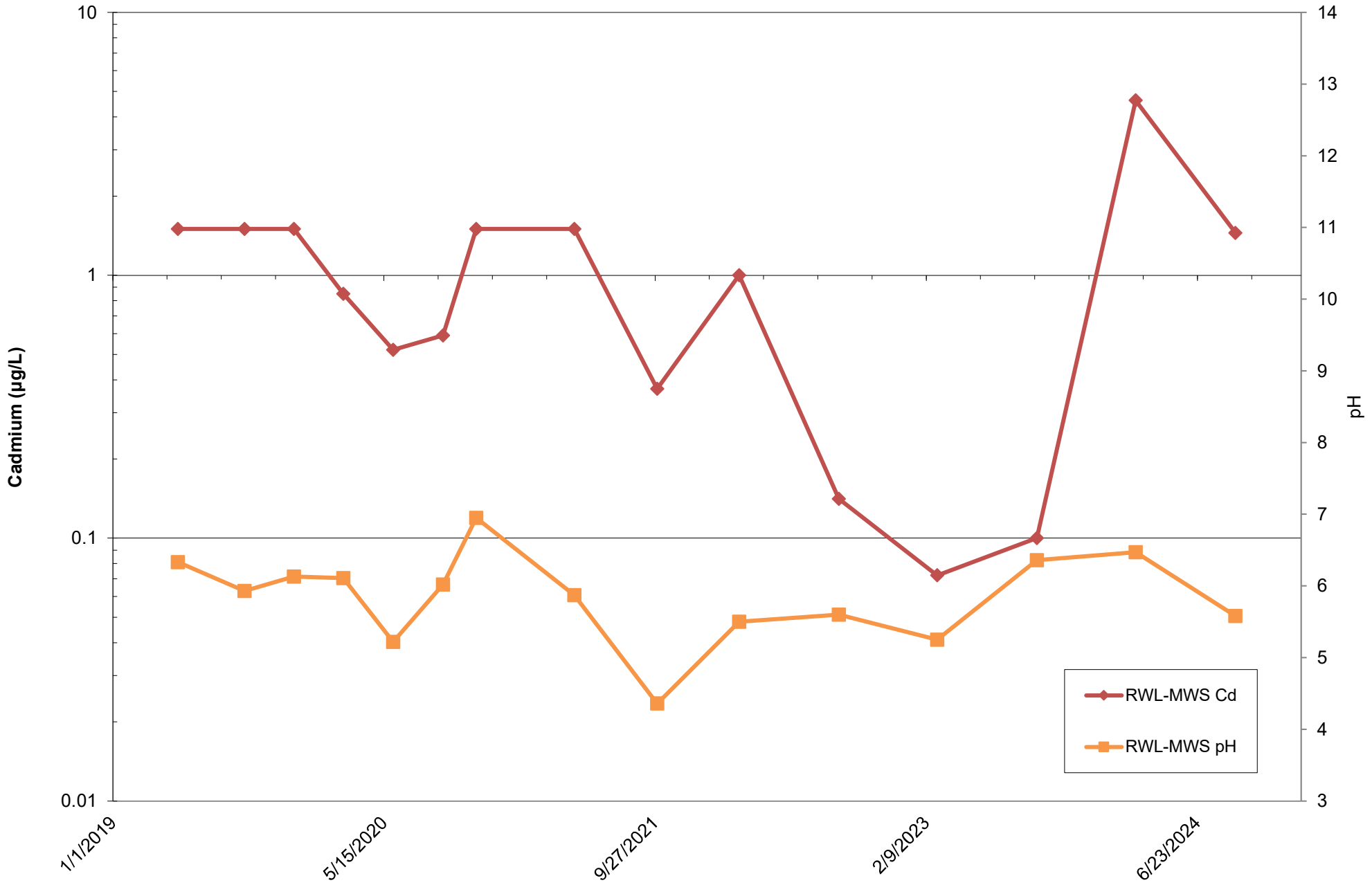
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RWK-MWS pH and Cadmium Concentrations

January 2025

**Appx B**




ARM Group LLC
Engineers and Scientists

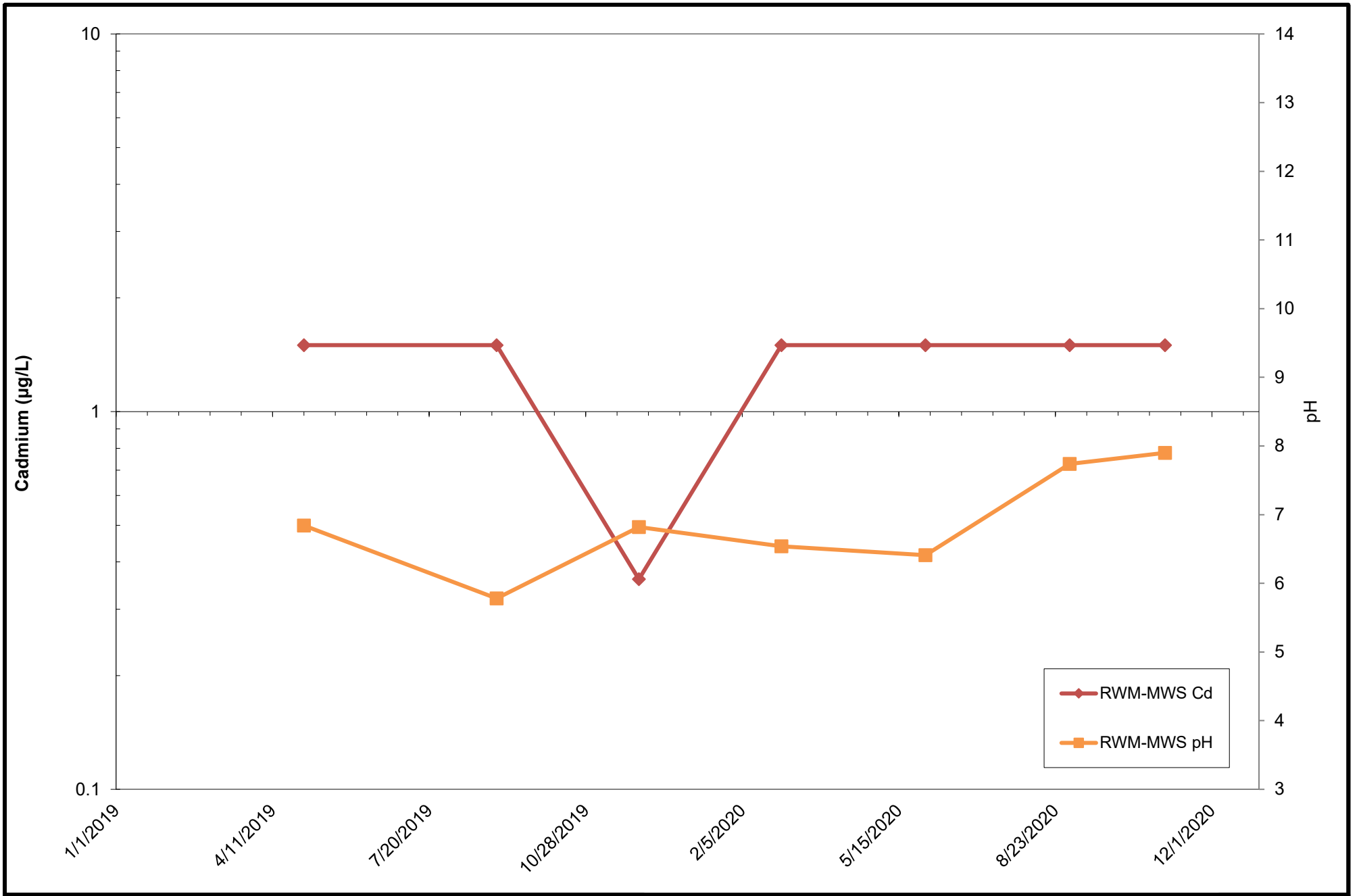
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RWL-MWS pH and Cadmium Concentrations

March 2025

**Appx B**




ARM Group LLC
Engineers and Scientists

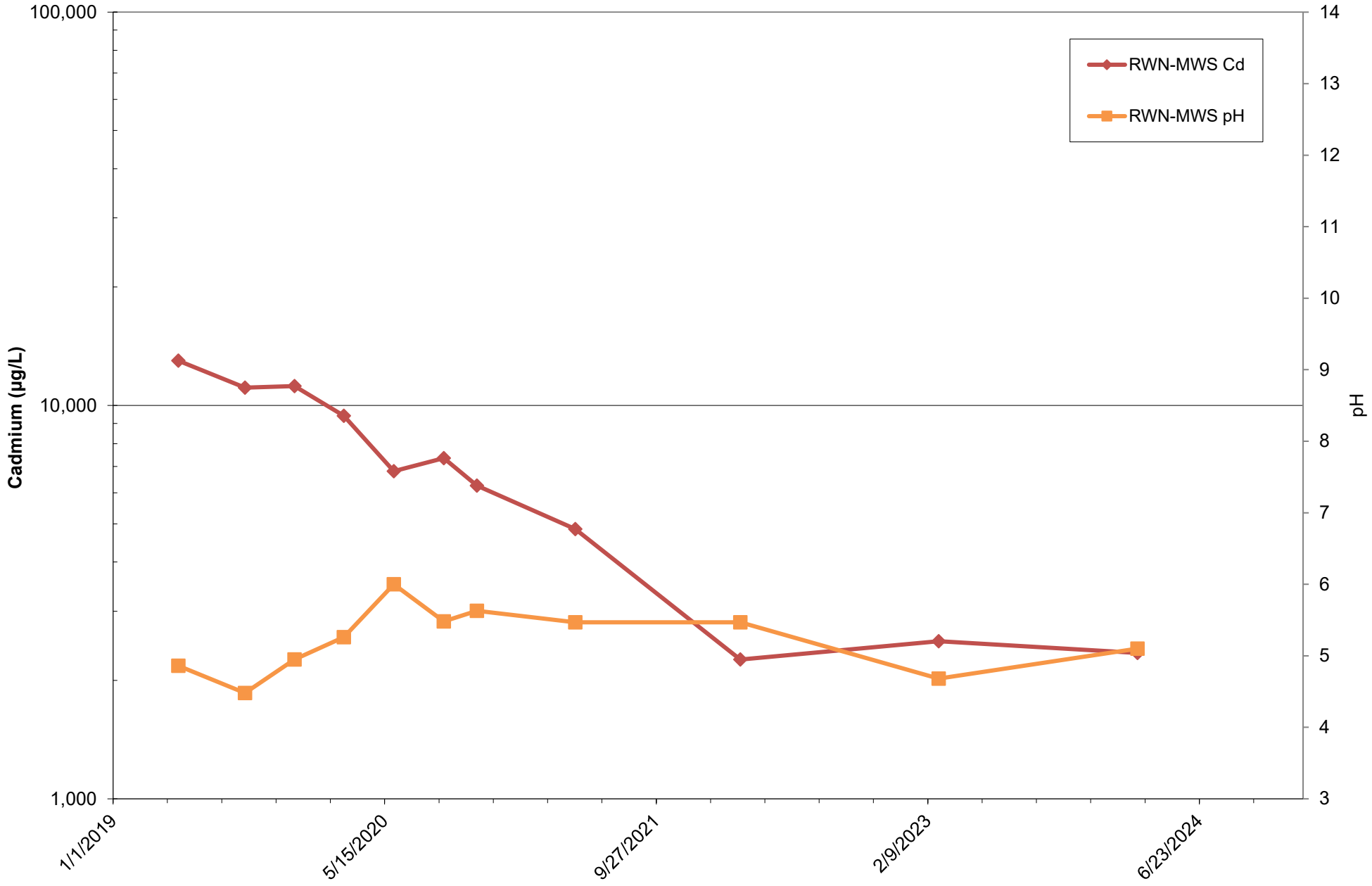
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RWM-MWS pH and Cadmium Concentrations

January 2025

**Appx B**




ARM Group LLC
Engineers and Scientists

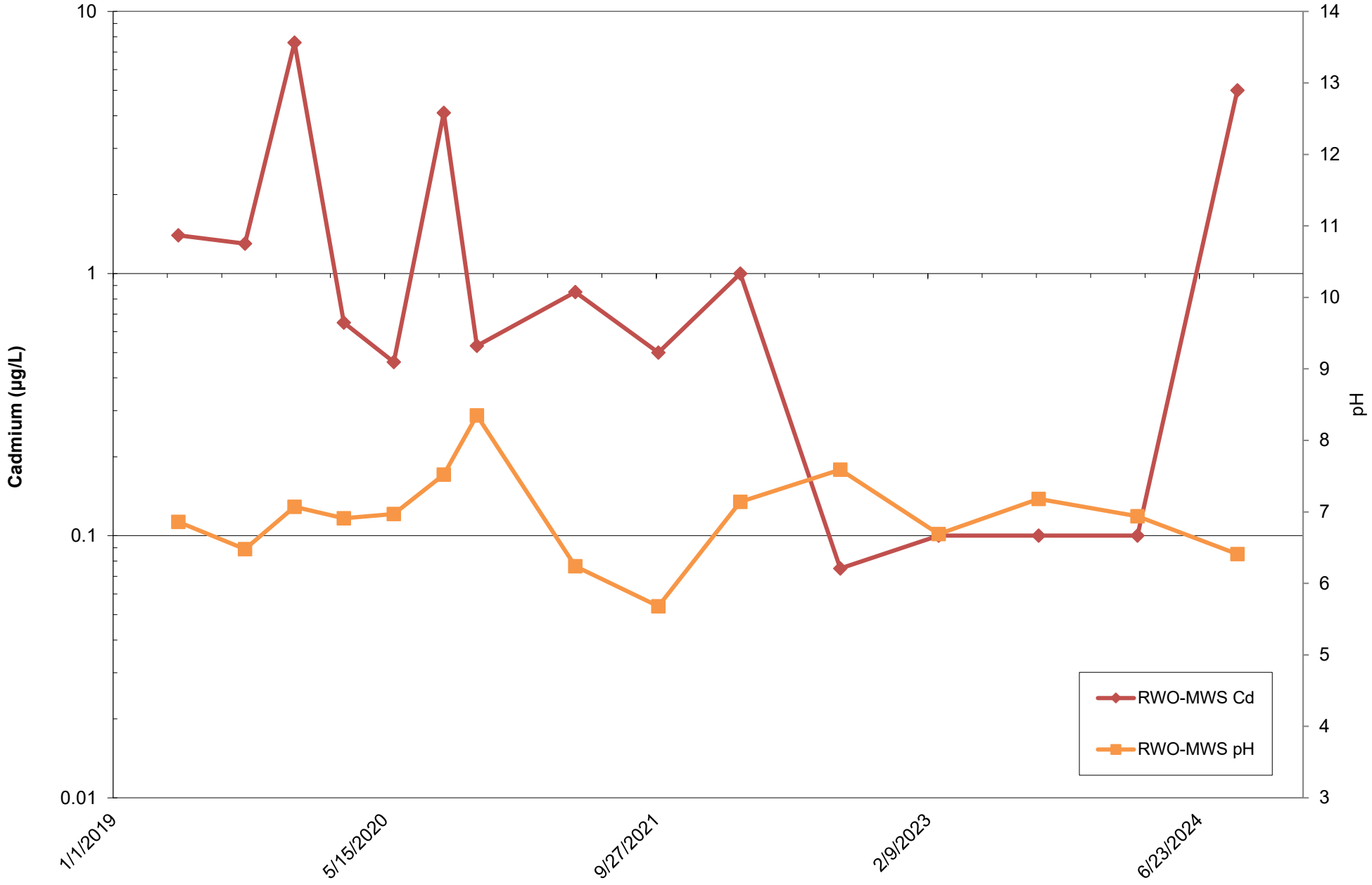
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RWN-MWS pH and Cadmium Concentrations

January 2025

**Appx B**




ARM Group LLC
Engineers and Scientists

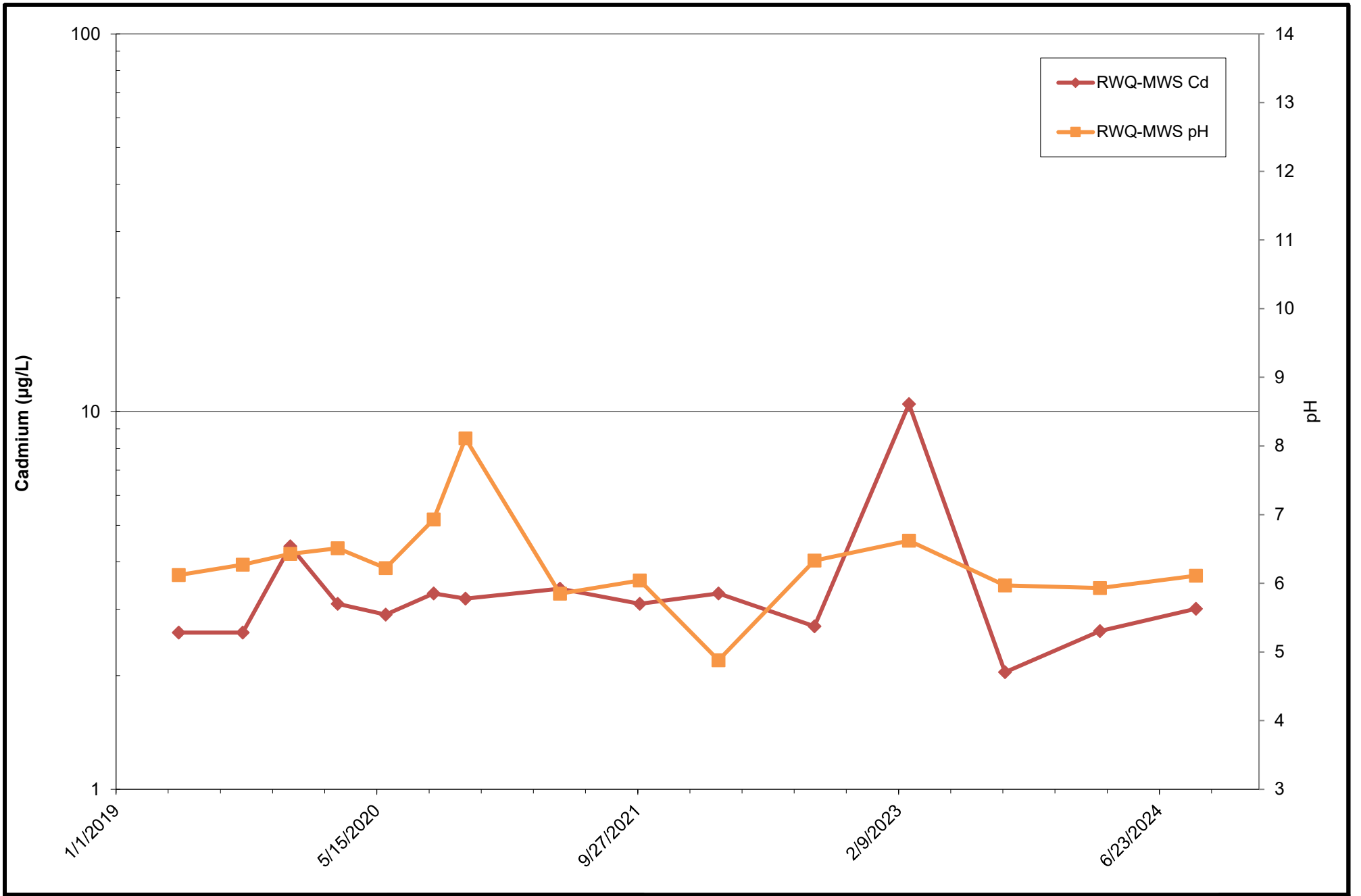
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RWO-MWS pH and Cadmium Concentrations

January 2025

**Appx B**




ARM Group LLC
Engineers and Scientists

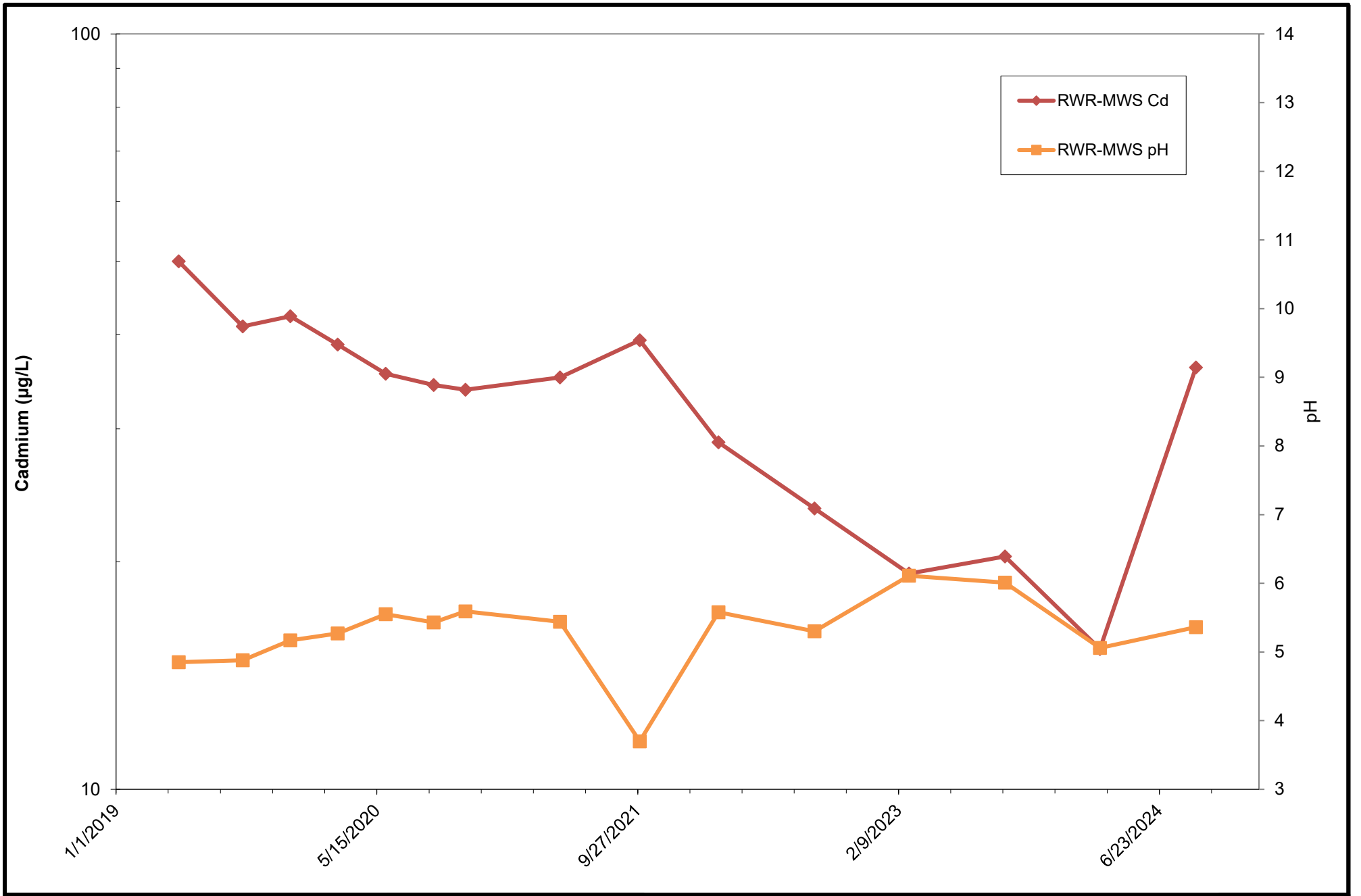
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RWQ-MWS pH and Cadmium Concentrations

January 2025

**Appx B**




ARM Group LLC
Engineers and Scientists

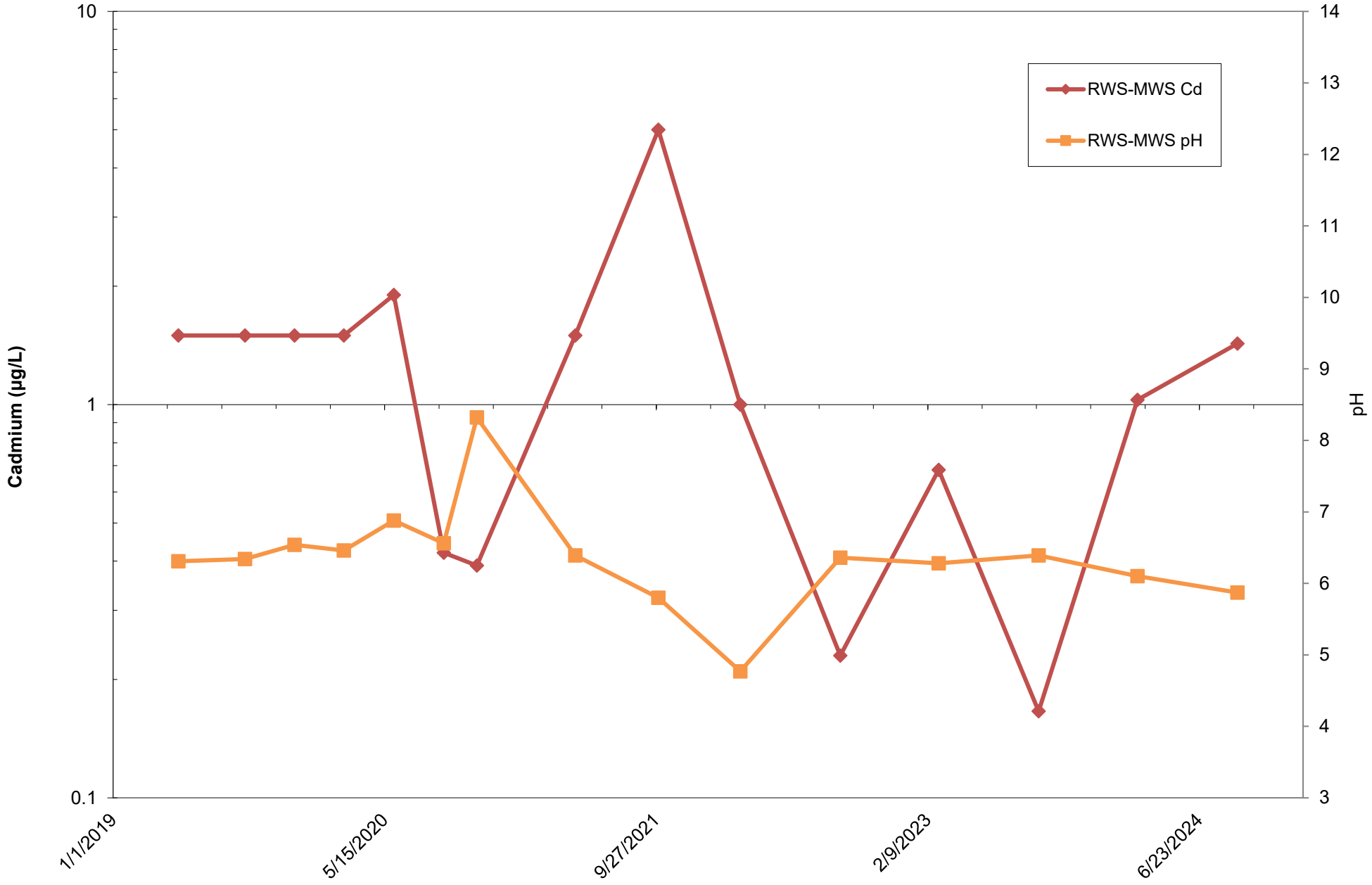
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RWR-MWS pH and Cadmium Concentrations

January 2025

**Appx B**




ARM Group LLC
Engineers and Scientists

Rod and Wire Mill
Tradepoint Atlantic

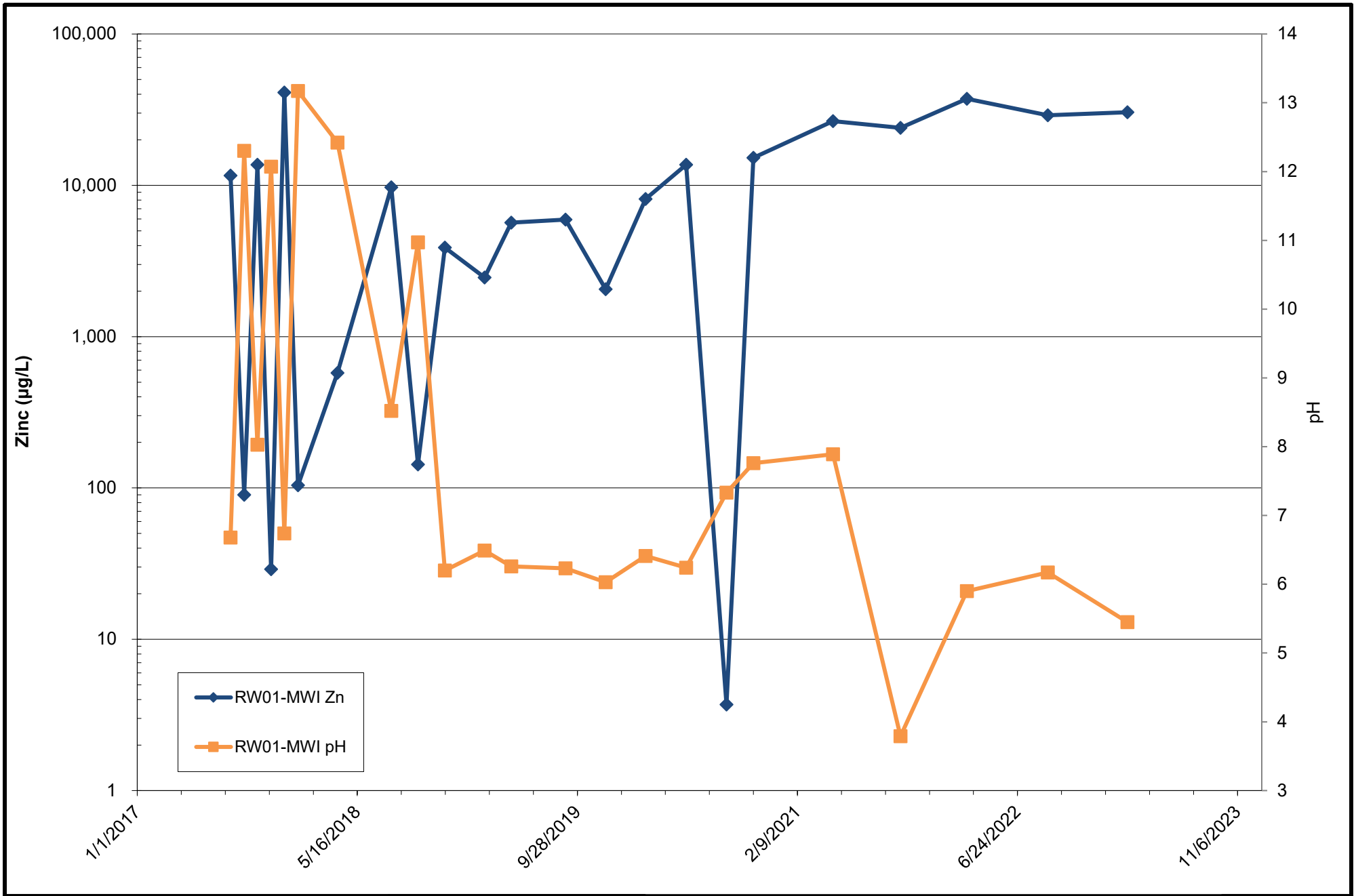
Sparrows Point, Maryland

# RWS-MWS pH and Cadmium Concentrations

January 2025

**Appx B**

# APPENDIX C




ARM Group LLC
Engineers and Scientists

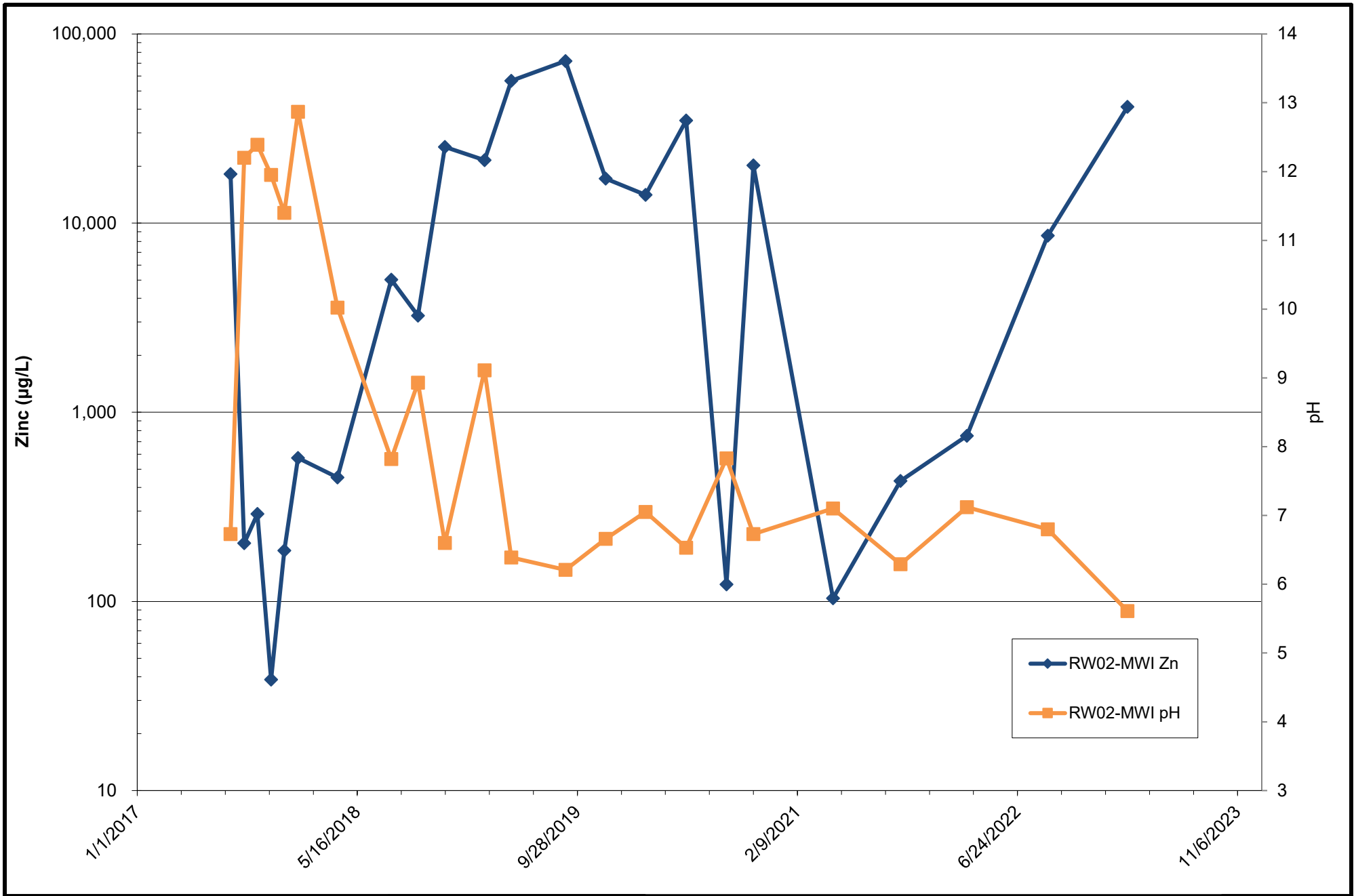
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RW01-MWI pH and Zinc Concentrations

January 2025

**Appx C**




ARM Group LLC
Engineers and Scientists

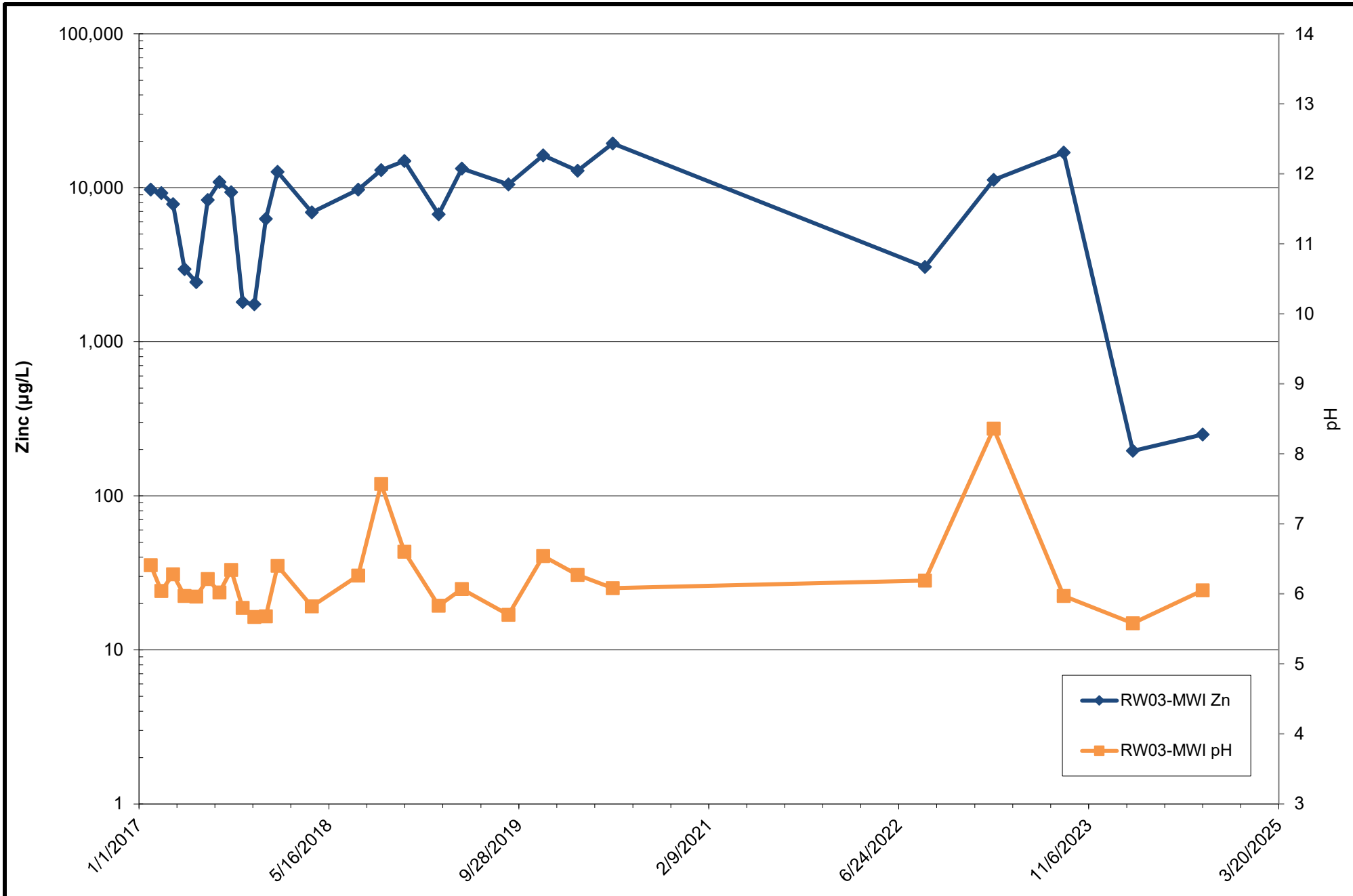
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RW02-MWI pH and Zinc Concentrations

January 2025

**Appx C**




ARM Group LLC
Engineers and Scientists

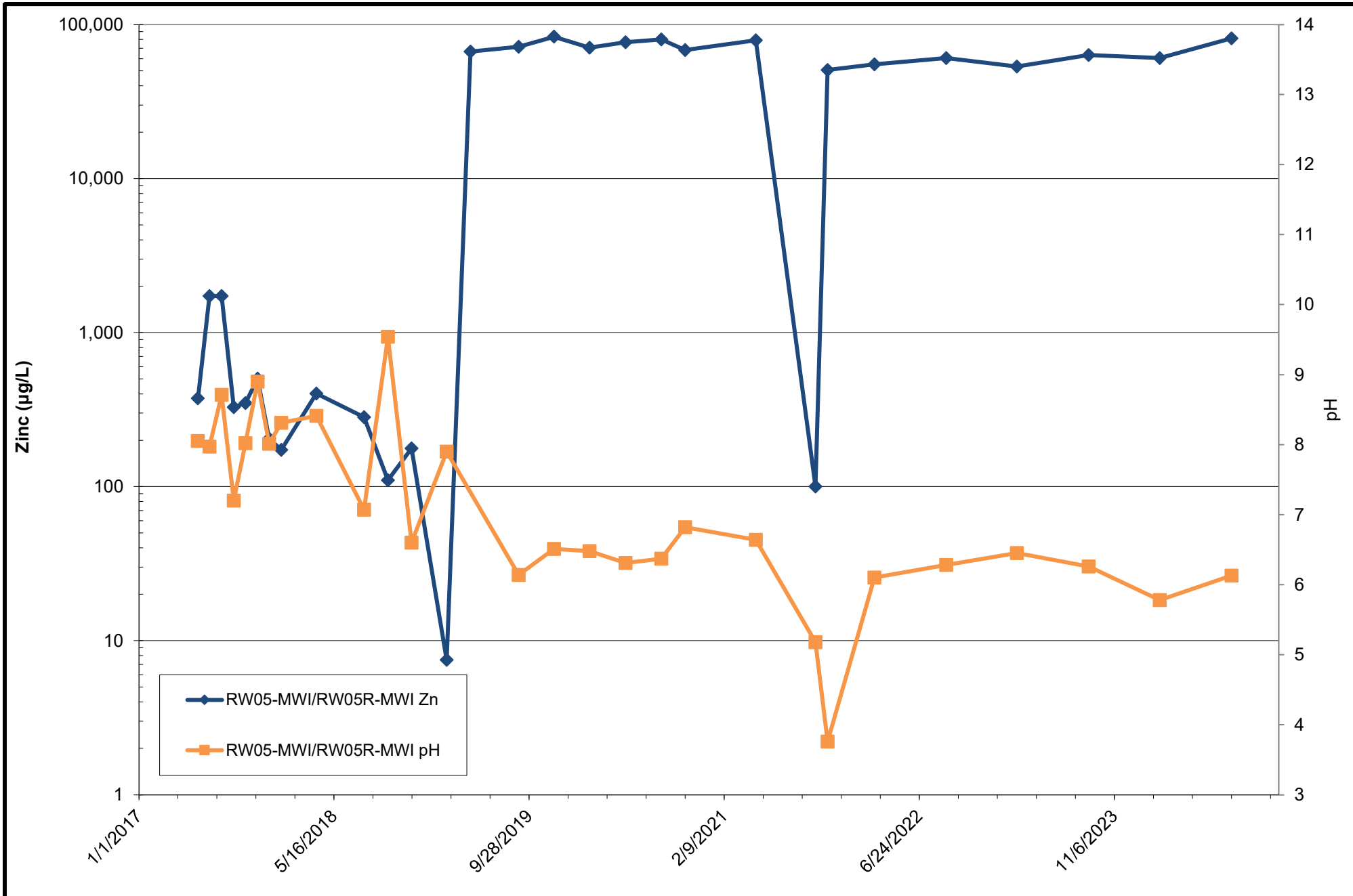
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RW03-MWI/RW03R-MWI pH and Zinc Concentrations

January 2025

**Appx C**




ARM Group LLC
Engineers and Scientists

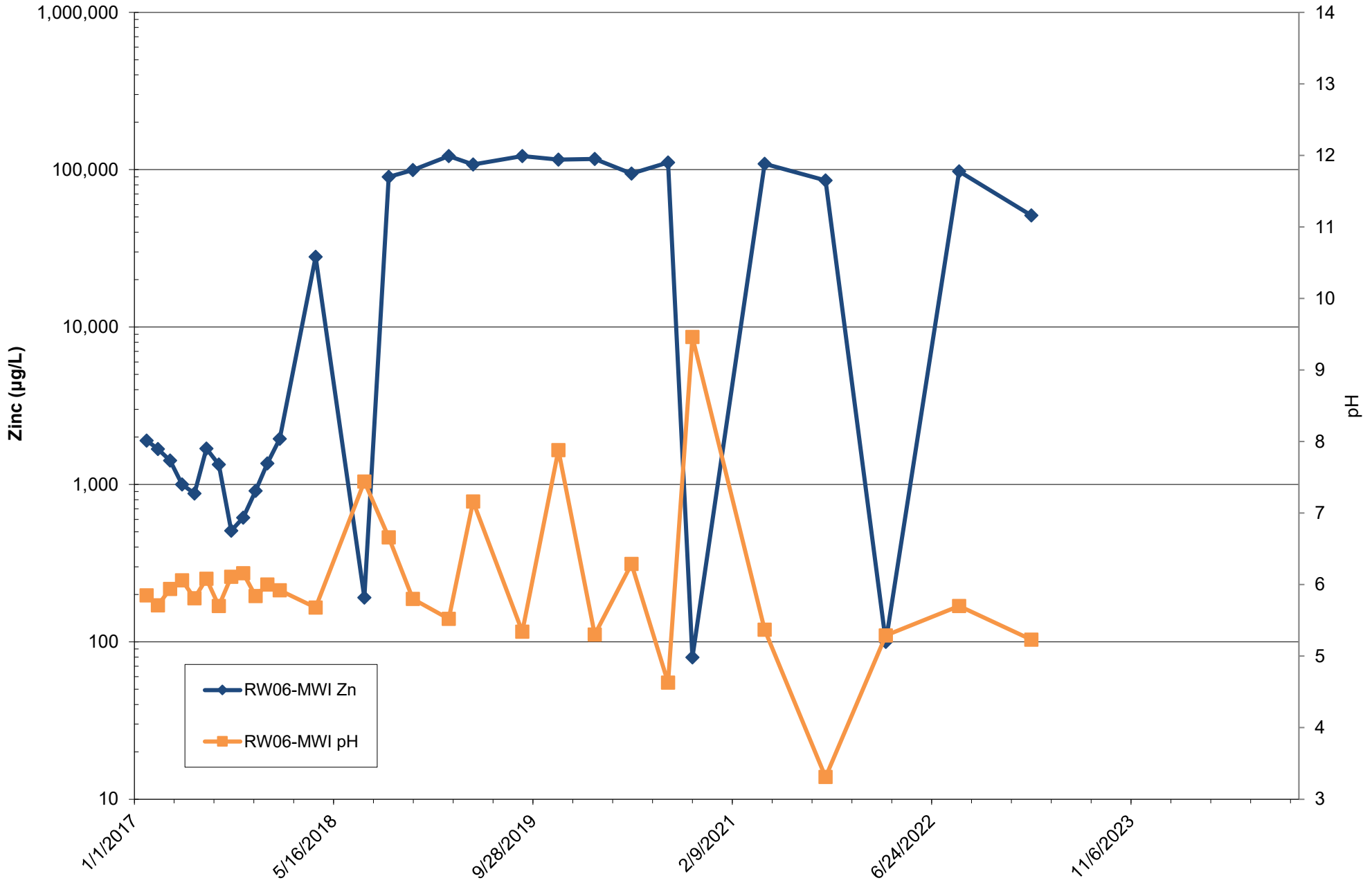
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RW05-MWI/RW05R-MWI pH and Zinc Concentrations

March 2025

**Appx C**




ARM Group LLC
Engineers and Scientists

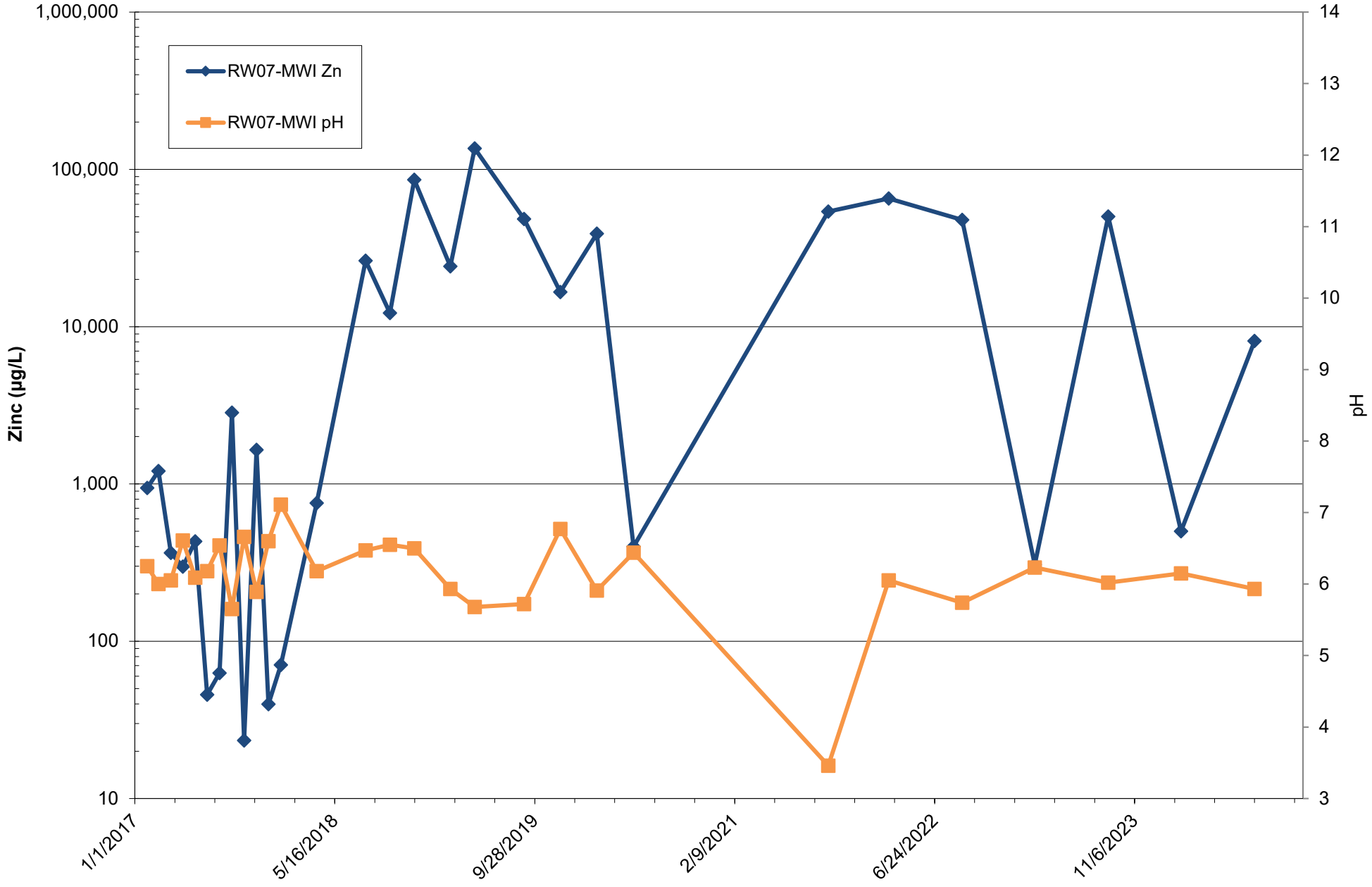
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RW06-MWI pH and Zinc Concentrations

March 2025

**Appx C**




ARM Group LLC
Engineers and Scientists

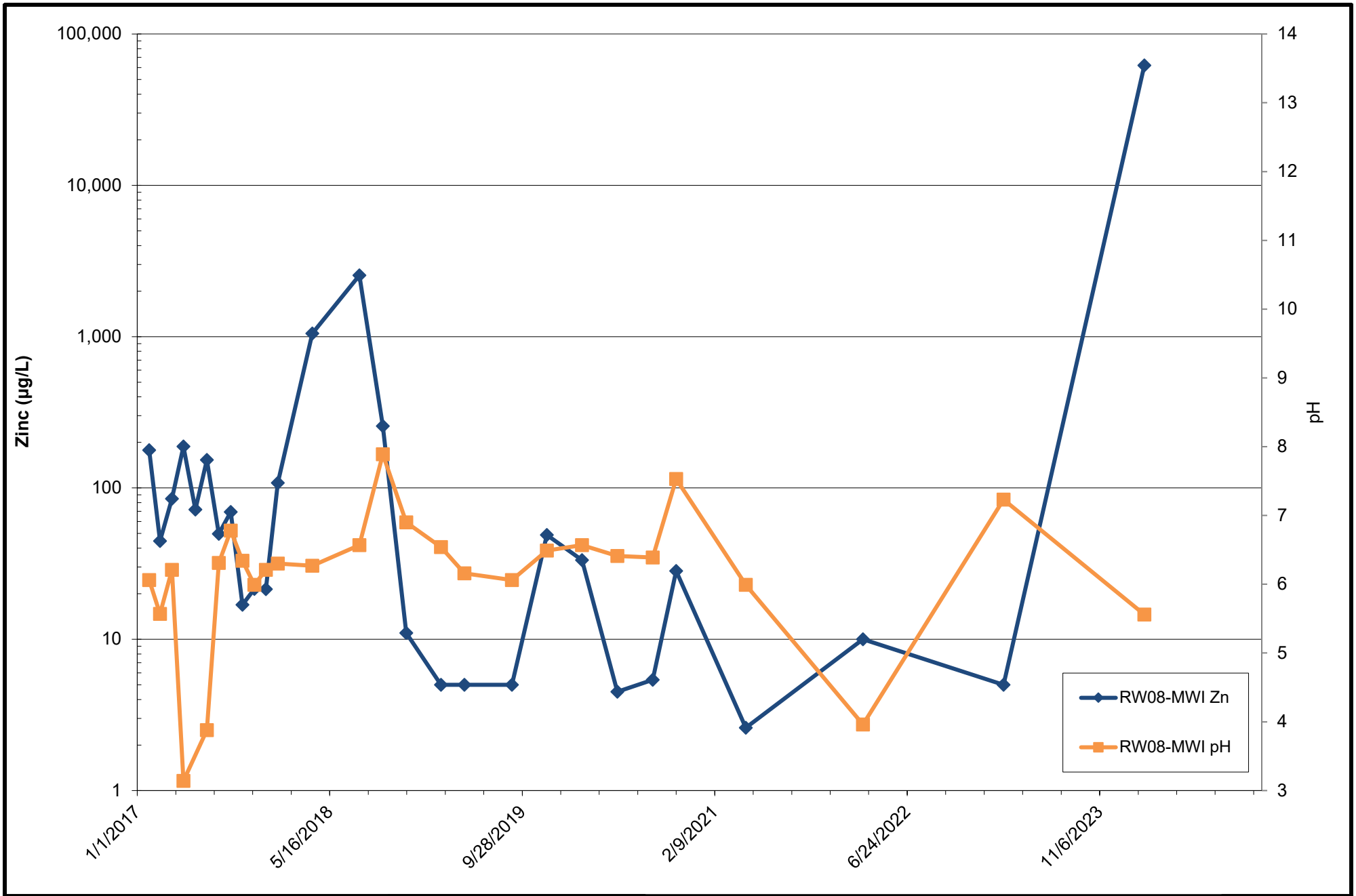
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RW07-MWI pH and Zinc Concentrations

January 2025

**Appx C**




ARM Group LLC
Engineers and Scientists

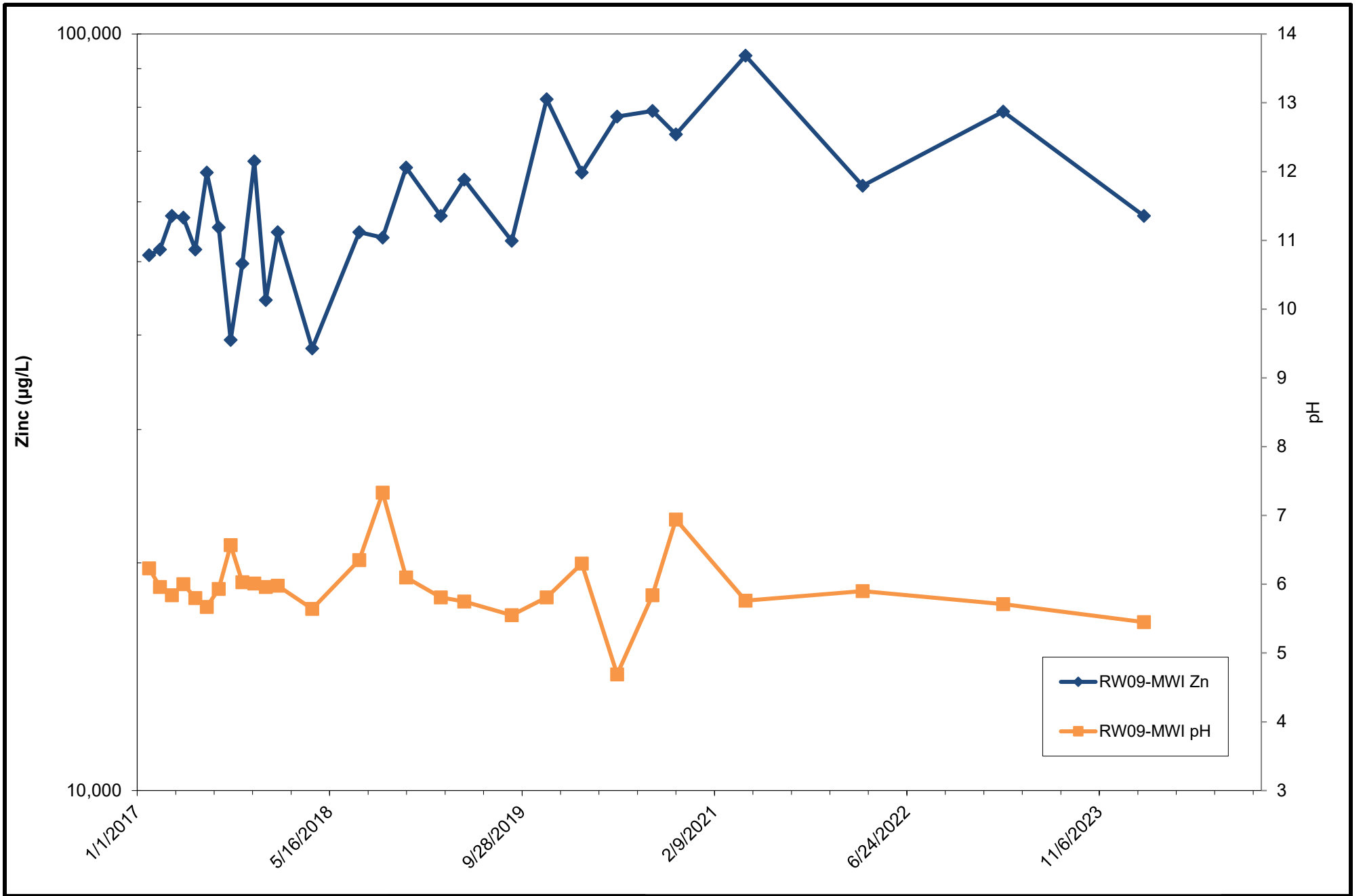
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RW08-MWI pH and Zinc Concentrations

January 2025

**Appx C**




ARM Group LLC
Engineers and Scientists

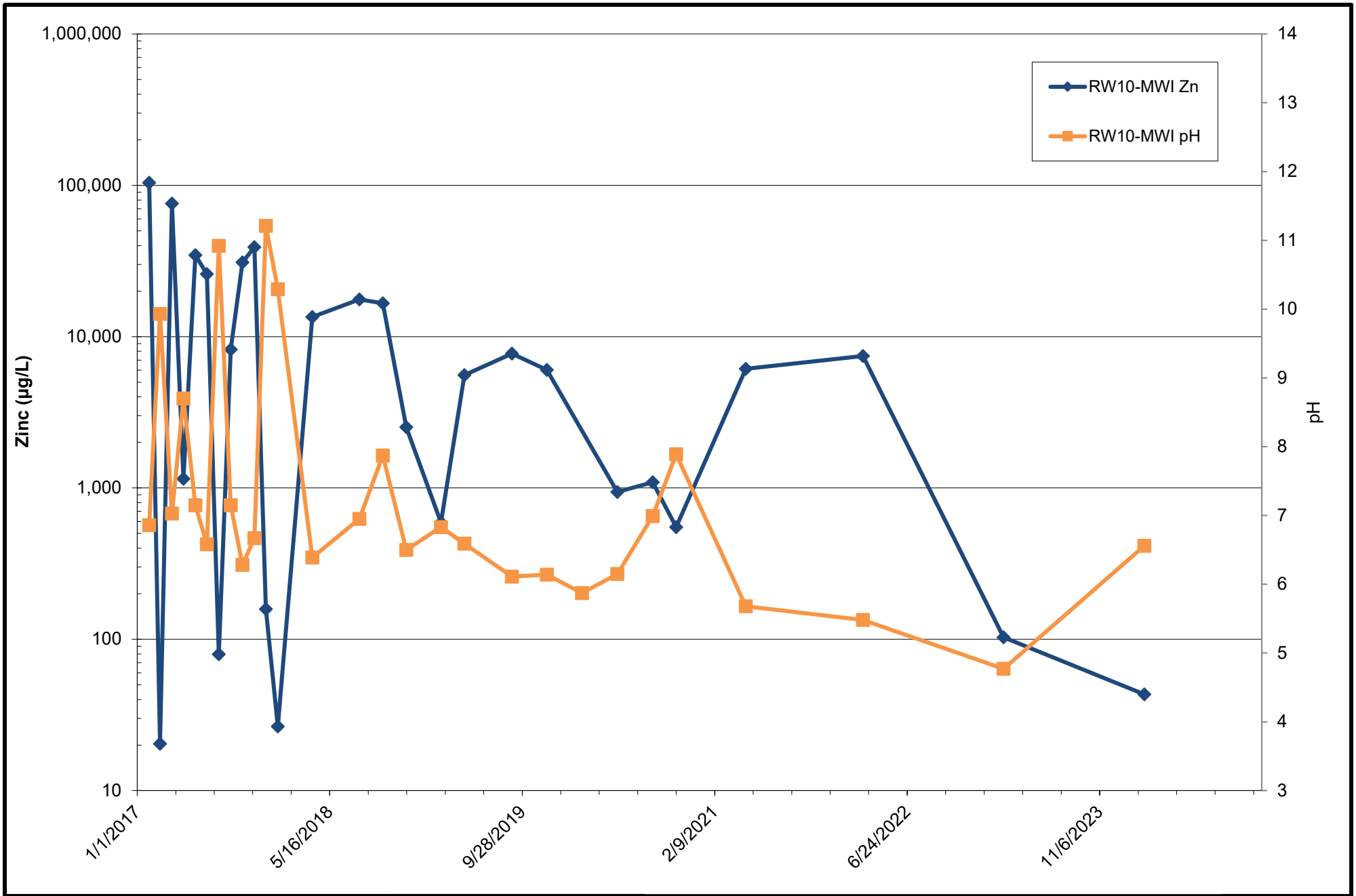
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RW09-MWI pH and Zinc Concentrations

January 2025

**Appx C**




ARM Group LLC
Engineers and Scientists

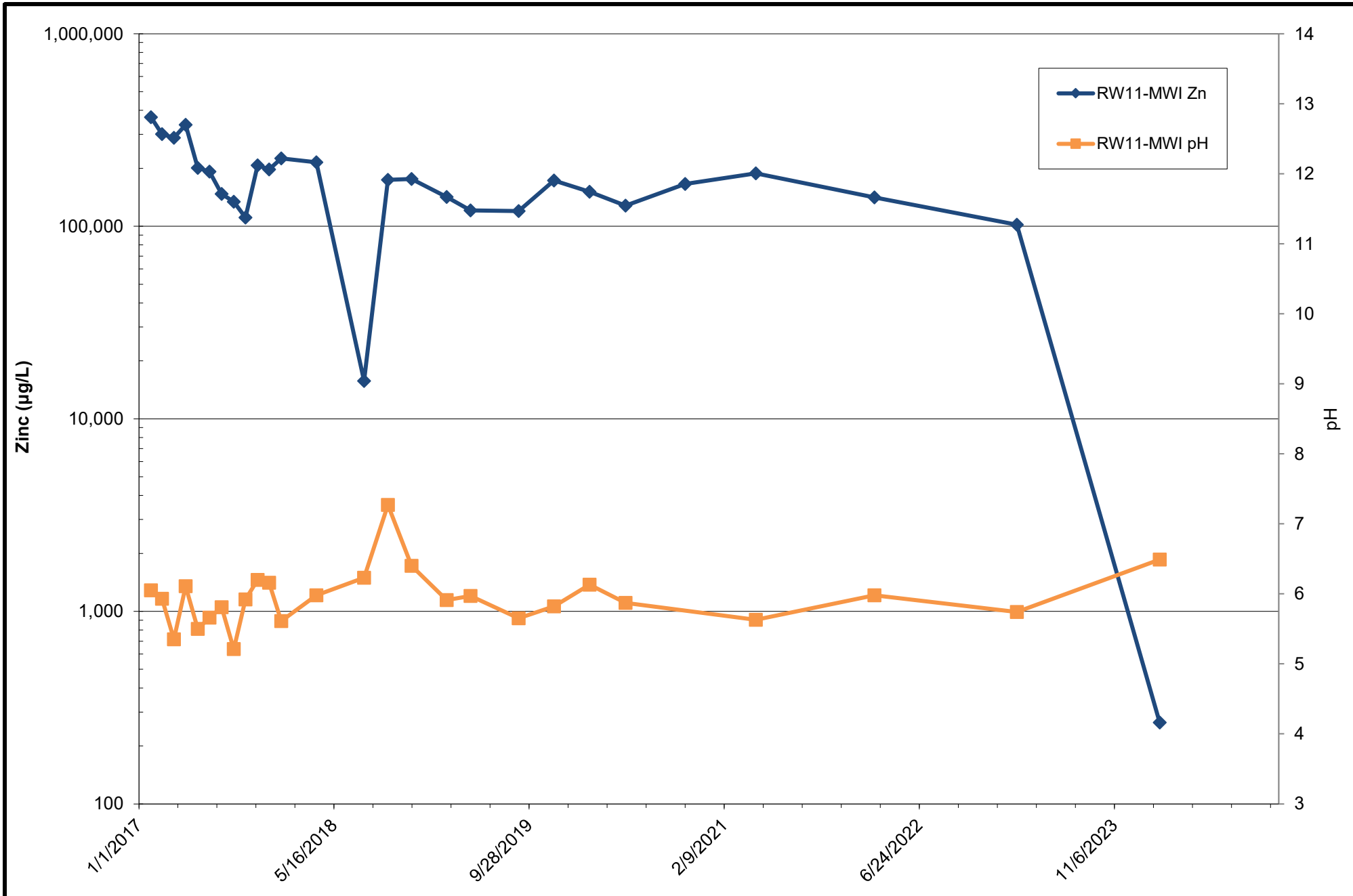
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RW10-MWI pH and Zinc Concentrations

January 2025

**Appx C**




ARM Group LLC
Engineers and Scientists

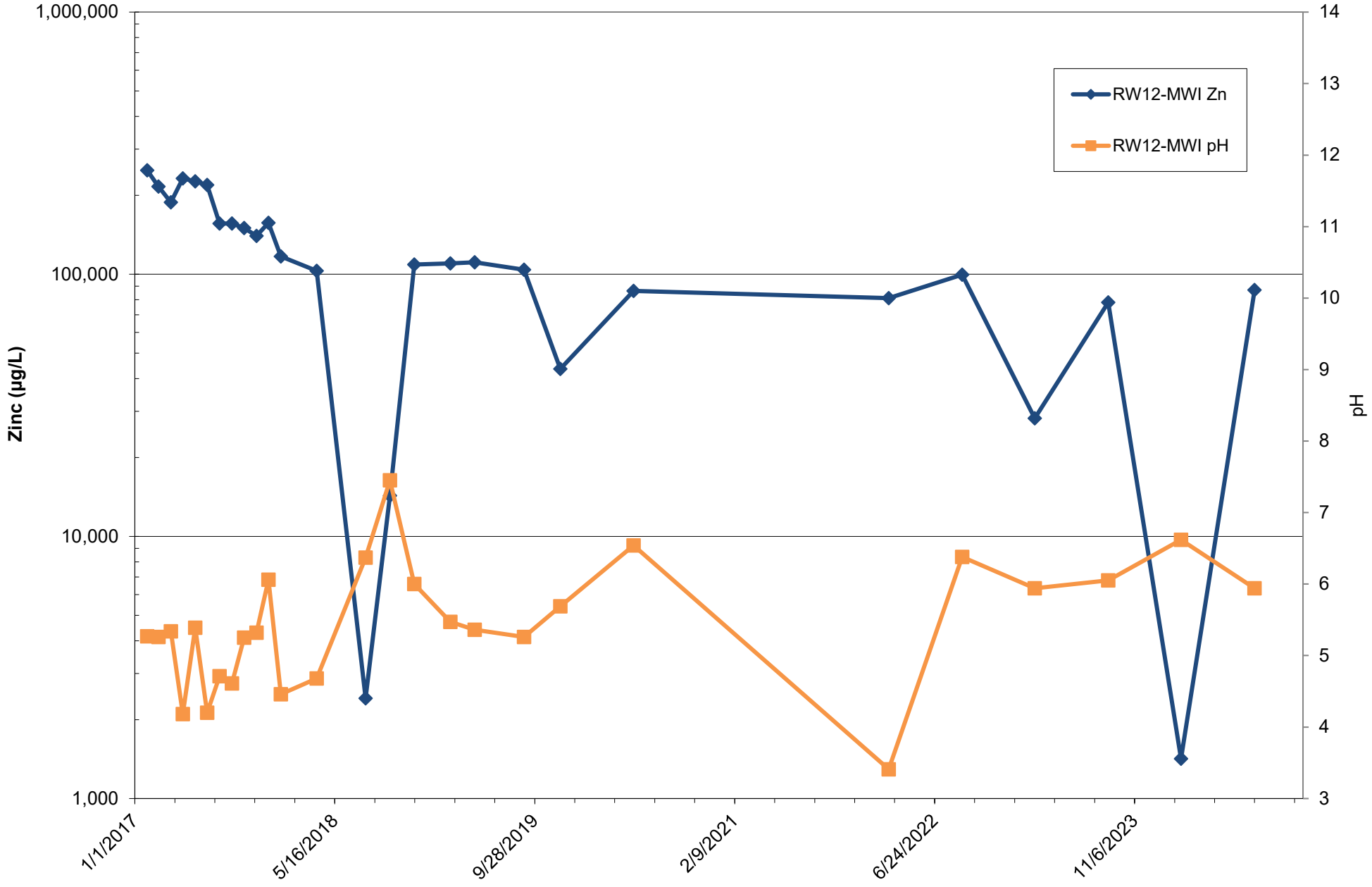
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RW11-MWI pH and Zinc Concentrations

March 2025

**Appx C**




ARM Group LLC
Engineers and Scientists

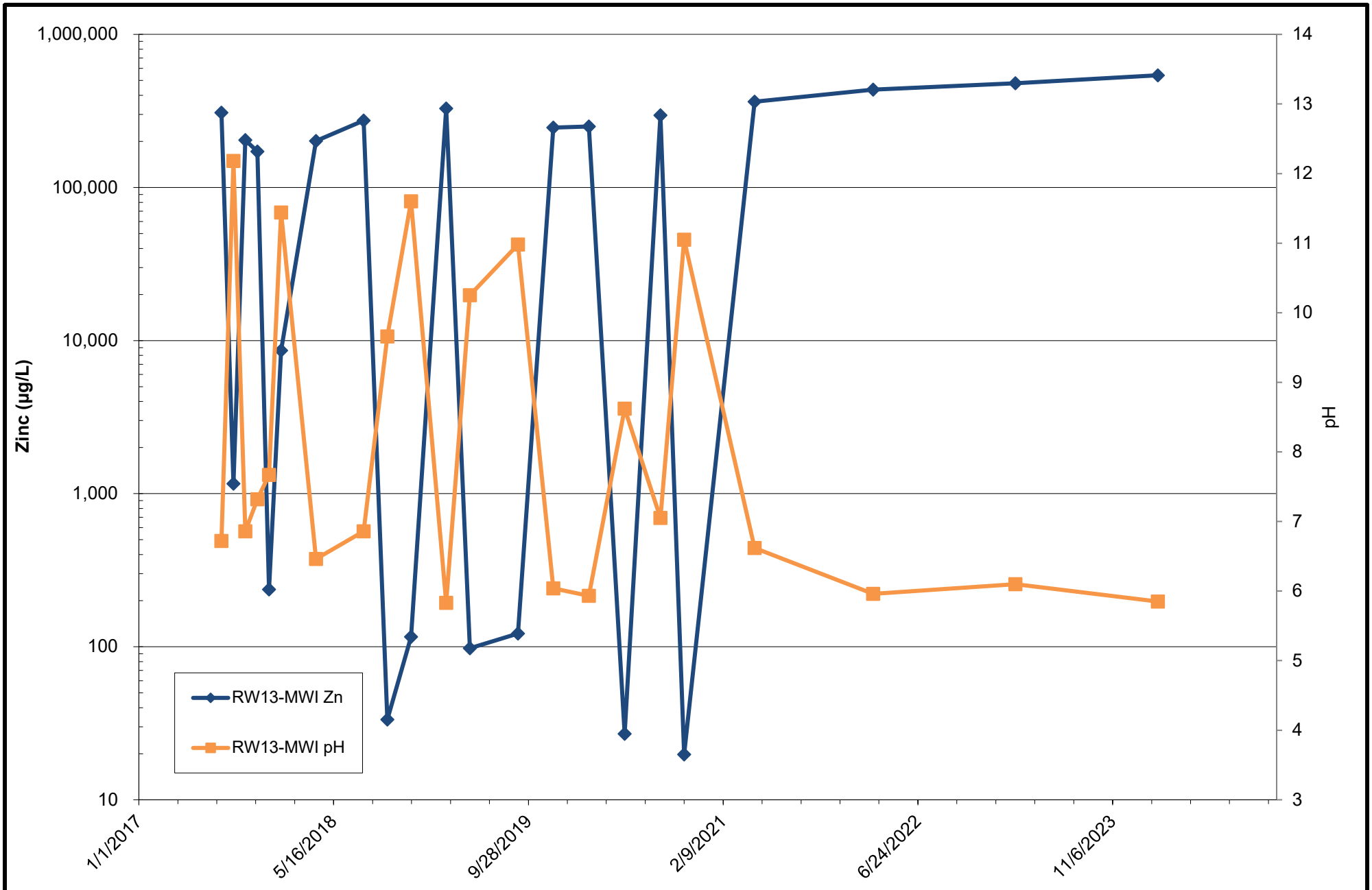
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RW12-MWI pH and Zinc Concentrations

January 2025

**Appx C**




ARM Group LLC
Engineers and Scientists

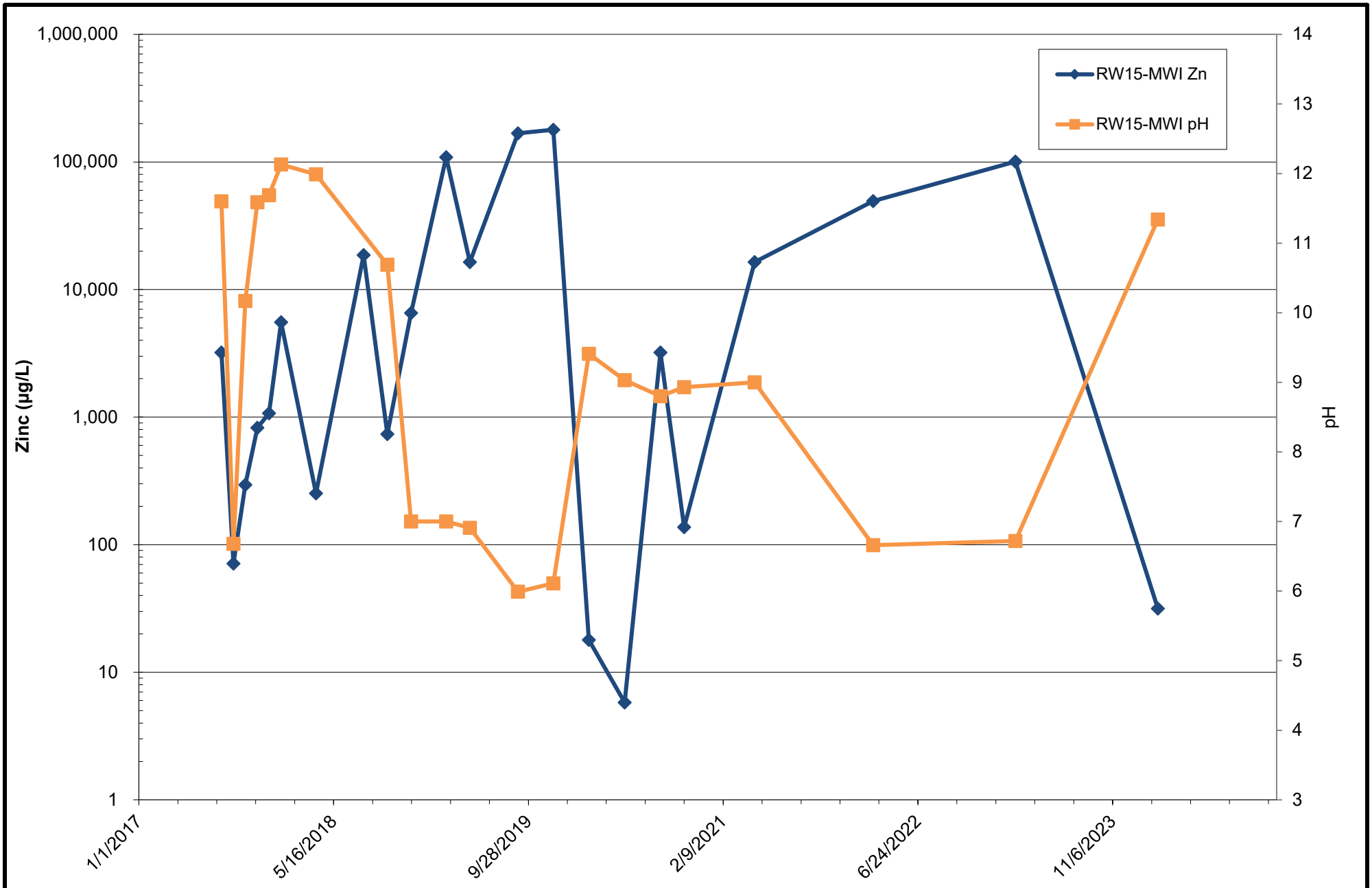
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RW13-MWI pH and Zinc Concentrations

January 2025

**Appx C**




ARM Group LLC
Engineers and Scientists

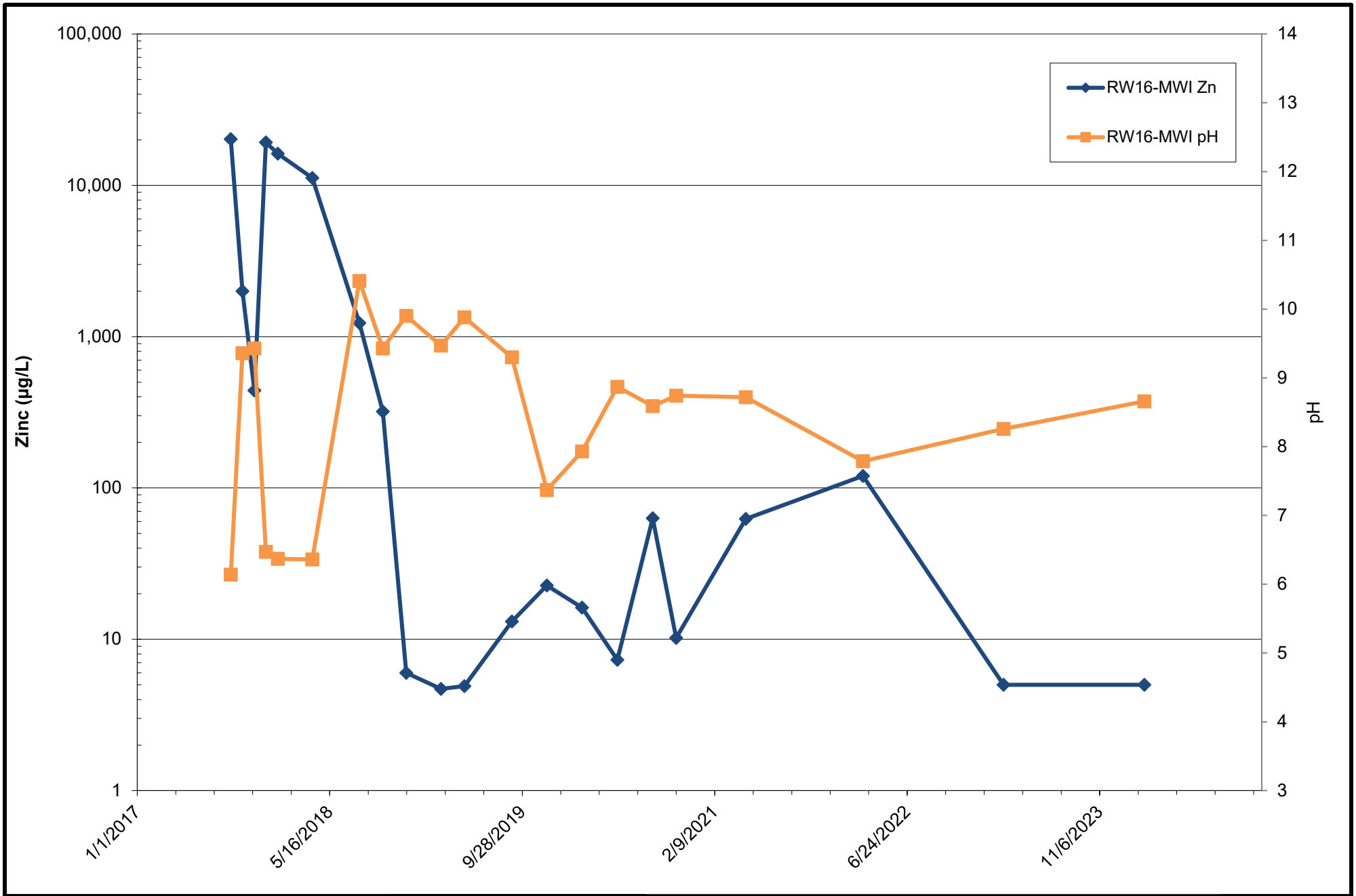
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RW15-MWI pH and Zinc Concentrations

January 2025

**Appx C**




ARM Group LLC
Engineers and Scientists

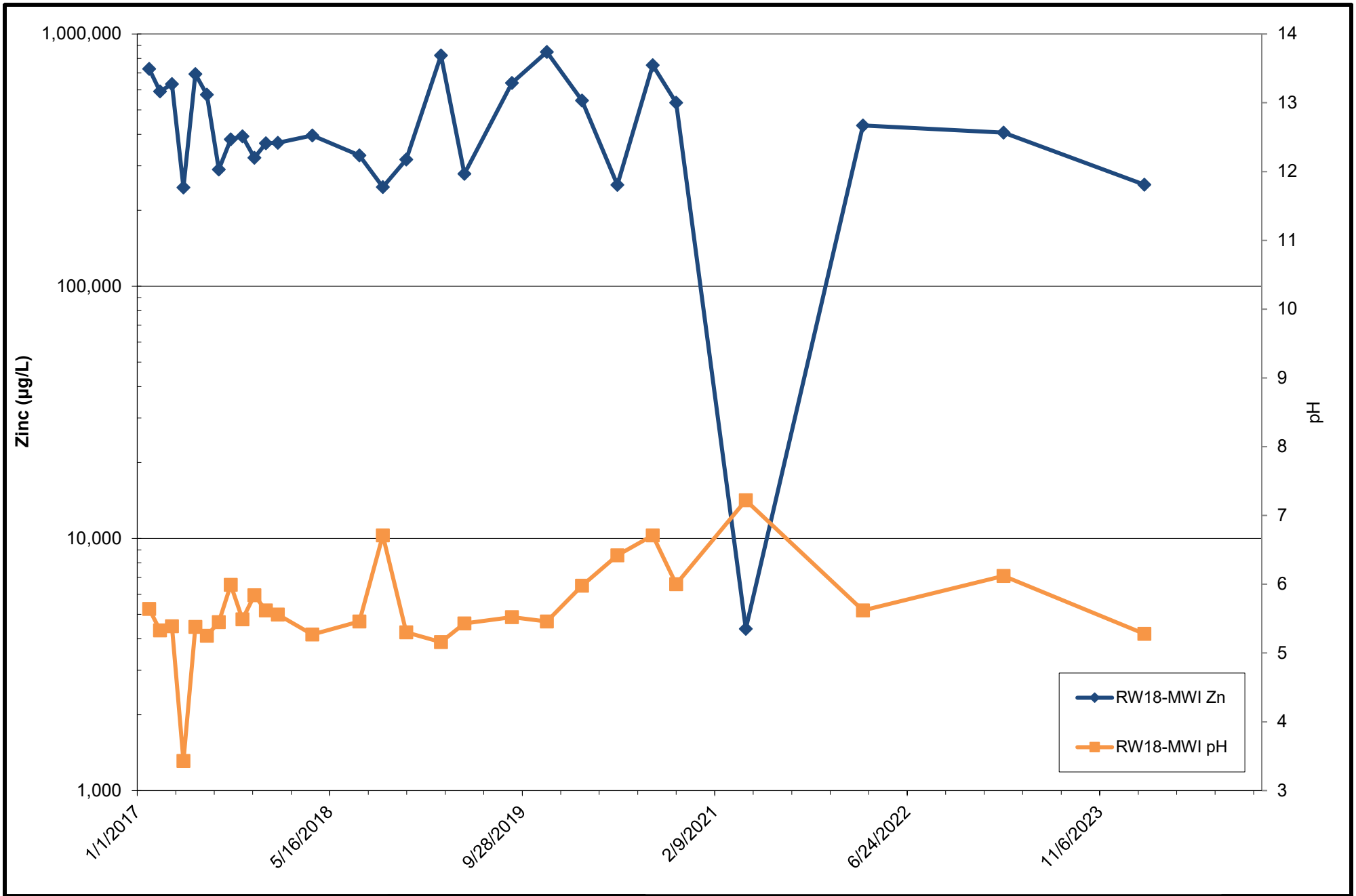
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RW16-MWI pH and Zinc Concentrations

January 2025

**Appx C**




ARM Group LLC
Engineers and Scientists

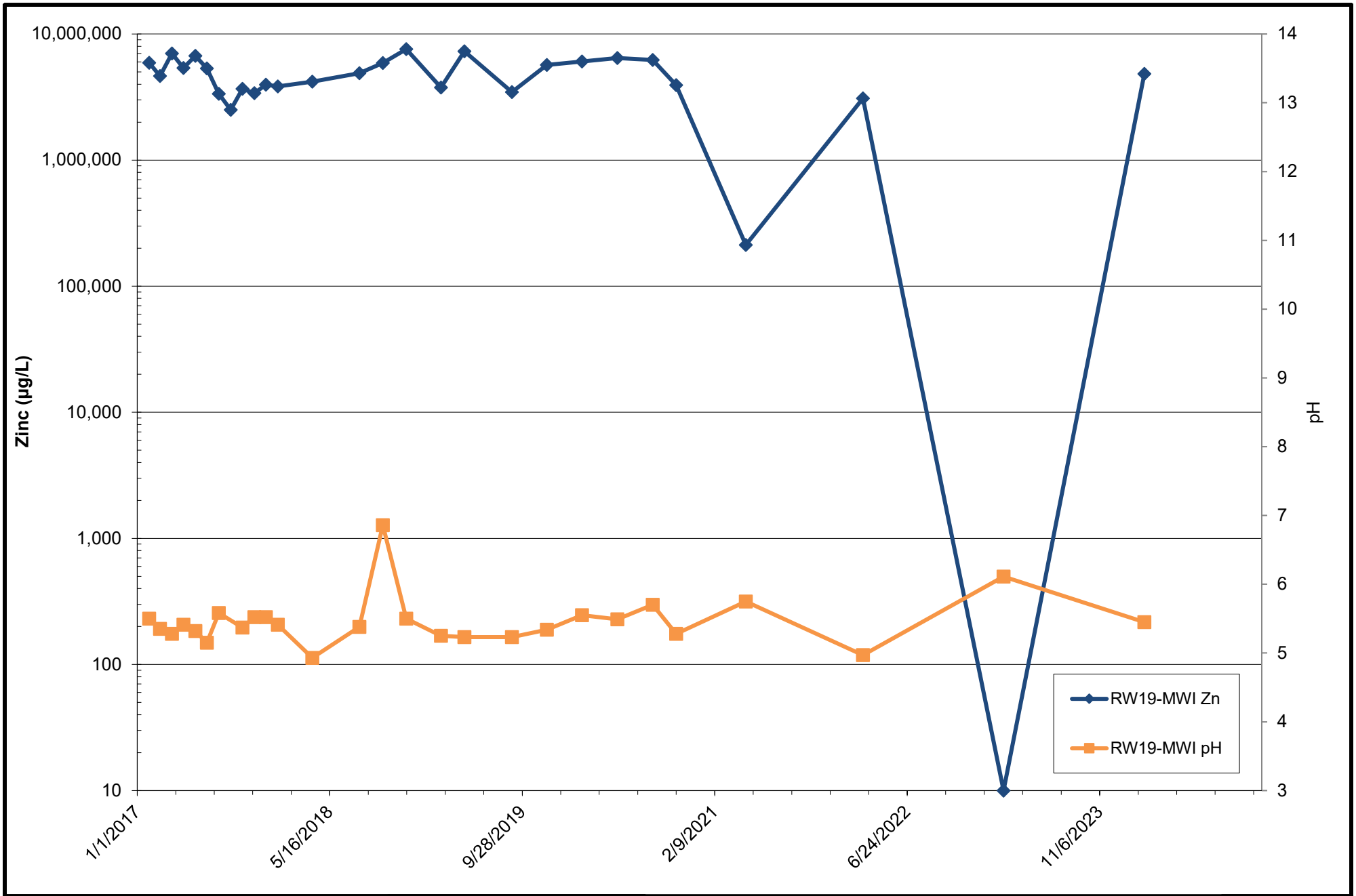
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RW18-MWI pH and Zinc Concentrations

January 2025

**Appx C**




ARM Group LLC
Engineers and Scientists

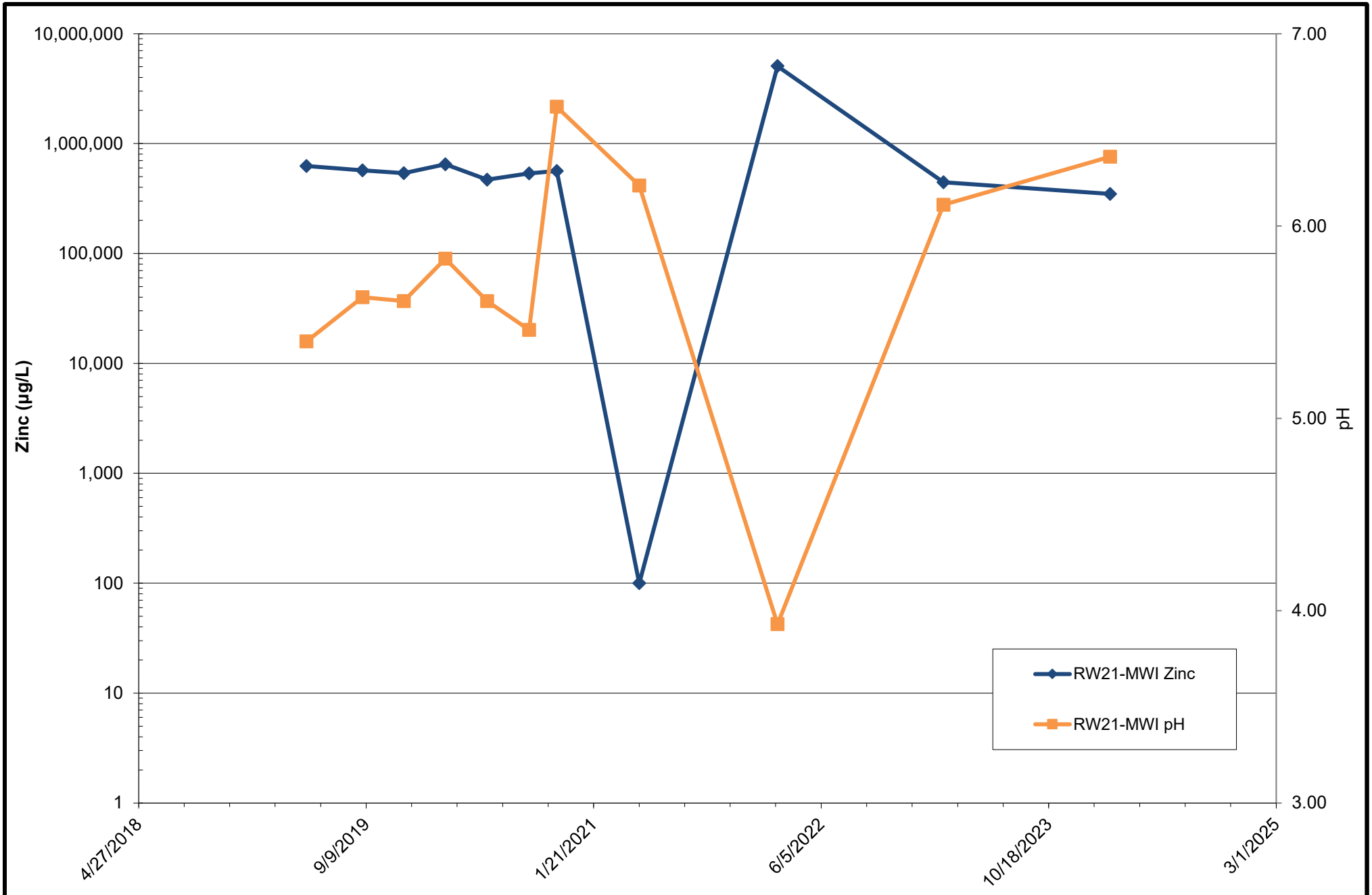
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RW19-MWI pH and Zinc Concentrations

January 2025

**Appx C**




ARM Group LLC
Engineers and Scientists

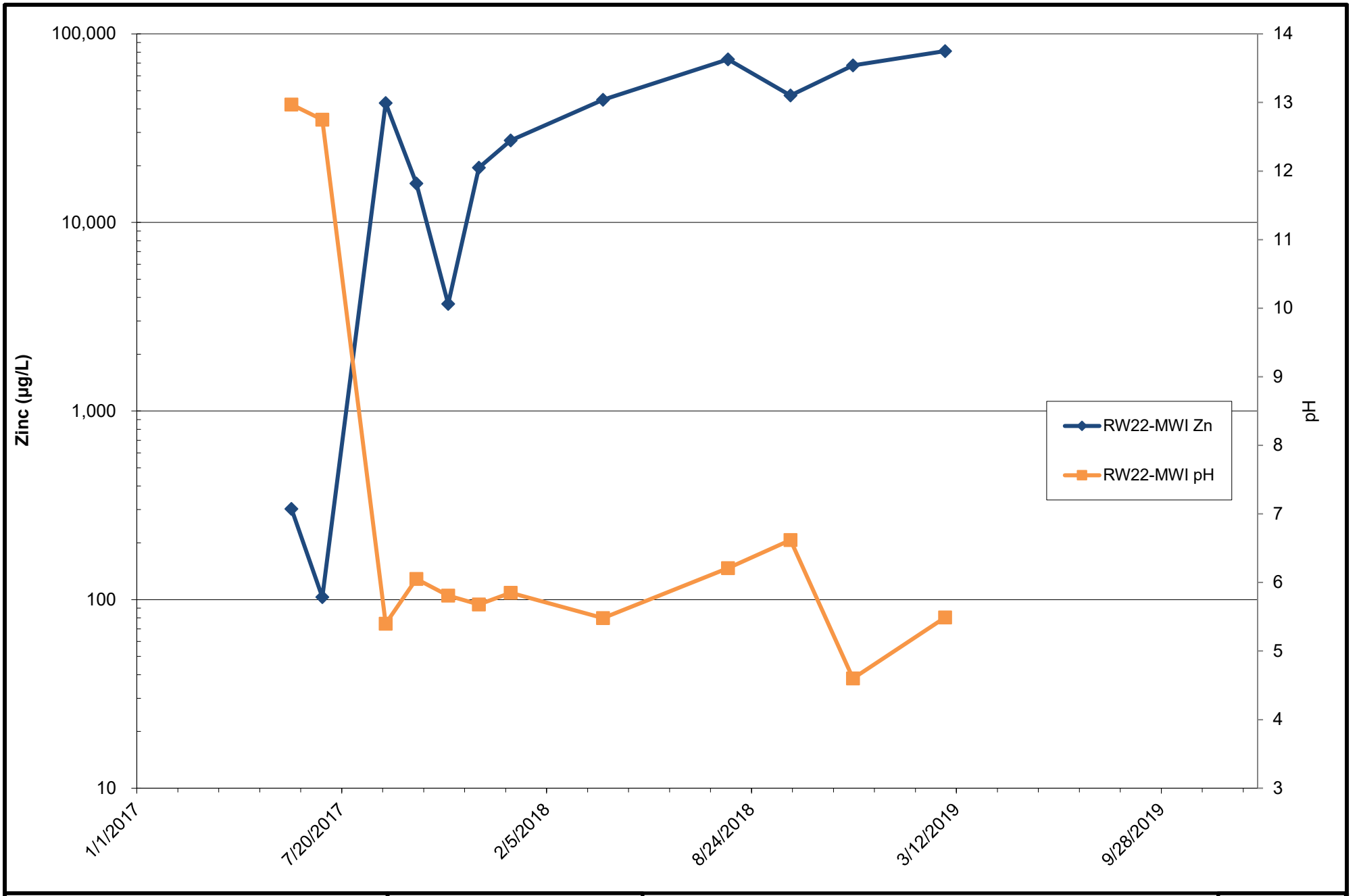
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RW21-MWI pH and Zinc Concentrations

March 2025

**Appx C**




ARM Group LLC
Engineers and Scientists

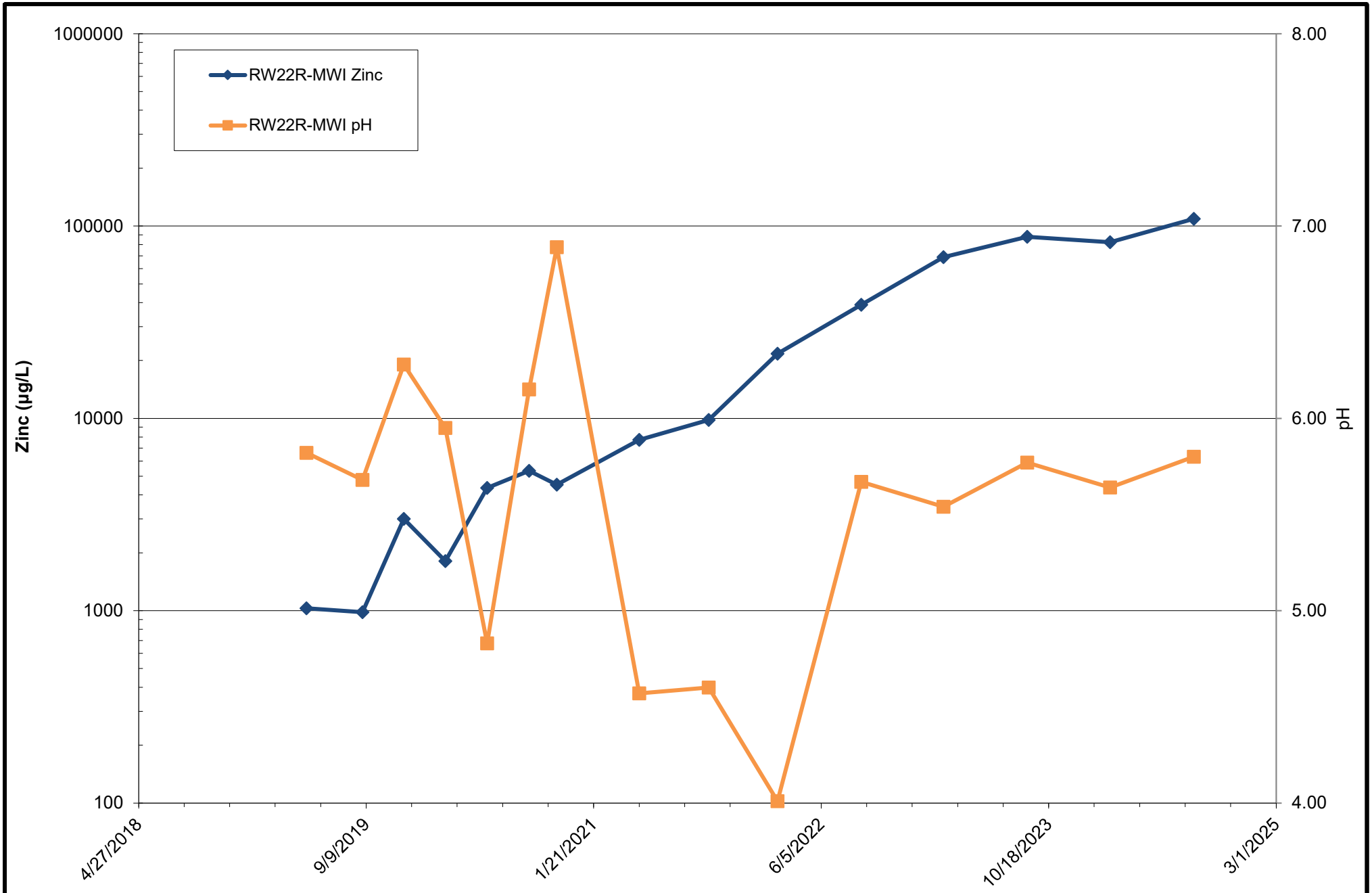
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RW22-MWI pH and Zinc Concentrations

January 2025

**Appx C**




ARM Group LLC
Engineers and Scientists

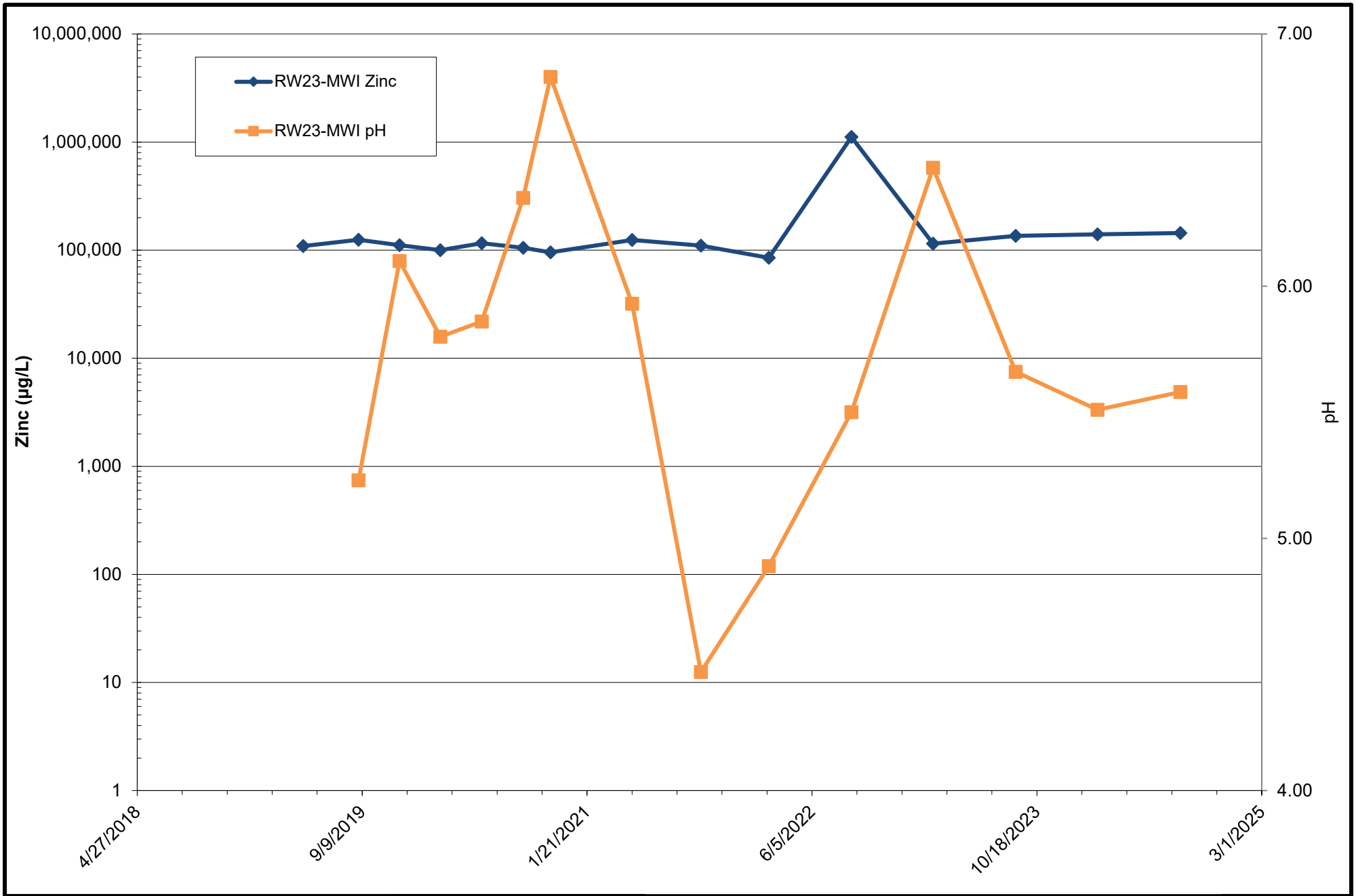
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RW22R-MWI pH and Zinc Concentrations

March 2025

**Appx C**




ARM Group LLC
Engineers and Scientists

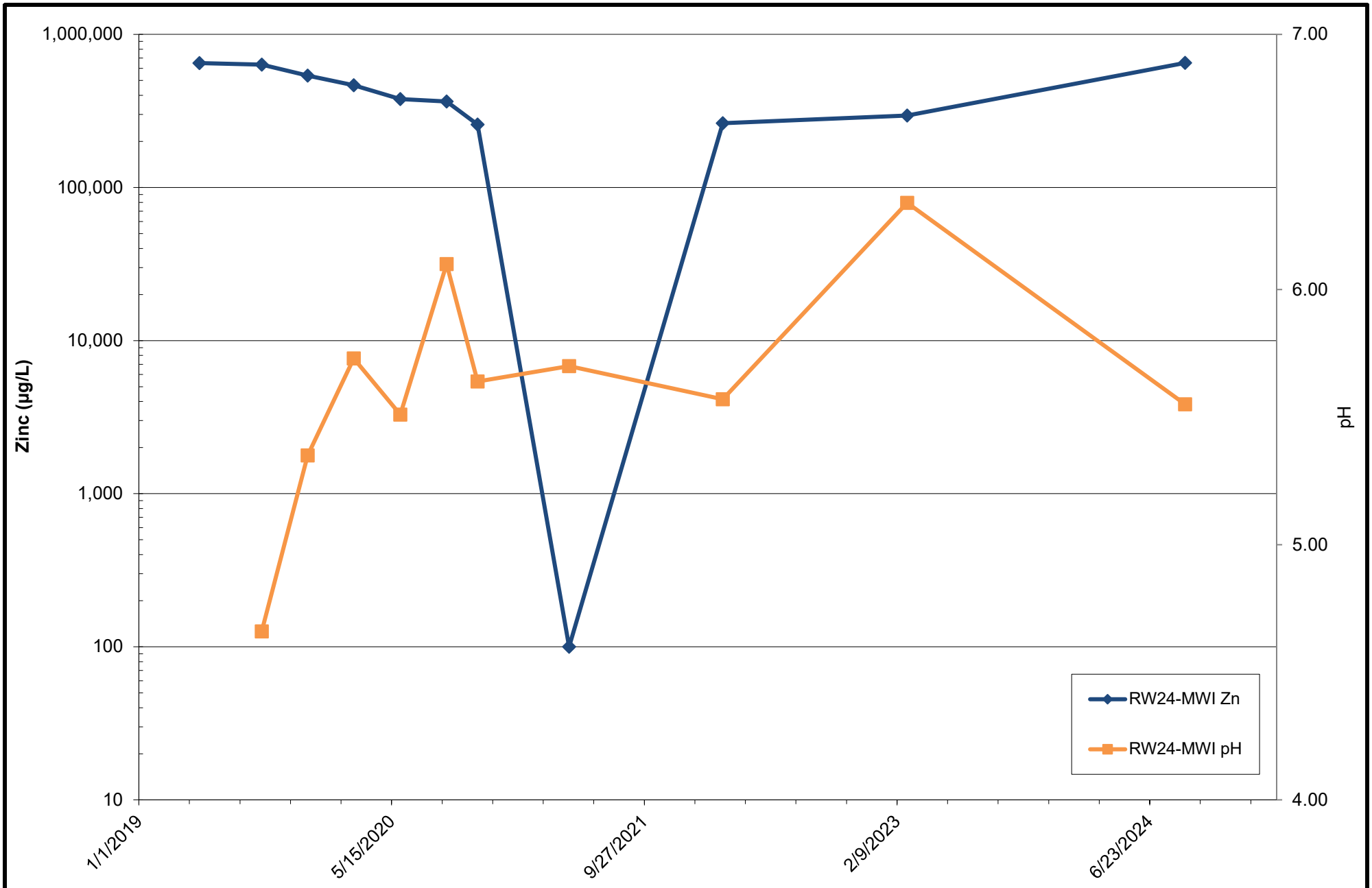
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RW23-MWI pH and Zinc Concentrations

January 2025

**Appx C**




ARM Group LLC
Engineers and Scientists

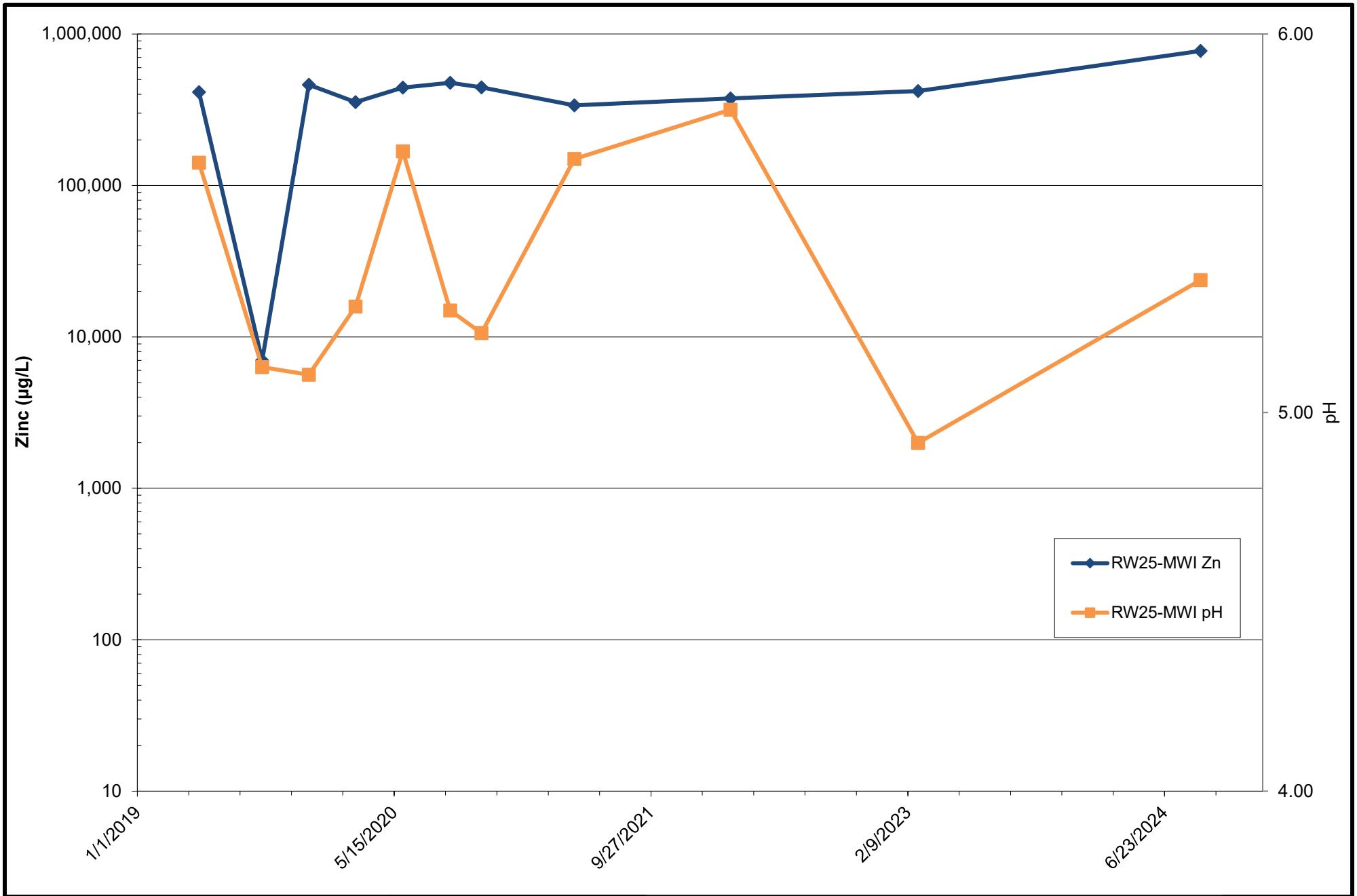
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RW24-MWI pH and Zinc Concentrations

January 2025

**Appx C**




ARM Group LLC
Engineers and Scientists

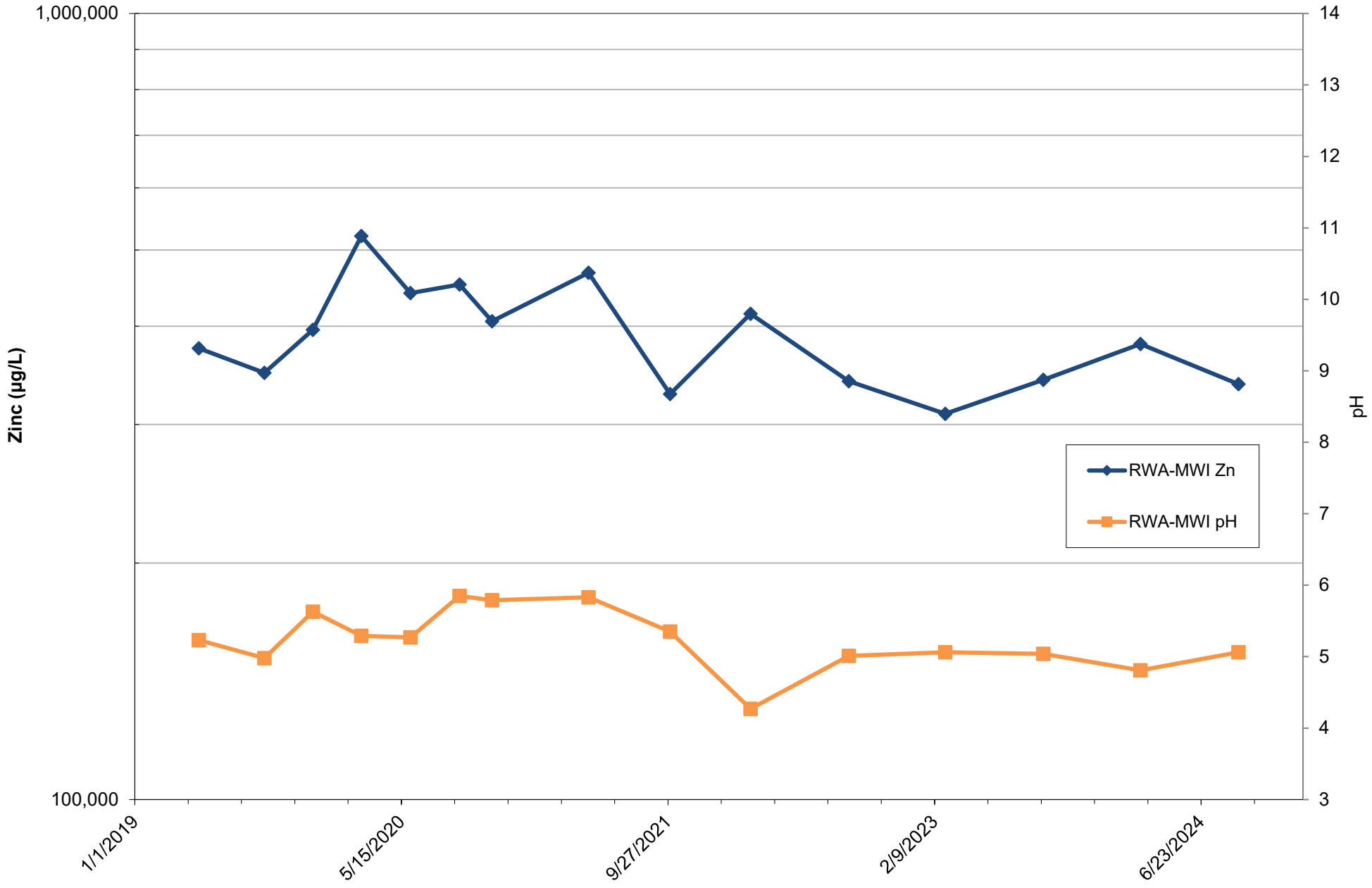
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RW25-MWI pH and Zinc Concentrations

January 2025

**Appx C**




ARM Group LLC
Engineers and Scientists

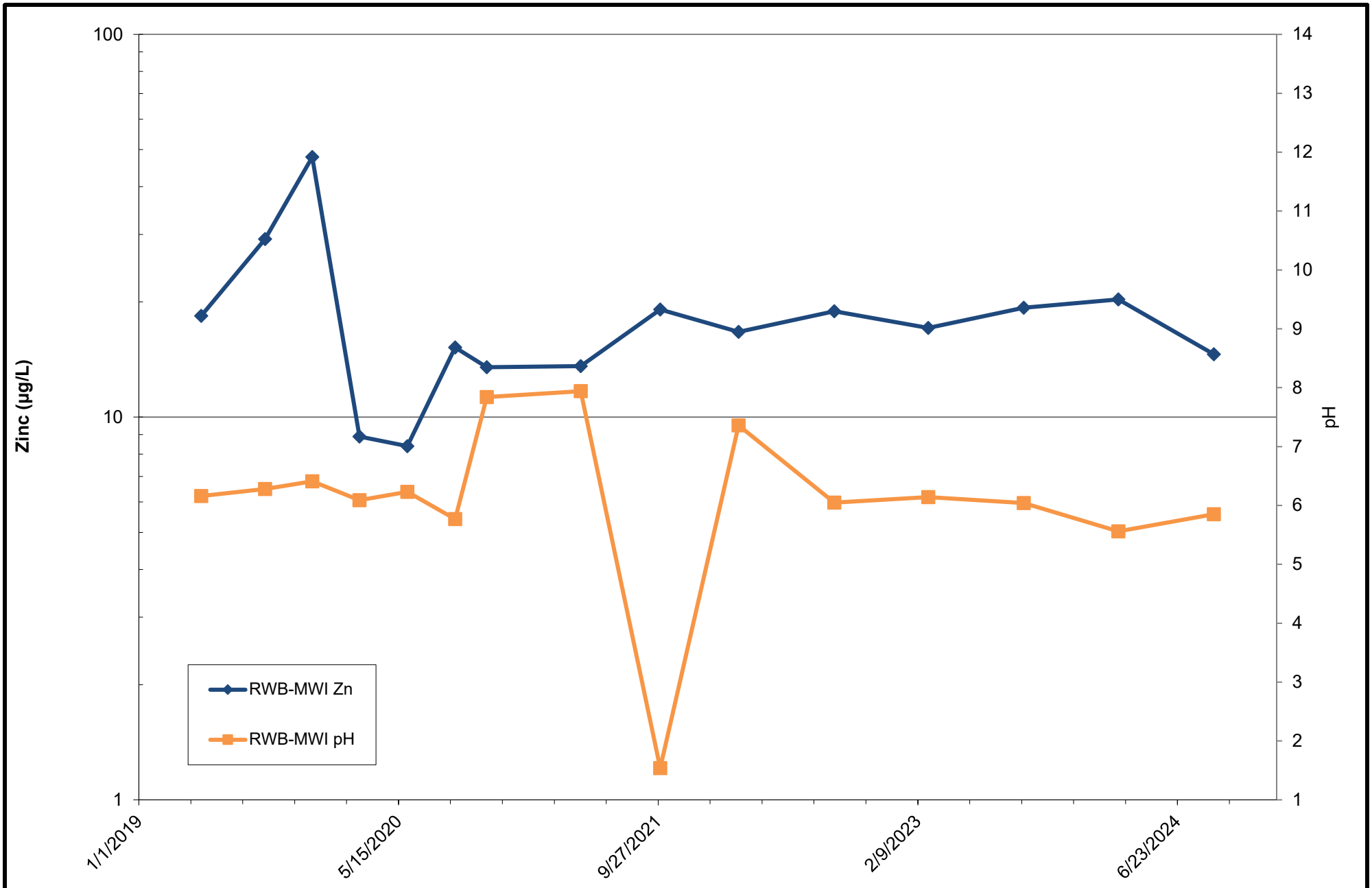
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RWA-MWI pH and Zinc Concentrations

January 2025

**Appx C**




ARM Group LLC
Engineers and Scientists

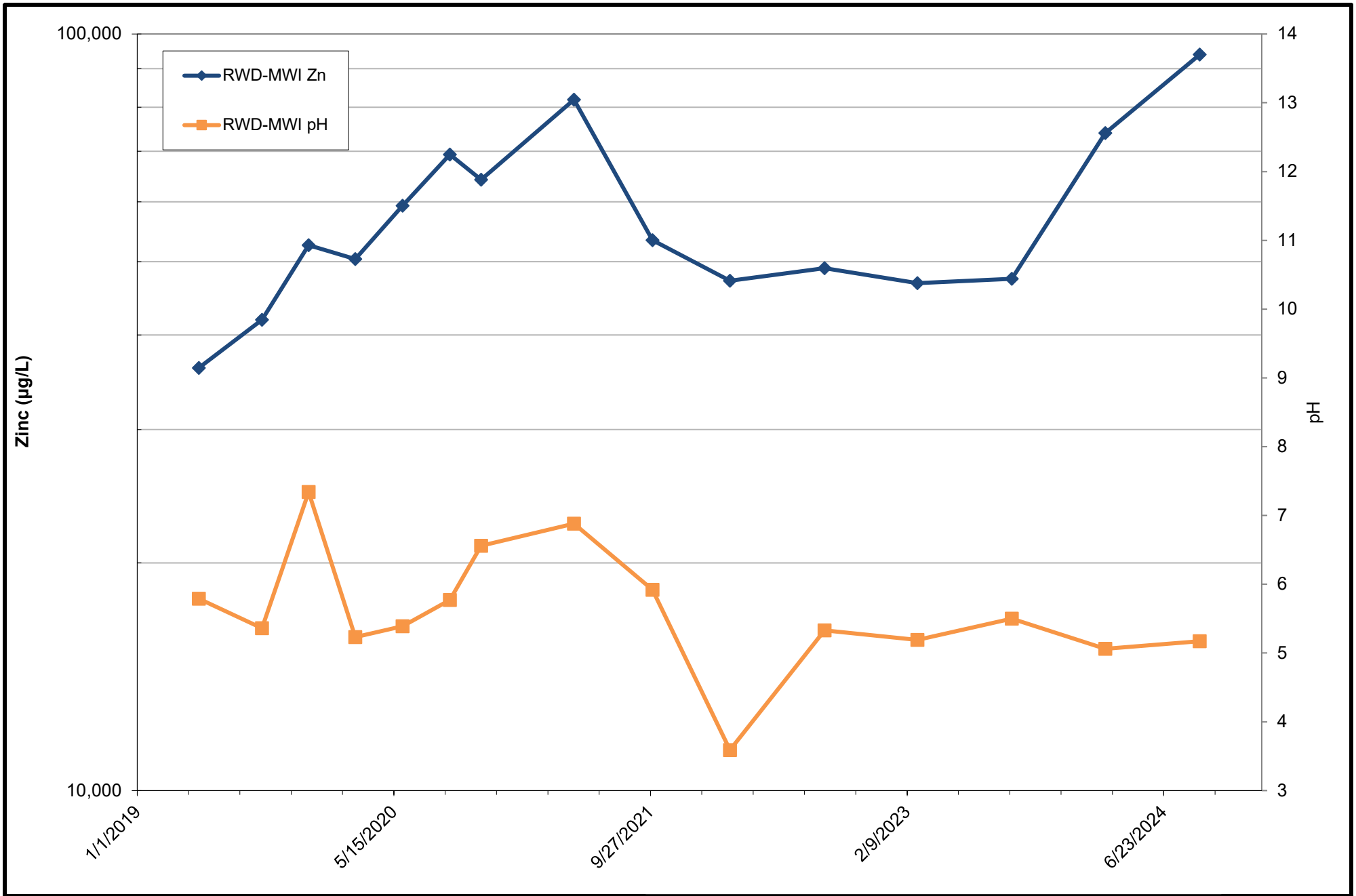
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RWB-MWI pH and Zinc Concentrations

January 2025

**Appx C**




ARM Group LLC
Engineers and Scientists

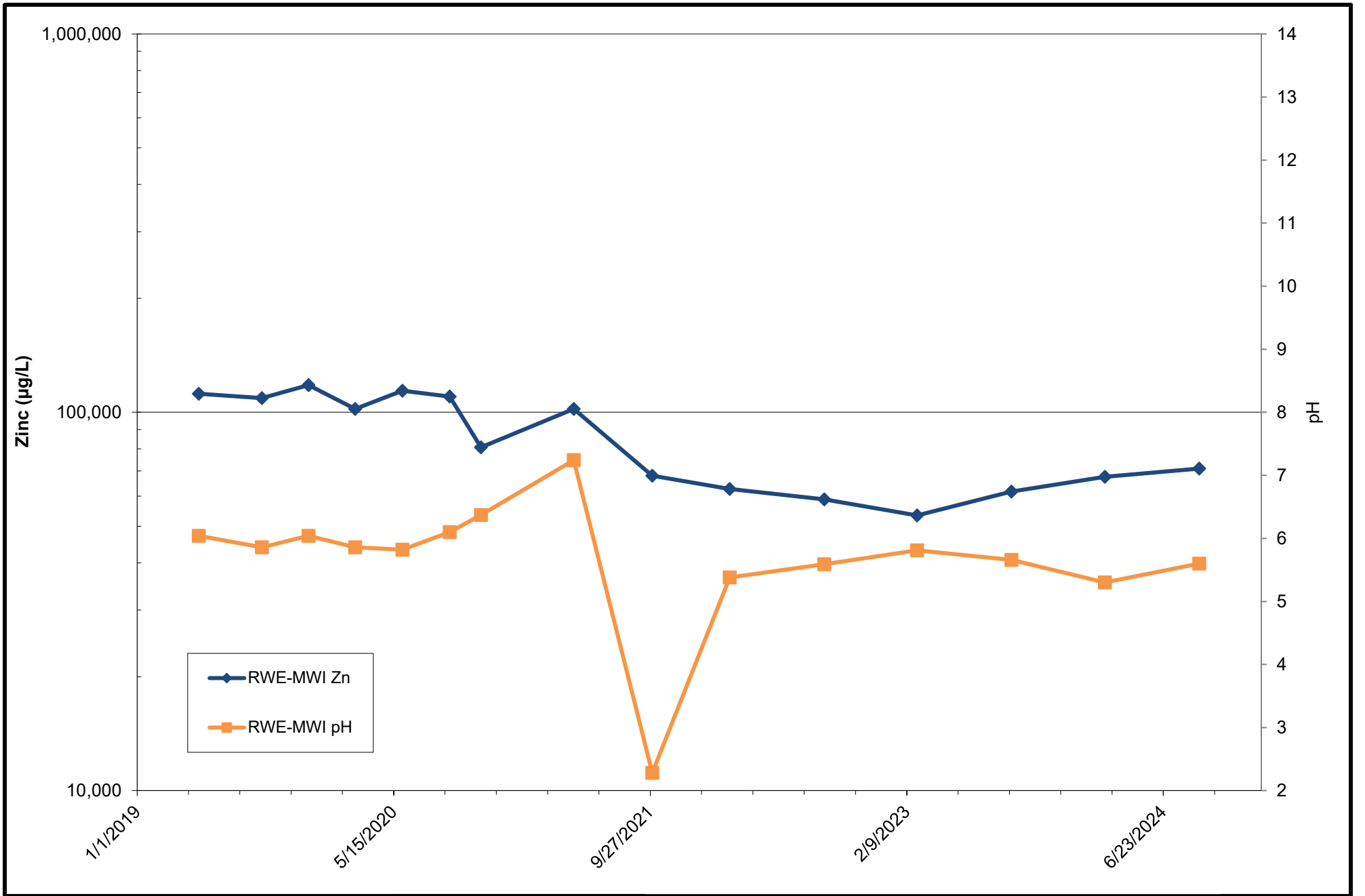
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RWD-MWI pH and Zinc Concentrations

January 2025

**Appx C**




ARM Group LLC
Engineers and Scientists

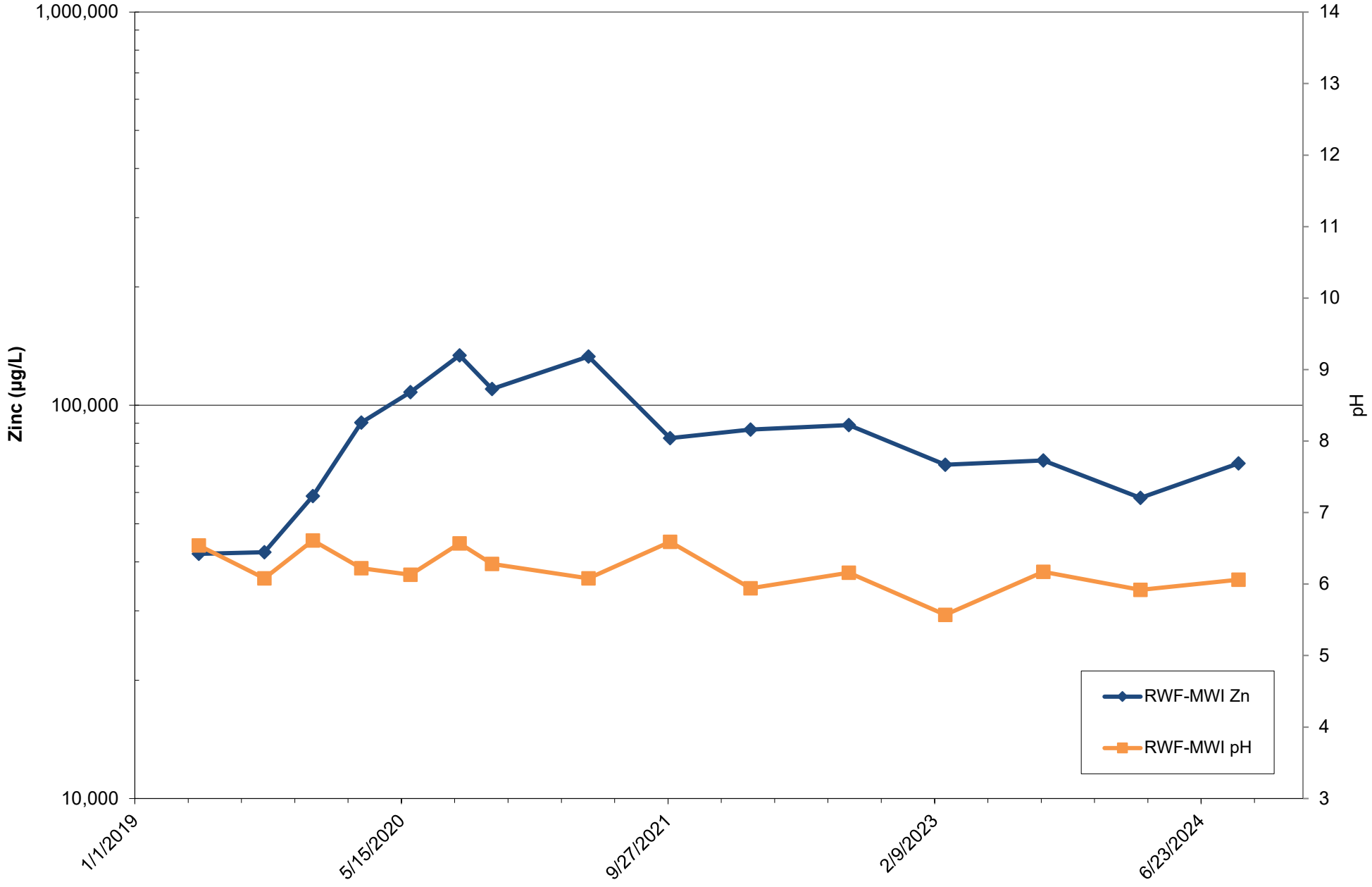
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RWE-MWI pH and Zinc Concentrations

January 2025

**Appx C**




ARM Group LLC
Engineers and Scientists

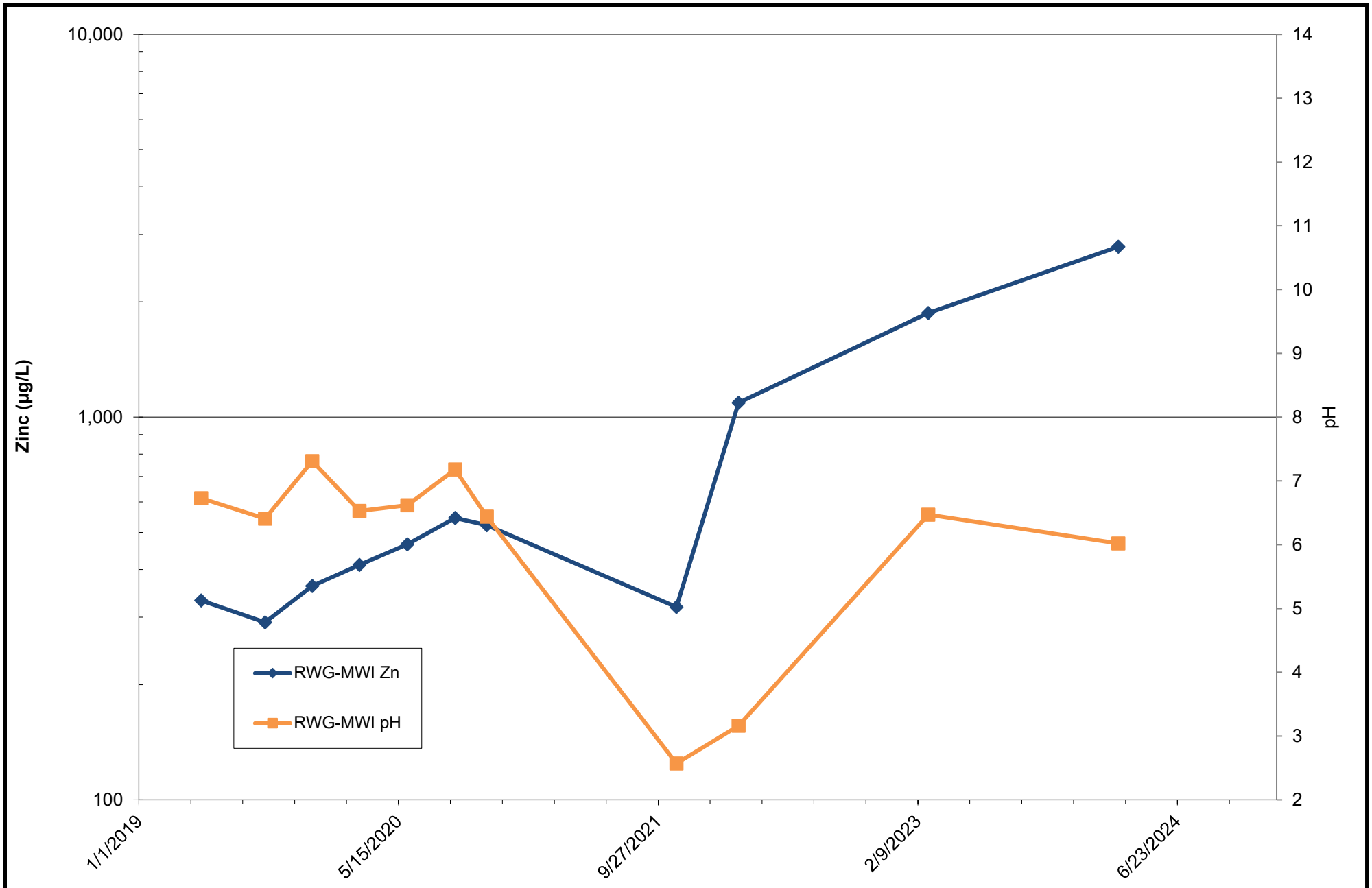
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RWF-MWI pH and Zinc Concentrations

January 2025

**Appx C**




ARM Group LLC
Engineers and Scientists

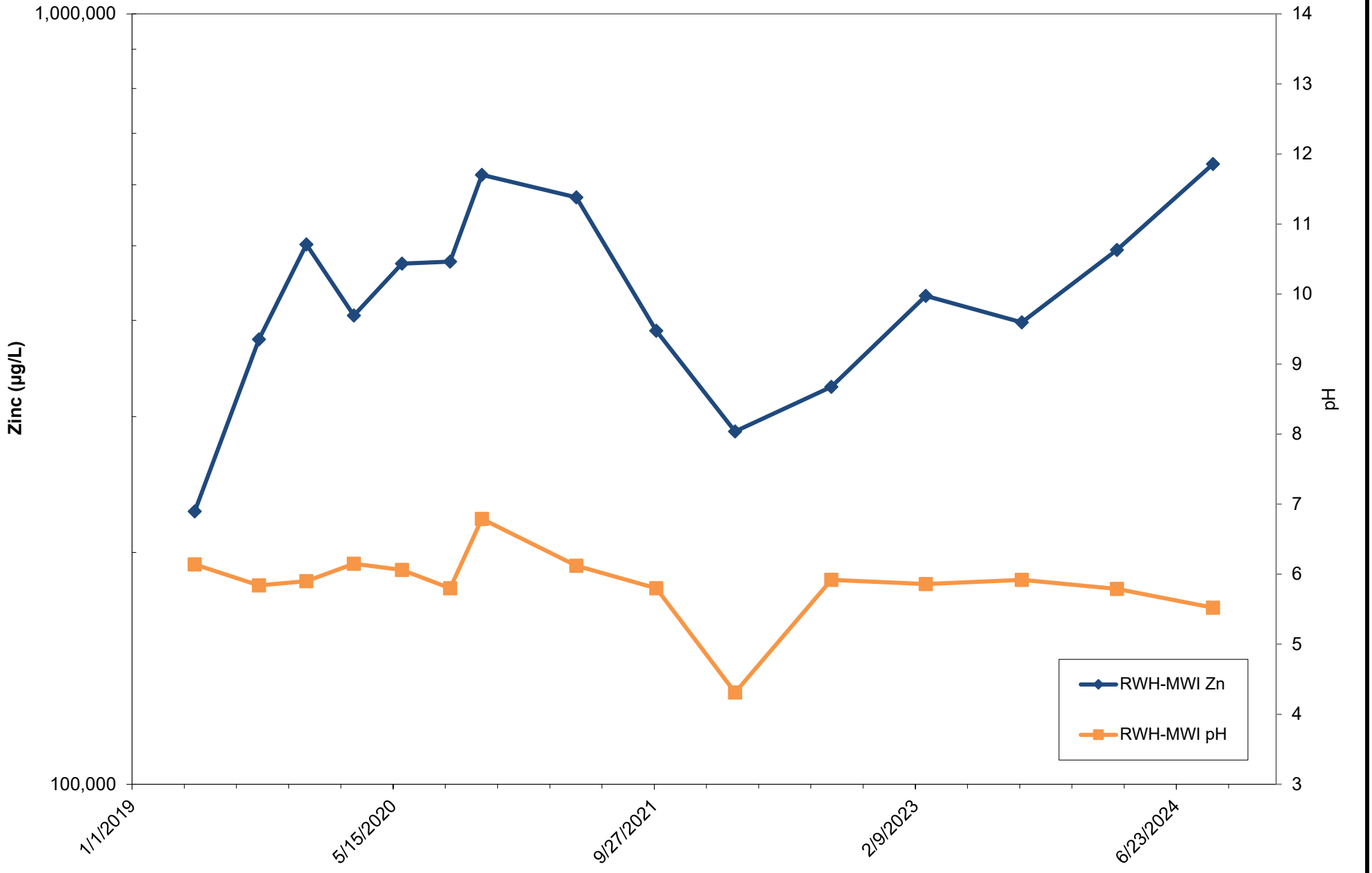
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RWG-MWI pH and Zinc Concentrations

January 2025

**Appx C**




ARM Group LLC
Engineers and Scientists

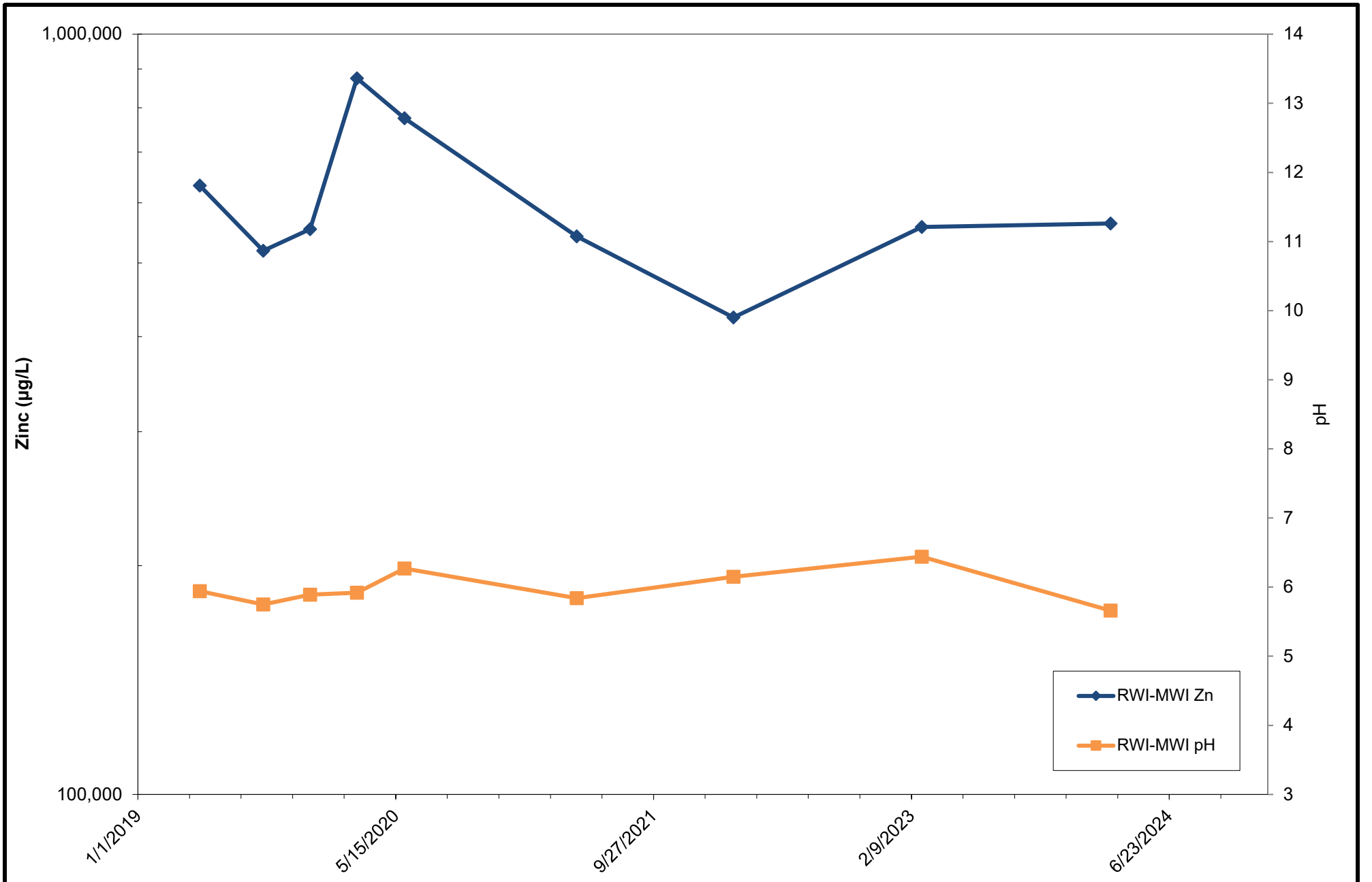
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RWH-MWI pH and Zinc Concentrations

January 2025

**Appx C**




ARM Group LLC
Engineers and Scientists

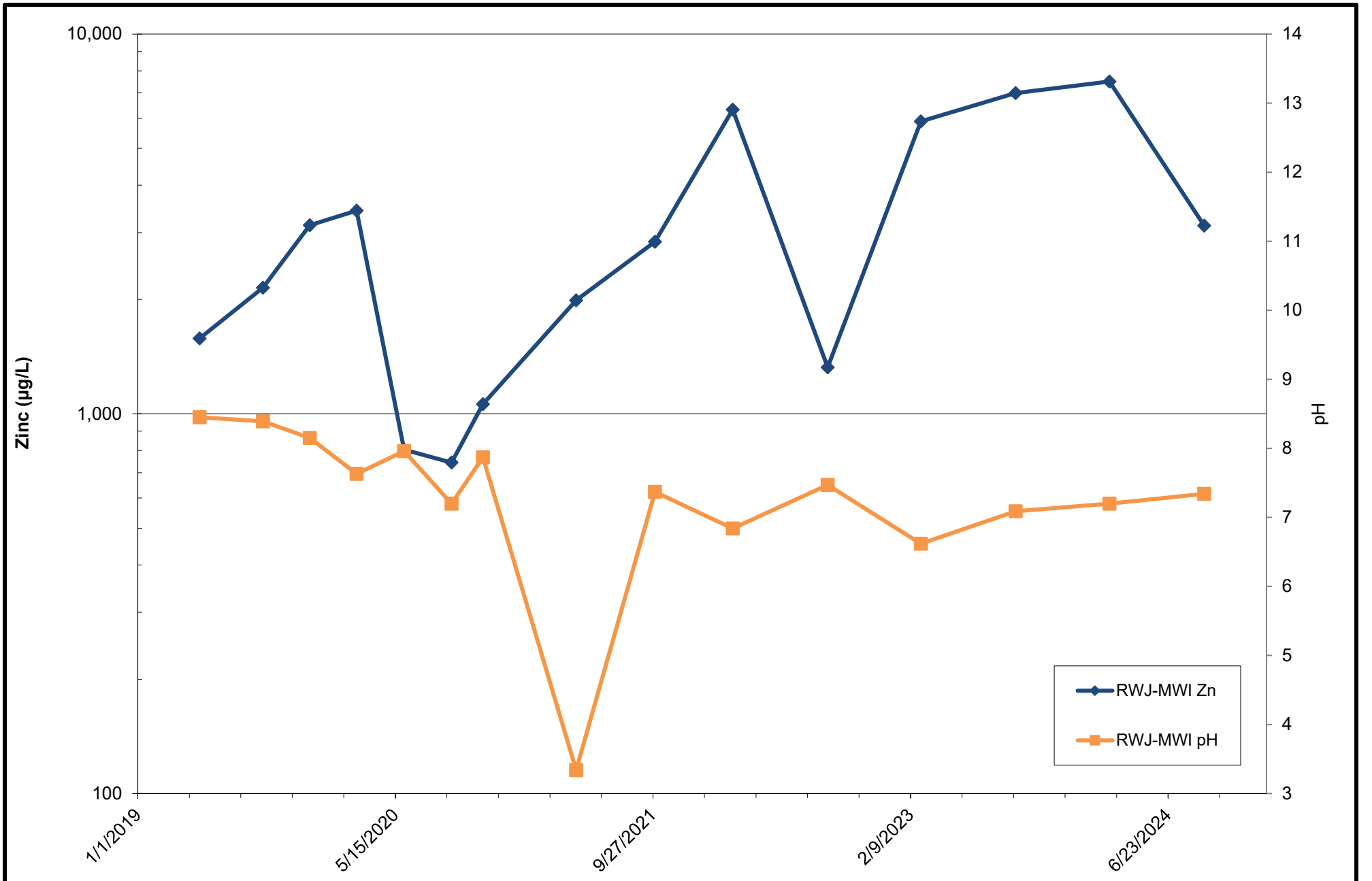
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RWI-MWI pH and Zinc Concentrations

January 2025

**Appx C**




ARM Group LLC
Engineers and Scientists

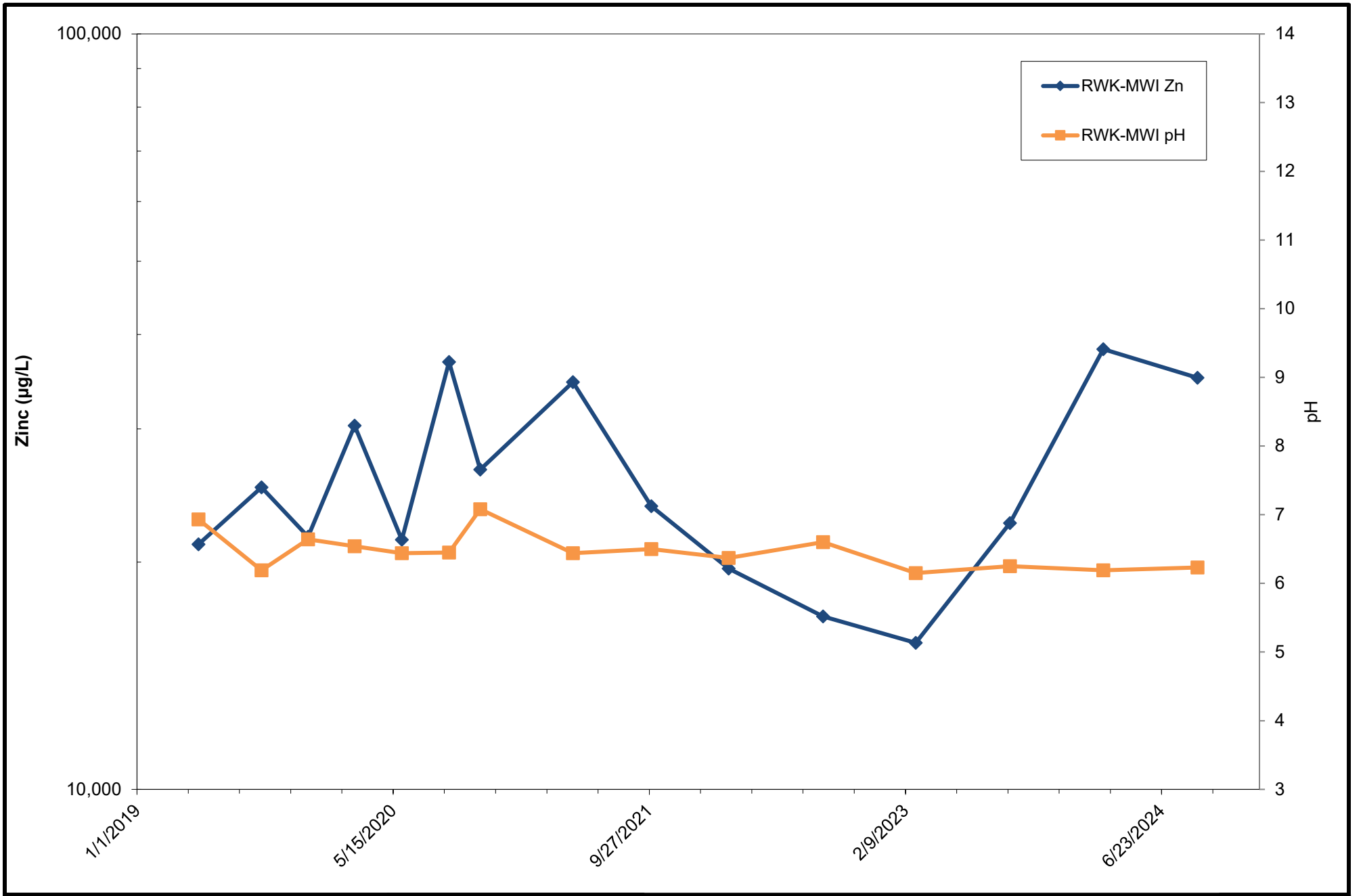
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RWJ-MWI pH and Zinc Concentrations

January 2025

**Appx C**




ARM Group LLC
Engineers and Scientists

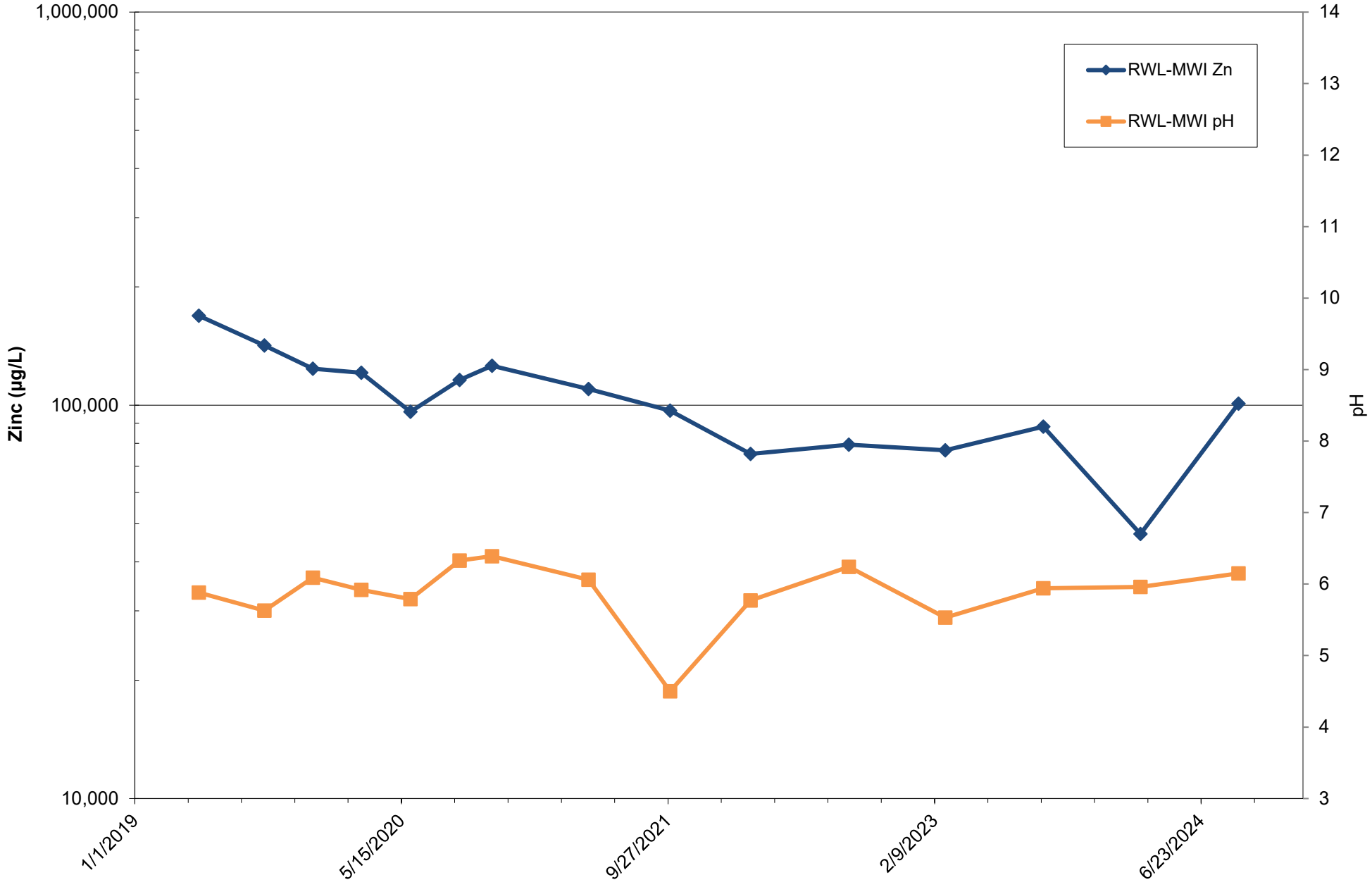
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RWK-MWI pH and Zinc Concentrations

January 2025

**Appx C**




ARM Group LLC
Engineers and Scientists

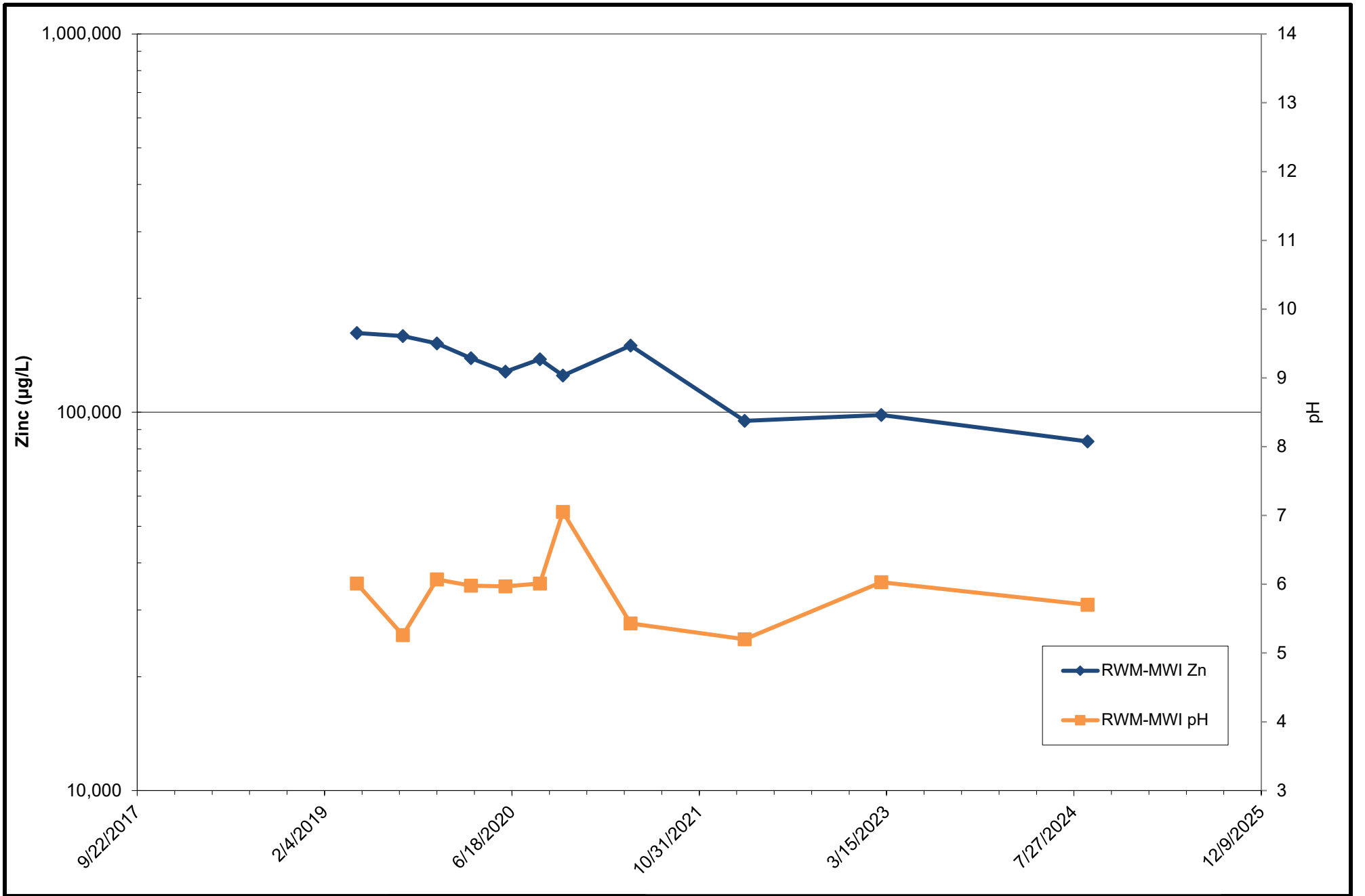
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RWL-MWI pH and Zinc Concentrations

January 2025

**Appx C**




ARM Group LLC
Engineers and Scientists

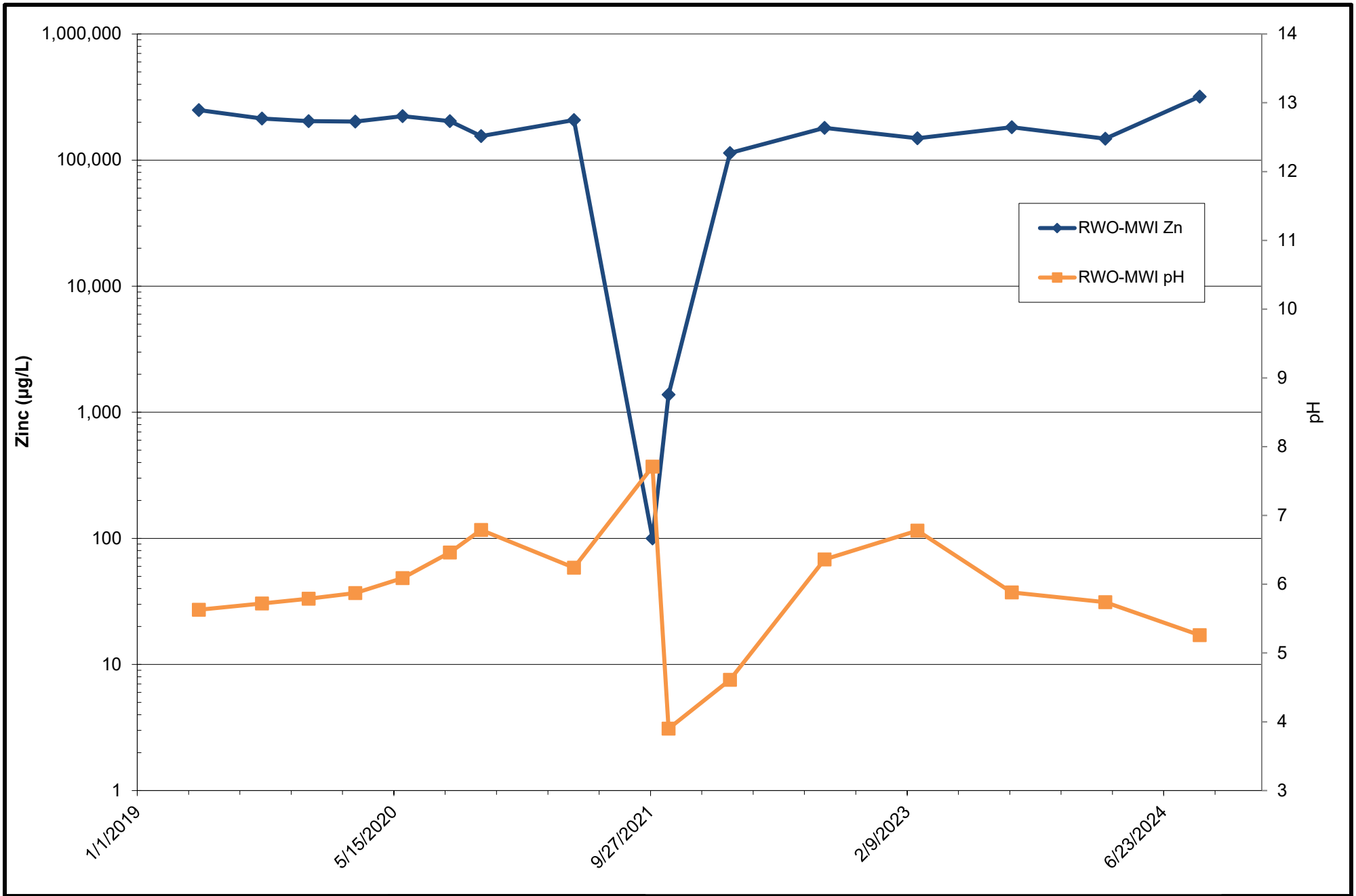
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RWM-MWI pH and Zinc Concentrations

January 2025

**Appx C**




ARM Group LLC
Engineers and Scientists

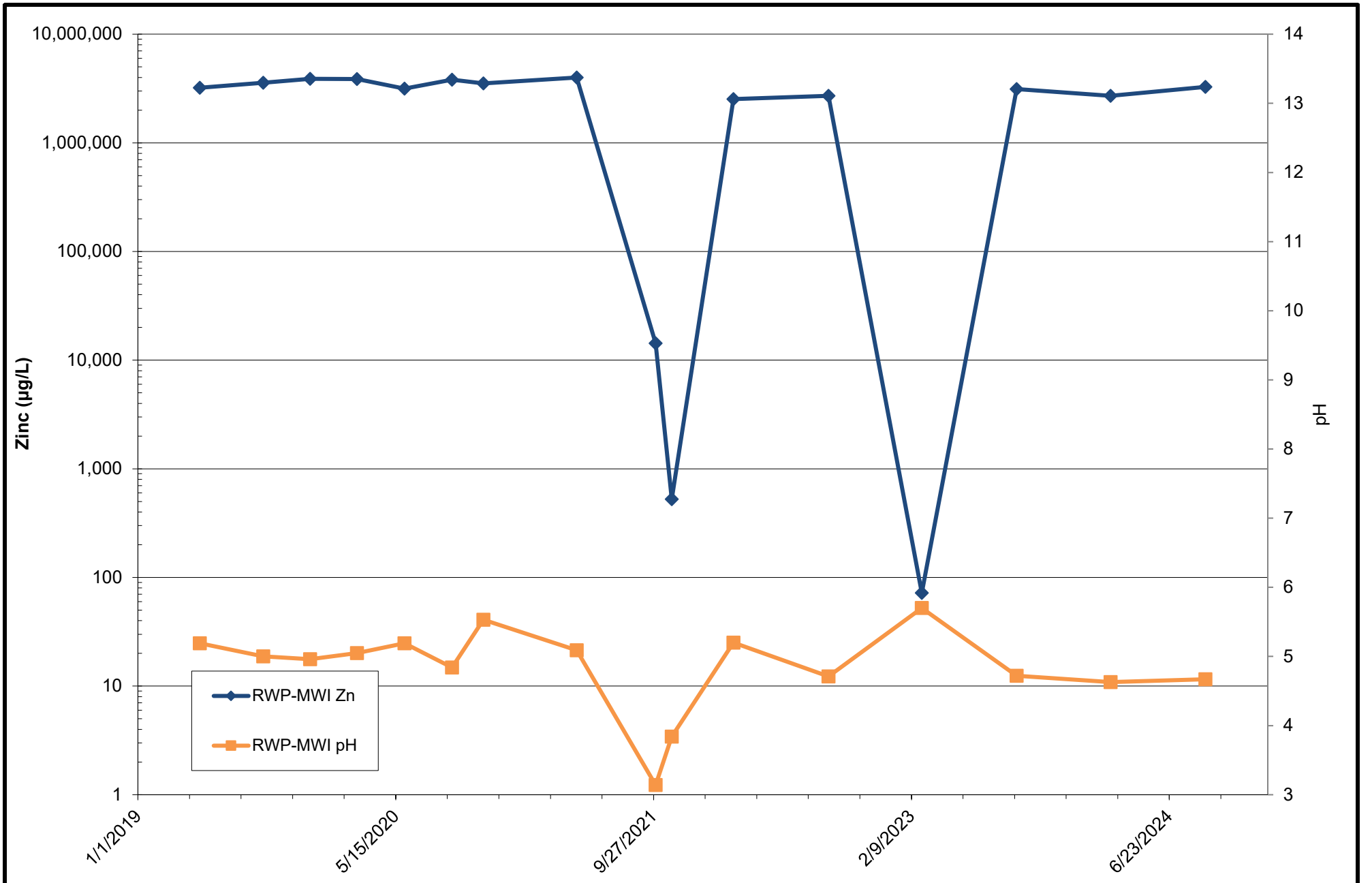
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RWO-MWI pH and Zinc Concentrations

January 2025

**Appx C**




ARM Group LLC
Engineers and Scientists

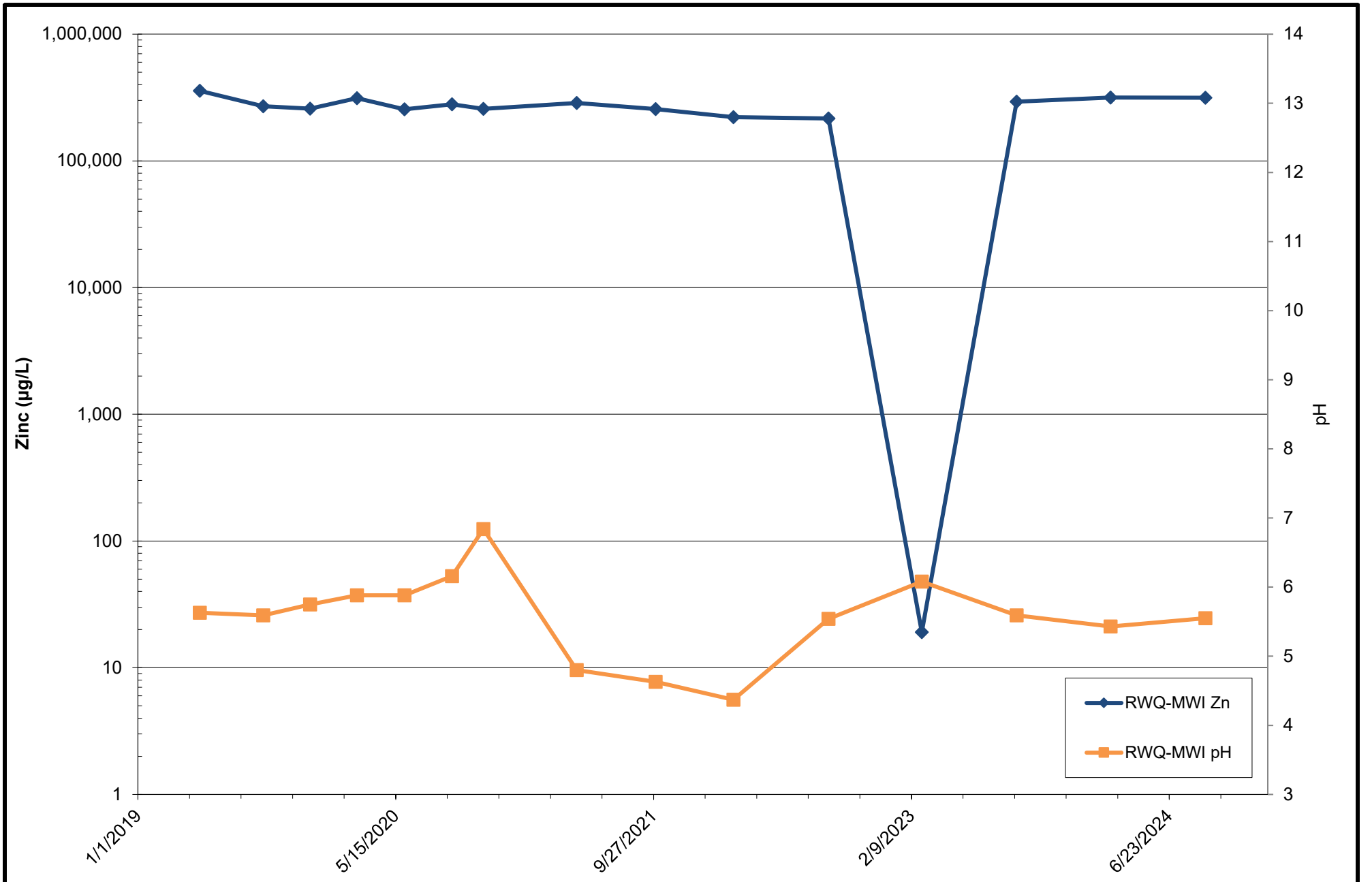
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RWP-MWI pH and Zinc Concentrations

January 2025

**Appx C**




ARM Group LLC
Engineers and Scientists

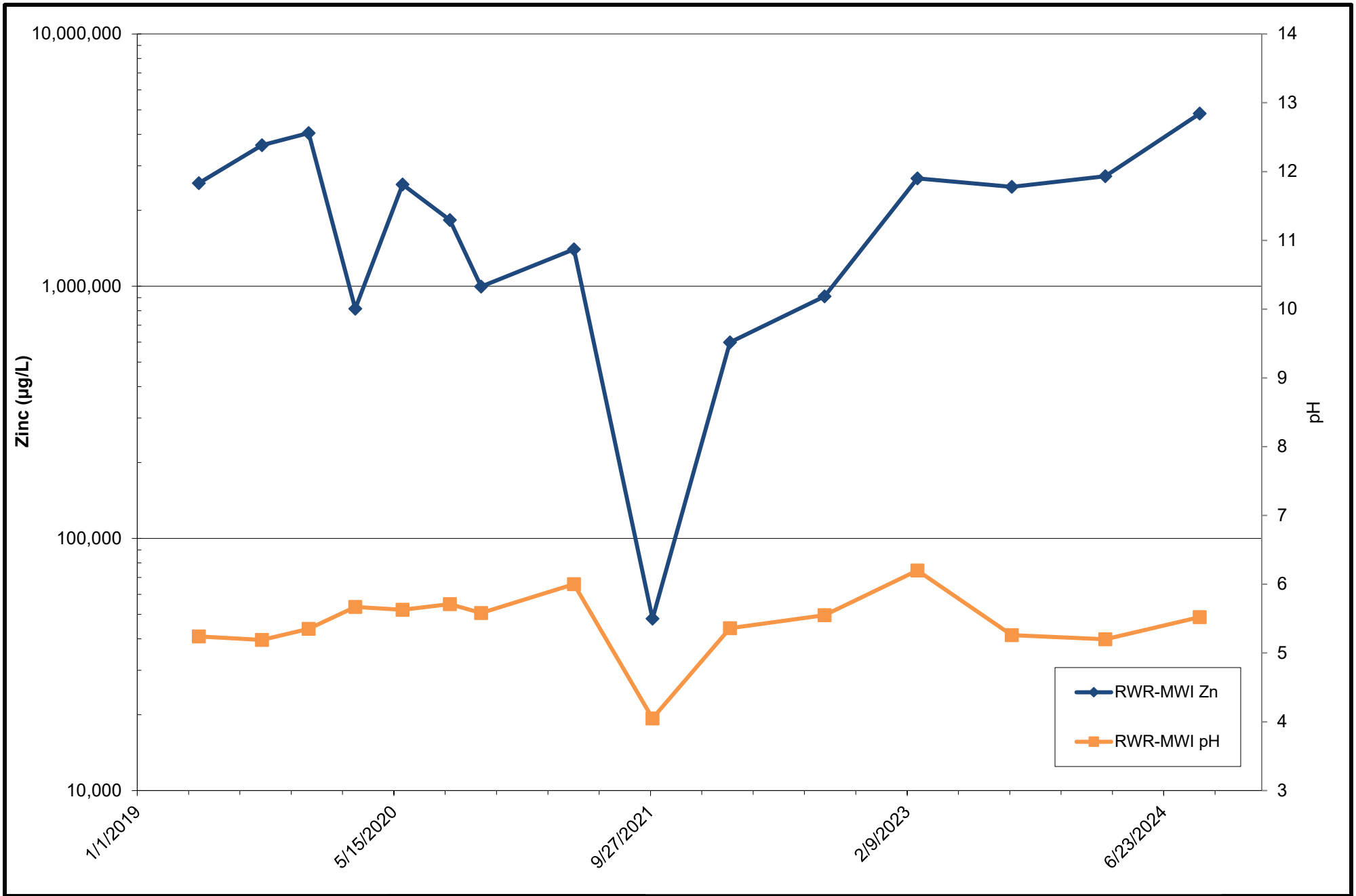
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RWQ-MWI pH and Zinc Concentrations

January 2025

**Appx C**




ARM Group LLC
Engineers and Scientists

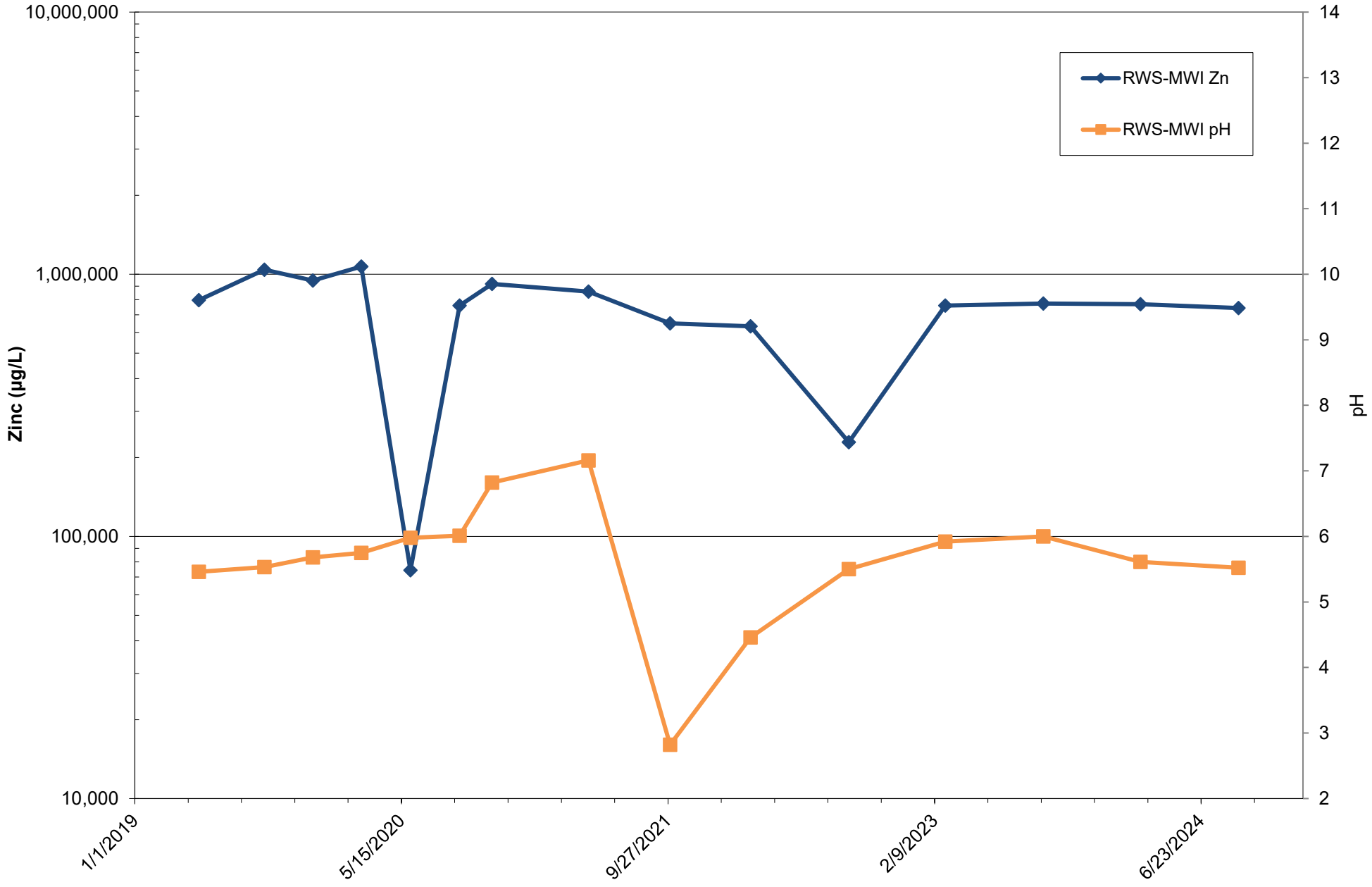
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RWR-MWI pH and Zinc Concentrations

January 2025

**Appx C**




ARM Group LLC
Engineers and Scientists

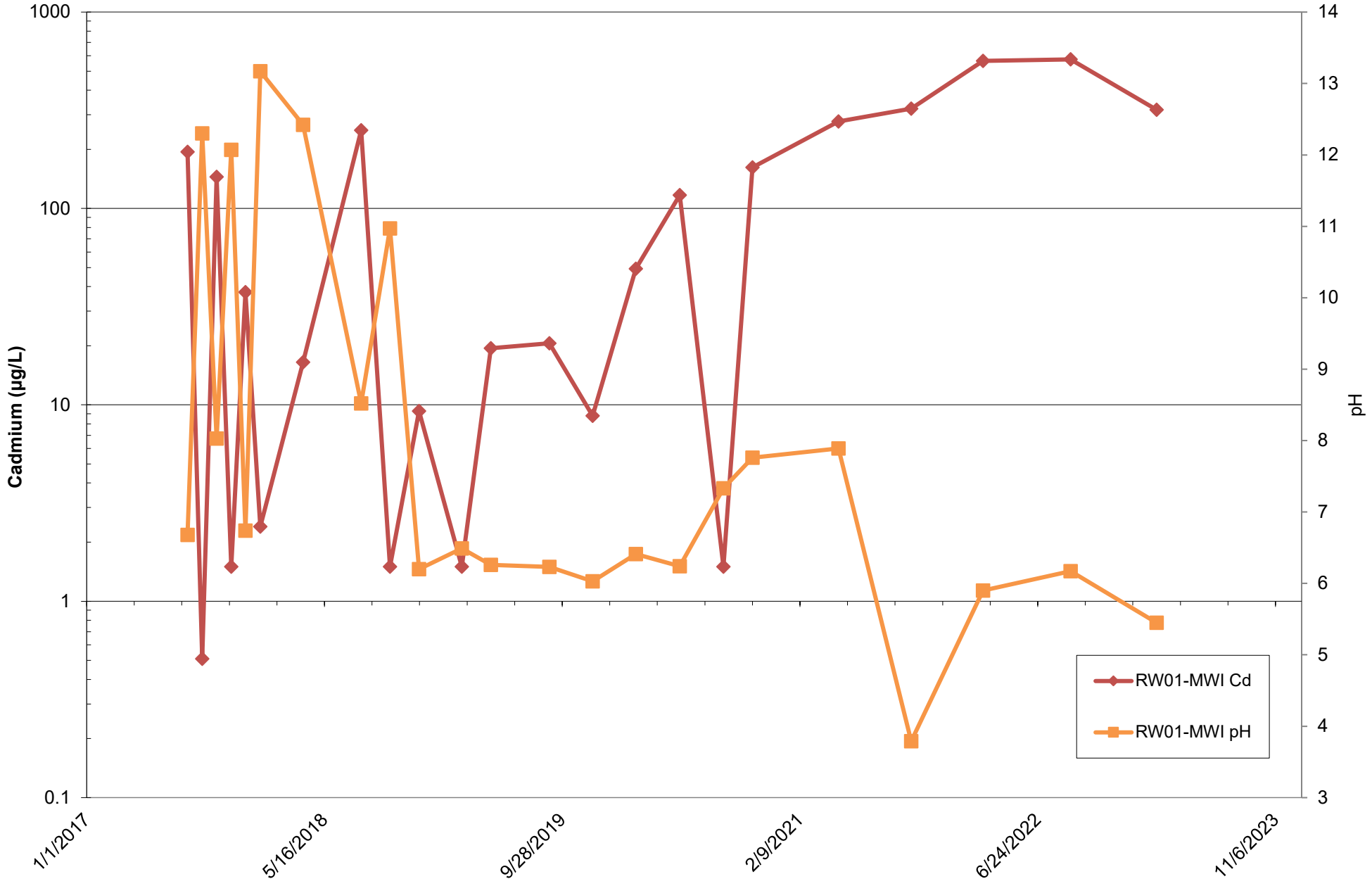
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RWS-MWI pH and Zinc Concentrations

January 2025

**Appx C**




ARM Group LLC
Engineers and Scientists

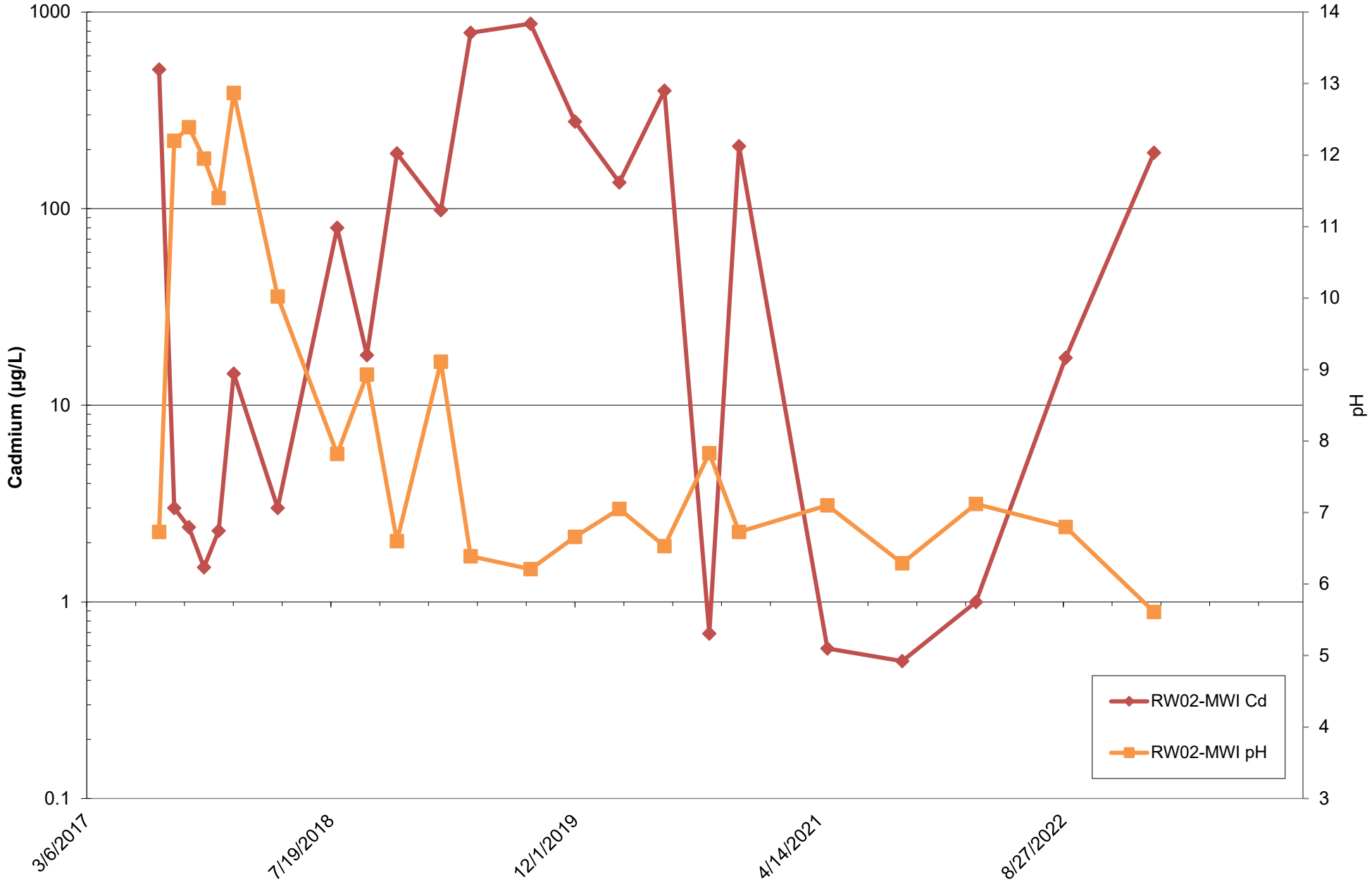
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RW01-MWI pH and Cadmium Concentrations

January 2025

**Appx C**




ARM Group LLC
Engineers and Scientists

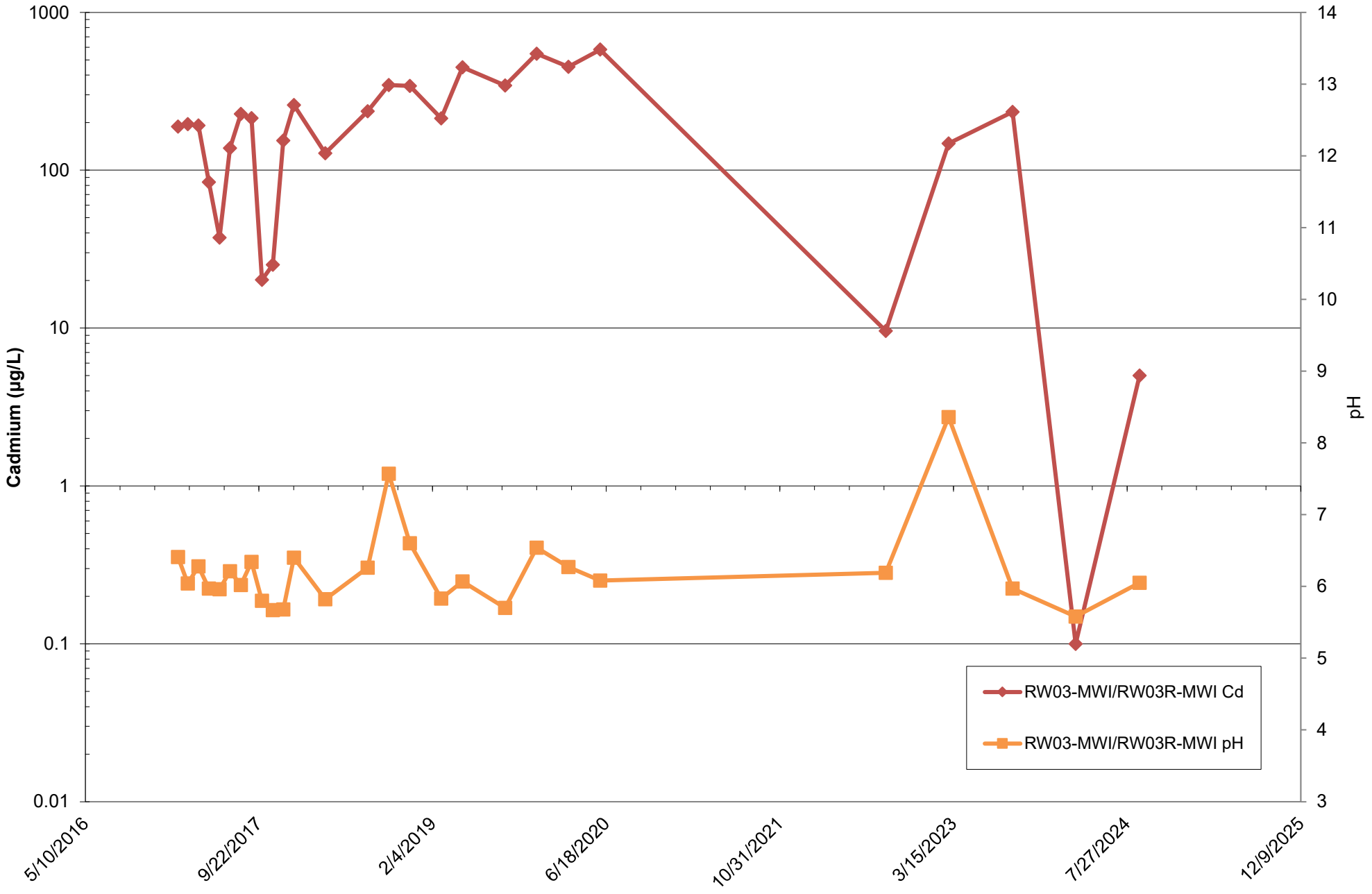
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RW02-MWI pH and Cadmium Concentrations

January 2025

**Appx C**




ARM Group LLC
Engineers and Scientists

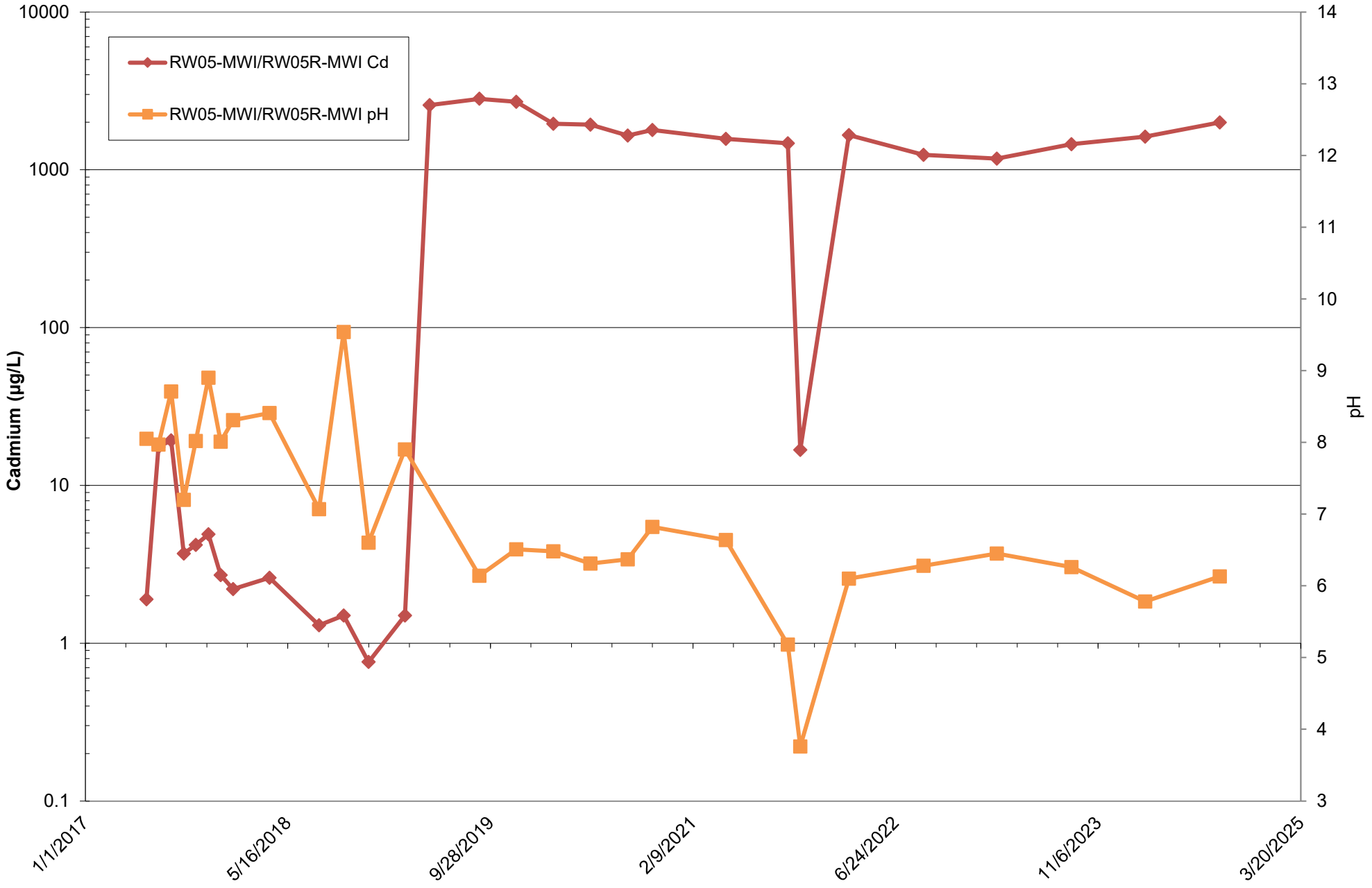
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RW03R-MWI/RW03R-MWI pH and Cadmium Concentrations

March 2025

**Appx C**




ARM Group LLC
Engineers and Scientists

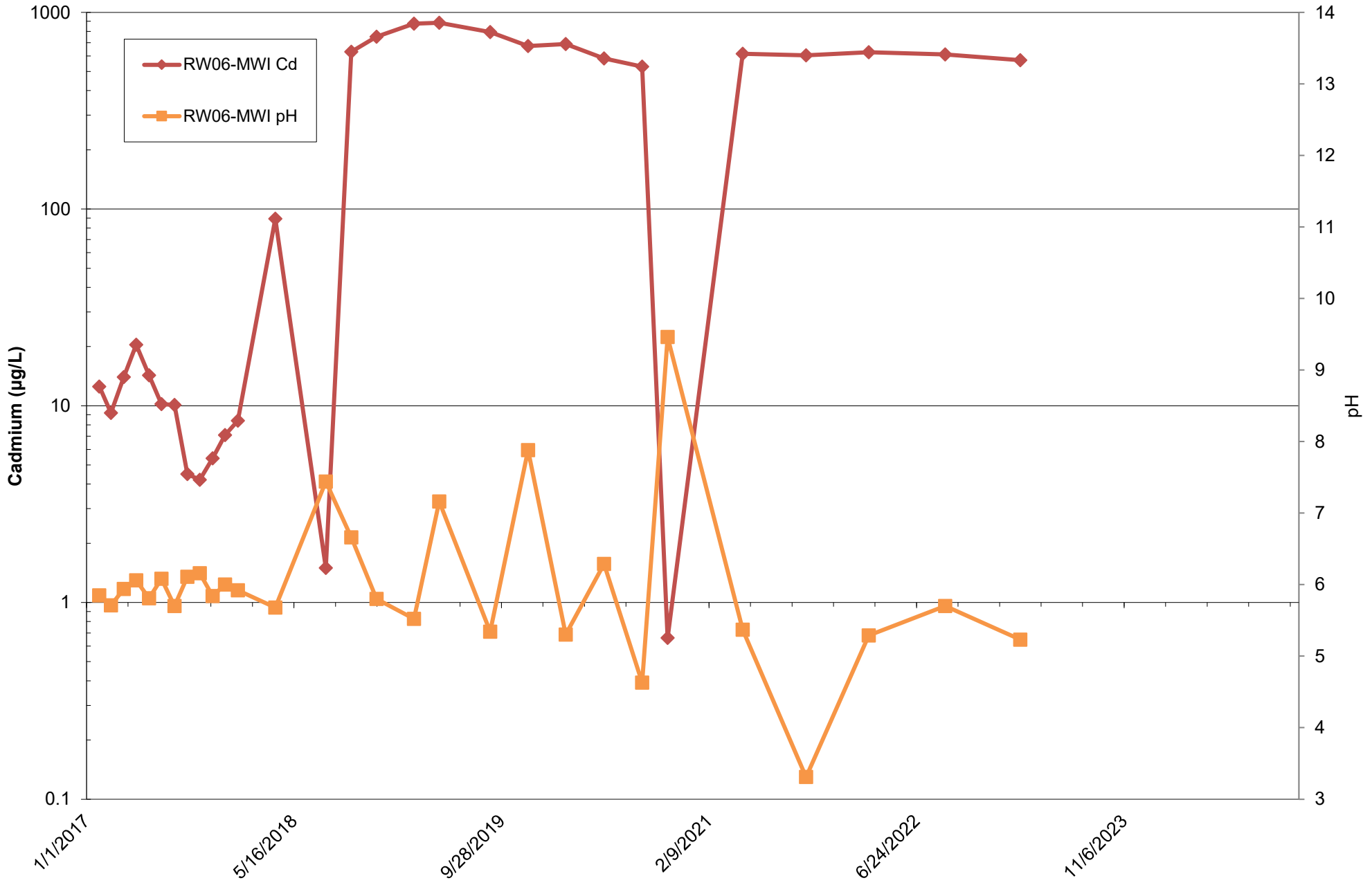
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RW05-MWI/RW05R-MWI pH and Cadmium Concentrations

March 2025

**Appx C**




ARM Group LLC
Engineers and Scientists

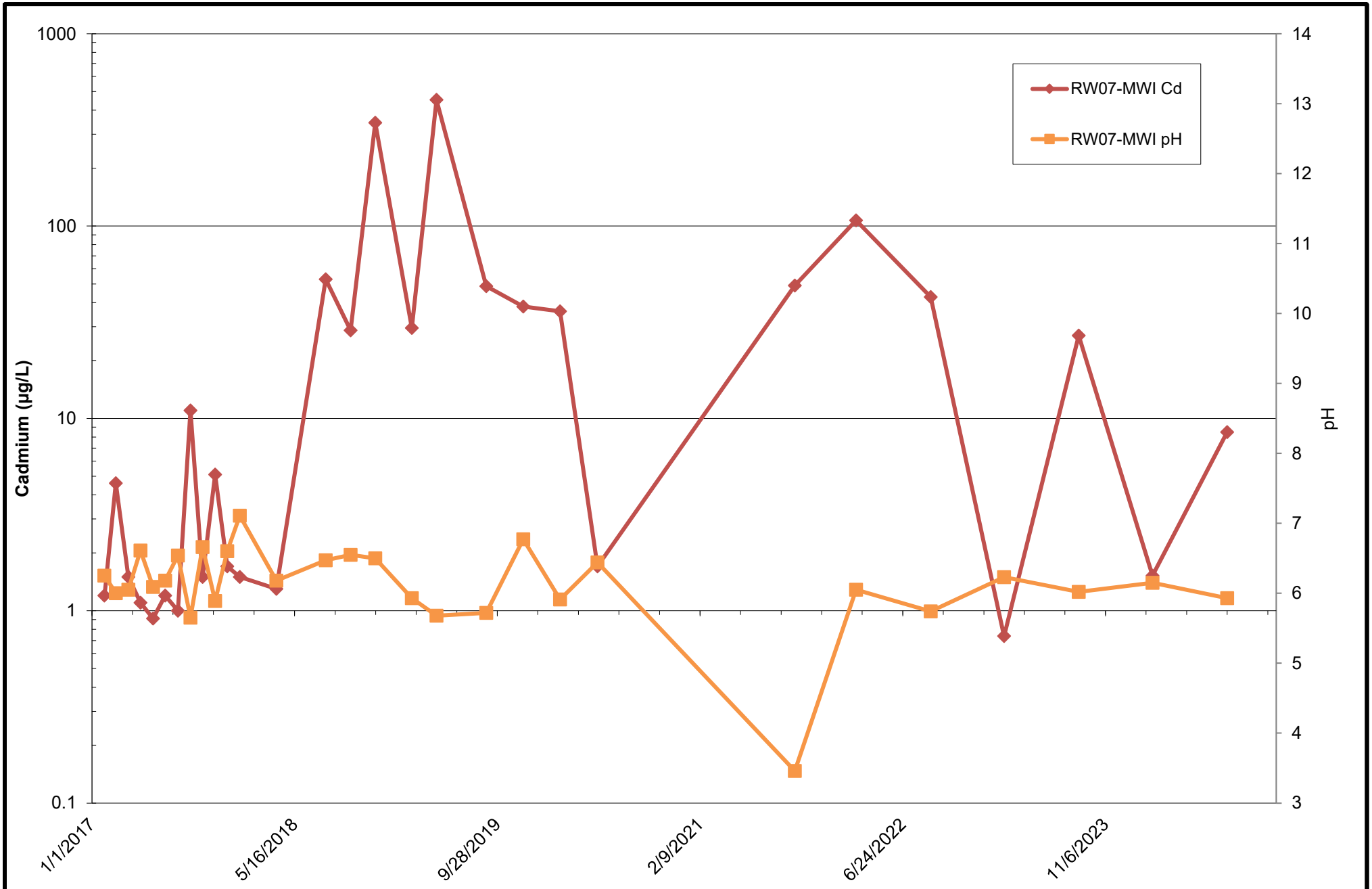
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RW06-MWI pH and Cadmium Concentrations

March 2025

**Appx C**




ARM Group LLC
Engineers and Scientists

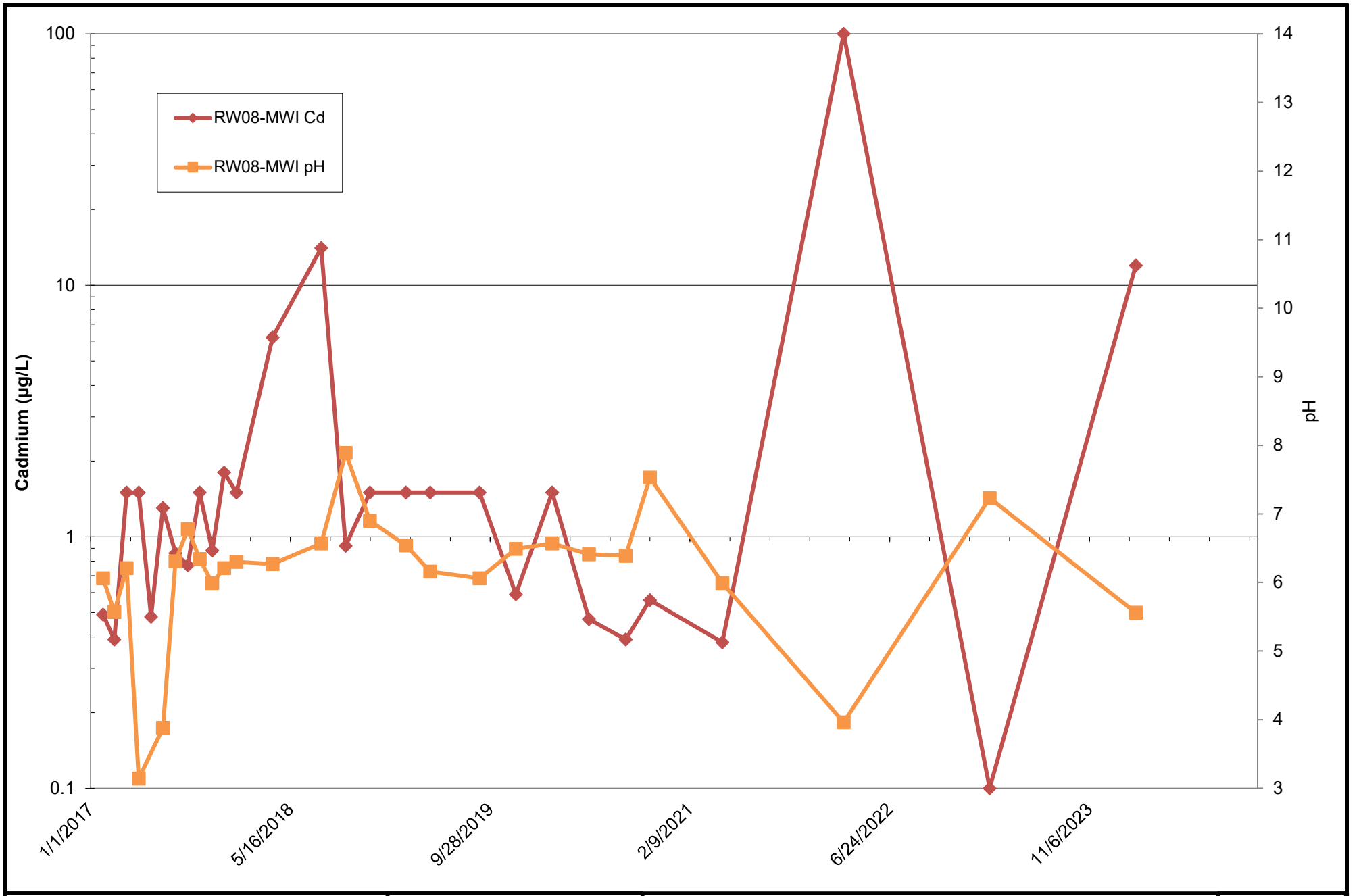
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RW07-MWI pH and Cadmium Concentrations

March 2025

**Appx C**




ARM Group LLC
Engineers and Scientists

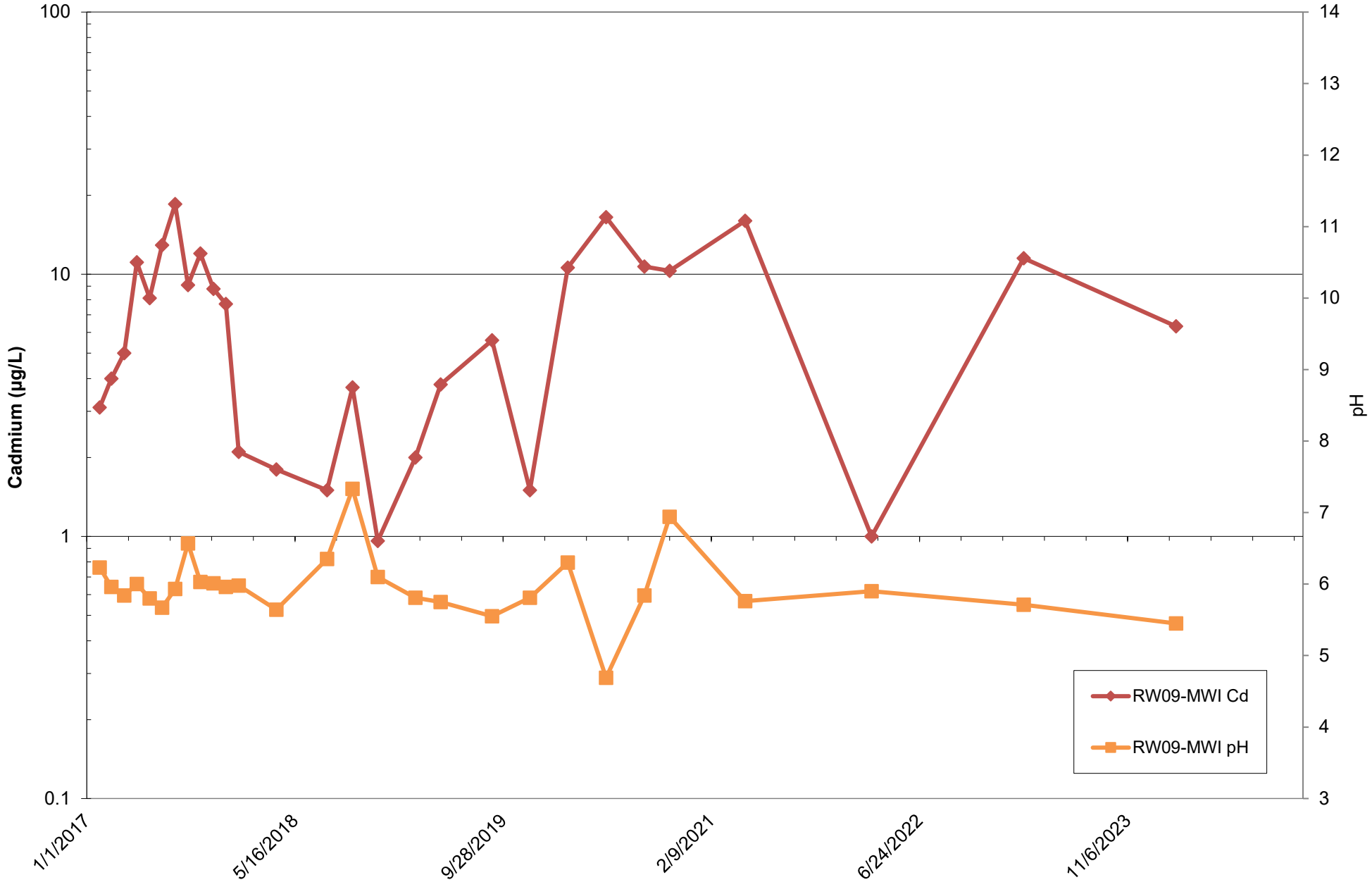
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RW08-MWI pH and Cadmium Concentrations

January 2025

**Appx C**




ARM Group LLC
Engineers and Scientists

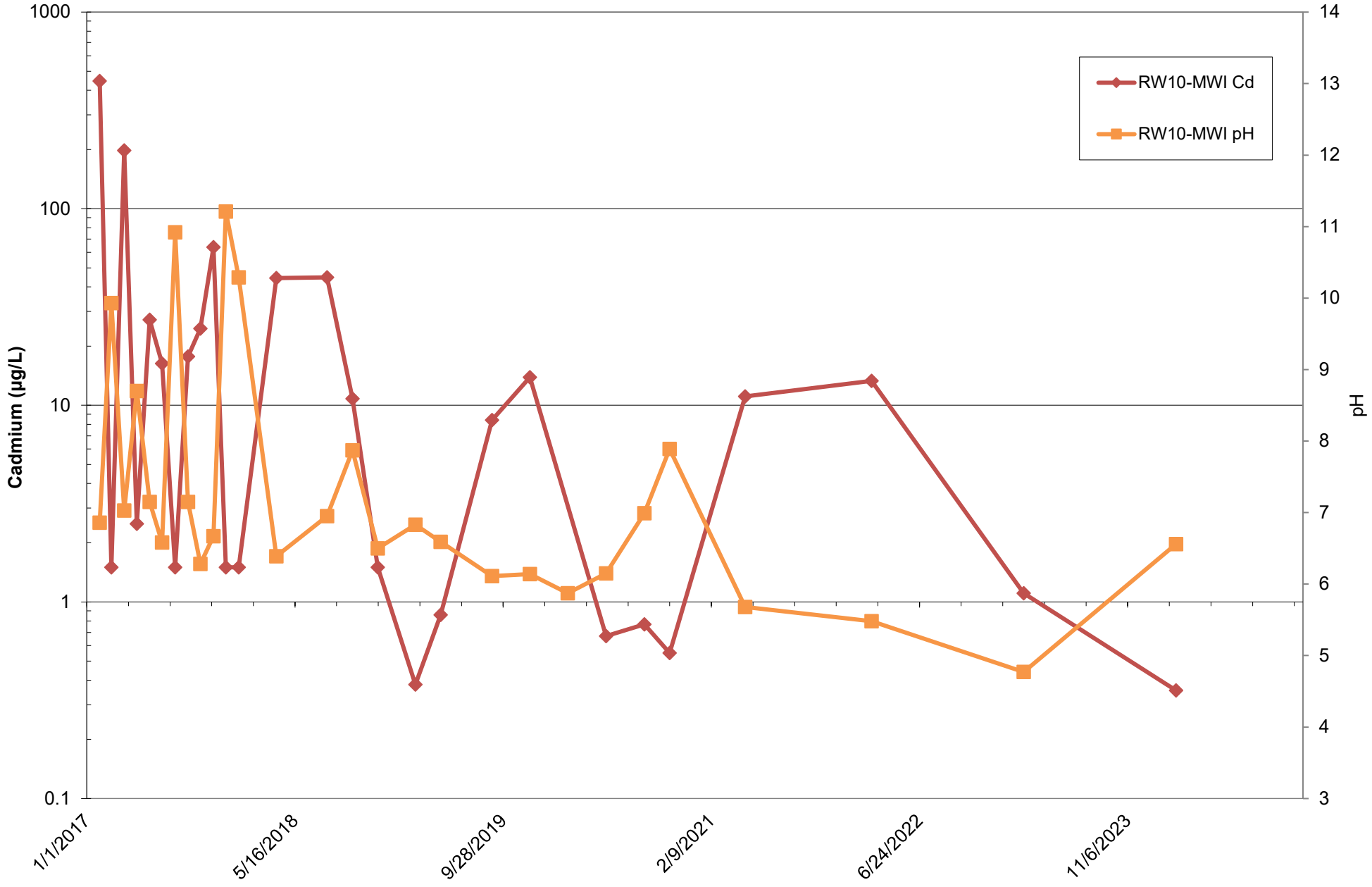
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RW09-MWI pH and Cadmium Concentrations

January 2025

**Appx C**




ARM Group LLC
Engineers and Scientists

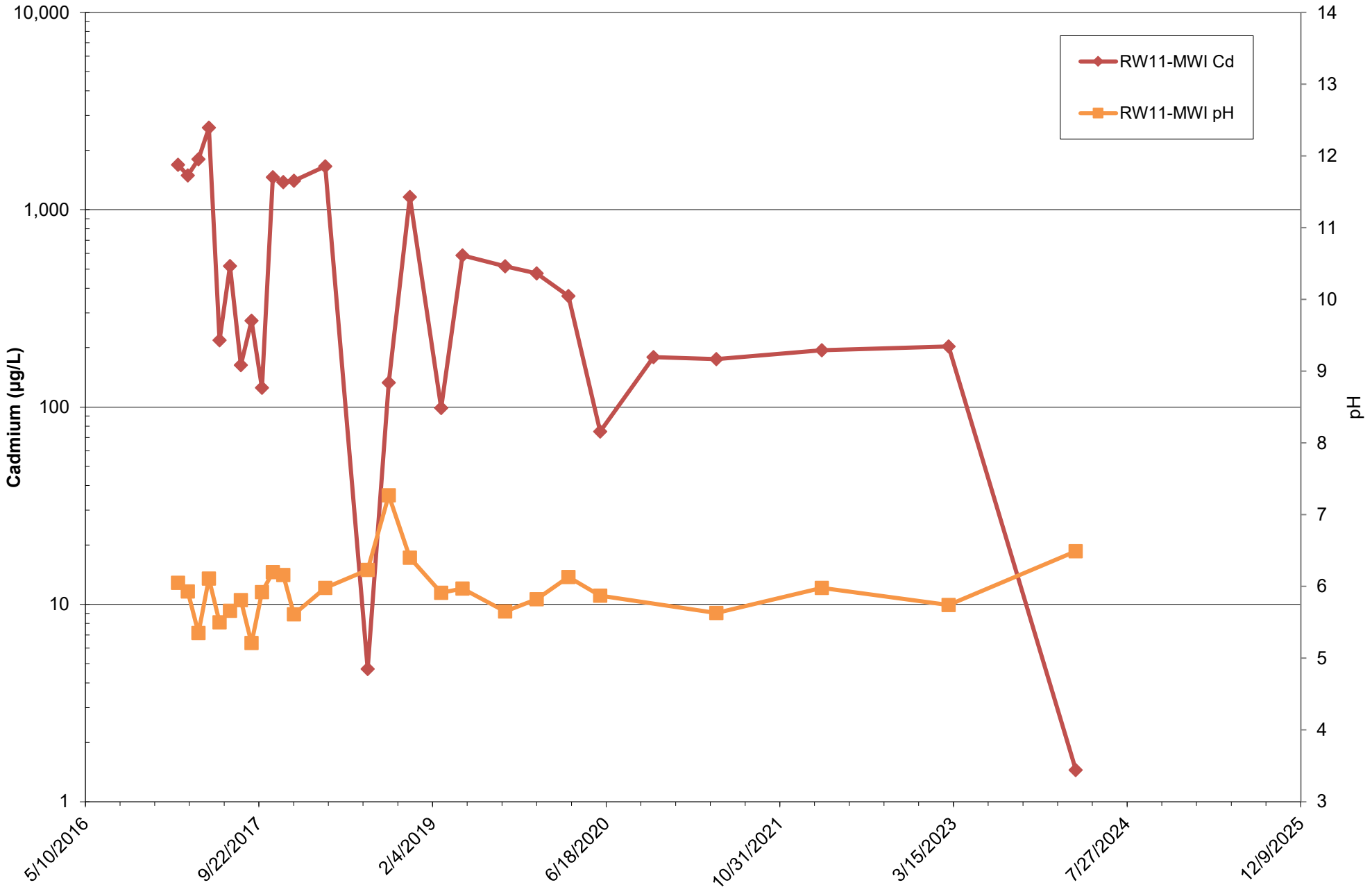
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RW10-MWI pH and Cadmium Concentrations

January 2025

**Appx C**




ARM Group LLC
Engineers and Scientists

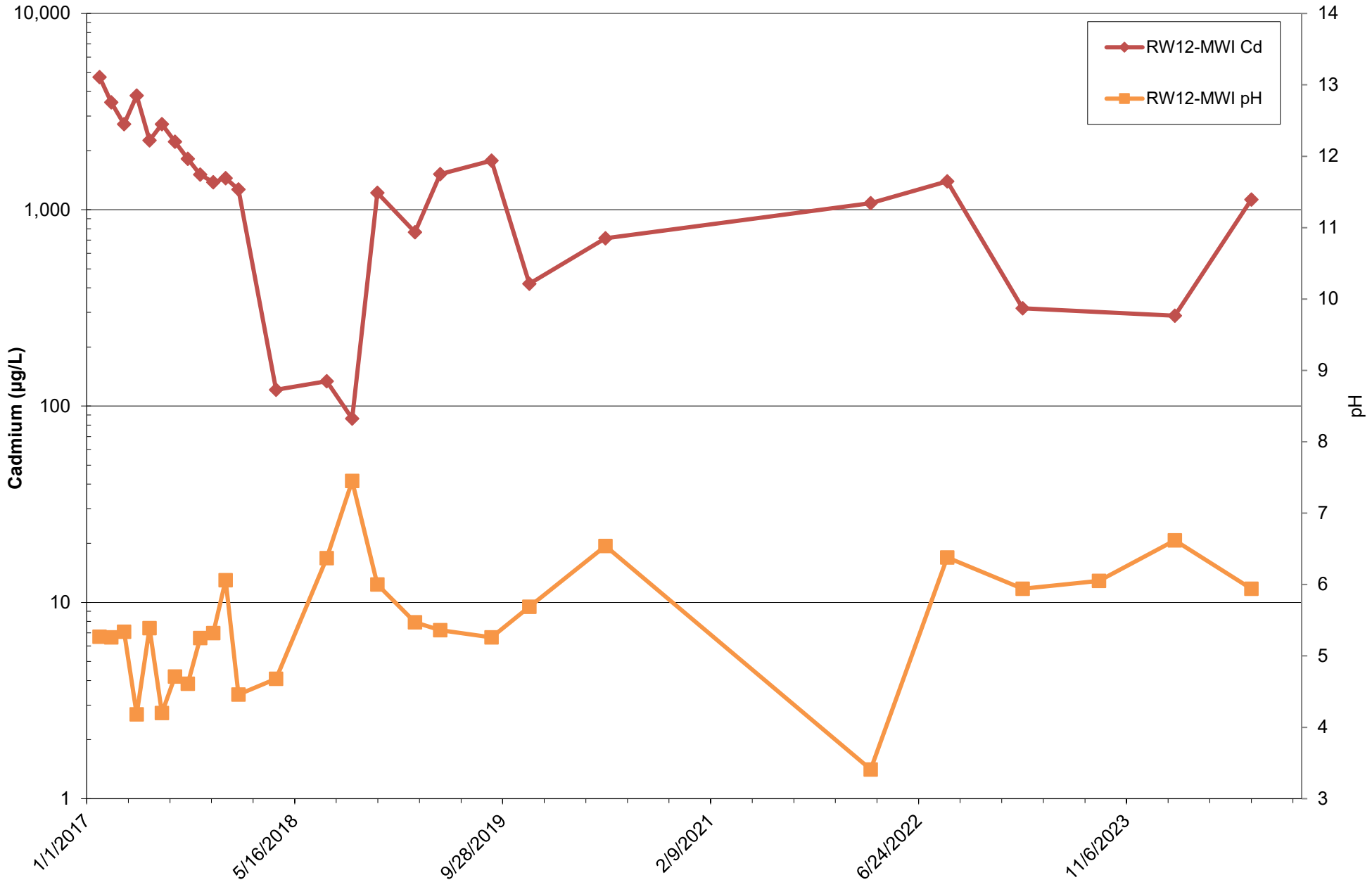
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RW11-MWI pH and Cadmium Concentrations

March 2025

**Appx C**




ARM Group LLC
Engineers and Scientists

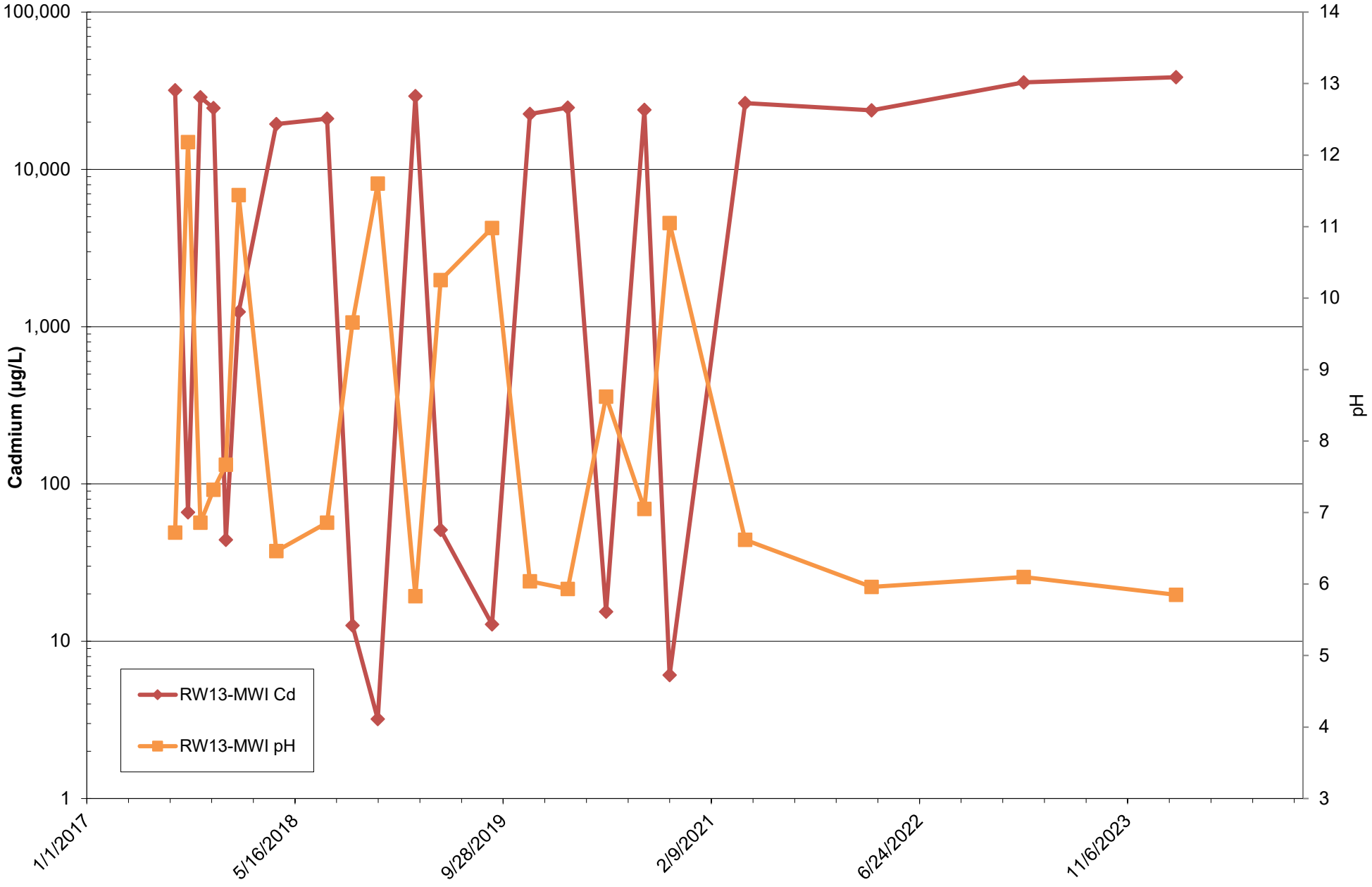
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RW12-MWI pH and Cadmium Concentrations

January 2025

**Appx C**




ARM Group LLC
Engineers and Scientists

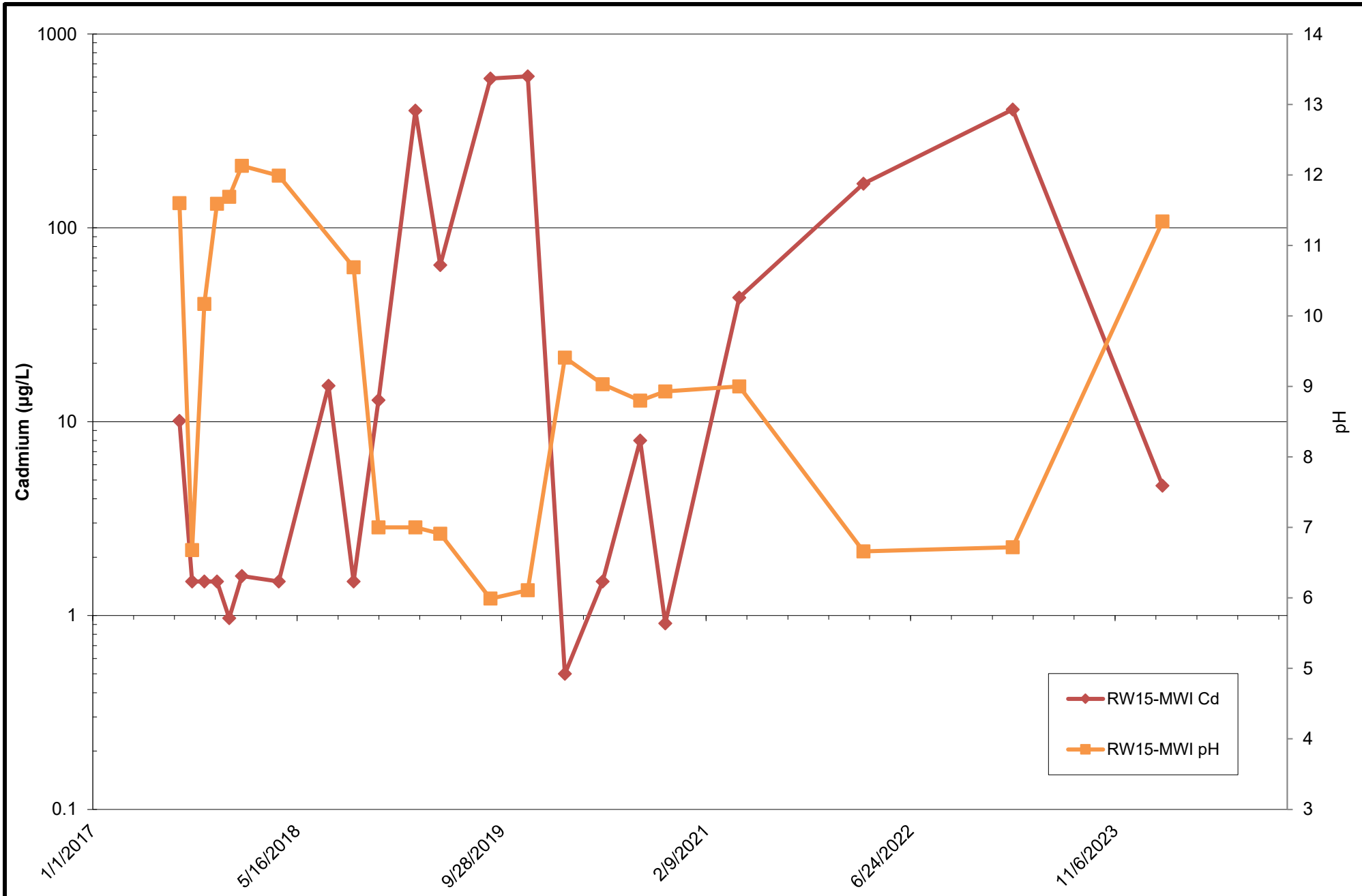
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RW13-MWI pH and Cadmium Concentrations

January 2025

**Appx C**




ARM Group LLC
Engineers and Scientists

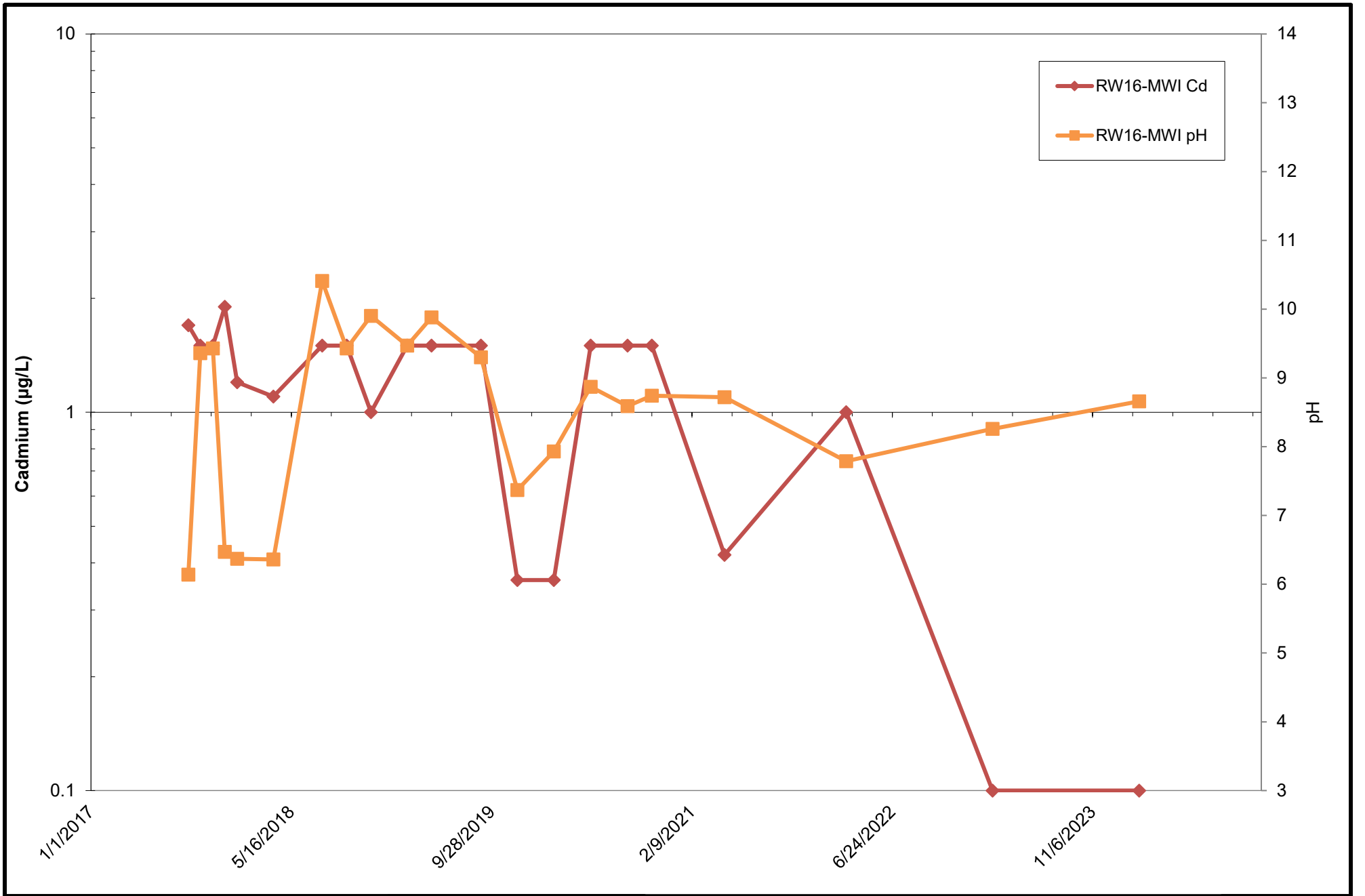
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RW15-MWI pH and Cadmium Concentrations

January 2025

**Appx C**




ARM Group LLC
Engineers and Scientists

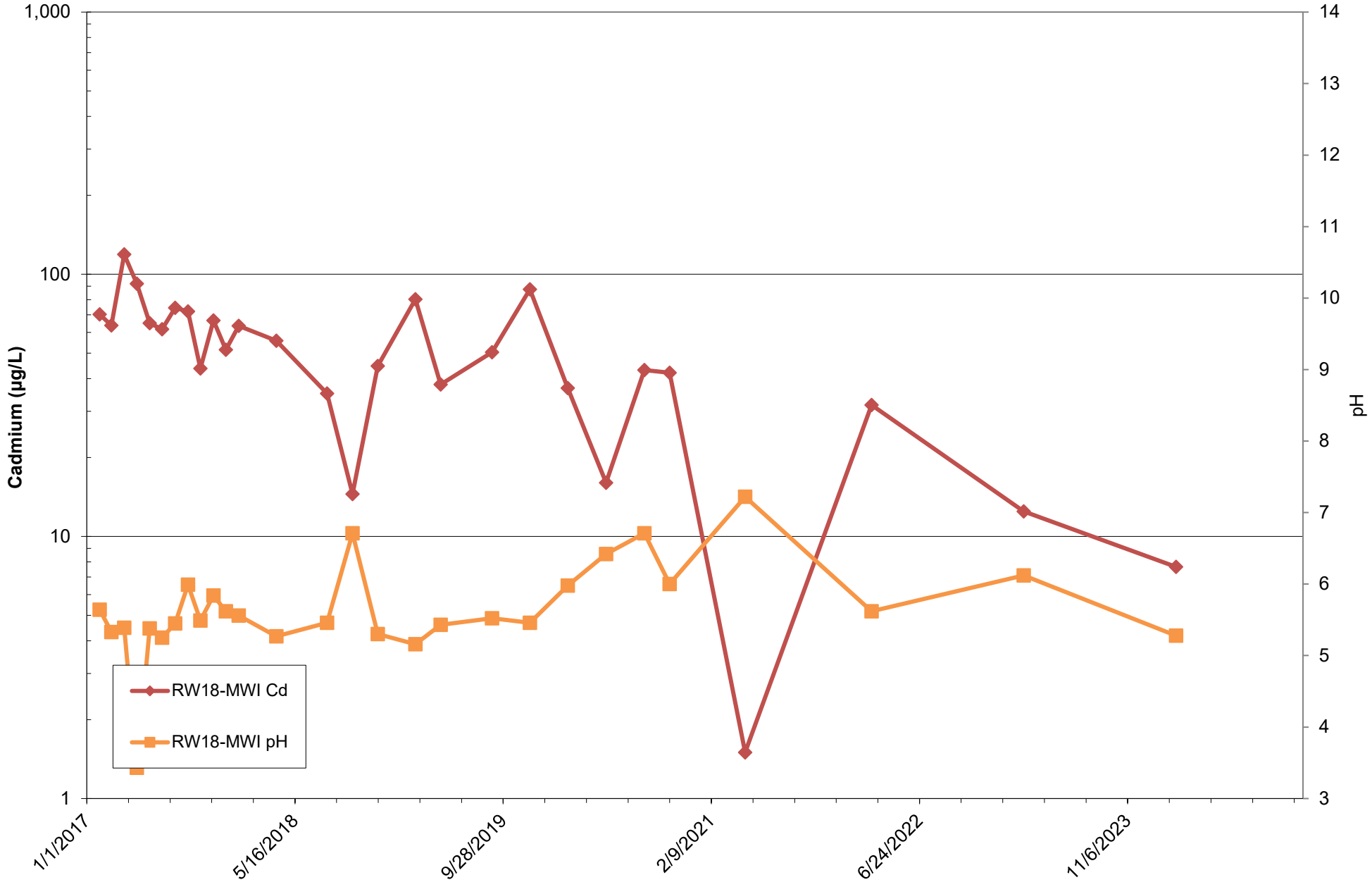
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RW16-MWI pH and Cadmium Concentrations

January 2025

**Appx C**




ARM Group LLC
Engineers and Scientists

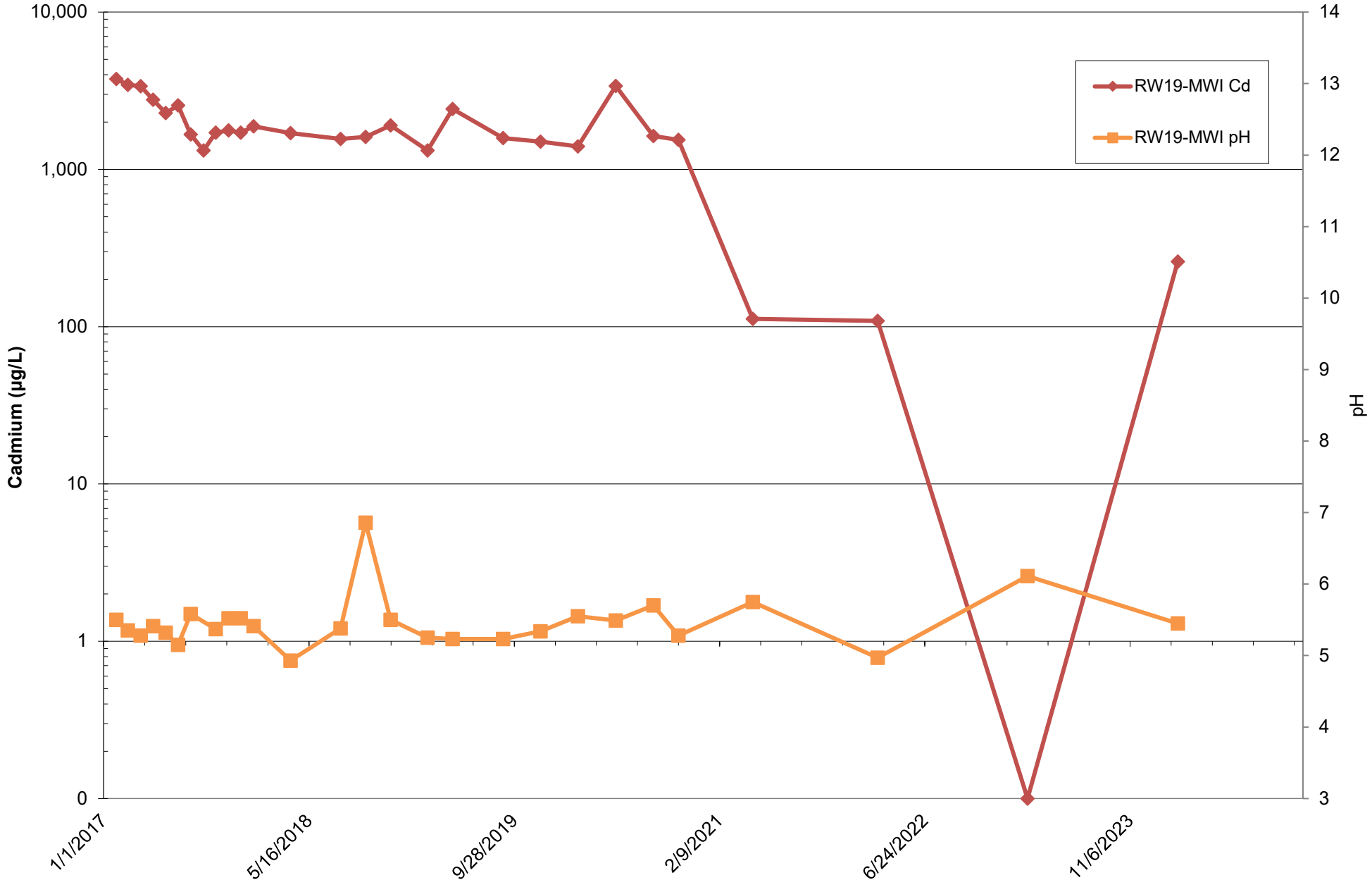
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RW18-MWI pH and Cadmium Concentrations

January 2025

**Appx C**




ARM Group LLC
Engineers and Scientists

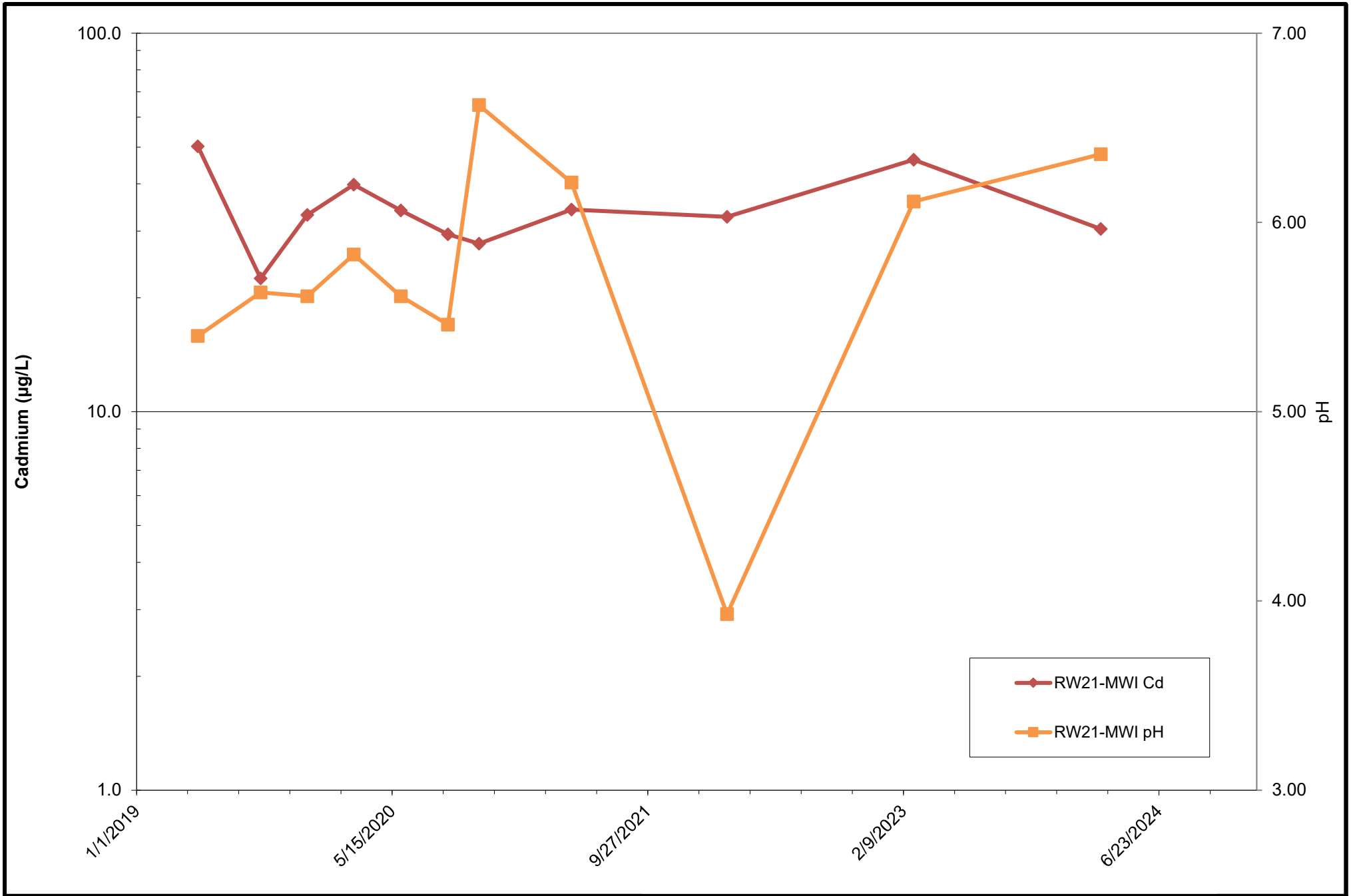
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RW19-MWI pH and Cadmium Concentrations

January 2025

**Appx C**




ARM Group LLC
Engineers and Scientists

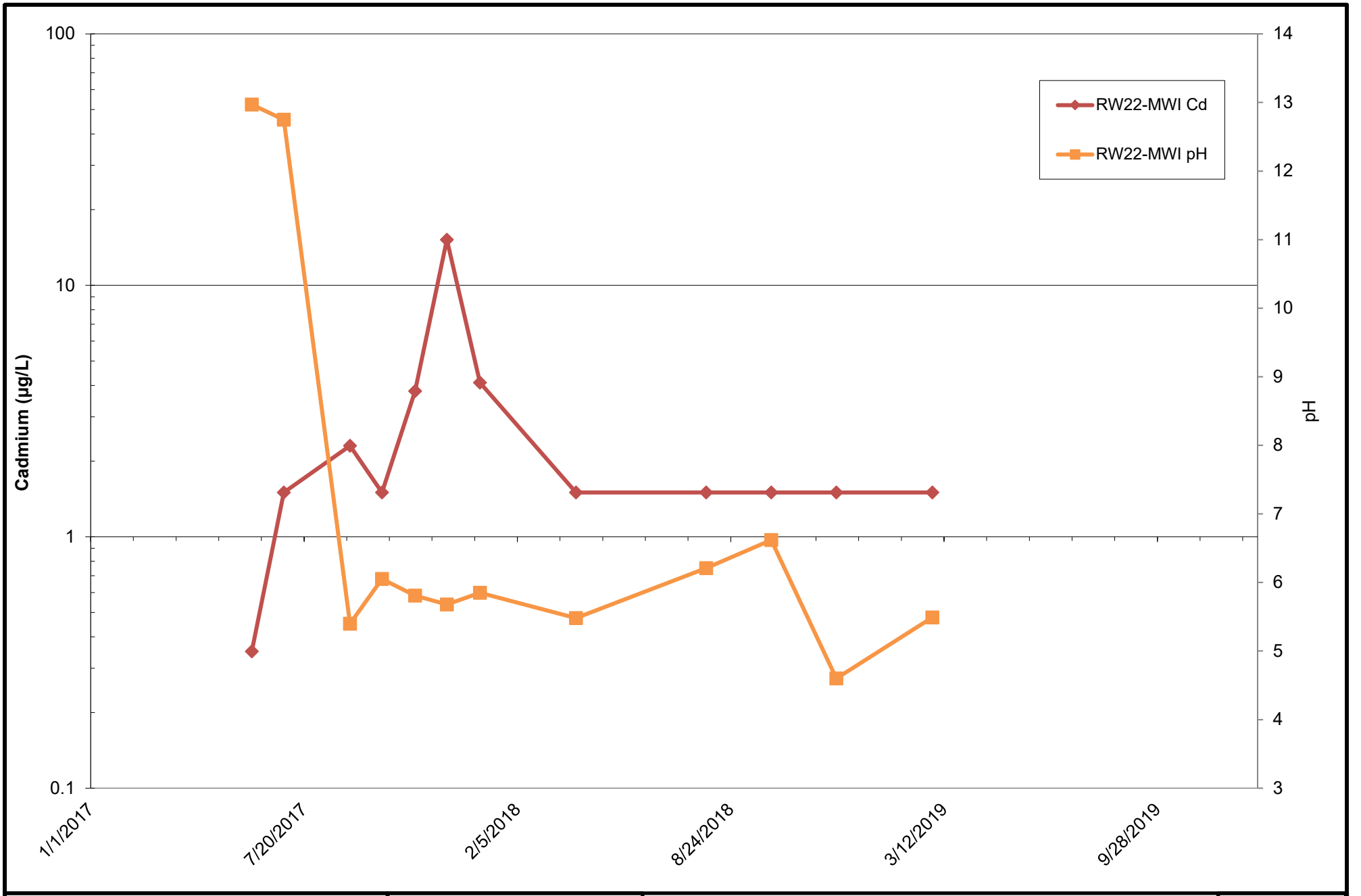
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RW21-MWI pH and Cadmium Concentrations

March 2025

**Appx C**




ARM Group LLC
Engineers and Scientists

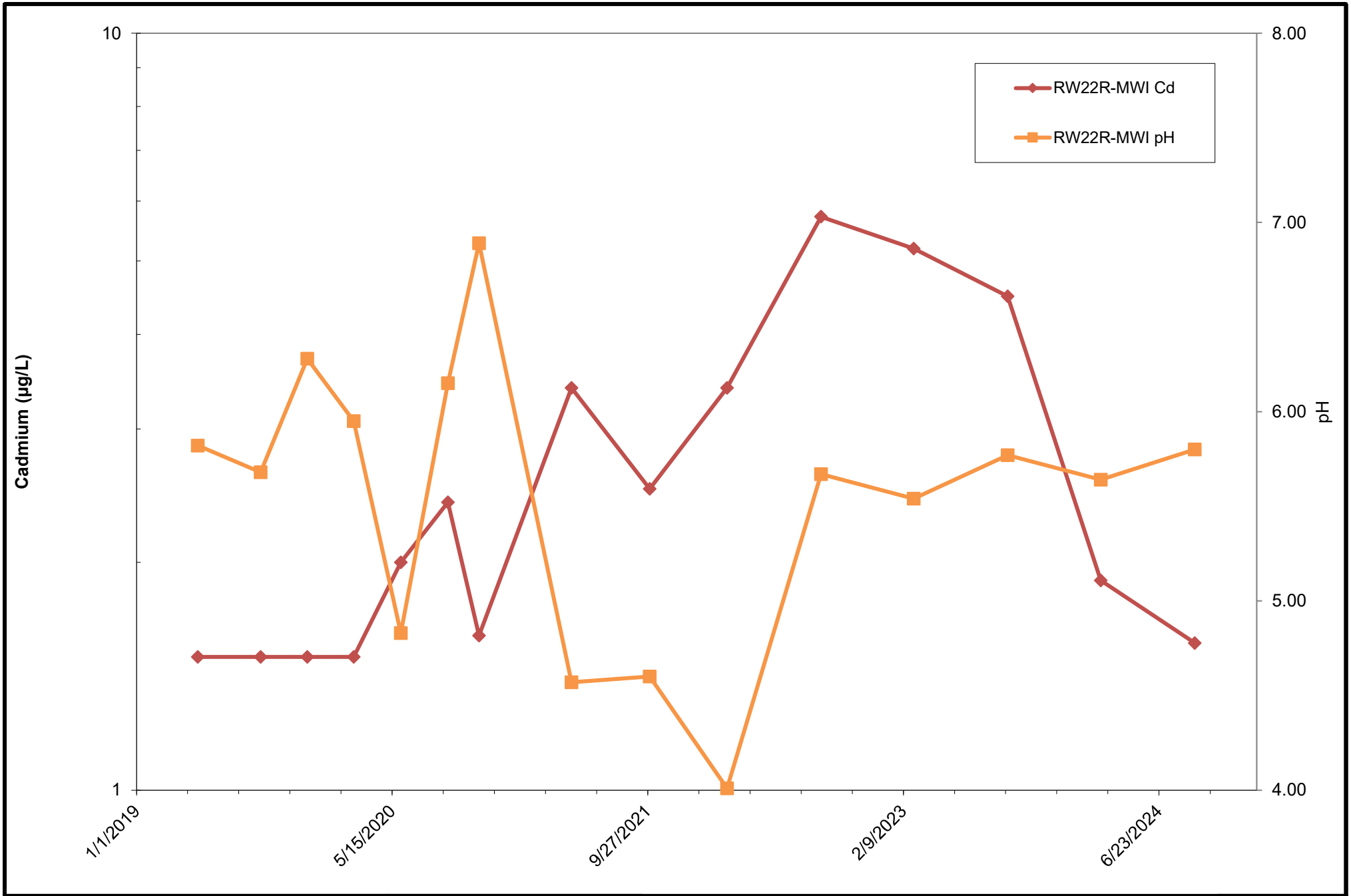
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RW22-MWI pH and Cadmium Concentrations

January 2025

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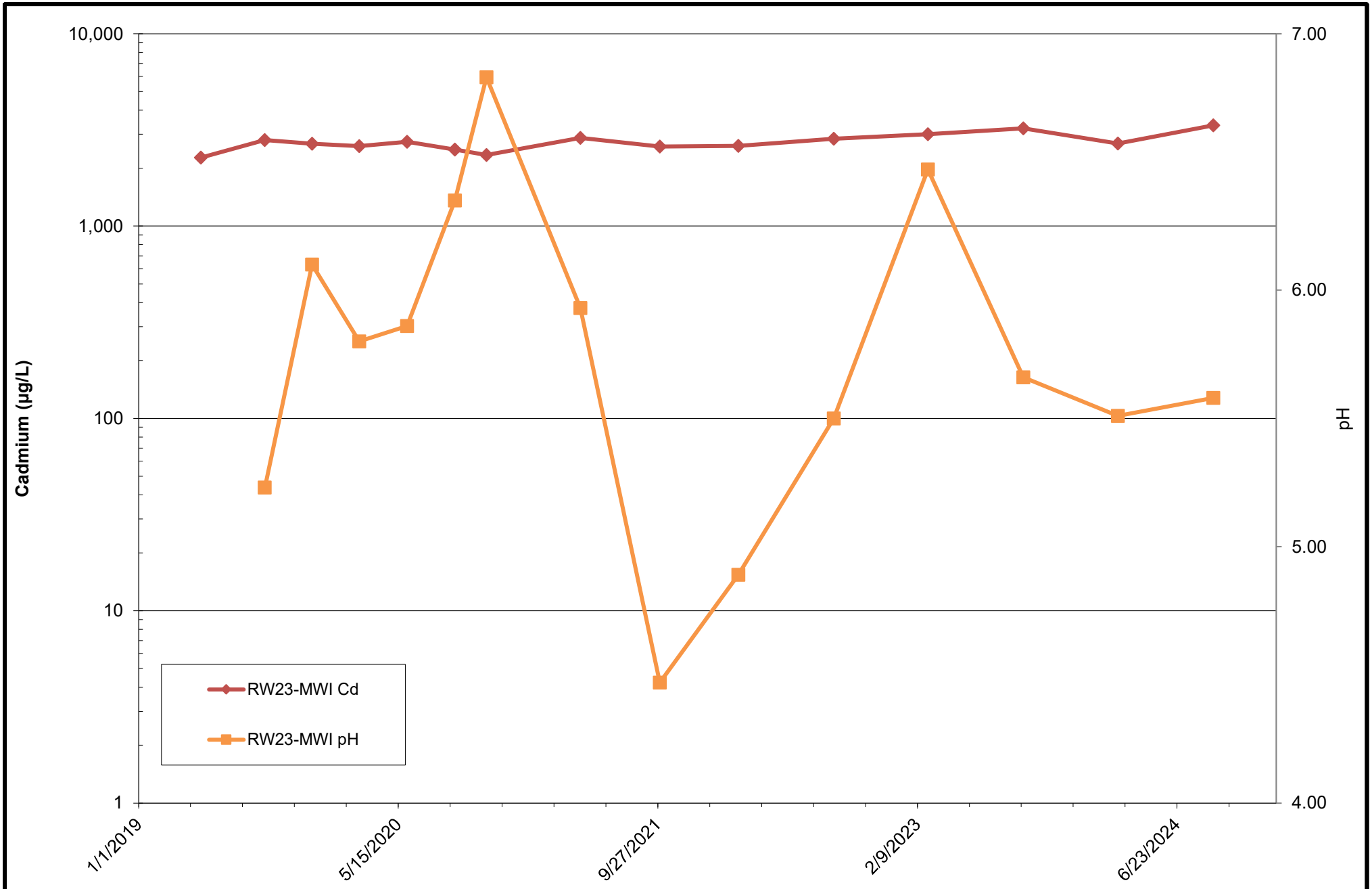
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RW22R-MWI pH and Cadmium Concentrations

March 2025

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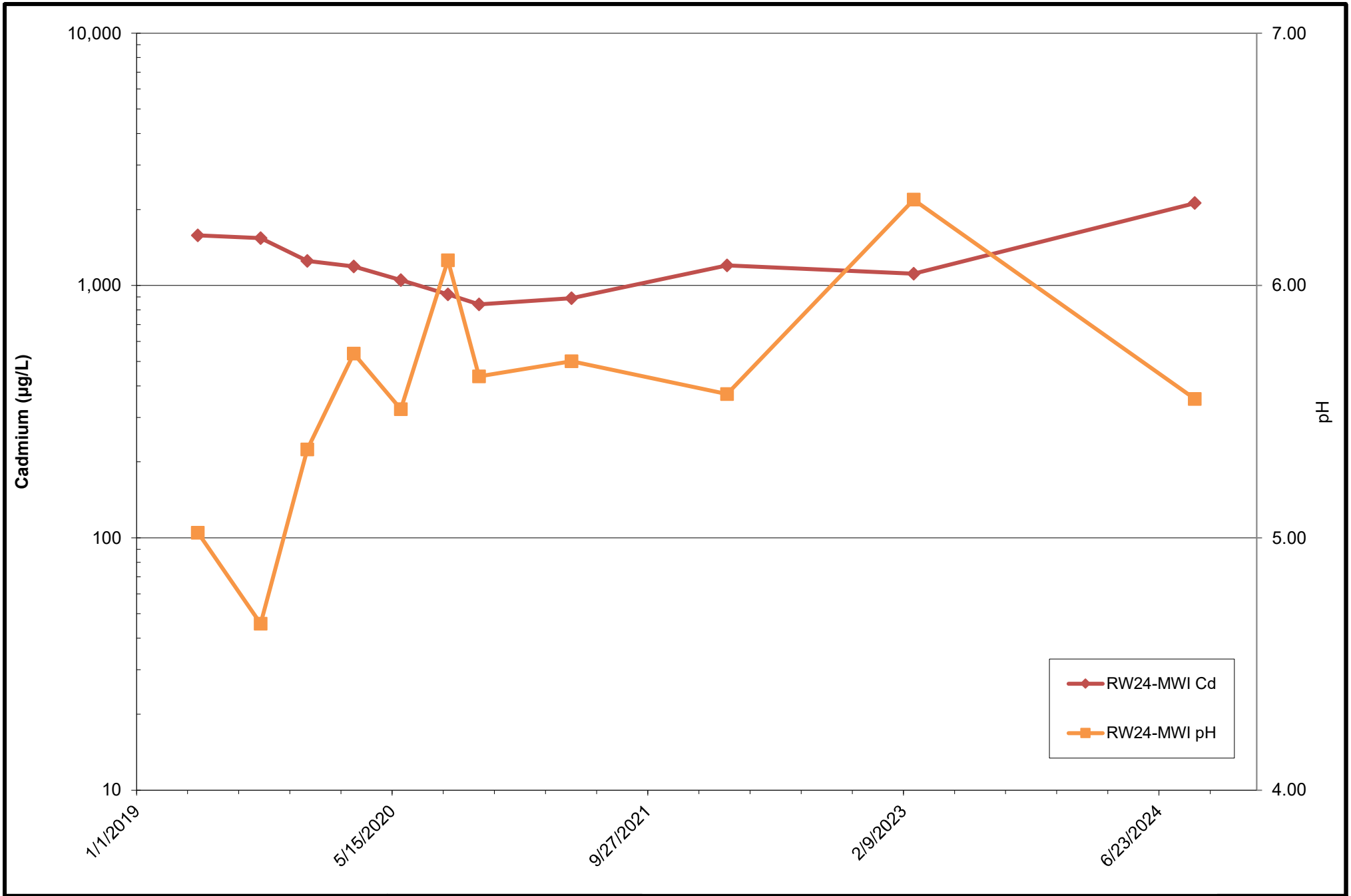
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Tradepoint Atlantic

Sparrows Point, Maryland

# RW23-MWI pH and Cadmium Concentrations

March 2025

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ARM Group LLC
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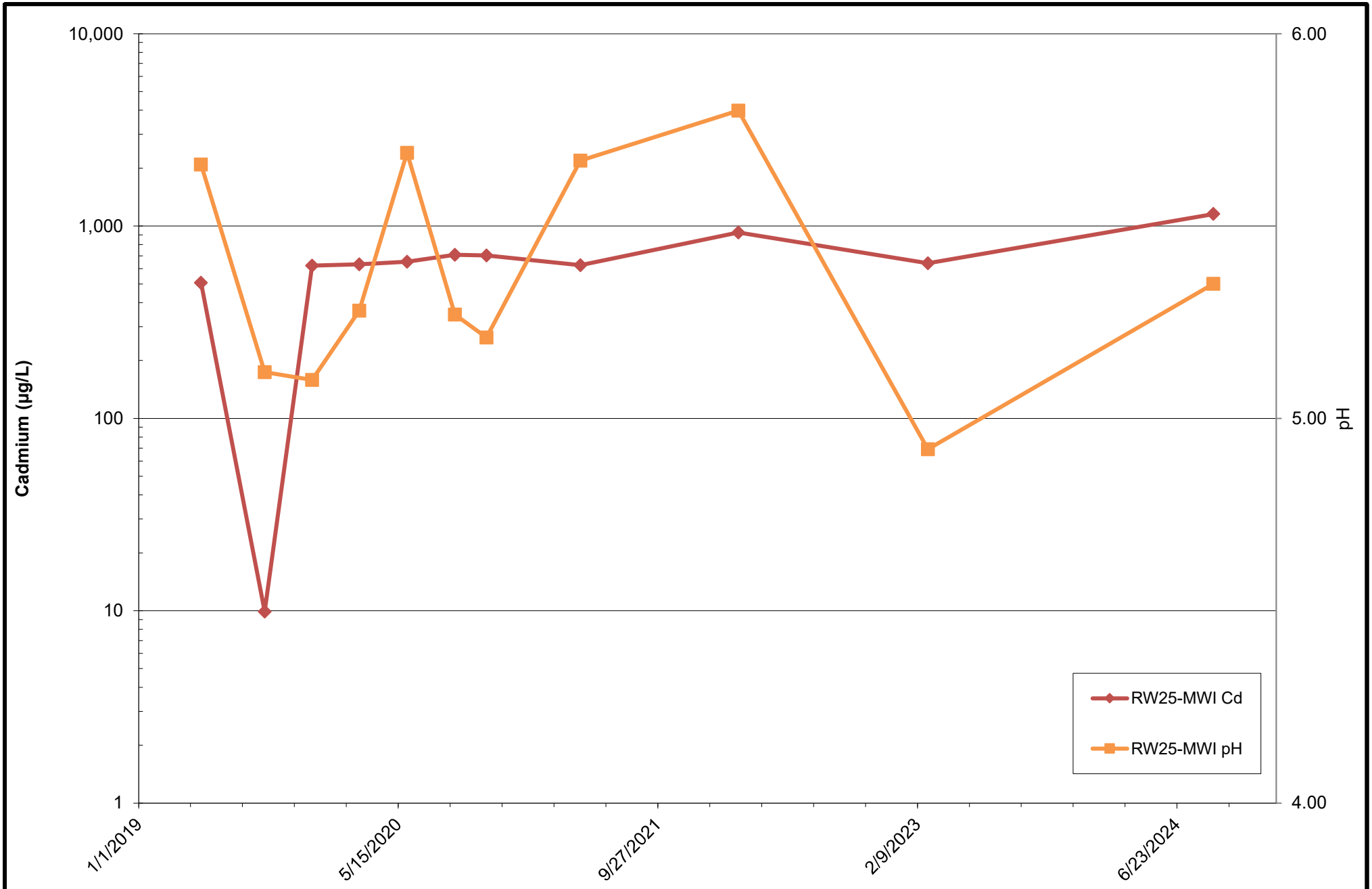
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Tradepoint Atlantic

Sparrows Point, Maryland

# RW24-MWI pH and Cadmium Concentrations

March 2025

**Appx C**




ARM Group LLC
Engineers and Scientists

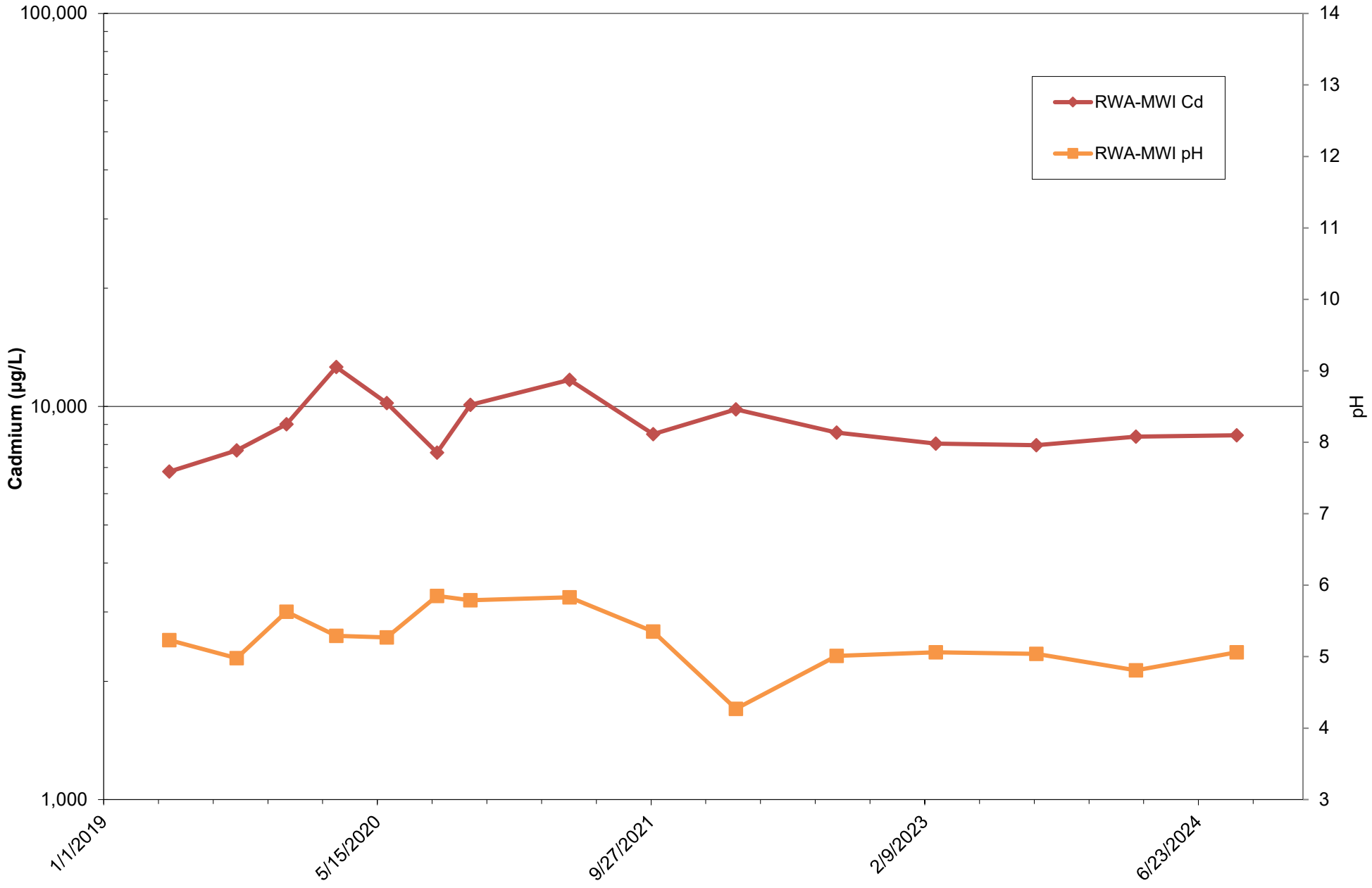
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RW25-MWI pH and Cadmium Concentrations

March 2025

**Appx C**




ARM Group LLC
Engineers and Scientists

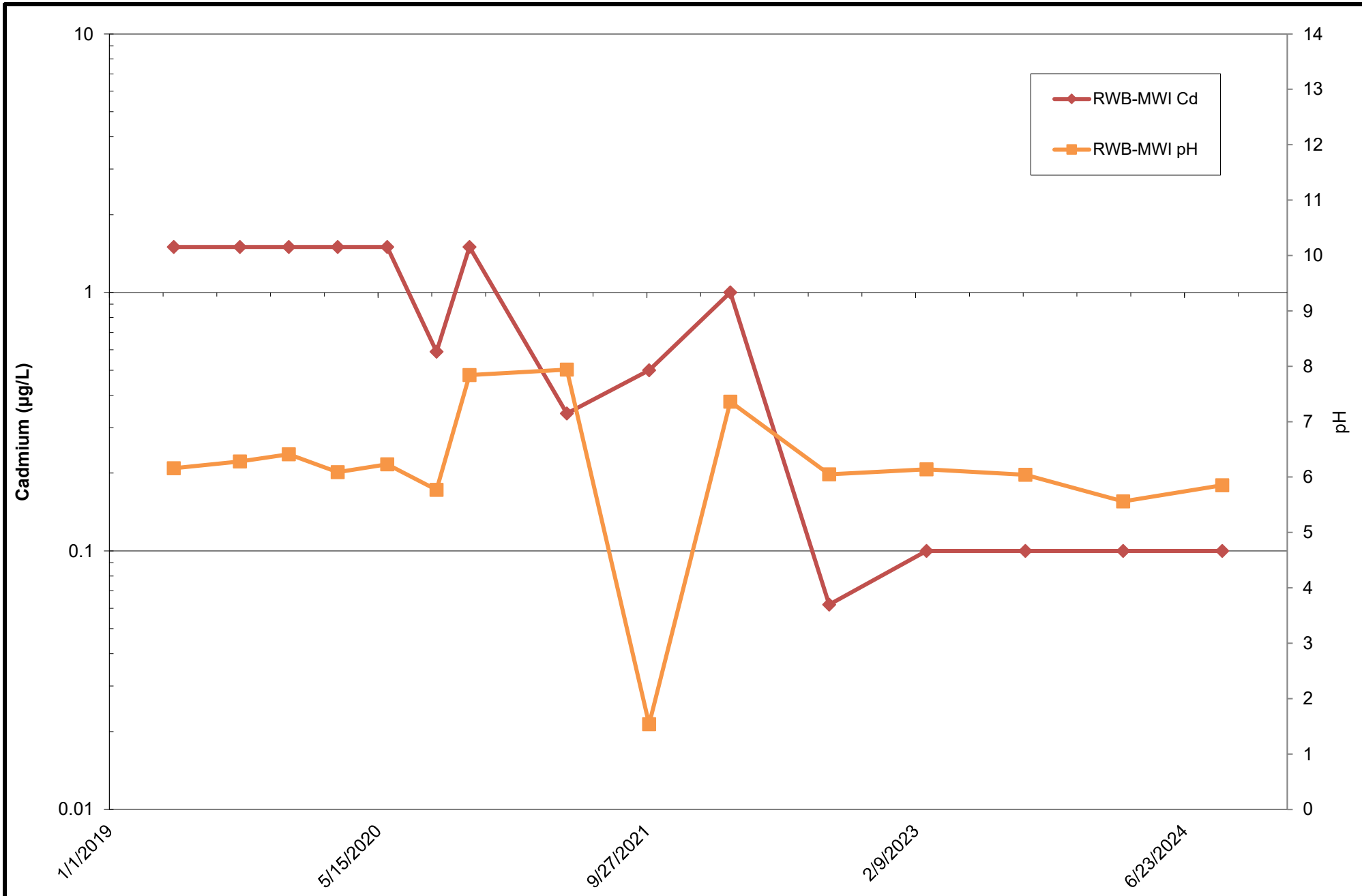
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RWA-MWI pH and Cadmium Concentrations

January 2025

**Appx C**




ARM Group LLC
Engineers and Scientists

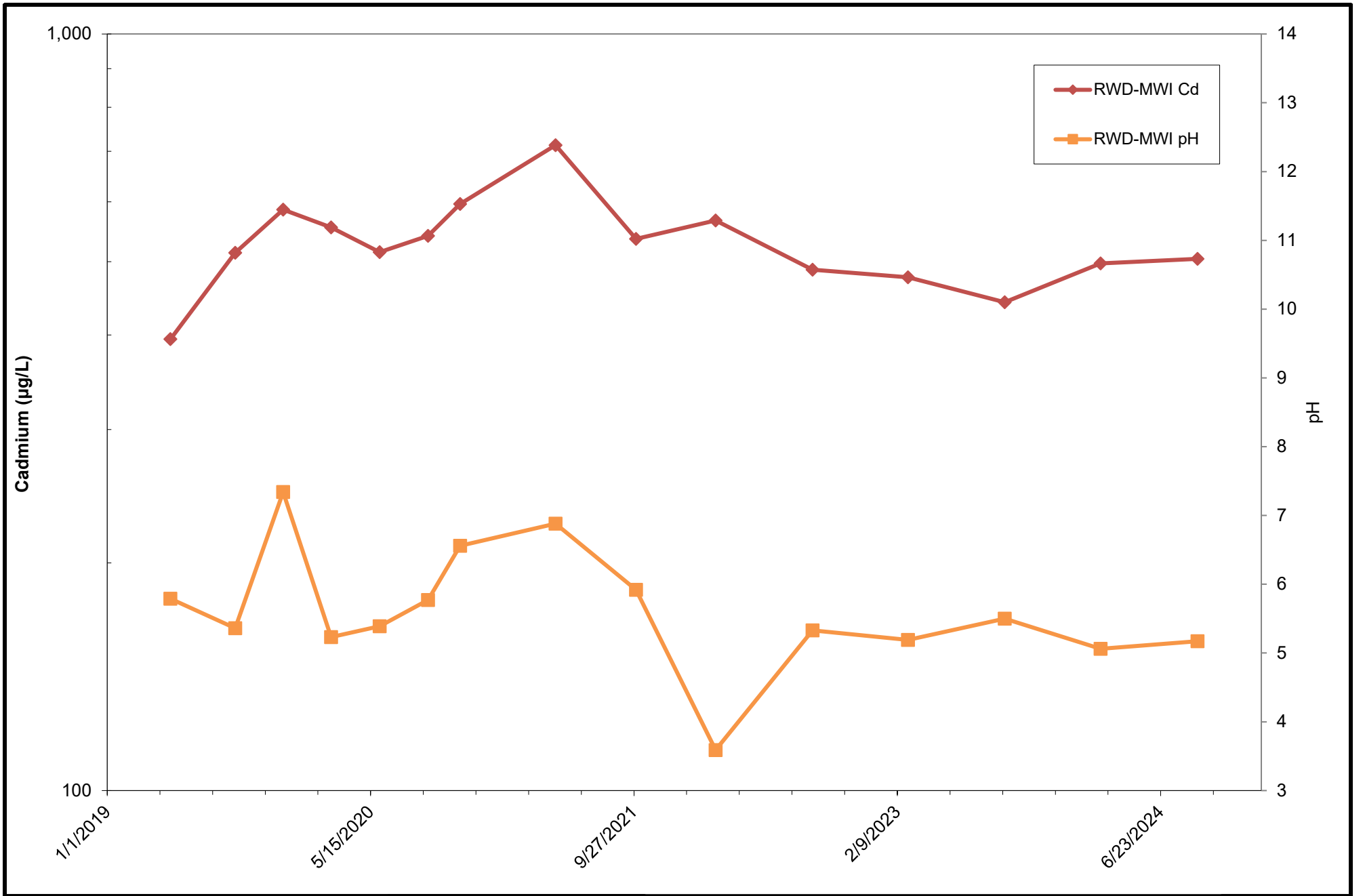
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RWB-MWI pH and Cadmium Concentrations

January 2025

**Appx C**




ARM Group LLC
Engineers and Scientists

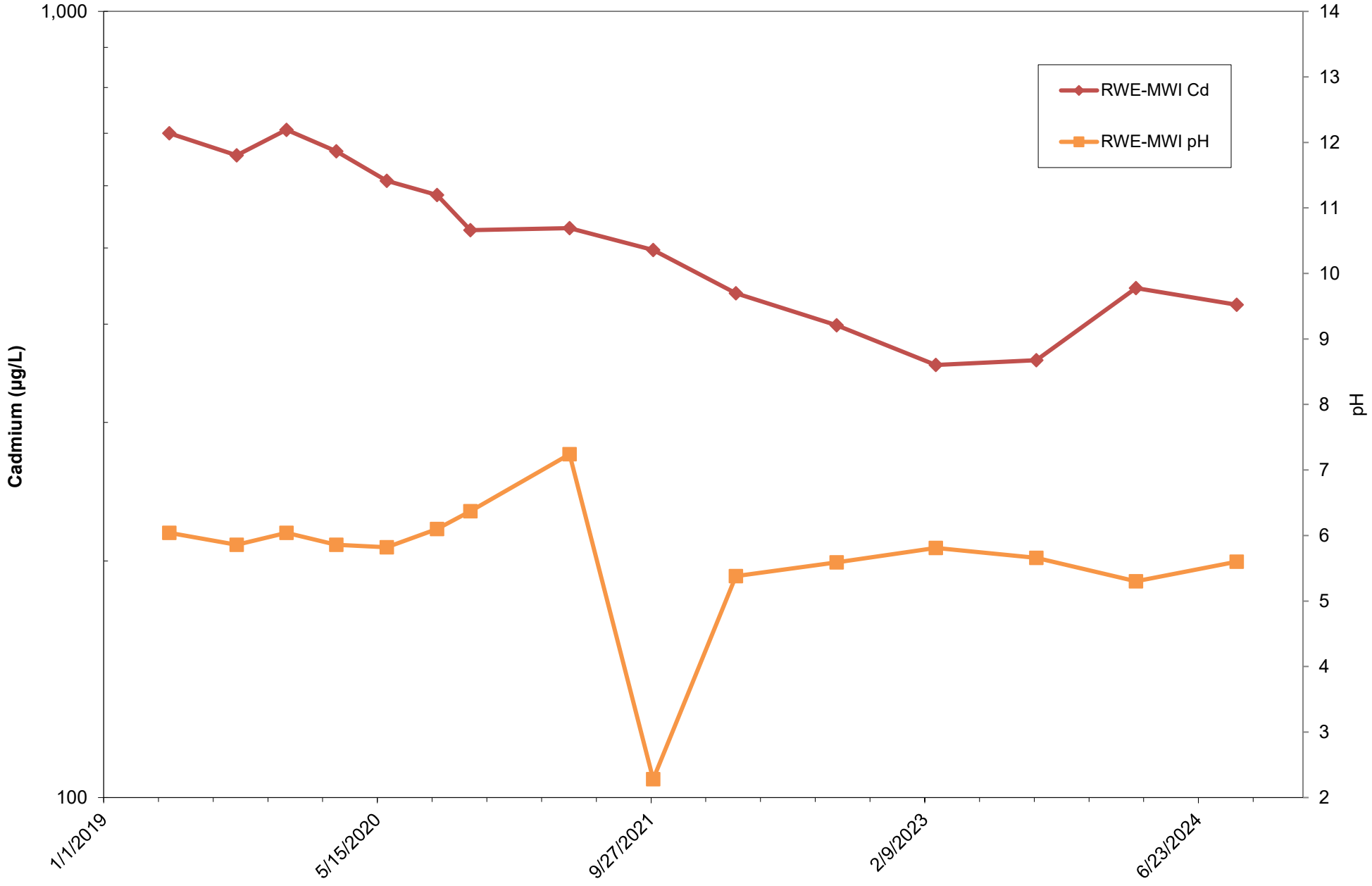
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RWD-MWI pH and Cadmium Concentrations

January 2025

**Appx C**




ARM Group LLC
Engineers and Scientists

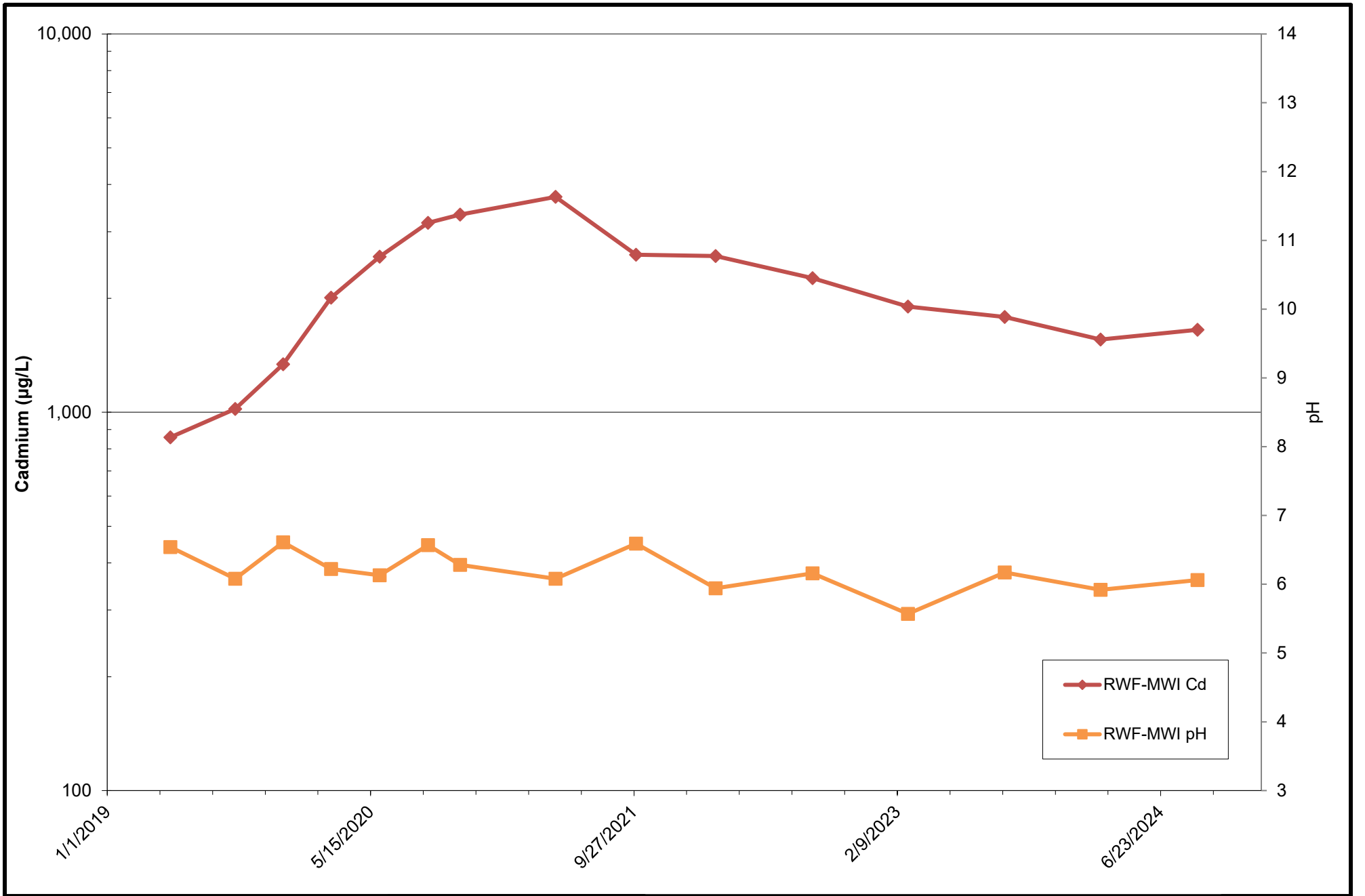
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RWE-MWI pH and Cadmium Concentrations

January 2025

**Appx C**




ARM Group LLC
Engineers and Scientists

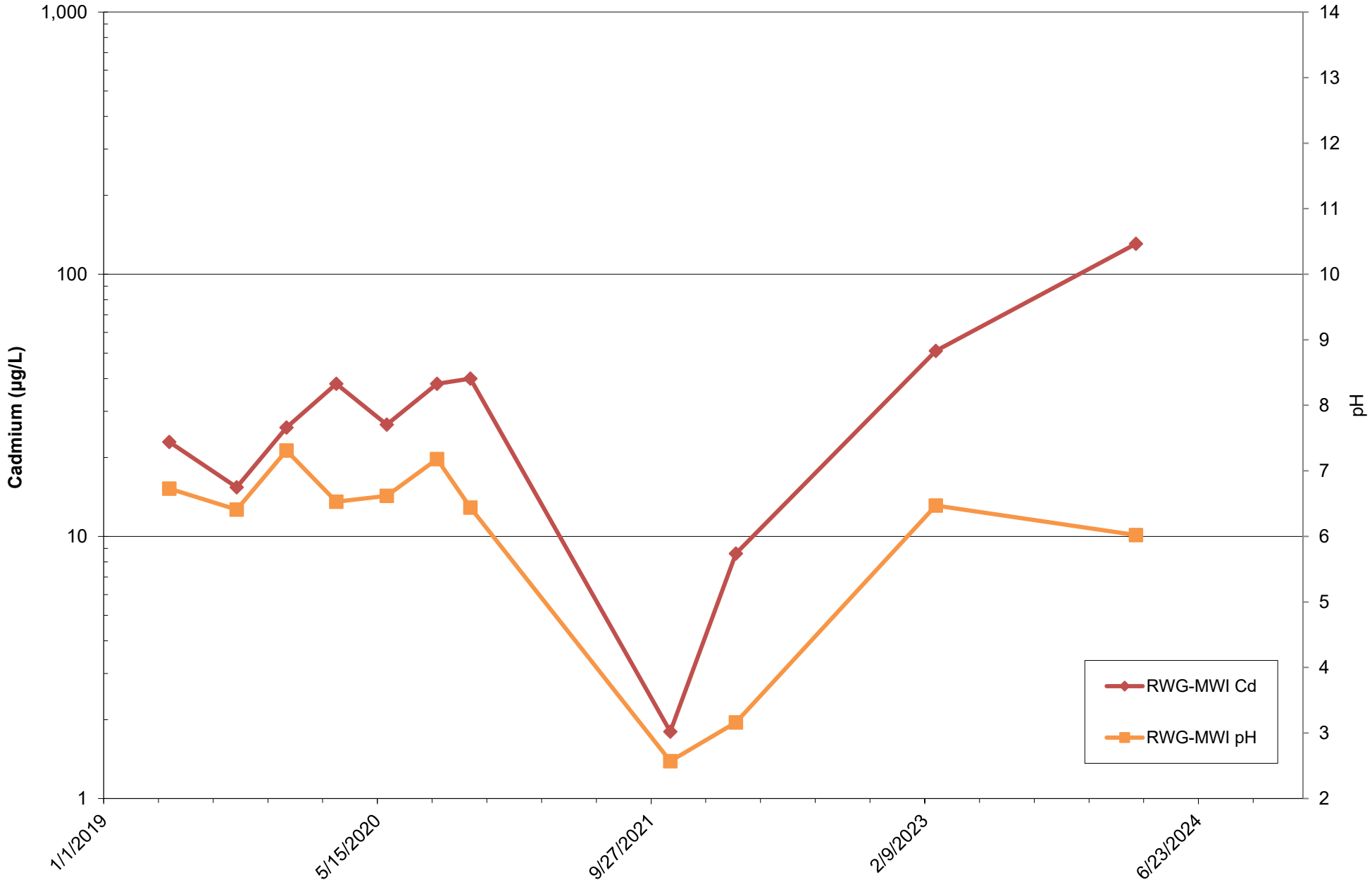
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Tradepoint Atlantic

Sparrows Point, Maryland

# RWF-MWI pH and Cadmium Concentrations

January 2025

**Appx C**




ARM Group LLC
Engineers and Scientists

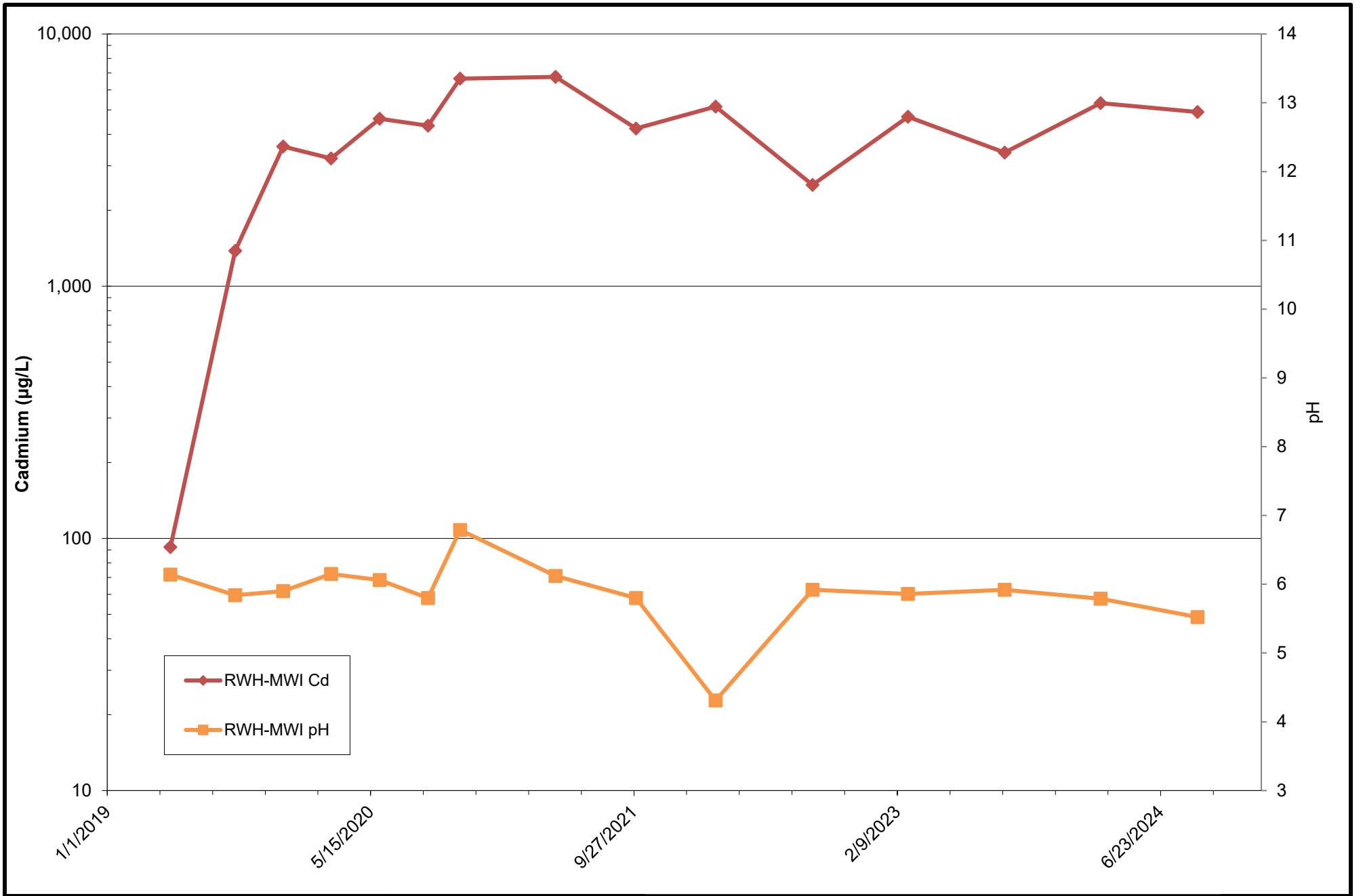
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Tradepoint Atlantic

Sparrows Point, Maryland

# RWG-MWI pH and Cadmium Concentrations

January 2025

**Appx C**




ARM Group LLC
Engineers and Scientists

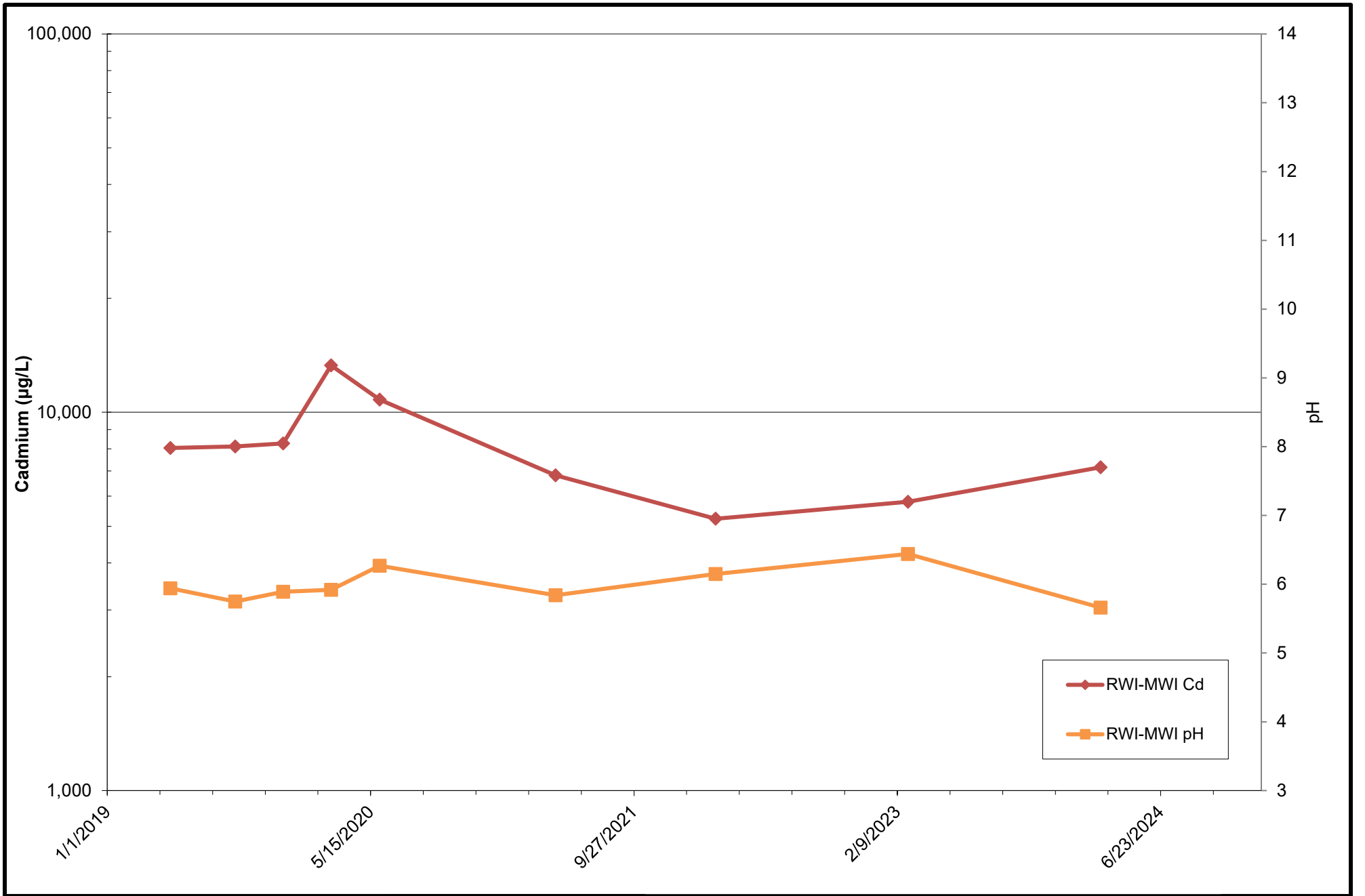
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Tradepoint Atlantic

Sparrows Point, Maryland

# RWH-MWI pH and Cadmium Concentrations

January 2025

**Appx C**




ARM Group LLC
Engineers and Scientists

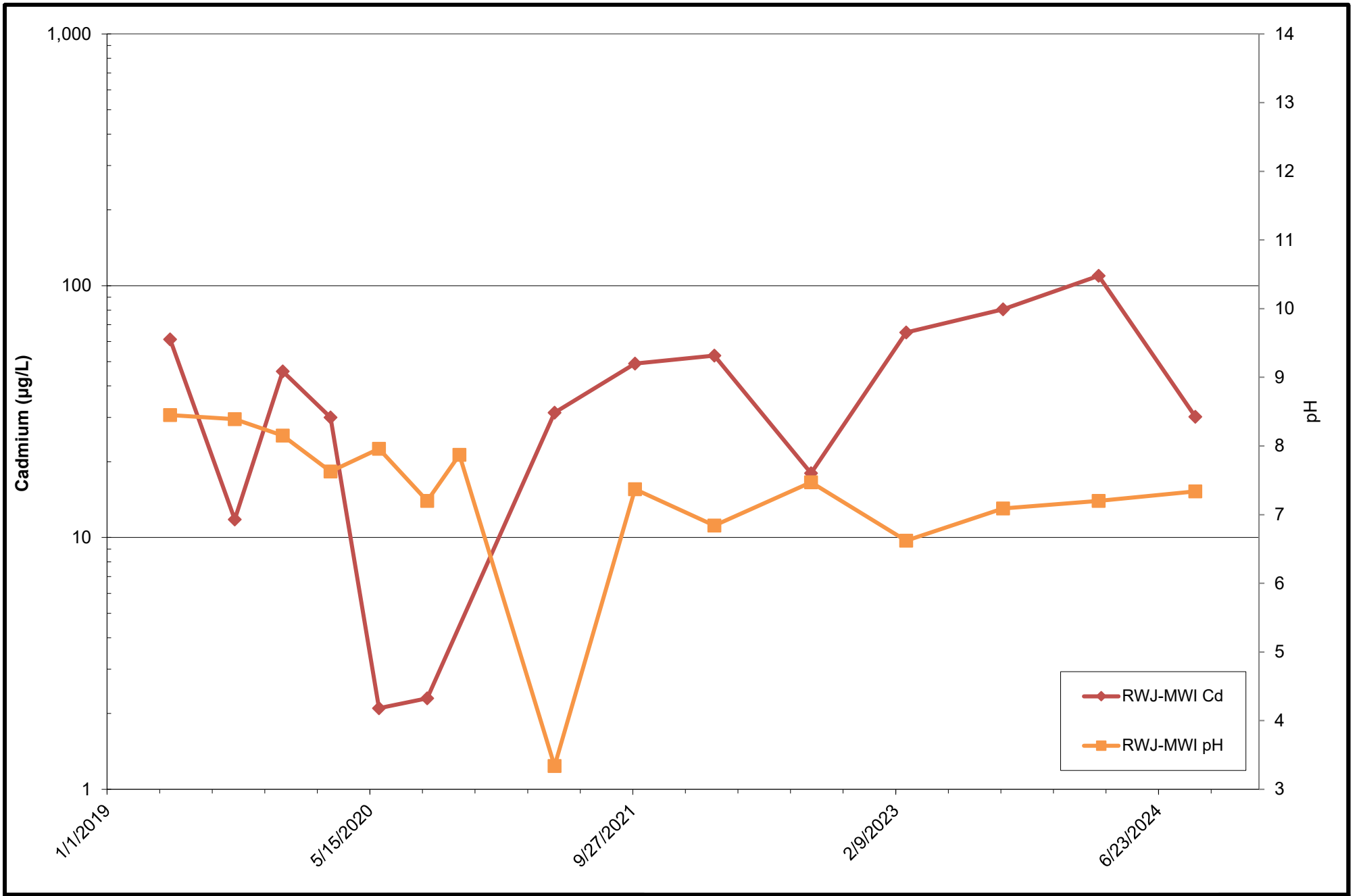
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# RWI-MWI pH and Cadmium Concentrations

January 2025

**Appx C**




ARM Group LLC
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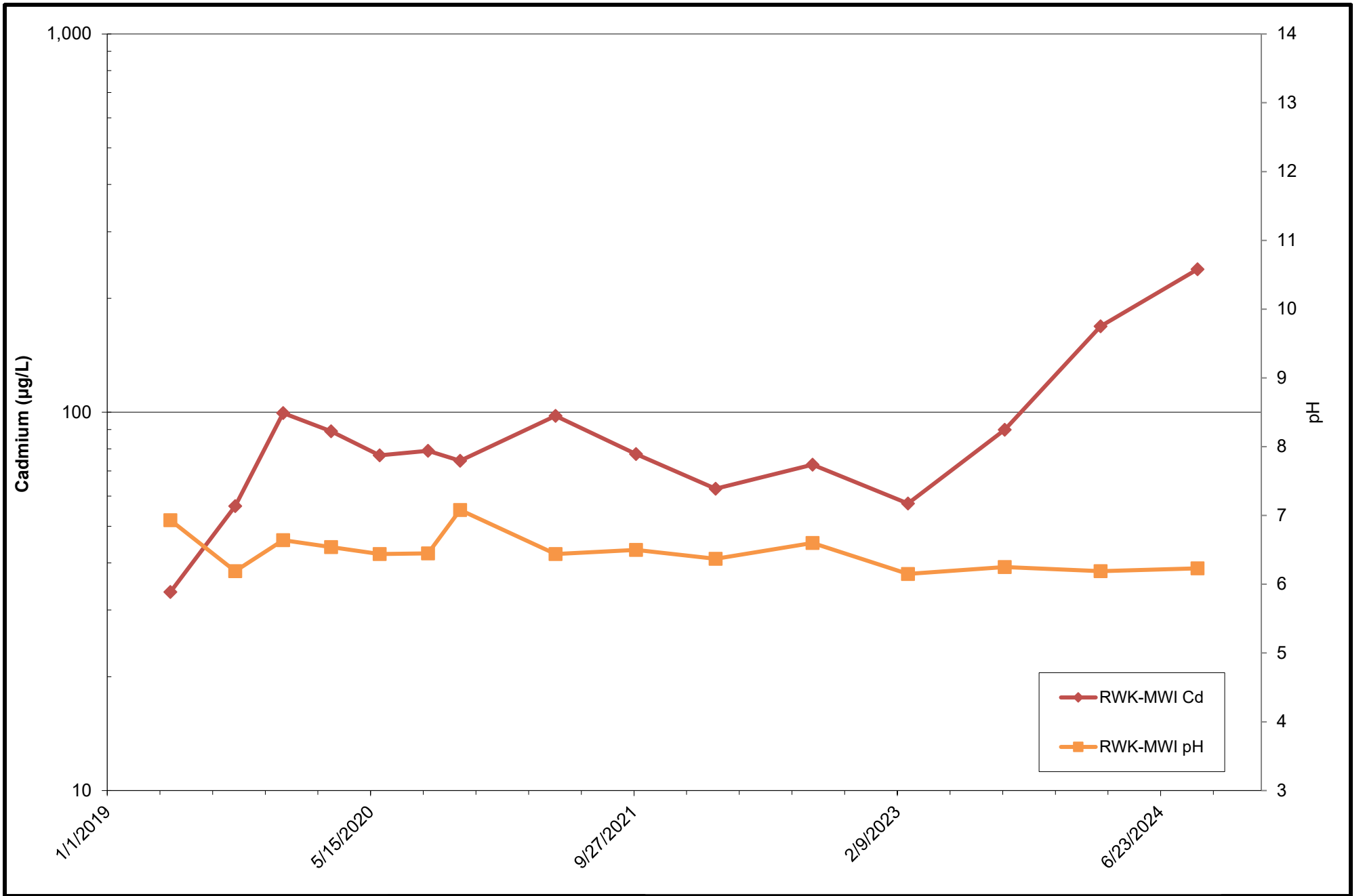
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Tradepoint Atlantic

Sparrows Point, Maryland

# RWJ-MWI pH and Cadmium Concentrations

January 2025

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ARM Group LLC
Engineers and Scientists

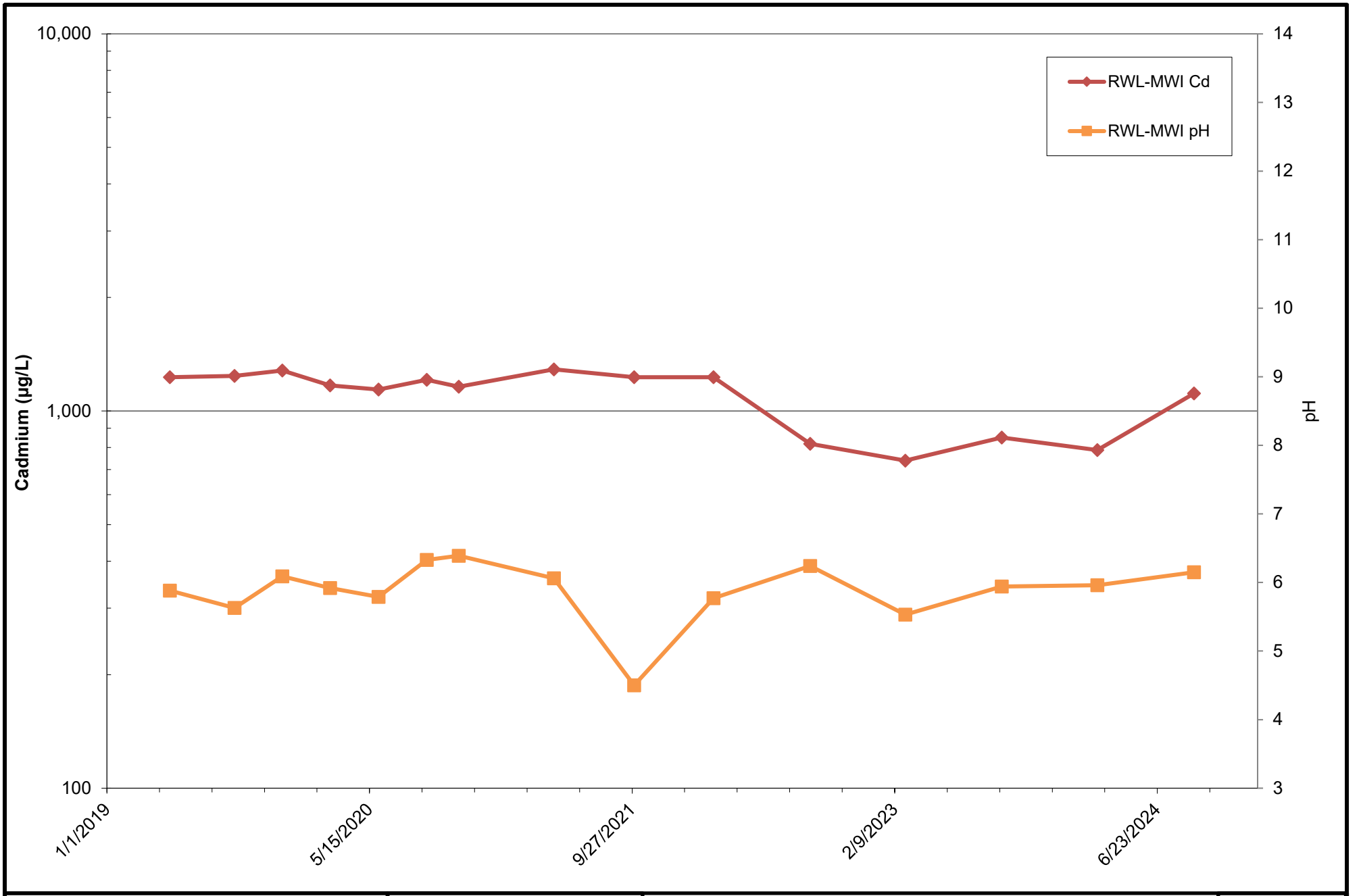
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Tradepoint Atlantic

Sparrows Point, Maryland

# RWK-MWI pH and Cadmium Concentrations

January 2025

**Appx C**




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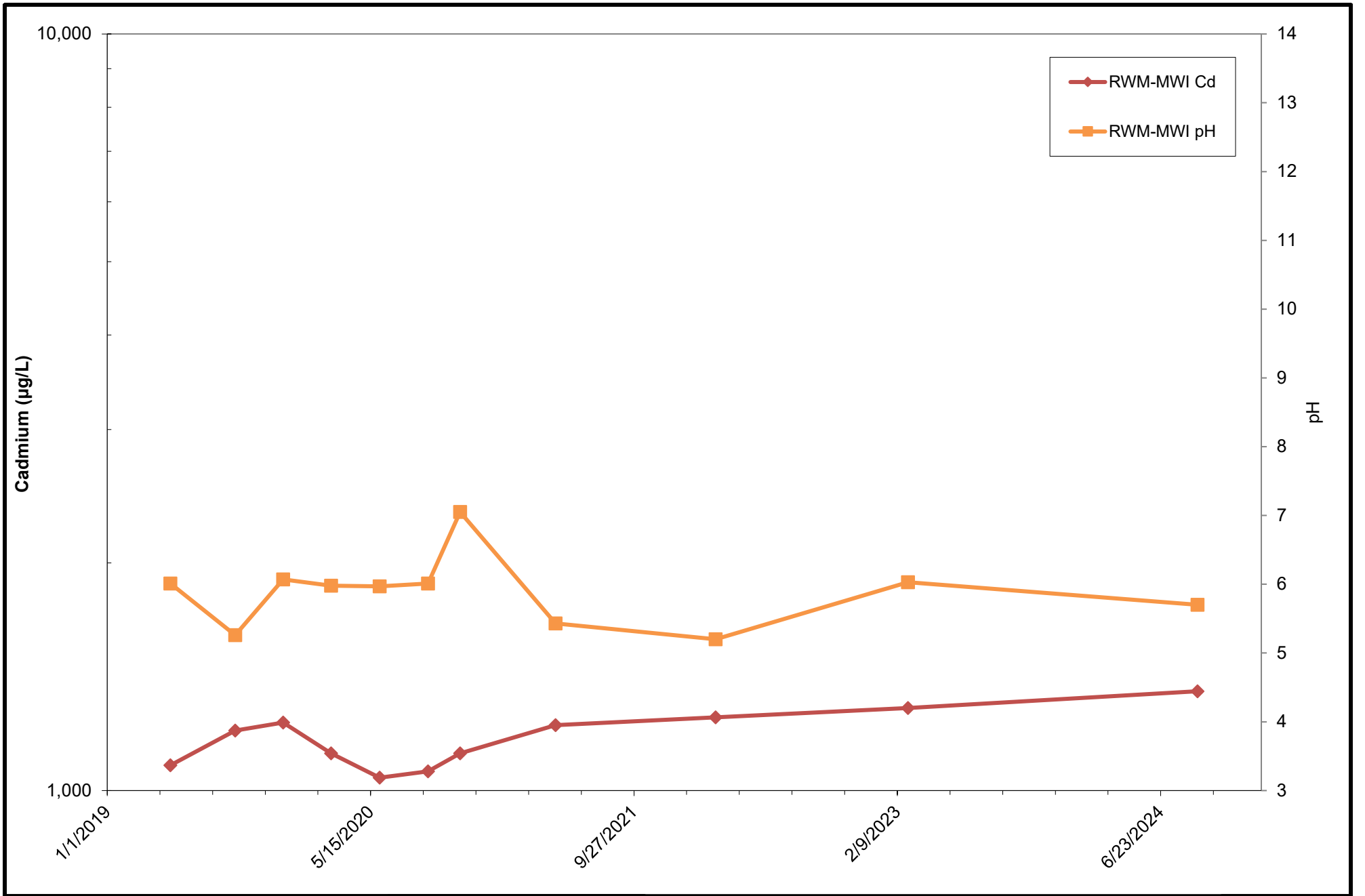
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RWL-MWI pH and Cadmium Concentrations

January 2025

**Appx C**




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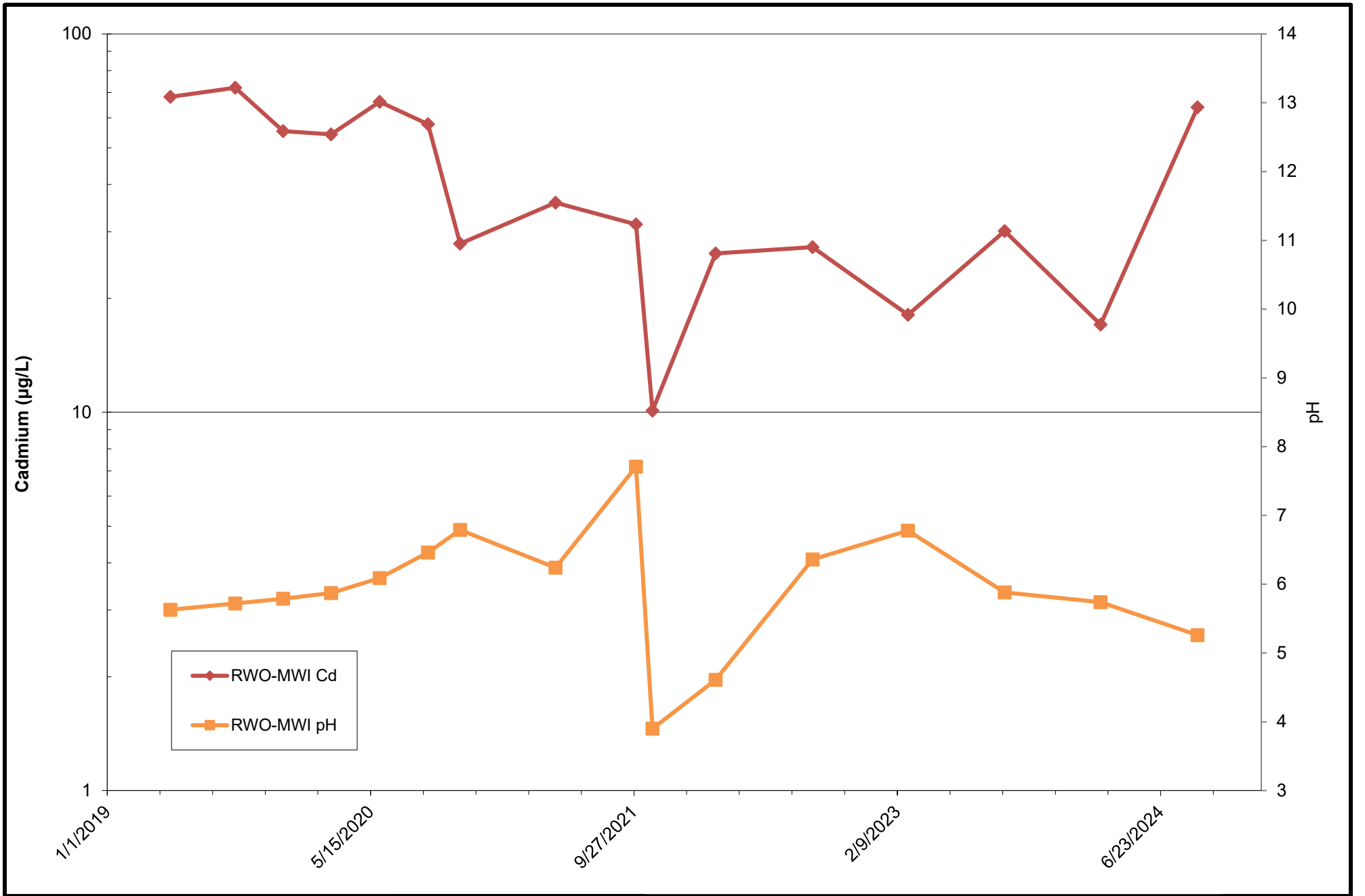
Rod and Wire Mill
Tradepoint Atlantic

Sparrows Point, Maryland

# RWM-MWI pH and Cadmium Concentrations

January 2025

**Appx C**




ARM Group LLC
Engineers and Scientists

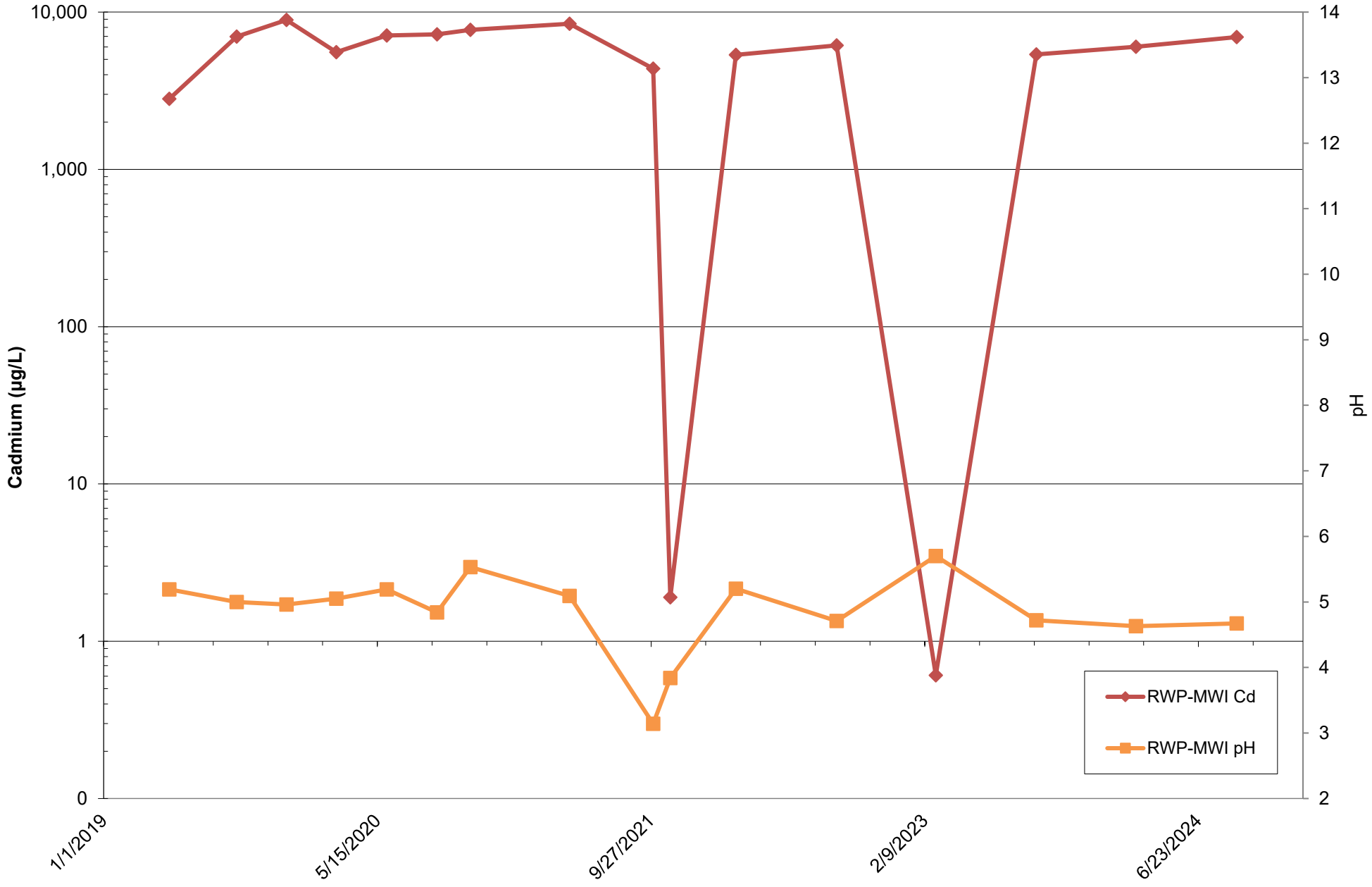
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Tradepoint Atlantic

Sparrows Point, Maryland

# RWO-MWI pH and Cadmium Concentrations

January 2025

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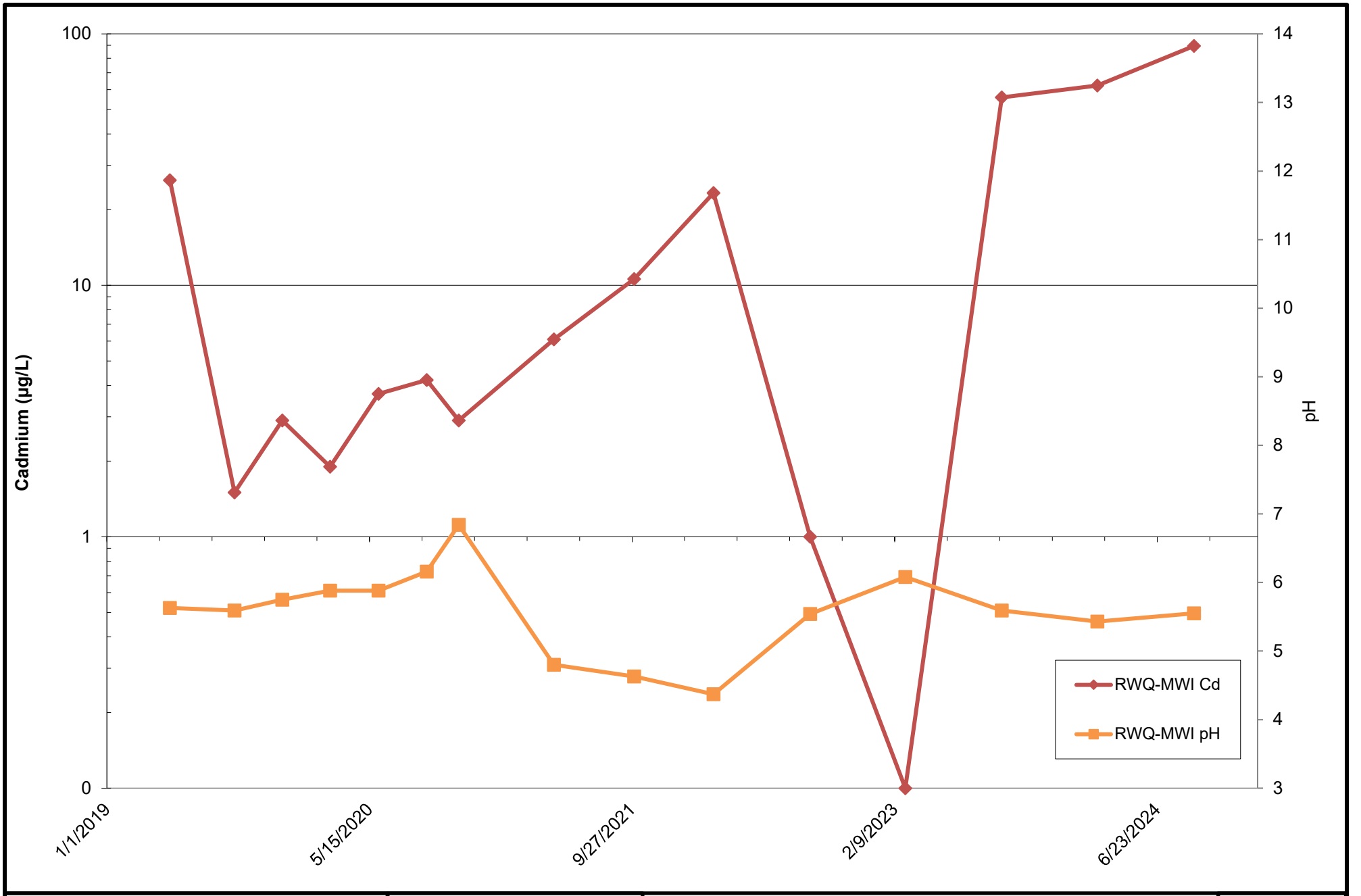
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# RWP-MWI pH and Cadmium Concentrations

January 2025

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ARM Group LLC
Engineers and Scientists

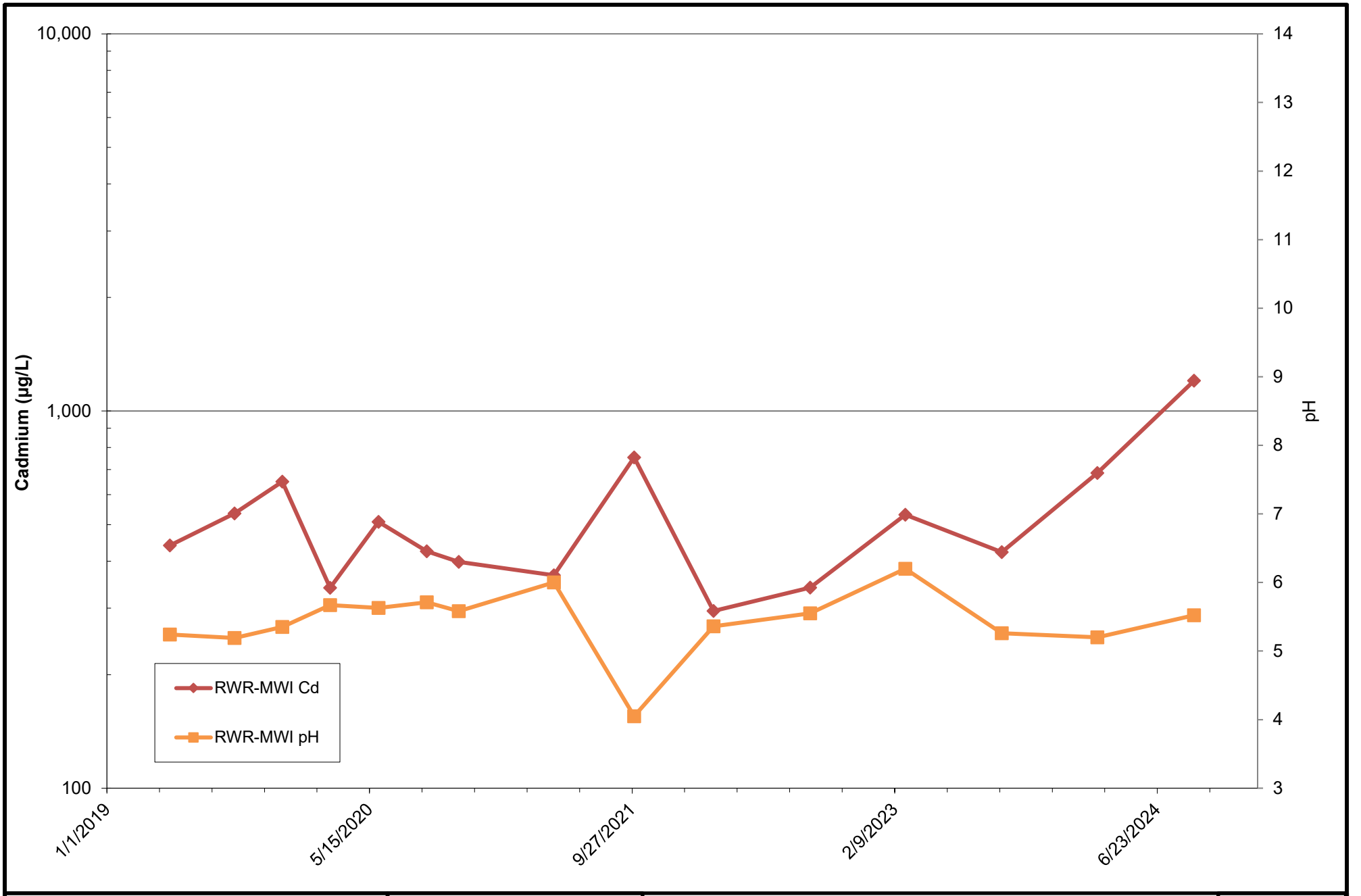
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Tradepoint Atlantic

Sparrows Point, Maryland

# RWQ-MWI pH and Cadmium Concentrations

January 2025

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ARM Group LLC
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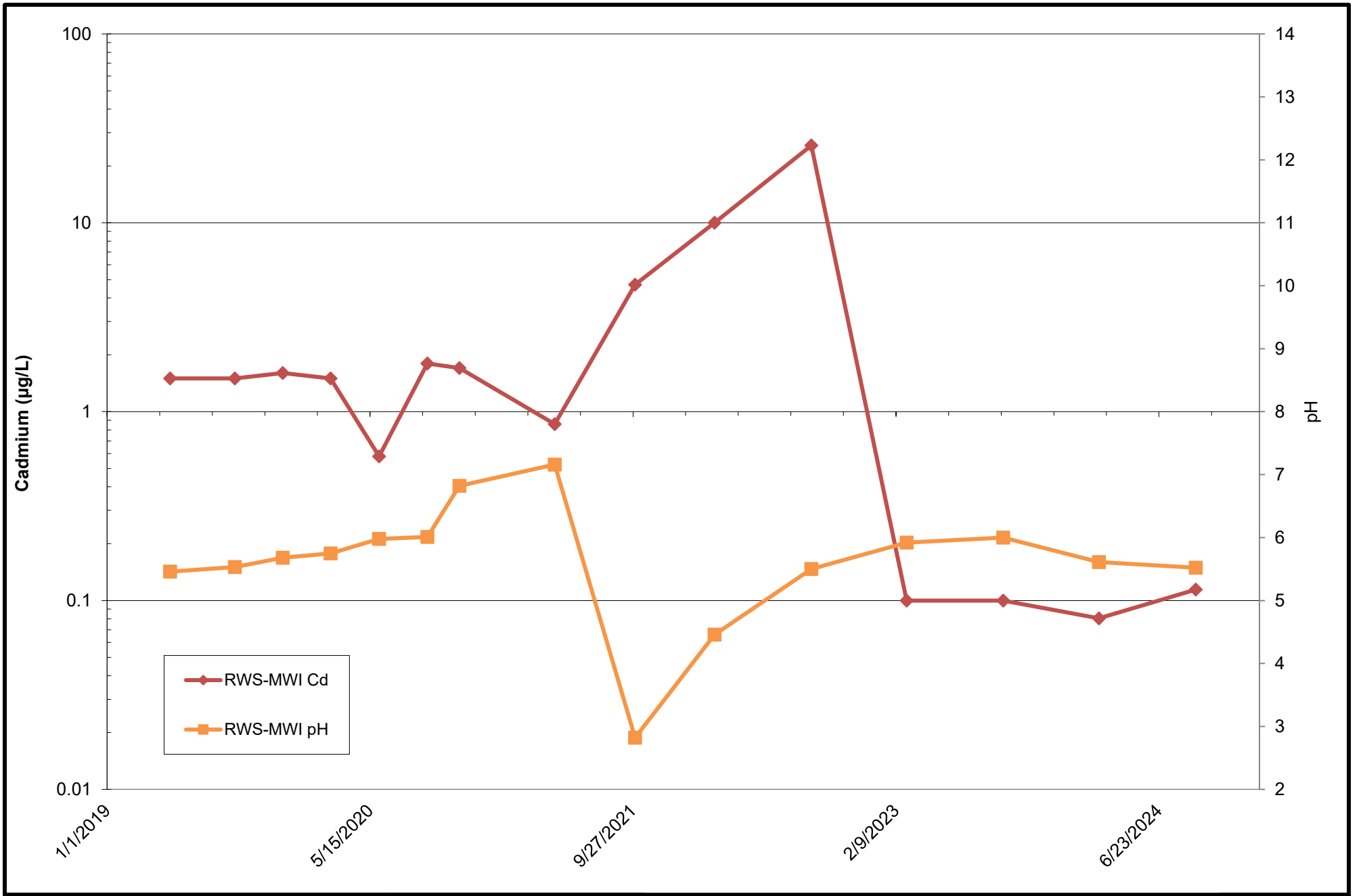
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Sparrows Point, Maryland

# RWR-MWI pH and Cadmium Concentrations

January 2025

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# RWS-MWI pH and Cadmium Concentrations

January 2025

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# APPENDIX D

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RW01-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 1.2 J | 1.6 J | -0.4 | 0 | 1 |
| 1.7 J | 1.6 J | 0.1 | 1 | 1 |
| 21.7 | 1.6 J | 20.1 | 2 | 1 |
| 98 | 1.6 J | 96.4 | 3 | 1 |
| 23.9 | 1.6 J | 22.3 | 4 | 1 |
| 7.6 | 1.6 J | 6 | 5 | 1 |
| 1.6 J | 1.6 J | 0 | 5 | 1 |
| 0.97 J | 1.6 J | -0.63 | 5 | 2 |
| 2.5 J | 1.6 J | 0.9 | 6 | 2 |
| 2.3 J | 1.6 J | 0.7 | 7 | 2 |
| 4.7 | 1.6 J | 3.1 | 8 | 2 |
| 4.8 | 1.6 J | 3.2 | 9 | 2 |
| 4.3 2c | 1.6 J | 2.7 | 10 | 2 |
| 3.9 B | 1.6 J | 2.3 | 11 | 2 |
| 4.4 | 1.6 J | 2.8 | 12 | 2 |
| 1.6 J | 1.6 J | 0 | 12 | 2 |
| 1.3 J | 1.6 J | -0.3 | 12 | 3 |
| 1.1 J | 1.6 J | -0.5 | 12 | 4 |
| 0.4 J | 1.6 J | -1.2 | 12 | 5 |
| ND<0.5 U | 1.6 J | -1.1 | 12 | 6 |
| ND<1 U | 1.6 J | -0.6 | 12 | 7 |
| 0.552 | 1.6 J | -1.048 | 12 | 8 |
| 0.5374 | 1.6 J | -1.0626 | 12 | 9 |
| | | | | |
| 1.7 J | 1.2 J | 0.5 | 13 | 9 |
| 21.7 | 1.2 J | 20.5 | 14 | 9 |
| 98 | 1.2 J | 96.8 | 15 | 9 |
| 23.9 | 1.2 J | 22.7 | 16 | 9 |
| 7.6 | 1.2 J | 6.4 | 17 | 9 |
| 1.6 J | 1.2 J | 0.4 | 18 | 9 |
| 0.97 J | 1.2 J | -0.23 | 18 | 10 |
| 2.5 J | 1.2 J | 1.3 | 19 | 10 |
| 2.3 J | 1.2 J | 1.1 | 20 | 10 |
| 4.7 | 1.2 J | 3.5 | 21 | 10 |
| 4.8 | 1.2 J | 3.6 | 22 | 10 |
| 4.3 2c | 1.2 J | 3.1 | 23 | 10 |
| 3.9 B | 1.2 J | 2.7 | 24 | 10 |
| 4.4 | 1.2 J | 3.2 | 25 | 10 |
| 1.6 J | 1.2 J | 0.4 | 26 | 10 |
| 1.3 J | 1.2 J | 0.1 | 27 | 10 |
| 1.1 J | 1.2 J | -0.1 | 27 | 11 |
| 0.4 J | 1.2 J | -0.8 | 27 | 12 |
| ND<0.5 U | 1.2 J | -0.7 | 27 | 13 |
| ND<1 U | 1.2 J | -0.2 | 27 | 14 |
| 0.552 | 1.2 J | -0.648 | 27 | 15 |
| 0.5374 | 1.2 J | -0.6626 | 27 | 16 |

| | | | | |
|---|---|---|---|---|
| 21.7 | 1.7 J | 20 | 28 | 16 |
| 98 | 1.7 J | 96.3 | 29 | 16 |
| 23.9 | 1.7 J | 22.2 | 30 | 16 |
| 7.6 | 1.7 J | 5.9 | 31 | 16 |
| 1.6 J | 1.7 J | -0.1 | 31 | 17 |
| 0.97 J | 1.7 J | -0.73 | 31 | 18 |
| 2.5 J | 1.7 J | 0.8 | 32 | 18 |
| 2.3 J | 1.7 J | 0.6 | 33 | 18 |
| 4.7 | 1.7 J | 3 | 34 | 18 |
| 4.8 | 1.7 J | 3.1 | 35 | 18 |
| 4.3 2c | 1.7 J | 2.6 | 36 | 18 |
| 3.9 B | 1.7 J | 2.2 | 37 | 18 |
| 4.4 | 1.7 J | 2.7 | 38 | 18 |
| 1.6 J | 1.7 J | -0.1 | 38 | 19 |
| 1.3 J | 1.7 J | -0.4 | 38 | 20 |
| 1.1 J | 1.7 J | -0.6 | 38 | 21 |
| 0.4 J | 1.7 J | -1.3 | 38 | 22 |
| ND<0.5 U | 1.7 J | -1.2 | 38 | 23 |
| ND<1 U | 1.7 J | -0.7 | 38 | 24 |
| 0.552 | 1.7 J | -1.148 | 38 | 25 |
| 0.5374 | 1.7 J | -1.1626 | 38 | 26 |
| | | | | |
| 98 | 21.7 | 76.3 | 39 | 26 |
| 23.9 | 21.7 | 2.2 | 40 | 26 |
| 7.6 | 21.7 | -14.1 | 40 | 27 |
| 1.6 J | 21.7 | -20.1 | 40 | 28 |
| 0.97 J | 21.7 | -20.73 | 40 | 29 |
| 2.5 J | 21.7 | -19.2 | 40 | 30 |
| 2.3 J | 21.7 | -19.4 | 40 | 31 |
| 4.7 | 21.7 | -17 | 40 | 32 |
| 4.8 | 21.7 | -16.9 | 40 | 33 |
| 4.3 2c | 21.7 | -17.4 | 40 | 34 |
| 3.9 B | 21.7 | -17.8 | 40 | 35 |
| 4.4 | 21.7 | -17.3 | 40 | 36 |
| 1.6 J | 21.7 | -20.1 | 40 | 37 |
| 1.3 J | 21.7 | -20.4 | 40 | 38 |
| 1.1 J | 21.7 | -20.6 | 40 | 39 |
| 0.4 J | 21.7 | -21.3 | 40 | 40 |
| ND<0.5 U | 21.7 | -21.2 | 40 | 41 |
| ND<1 U | 21.7 | -20.7 | 40 | 42 |
| 0.552 | 21.7 | -21.148 | 40 | 43 |
| 0.5374 | 21.7 | -21.1626 | 40 | 44 |
| | | | | |
| 23.9 | 98 | -74.1 | 40 | 45 |
| 7.6 | 98 | -90.4 | 40 | 46 |
| 1.6 J | 98 | -96.4 | 40 | 47 |
| 0.97 J | 98 | -97.03 | 40 | 48 |
| 2.5 J | 98 | -95.5 | 40 | 49 |
| 2.3 J | 98 | -95.7 | 40 | 50 |
| 4.7 | 98 | -93.3 | 40 | 51 |
| 4.8 | 98 | -93.2 | 40 | 52 |
| 4.3 2c | 98 | -93.7 | 40 | 53 |
| 3.9 B | 98 | -94.1 | 40 | 54 |
| 4.4 | 98 | -93.6 | 40 | 55 |
| 1.6 J | 98 | -96.4 | 40 | 56 |
| 1.3 J | 98 | -96.7 | 40 | 57 |
| 1.1 J | 98 | -96.9 | 40 | 58 |

| | | | | |
|---|---|---|---|---|
| 0.4 J | 98 | -97.6 | 40 | 59 |
| ND<0.5 U | 98 | -97.5 | 40 | 60 |
| ND<1 U | 98 | -97 | 40 | 61 |
| 0.552 | 98 | -97.448 | 40 | 62 |
| 0.5374 | 98 | -97.4626 | 40 | 63 |
| | | | | |
| 7.6 | 23.9 | -16.3 | 40 | 64 |
| 1.6 J | 23.9 | -22.3 | 40 | 65 |
| 0.97 J | 23.9 | -22.93 | 40 | 66 |
| 2.5 J | 23.9 | -21.4 | 40 | 67 |
| 2.3 J | 23.9 | -21.6 | 40 | 68 |
| 4.7 | 23.9 | -19.2 | 40 | 69 |
| 4.8 | 23.9 | -19.1 | 40 | 70 |
| 4.3 2c | 23.9 | -19.6 | 40 | 71 |
| 3.9 B | 23.9 | -20 | 40 | 72 |
| 4.4 | 23.9 | -19.5 | 40 | 73 |
| 1.6 J | 23.9 | -22.3 | 40 | 74 |
| 1.3 J | 23.9 | -22.6 | 40 | 75 |
| 1.1 J | 23.9 | -22.8 | 40 | 76 |
| 0.4 J | 23.9 | -23.5 | 40 | 77 |
| ND<0.5 U | 23.9 | -23.4 | 40 | 78 |
| ND<1 U | 23.9 | -22.9 | 40 | 79 |
| 0.552 | 23.9 | -23.348 | 40 | 80 |
| 0.5374 | 23.9 | -23.3626 | 40 | 81 |
| | | | | |
| 1.6 J | 7.6 | -6 | 40 | 82 |
| 0.97 J | 7.6 | -6.63 | 40 | 83 |
| 2.5 J | 7.6 | -5.1 | 40 | 84 |
| 2.3 J | 7.6 | -5.3 | 40 | 85 |
| 4.7 | 7.6 | -2.9 | 40 | 86 |
| 4.8 | 7.6 | -2.8 | 40 | 87 |
| 4.3 2c | 7.6 | -3.3 | 40 | 88 |
| 3.9 B | 7.6 | -3.7 | 40 | 89 |
| 4.4 | 7.6 | -3.2 | 40 | 90 |
| 1.6 J | 7.6 | -6 | 40 | 91 |
| 1.3 J | 7.6 | -6.3 | 40 | 92 |
| 1.1 J | 7.6 | -6.5 | 40 | 93 |
| 0.4 J | 7.6 | -7.2 | 40 | 94 |
| ND<0.5 U | 7.6 | -7.1 | 40 | 95 |
| ND<1 U | 7.6 | -6.6 | 40 | 96 |
| 0.552 | 7.6 | -7.048 | 40 | 97 |
| 0.5374 | 7.6 | -7.0626 | 40 | 98 |
| | | | | |
| 0.97 J | 1.6 J | -0.63 | 40 | 99 |
| 2.5 J | 1.6 J | 0.9 | 41 | 99 |
| 2.3 J | 1.6 J | 0.7 | 42 | 99 |
| 4.7 | 1.6 J | 3.1 | 43 | 99 |
| 4.8 | 1.6 J | 3.2 | 44 | 99 |
| 4.3 2c | 1.6 J | 2.7 | 45 | 99 |
| 3.9 B | 1.6 J | 2.3 | 46 | 99 |
| 4.4 | 1.6 J | 2.8 | 47 | 99 |
| 1.6 J | 1.6 J | 0 | 47 | 99 |
| 1.3 J | 1.6 J | -0.3 | 47 | 100 |
| 1.1 J | 1.6 J | -0.5 | 47 | 101 |
| 0.4 J | 1.6 J | -1.2 | 47 | 102 |
| ND<0.5 U | 1.6 J | -1.1 | 47 | 103 |
| ND<1 U | 1.6 J | -0.6 | 47 | 104 |

| | | | | |
|---|---|---|---|---|
| 0.552 | 1.6 J | -1.048 | 47 | 105 |
| 0.5374 | 1.6 J | -1.0626 | 47 | 106 |
| | | | | |
| 2.5 J | 0.97 J | 1.53 | 48 | 106 |
| 2.3 J | 0.97 J | 1.33 | 49 | 106 |
| 4.7 | 0.97 J | 3.73 | 50 | 106 |
| 4.8 | 0.97 J | 3.83 | 51 | 106 |
| 4.3 2c | 0.97 J | 3.33 | 52 | 106 |
| 3.9 B | 0.97 J | 2.93 | 53 | 106 |
| 4.4 | 0.97 J | 3.43 | 54 | 106 |
| 1.6 J | 0.97 J | 0.63 | 55 | 106 |
| 1.3 J | 0.97 J | 0.33 | 56 | 106 |
| 1.1 J | 0.97 J | 0.13 | 57 | 106 |
| 0.4 J | 0.97 J | -0.57 | 57 | 107 |
| ND<0.5 U | 0.97 J | -0.47 | 57 | 108 |
| ND<1 U | 0.97 J | 0.03 | 58 | 108 |
| 0.552 | 0.97 J | -0.418 | 58 | 109 |
| 0.5374 | 0.97 J | -0.4326 | 58 | 110 |
| | | | | |
| 2.3 J | 2.5 J | Same Date | 58 | 110 |
| 4.7 | 2.5 J | 2.2 | 59 | 110 |
| 4.8 | 2.5 J | 2.3 | 60 | 110 |
| 4.3 2c | 2.5 J | 1.8 | 61 | 110 |
| 3.9 B | 2.5 J | 1.4 | 62 | 110 |
| 4.4 | 2.5 J | 1.9 | 63 | 110 |
| 1.6 J | 2.5 J | -0.9 | 63 | 111 |
| 1.3 J | 2.5 J | -1.2 | 63 | 112 |
| 1.1 J | 2.5 J | -1.4 | 63 | 113 |
| 0.4 J | 2.5 J | -2.1 | 63 | 114 |
| ND<0.5 U | 2.5 J | -2 | 63 | 115 |
| ND<1 U | 2.5 J | -1.5 | 63 | 116 |
| 0.552 | 2.5 J | -1.948 | 63 | 117 |
| 0.5374 | 2.5 J | -1.9626 | 63 | 118 |
| | | | | |
| 4.7 | 2.3 J | 2.4 | 64 | 118 |
| 4.8 | 2.3 J | 2.5 | 65 | 118 |
| 4.3 2c | 2.3 J | 2 | 66 | 118 |
| 3.9 B | 2.3 J | 1.6 | 67 | 118 |
| 4.4 | 2.3 J | 2.1 | 68 | 118 |
| 1.6 J | 2.3 J | -0.7 | 68 | 119 |
| 1.3 J | 2.3 J | -1 | 68 | 120 |
| 1.1 J | 2.3 J | -1.2 | 68 | 121 |
| 0.4 J | 2.3 J | -1.9 | 68 | 122 |
| ND<0.5 U | 2.3 J | -1.8 | 68 | 123 |
| ND<1 U | 2.3 J | -1.3 | 68 | 124 |
| 0.552 | 2.3 J | -1.748 | 68 | 125 |
| 0.5374 | 2.3 J | -1.7626 | 68 | 126 |
| | | | | |
| 4.8 | 4.7 | Same Date | 68 | 126 |
| 4.3 2c | 4.7 | -0.4 | 68 | 127 |
| 3.9 B | 4.7 | -0.8 | 68 | 128 |
| 4.4 | 4.7 | -0.3 | 68 | 129 |
| 1.6 J | 4.7 | -3.1 | 68 | 130 |
| 1.3 J | 4.7 | -3.4 | 68 | 131 |
| 1.1 J | 4.7 | -3.6 | 68 | 132 |
| 0.4 J | 4.7 | -4.3 | 68 | 133 |
| ND<0.5 U | 4.7 | -4.2 | 68 | 134 |

| | | | | |
|---|---|---|---|---|
| ND<1 U | 4.7 | -3.7 | 68 | 135 |
| 0.552 | 4.7 | -4.148 | 68 | 136 |
| 0.5374 | 4.7 | -4.1626 | 68 | 137 |
| | | | | |
| 4.3 2c | 4.8 | -0.5 | 68 | 138 |
| 3.9 B | 4.8 | -0.9 | 68 | 139 |
| 4.4 | 4.8 | -0.4 | 68 | 140 |
| 1.6 J | 4.8 | -3.2 | 68 | 141 |
| 1.3 J | 4.8 | -3.5 | 68 | 142 |
| 1.1 J | 4.8 | -3.7 | 68 | 143 |
| 0.4 J | 4.8 | -4.4 | 68 | 144 |
| ND<0.5 U | 4.8 | -4.3 | 68 | 145 |
| ND<1 U | 4.8 | -3.8 | 68 | 146 |
| 0.552 | 4.8 | -4.248 | 68 | 147 |
| 0.5374 | 4.8 | -4.2626 | 68 | 148 |
| | | | | |
| 3.9 B | 4.3 2c | -0.4 | 68 | 149 |
| 4.4 | 4.3 2c | 0.1 | 69 | 149 |
| 1.6 J | 4.3 2c | -2.7 | 69 | 150 |
| 1.3 J | 4.3 2c | -3 | 69 | 151 |
| 1.1 J | 4.3 2c | -3.2 | 69 | 152 |
| 0.4 J | 4.3 2c | -3.9 | 69 | 153 |
| ND<0.5 U | 4.3 2c | -3.8 | 69 | 154 |
| ND<1 U | 4.3 2c | -3.3 | 69 | 155 |
| 0.552 | 4.3 2c | -3.748 | 69 | 156 |
| 0.5374 | 4.3 2c | -3.7626 | 69 | 157 |
| | | | | |
| 4.4 | 3.9 B | 0.5 | 70 | 157 |
| 1.6 J | 3.9 B | -2.3 | 70 | 158 |
| 1.3 J | 3.9 B | -2.6 | 70 | 159 |
| 1.1 J | 3.9 B | -2.8 | 70 | 160 |
| 0.4 J | 3.9 B | -3.5 | 70 | 161 |
| ND<0.5 U | 3.9 B | -3.4 | 70 | 162 |
| ND<1 U | 3.9 B | -2.9 | 70 | 163 |
| 0.552 | 3.9 B | -3.348 | 70 | 164 |
| 0.5374 | 3.9 B | -3.3626 | 70 | 165 |
| | | | | |
| 1.6 J | 4.4 | -2.8 | 70 | 166 |
| 1.3 J | 4.4 | -3.1 | 70 | 167 |
| 1.1 J | 4.4 | -3.3 | 70 | 168 |
| 0.4 J | 4.4 | -4 | 70 | 169 |
| ND<0.5 U | 4.4 | -3.9 | 70 | 170 |
| ND<1 U | 4.4 | -3.4 | 70 | 171 |
| 0.552 | 4.4 | -3.848 | 70 | 172 |
| 0.5374 | 4.4 | -3.8626 | 70 | 173 |
| | | | | |
| 1.3 J | 1.6 J | -0.3 | 70 | 174 |
| 1.1 J | 1.6 J | -0.5 | 70 | 175 |
| 0.4 J | 1.6 J | -1.2 | 70 | 176 |
| ND<0.5 U | 1.6 J | -1.1 | 70 | 177 |
| ND<1 U | 1.6 J | -0.6 | 70 | 178 |
| 0.552 | 1.6 J | -1.048 | 70 | 179 |
| 0.5374 | 1.6 J | -1.0626 | 70 | 180 |
| | | | | |
| 1.1 J | 1.3 J | -0.2 | 70 | 181 |
| 0.4 J | 1.3 J | -0.9 | 70 | 182 |
| ND<0.5 U | 1.3 J | -0.8 | 70 | 183 |

| | | | | |
|---|---|---|---|---|
| ND<1 U | 1.3 J | -0.3 | 70 | 184 |
| 0.552 | 1.3 J | -0.748 | 70 | 185 |
| 0.5374 | 1.3 J | -0.7626 | 70 | 186 |
| | | | | |
| 0.4 J | 1.1 J | -0.7 | 70 | 187 |
| ND<0.5 U | 1.1 J | -0.6 | 70 | 188 |
| ND<1 U | 1.1 J | -0.1 | 70 | 189 |
| 0.552 | 1.1 J | -0.548 | 70 | 190 |
| 0.5374 | 1.1 J | -0.5626 | 70 | 191 |
| | | | | |
| ND<0.5 U | 0.4 J | 0.1 | 71 | 191 |
| ND<1 U | 0.4 J | 0.6 | 72 | 191 |
| 0.552 | 0.4 J | 0.152 | 73 | 191 |
| 0.5374 | 0.4 J | 0.1374 | 74 | 191 |
| | | | | |
| ND<1 U | ND<0.5 U | 0.5 | 75 | 191 |
| 0.552 | ND<0.5 U | 0.052 | 76 | 191 |
| 0.5374 | ND<0.5 U | 0.0374 | 77 | 191 |
| | | | | |
| 0.552 | ND<1 U | -0.448 | 77 | 192 |
| 0.5374 | ND<1 U | -0.4626 | 77 | 193 |
| | | | | |
| 0.5374 | 0.552 | -0.0146 | 77 | 194 |

S Statistic = 77 - 194 = -117

| Tied Group | Value | Members |
|---|---|---|
| 1 | 1.6 | 3 |

| Time Period | Observations |
|---|---|
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |

There are 2 time periods with multiple data

A = 66
B = 36

C = 6
D = 0
E = 6
F = 4
a = 29256
b = 109296
c = 1104
Group Variance = 1619.69
Z-Score = -2.88232
Comparison Level at 95% confidence level = -1.65463 (downward trend)
**-2.88232 < -1.65463 indicating a downward trend**

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RW02-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 11.8 | 12 | -0.2 | 0 | 1 |
| 9.1 | 12 | -2.9 | 0 | 2 |
| 7.7 | 12 | -4.3 | 0 | 3 |
| ND<1.5 U | 12 | -10.5 | 0 | 4 |
| 13.1 | 12 | 1.1 | 1 | 4 |
| 16.7 | 12 | 4.7 | 2 | 4 |
| 5.2 | 12 | -6.8 | 2 | 5 |
| 3.4 | 12 | -8.6 | 2 | 6 |
| 4.1 | 12 | -7.9 | 2 | 7 |
| 3.8 | 12 | -8.2 | 2 | 8 |
| 2 J | 12 | -10 | 2 | 9 |
| 1.7 J | 12 | -10.3 | 2 | 10 |
| 1.1 J2c | 12 | -10.9 | 2 | 11 |
| 0.55 JB | 12 | -11.45 | 2 | 12 |
| 0.97 J | 12 | -11.03 | 2 | 13 |
| 0.61 J | 12 | -11.39 | 2 | 14 |
| 0.43 J | 12 | -11.57 | 2 | 15 |
| 0.58 J | 12 | -11.42 | 2 | 16 |
| ND<1.5 U | 12 | -10.5 | 2 | 17 |
| ND<0.5 U | 12 | -11.5 | 2 | 18 |
| ND<1 U | 12 | -11 | 2 | 19 |
| 0.1269 J | 12 | -11.8731 | 2 | 20 |
| ND<0.1 U | 12 | -11.9 | 2 | 21 |
| | | | | |
| 9.1 | 11.8 | -2.7 | 2 | 22 |
| 7.7 | 11.8 | -4.1 | 2 | 23 |
| ND<1.5 U | 11.8 | -10.3 | 2 | 24 |
| 13.1 | 11.8 | 1.3 | 3 | 24 |
| 16.7 | 11.8 | 4.9 | 4 | 24 |
| 5.2 | 11.8 | -6.6 | 4 | 25 |
| 3.4 | 11.8 | -8.4 | 4 | 26 |
| 4.1 | 11.8 | -7.7 | 4 | 27 |
| 3.8 | 11.8 | -8 | 4 | 28 |
| 2 J | 11.8 | -9.8 | 4 | 29 |
| 1.7 J | 11.8 | -10.1 | 4 | 30 |
| 1.1 J2c | 11.8 | -10.7 | 4 | 31 |
| 0.55 JB | 11.8 | -11.25 | 4 | 32 |
| 0.97 J | 11.8 | -10.83 | 4 | 33 |
| 0.61 J | 11.8 | -11.19 | 4 | 34 |
| 0.43 J | 11.8 | -11.37 | 4 | 35 |
| 0.58 J | 11.8 | -11.22 | 4 | 36 |
| ND<1.5 U | 11.8 | -10.3 | 4 | 37 |
| ND<0.5 U | 11.8 | -11.3 | 4 | 38 |
| ND<1 U | 11.8 | -10.8 | 4 | 39 |
| 0.1269 J | 11.8 | -11.6731 | 4 | 40 |
| ND<0.1 U | 11.8 | -11.7 | 4 | 41 |

| | | | | |
|---|---|---|---|---|
| 7.7 | 9.1 | -1.4 | 4 | 42 |
| ND<1.5 U | 9.1 | -7.6 | 4 | 43 |
| 13.1 | 9.1 | 4 | 5 | 43 |
| 16.7 | 9.1 | 7.6 | 6 | 43 |
| 5.2 | 9.1 | -3.9 | 6 | 44 |
| 3.4 | 9.1 | -5.7 | 6 | 45 |
| 4.1 | 9.1 | -5 | 6 | 46 |
| 3.8 | 9.1 | -5.3 | 6 | 47 |
| 2 J | 9.1 | -7.1 | 6 | 48 |
| 1.7 J | 9.1 | -7.4 | 6 | 49 |
| 1.1 J2c | 9.1 | -8 | 6 | 50 |
| 0.55 JB | 9.1 | -8.55 | 6 | 51 |
| 0.97 J | 9.1 | -8.13 | 6 | 52 |
| 0.61 J | 9.1 | -8.49 | 6 | 53 |
| 0.43 J | 9.1 | -8.67 | 6 | 54 |
| 0.58 J | 9.1 | -8.52 | 6 | 55 |
| ND<1.5 U | 9.1 | -7.6 | 6 | 56 |
| ND<0.5 U | 9.1 | -8.6 | 6 | 57 |
| ND<1 U | 9.1 | -8.1 | 6 | 58 |
| 0.1269 J | 9.1 | -8.9731 | 6 | 59 |
| ND<0.1 U | 9.1 | -9 | 6 | 60 |
| | | | | |
| ND<1.5 U | 7.7 | -6.2 | 6 | 61 |
| 13.1 | 7.7 | 5.4 | 7 | 61 |
| 16.7 | 7.7 | 9 | 8 | 61 |
| 5.2 | 7.7 | -2.5 | 8 | 62 |
| 3.4 | 7.7 | -4.3 | 8 | 63 |
| 4.1 | 7.7 | -3.6 | 8 | 64 |
| 3.8 | 7.7 | -3.9 | 8 | 65 |
| 2 J | 7.7 | -5.7 | 8 | 66 |
| 1.7 J | 7.7 | -6 | 8 | 67 |
| 1.1 J2c | 7.7 | -6.6 | 8 | 68 |
| 0.55 JB | 7.7 | -7.15 | 8 | 69 |
| 0.97 J | 7.7 | -6.73 | 8 | 70 |
| 0.61 J | 7.7 | -7.09 | 8 | 71 |
| 0.43 J | 7.7 | -7.27 | 8 | 72 |
| 0.58 J | 7.7 | -7.12 | 8 | 73 |
| ND<1.5 U | 7.7 | -6.2 | 8 | 74 |
| ND<0.5 U | 7.7 | -7.2 | 8 | 75 |
| ND<1 U | 7.7 | -6.7 | 8 | 76 |
| 0.1269 J | 7.7 | -7.5731 | 8 | 77 |
| ND<0.1 U | 7.7 | -7.6 | 8 | 78 |
| | | | | |
| 13.1 | ND<1.5 U | 11.6 | 9 | 78 |
| 16.7 | ND<1.5 U | 15.2 | 10 | 78 |
| 5.2 | ND<1.5 U | 3.7 | 11 | 78 |
| 3.4 | ND<1.5 U | 1.9 | 12 | 78 |
| 4.1 | ND<1.5 U | 2.6 | 13 | 78 |
| 3.8 | ND<1.5 U | 2.3 | 14 | 78 |
| 2 J | ND<1.5 U | 0.5 | 15 | 78 |
| 1.7 J | ND<1.5 U | 0.2 | 16 | 78 |
| 1.1 J2c | ND<1.5 U | -0.4 | 16 | 79 |
| 0.55 JB | ND<1.5 U | -0.95 | 16 | 80 |
| 0.97 J | ND<1.5 U | -0.53 | 16 | 81 |
| 0.61 J | ND<1.5 U | -0.89 | 16 | 82 |
| 0.43 J | ND<1.5 U | -1.07 | 16 | 83 |
| 0.58 J | ND<1.5 U | -0.92 | 16 | 84 |

| | | | | |
|---|---|---|---|---|
| ND<1.5 U | ND<1.5 U | 0 | 16 | 84 |
| ND<0.5 U | ND<1.5 U | -1 | 16 | 85 |
| ND<1 U | ND<1.5 U | -0.5 | 16 | 86 |
| 0.1269 J | ND<1.5 U | -1.3731 | 16 | 87 |
| ND<0.1 U | ND<1.5 U | -1.4 | 16 | 88 |
| | | | | |
| 16.7 | 13.1 | 3.6 | 17 | 88 |
| 5.2 | 13.1 | -7.9 | 17 | 89 |
| 3.4 | 13.1 | -9.7 | 17 | 90 |
| 4.1 | 13.1 | -9 | 17 | 91 |
| 3.8 | 13.1 | -9.3 | 17 | 92 |
| 2 J | 13.1 | -11.1 | 17 | 93 |
| 1.7 J | 13.1 | -11.4 | 17 | 94 |
| 1.1 J2c | 13.1 | -12 | 17 | 95 |
| 0.55 JB | 13.1 | -12.55 | 17 | 96 |
| 0.97 J | 13.1 | -12.13 | 17 | 97 |
| 0.61 J | 13.1 | -12.49 | 17 | 98 |
| 0.43 J | 13.1 | -12.67 | 17 | 99 |
| 0.58 J | 13.1 | -12.52 | 17 | 100 |
| ND<1.5 U | 13.1 | -11.6 | 17 | 101 |
| ND<0.5 U | 13.1 | -12.6 | 17 | 102 |
| ND<1 U | 13.1 | -12.1 | 17 | 103 |
| 0.1269 J | 13.1 | -12.9731 | 17 | 104 |
| ND<0.1 U | 13.1 | -13 | 17 | 105 |
| | | | | |
| 5.2 | 16.7 | -11.5 | 17 | 106 |
| 3.4 | 16.7 | -13.3 | 17 | 107 |
| 4.1 | 16.7 | -12.6 | 17 | 108 |
| 3.8 | 16.7 | -12.9 | 17 | 109 |
| 2 J | 16.7 | -14.7 | 17 | 110 |
| 1.7 J | 16.7 | -15 | 17 | 111 |
| 1.1 J2c | 16.7 | -15.6 | 17 | 112 |
| 0.55 JB | 16.7 | -16.15 | 17 | 113 |
| 0.97 J | 16.7 | -15.73 | 17 | 114 |
| 0.61 J | 16.7 | -16.09 | 17 | 115 |
| 0.43 J | 16.7 | -16.27 | 17 | 116 |
| 0.58 J | 16.7 | -16.12 | 17 | 117 |
| ND<1.5 U | 16.7 | -15.2 | 17 | 118 |
| ND<0.5 U | 16.7 | -16.2 | 17 | 119 |
| ND<1 U | 16.7 | -15.7 | 17 | 120 |
| 0.1269 J | 16.7 | -16.5731 | 17 | 121 |
| ND<0.1 U | 16.7 | -16.6 | 17 | 122 |
| | | | | |
| 3.4 | 5.2 | -1.8 | 17 | 123 |
| 4.1 | 5.2 | -1.1 | 17 | 124 |
| 3.8 | 5.2 | -1.4 | 17 | 125 |
| 2 J | 5.2 | -3.2 | 17 | 126 |
| 1.7 J | 5.2 | -3.5 | 17 | 127 |
| 1.1 J2c | 5.2 | -4.1 | 17 | 128 |
| 0.55 JB | 5.2 | -4.65 | 17 | 129 |
| 0.97 J | 5.2 | -4.23 | 17 | 130 |
| 0.61 J | 5.2 | -4.59 | 17 | 131 |
| 0.43 J | 5.2 | -4.77 | 17 | 132 |
| 0.58 J | 5.2 | -4.62 | 17 | 133 |
| ND<1.5 U | 5.2 | -3.7 | 17 | 134 |
| ND<0.5 U | 5.2 | -4.7 | 17 | 135 |
| ND<1 U | 5.2 | -4.2 | 17 | 136 |

| | | | | |
|---|---|---|---|---|
| 0.1269 J | 5.2 | -5.0731 | 17 | 137 |
| ND<0.1 U | 5.2 | -5.1 | 17 | 138 |
| | | | | |
| 4.1 | 3.4 | 0.7 | 18 | 138 |
| 3.8 | 3.4 | 0.4 | 19 | 138 |
| 2 J | 3.4 | -1.4 | 19 | 139 |
| 1.7 J | 3.4 | -1.7 | 19 | 140 |
| 1.1 J2c | 3.4 | -2.3 | 19 | 141 |
| 0.55 JB | 3.4 | -2.85 | 19 | 142 |
| 0.97 J | 3.4 | -2.43 | 19 | 143 |
| 0.61 J | 3.4 | -2.79 | 19 | 144 |
| 0.43 J | 3.4 | -2.97 | 19 | 145 |
| 0.58 J | 3.4 | -2.82 | 19 | 146 |
| ND<1.5 U | 3.4 | -1.9 | 19 | 147 |
| ND<0.5 U | 3.4 | -2.9 | 19 | 148 |
| ND<1 U | 3.4 | -2.4 | 19 | 149 |
| 0.1269 J | 3.4 | -3.2731 | 19 | 150 |
| ND<0.1 U | 3.4 | -3.3 | 19 | 151 |
| | | | | |
| 3.8 | 4.1 | Same Date | 19 | 151 |
| 2 J | 4.1 | -2.1 | 19 | 152 |
| 1.7 J | 4.1 | -2.4 | 19 | 153 |
| 1.1 J2c | 4.1 | -3 | 19 | 154 |
| 0.55 JB | 4.1 | -3.55 | 19 | 155 |
| 0.97 J | 4.1 | -3.13 | 19 | 156 |
| 0.61 J | 4.1 | -3.49 | 19 | 157 |
| 0.43 J | 4.1 | -3.67 | 19 | 158 |
| 0.58 J | 4.1 | -3.52 | 19 | 159 |
| ND<1.5 U | 4.1 | -2.6 | 19 | 160 |
| ND<0.5 U | 4.1 | -3.6 | 19 | 161 |
| ND<1 U | 4.1 | -3.1 | 19 | 162 |
| 0.1269 J | 4.1 | -3.9731 | 19 | 163 |
| ND<0.1 U | 4.1 | -4 | 19 | 164 |
| | | | | |
| 2 J | 3.8 | -1.8 | 19 | 165 |
| 1.7 J | 3.8 | -2.1 | 19 | 166 |
| 1.1 J2c | 3.8 | -2.7 | 19 | 167 |
| 0.55 JB | 3.8 | -3.25 | 19 | 168 |
| 0.97 J | 3.8 | -2.83 | 19 | 169 |
| 0.61 J | 3.8 | -3.19 | 19 | 170 |
| 0.43 J | 3.8 | -3.37 | 19 | 171 |
| 0.58 J | 3.8 | -3.22 | 19 | 172 |
| ND<1.5 U | 3.8 | -2.3 | 19 | 173 |
| ND<0.5 U | 3.8 | -3.3 | 19 | 174 |
| ND<1 U | 3.8 | -2.8 | 19 | 175 |
| 0.1269 J | 3.8 | -3.6731 | 19 | 176 |
| ND<0.1 U | 3.8 | -3.7 | 19 | 177 |
| | | | | |
| 1.7 J | 2 J | Same Date | 19 | 177 |
| 1.1 J2c | 2 J | -0.9 | 19 | 178 |
| 0.55 JB | 2 J | -1.45 | 19 | 179 |
| 0.97 J | 2 J | -1.03 | 19 | 180 |
| 0.61 J | 2 J | -1.39 | 19 | 181 |
| 0.43 J | 2 J | -1.57 | 19 | 182 |
| 0.58 J | 2 J | -1.42 | 19 | 183 |
| ND<1.5 U | 2 J | -0.5 | 19 | 184 |
| ND<0.5 U | 2 J | -1.5 | 19 | 185 |

| | | | | |
|---|---|---|---|---|
| ND<1 U | 2 J | -1 | 19 | 186 |
| 0.1269 J | 2 J | -1.8731 | 19 | 187 |
| ND<0.1 U | 2 J | -1.9 | 19 | 188 |
| | | | | |
| 1.1 J2c | 1.7 J | -0.6 | 19 | 189 |
| 0.55 JB | 1.7 J | -1.15 | 19 | 190 |
| 0.97 J | 1.7 J | -0.73 | 19 | 191 |
| 0.61 J | 1.7 J | -1.09 | 19 | 192 |
| 0.43 J | 1.7 J | -1.27 | 19 | 193 |
| 0.58 J | 1.7 J | -1.12 | 19 | 194 |
| ND<1.5 U | 1.7 J | -0.2 | 19 | 195 |
| ND<0.5 U | 1.7 J | -1.2 | 19 | 196 |
| ND<1 U | 1.7 J | -0.7 | 19 | 197 |
| 0.1269 J | 1.7 J | -1.5731 | 19 | 198 |
| ND<0.1 U | 1.7 J | -1.6 | 19 | 199 |
| | | | | |
| 0.55 JB | 1.1 J2c | -0.55 | 19 | 200 |
| 0.97 J | 1.1 J2c | -0.13 | 19 | 201 |
| 0.61 J | 1.1 J2c | -0.49 | 19 | 202 |
| 0.43 J | 1.1 J2c | -0.67 | 19 | 203 |
| 0.58 J | 1.1 J2c | -0.52 | 19 | 204 |
| ND<1.5 U | 1.1 J2c | 0.4 | 20 | 204 |
| ND<0.5 U | 1.1 J2c | -0.6 | 20 | 205 |
| ND<1 U | 1.1 J2c | -0.1 | 20 | 206 |
| 0.1269 J | 1.1 J2c | -0.9731 | 20 | 207 |
| ND<0.1 U | 1.1 J2c | -1 | 20 | 208 |
| | | | | |
| 0.97 J | 0.55 JB | 0.42 | 21 | 208 |
| 0.61 J | 0.55 JB | 0.06 | 22 | 208 |
| 0.43 J | 0.55 JB | -0.12 | 22 | 209 |
| 0.58 J | 0.55 JB | 0.03 | 23 | 209 |
| ND<1.5 U | 0.55 JB | 0.95 | 24 | 209 |
| ND<0.5 U | 0.55 JB | -0.05 | 24 | 210 |
| ND<1 U | 0.55 JB | 0.45 | 25 | 210 |
| 0.1269 J | 0.55 JB | -0.4231 | 25 | 211 |
| ND<0.1 U | 0.55 JB | -0.45 | 25 | 212 |
| | | | | |
| 0.61 J | 0.97 J | -0.36 | 25 | 213 |
| 0.43 J | 0.97 J | -0.54 | 25 | 214 |
| 0.58 J | 0.97 J | -0.39 | 25 | 215 |
| ND<1.5 U | 0.97 J | 0.53 | 26 | 215 |
| ND<0.5 U | 0.97 J | -0.47 | 26 | 216 |
| ND<1 U | 0.97 J | 0.03 | 27 | 216 |
| 0.1269 J | 0.97 J | -0.8431 | 27 | 217 |
| ND<0.1 U | 0.97 J | -0.87 | 27 | 218 |
| | | | | |
| 0.43 J | 0.61 J | -0.18 | 27 | 219 |
| 0.58 J | 0.61 J | -0.03 | 27 | 220 |
| ND<1.5 U | 0.61 J | 0.89 | 28 | 220 |
| ND<0.5 U | 0.61 J | -0.11 | 28 | 221 |
| ND<1 U | 0.61 J | 0.39 | 29 | 221 |
| 0.1269 J | 0.61 J | -0.4831 | 29 | 222 |
| ND<0.1 U | 0.61 J | -0.51 | 29 | 223 |
| | | | | |
| 0.58 J | 0.43 J | 0.15 | 30 | 223 |
| ND<1.5 U | 0.43 J | 1.07 | 31 | 223 |
| ND<0.5 U | 0.43 J | 0.07 | 32 | 223 |

| | | | | |
|---|---|---|---|---|
| ND<1 U | 0.43 J | 0.57 | 33 | 223 |
| 0.1269 J | 0.43 J | -0.3031 | 33 | 224 |
| ND<0.1 U | 0.43 J | -0.33 | 33 | 225 |
| | | | | |
| ND<1.5 U | 0.58 J | 0.92 | 34 | 225 |
| ND<0.5 U | 0.58 J | -0.08 | 34 | 226 |
| ND<1 U | 0.58 J | 0.42 | 35 | 226 |
| 0.1269 J | 0.58 J | -0.4531 | 35 | 227 |
| ND<0.1 U | 0.58 J | -0.48 | 35 | 228 |
| | | | | |
| ND<0.5 U | ND<1.5 U | -1 | 35 | 229 |
| ND<1 U | ND<1.5 U | -0.5 | 35 | 230 |
| 0.1269 J | ND<1.5 U | -1.3731 | 35 | 231 |
| ND<0.1 U | ND<1.5 U | -1.4 | 35 | 232 |
| | | | | |
| ND<1 U | ND<0.5 U | 0.5 | 36 | 232 |
| 0.1269 J | ND<0.5 U | -0.3731 | 36 | 233 |
| ND<0.1 U | ND<0.5 U | -0.4 | 36 | 234 |
| | | | | |
| 0.1269 J | ND<1 U | -0.8731 | 36 | 235 |
| ND<0.1 U | ND<1 U | -0.9 | 36 | 236 |
| | | | | |
| ND<0.1 U | 0.1269 J | -0.0269 | 36 | 237 |

S Statistic = 36 - 237 = -201

| Tied Group | Value | Members |
|---|---|---|
| 1 | 1.5 | 2 |

| Time Period | Observations |
|---|---|
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |

There are 2 time periods with multiple data

A = 18
B = 36

C = 0
D = 0
E = 2
F = 4
a = 29256
b = 109296
c = 1104
Group Variance = 1622.34
Z-Score = -4.96545
Comparison Level at 95% confidence level = -1.65463 (downward trend)
**-4.96545 < -1.65463 indicating a downward trend**

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RW03R-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 0.1837 J | ND<0.1 U | 0.0837 | 1 | 0 |
| 0.1364 J | ND<0.1 U | 0.0364 | 2 | 0 |
| 0.0618 J | ND<0.1 U | -0.0382 | 2 | 1 |
| ND<5 U | ND<0.1 U | 4.9 | 3 | 1 |
| 0.1364 J | 0.1837 J | -0.0473 | 3 | 2 |
| 0.0618 J | 0.1837 J | -0.1219 | 3 | 3 |
| ND<5 U | 0.1837 J | 4.8163 | 4 | 3 |
| 0.0618 J | 0.1364 J | -0.0746 | 4 | 4 |
| ND<5 U | 0.1364 J | 4.8636 | 5 | 4 |
| ND<5 U | 0.0618 J | 4.9382 | 6 | 4 |

S Statistic = 6 - 4 = 2

Comparing at 95% confidence level (downward trend)

Probability of obtaining S >= 2 is 0.408

S > 0 or 0.408 > 0.05 indicating no evidence of a downward trend

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RW04-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 1.2 J | 0.7 J | 0.5 | 1 | 0 |
| ND<1.5 U | 0.7 J | 0.8 | 2 | 0 |
| 0.71 J | 0.7 J | 0.01 | 3 | 0 |
| ND<1.5 U | 0.7 J | 0.8 | 4 | 0 |
| 1.1 J | 0.7 J | 0.4 | 5 | 0 |
| 1.1 J | 0.7 J | 0.4 | 6 | 0 |
| ND<1.5 U | 0.7 J | 0.8 | 7 | 0 |
| ND<1.5 U | 0.7 J | 0.8 | 8 | 0 |
| ND<1.5 U | 0.7 J | 0.8 | 9 | 0 |
| ND<1.5 U | 0.7 J | 0.8 | 10 | 0 |
| 0.43 J1c | 0.7 J | -0.27 | 10 | 1 |
| ND<1.5 U2c | 0.7 J | 0.8 | 11 | 1 |
| ND<1.5 U | 0.7 J | 0.8 | 12 | 1 |
| ND<1.5 U | 0.7 J | 0.8 | 13 | 1 |
| 0.55 J | 0.7 J | -0.15 | 13 | 2 |
| 1.8 J | 0.7 J | 1.1 | 14 | 2 |
| 1.7 J | 0.7 J | 1 | 15 | 2 |
| 0.99 J | 0.7 J | 0.29 | 16 | 2 |
| 0.62 J | 0.7 J | -0.08 | 16 | 3 |
| 0.38 J | 0.7 J | -0.32 | 16 | 4 |
| | | | | |
| ND<1.5 U | 1.2 J | 0.3 | 17 | 4 |
| 0.71 J | 1.2 J | -0.49 | 17 | 5 |
| ND<1.5 U | 1.2 J | 0.3 | 18 | 5 |
| 1.1 J | 1.2 J | -0.1 | 18 | 6 |
| 1.1 J | 1.2 J | -0.1 | 18 | 7 |
| ND<1.5 U | 1.2 J | 0.3 | 19 | 7 |
| ND<1.5 U | 1.2 J | 0.3 | 20 | 7 |
| ND<1.5 U | 1.2 J | 0.3 | 21 | 7 |
| ND<1.5 U | 1.2 J | 0.3 | 22 | 7 |
| 0.43 J1c | 1.2 J | -0.77 | 22 | 8 |
| ND<1.5 U2c | 1.2 J | 0.3 | 23 | 8 |
| ND<1.5 U | 1.2 J | 0.3 | 24 | 8 |
| ND<1.5 U | 1.2 J | 0.3 | 25 | 8 |
| 0.55 J | 1.2 J | -0.65 | 25 | 9 |
| 1.8 J | 1.2 J | 0.6 | 26 | 9 |
| 1.7 J | 1.2 J | 0.5 | 27 | 9 |
| 0.99 J | 1.2 J | -0.21 | 27 | 10 |
| 0.62 J | 1.2 J | -0.58 | 27 | 11 |
| 0.38 J | 1.2 J | -0.82 | 27 | 12 |
| | | | | |
| 0.71 J | ND<1.5 U | -0.79 | 27 | 13 |
| ND<1.5 U | ND<1.5 U | 0 | 27 | 13 |
| 1.1 J | ND<1.5 U | -0.4 | 27 | 14 |
| 1.1 J | ND<1.5 U | -0.4 | 27 | 15 |
| ND<1.5 U | ND<1.5 U | 0 | 27 | 15 |
| ND<1.5 U | ND<1.5 U | 0 | 27 | 15 |

| | | | | |
|---|---|---|---|---|
| ND<1.5 U | ND<1.5 U | 0 | 27 | 15 |
| ND<1.5 U | ND<1.5 U | 0 | 27 | 15 |
| 0.43 J1c | ND<1.5 U | -1.07 | 27 | 16 |
| ND<1.5 U2c | ND<1.5 U | 0 | 27 | 16 |
| ND<1.5 U | ND<1.5 U | 0 | 27 | 16 |
| ND<1.5 U | ND<1.5 U | 0 | 27 | 16 |
| 0.55 J | ND<1.5 U | -0.95 | 27 | 17 |
| 1.8 J | ND<1.5 U | 0.3 | 28 | 17 |
| 1.7 J | ND<1.5 U | 0.2 | 29 | 17 |
| 0.99 J | ND<1.5 U | -0.51 | 29 | 18 |
| 0.62 J | ND<1.5 U | -0.88 | 29 | 19 |
| 0.38 J | ND<1.5 U | -1.12 | 29 | 20 |
| | | | | |
| ND<1.5 U | 0.71 J | 0.79 | 30 | 20 |
| 1.1 J | 0.71 J | 0.39 | 31 | 20 |
| 1.1 J | 0.71 J | 0.39 | 32 | 20 |
| ND<1.5 U | 0.71 J | 0.79 | 33 | 20 |
| ND<1.5 U | 0.71 J | 0.79 | 34 | 20 |
| ND<1.5 U | 0.71 J | 0.79 | 35 | 20 |
| ND<1.5 U | 0.71 J | 0.79 | 36 | 20 |
| 0.43 J1c | 0.71 J | -0.28 | 36 | 21 |
| ND<1.5 U2c | 0.71 J | 0.79 | 37 | 21 |
| ND<1.5 U | 0.71 J | 0.79 | 38 | 21 |
| ND<1.5 U | 0.71 J | 0.79 | 39 | 21 |
| 0.55 J | 0.71 J | -0.16 | 39 | 22 |
| 1.8 J | 0.71 J | 1.09 | 40 | 22 |
| 1.7 J | 0.71 J | 0.99 | 41 | 22 |
| 0.99 J | 0.71 J | 0.28 | 42 | 22 |
| 0.62 J | 0.71 J | -0.09 | 42 | 23 |
| 0.38 J | 0.71 J | -0.33 | 42 | 24 |
| | | | | |
| 1.1 J | ND<1.5 U | -0.4 | 42 | 25 |
| 1.1 J | ND<1.5 U | -0.4 | 42 | 26 |
| ND<1.5 U | ND<1.5 U | 0 | 42 | 26 |
| ND<1.5 U | ND<1.5 U | 0 | 42 | 26 |
| ND<1.5 U | ND<1.5 U | 0 | 42 | 26 |
| ND<1.5 U | ND<1.5 U | 0 | 42 | 26 |
| 0.43 J1c | ND<1.5 U | -1.07 | 42 | 27 |
| ND<1.5 U2c | ND<1.5 U | 0 | 42 | 27 |
| ND<1.5 U | ND<1.5 U | 0 | 42 | 27 |
| ND<1.5 U | ND<1.5 U | 0 | 42 | 27 |
| 0.55 J | ND<1.5 U | -0.95 | 42 | 28 |
| 1.8 J | ND<1.5 U | 0.3 | 43 | 28 |
| 1.7 J | ND<1.5 U | 0.2 | 44 | 28 |
| 0.99 J | ND<1.5 U | -0.51 | 44 | 29 |
| 0.62 J | ND<1.5 U | -0.88 | 44 | 30 |
| 0.38 J | ND<1.5 U | -1.12 | 44 | 31 |
| | | | | |
| 1.1 J | 1.1 J | 0 | 44 | 31 |
| ND<1.5 U | 1.1 J | 0.4 | 45 | 31 |
| ND<1.5 U | 1.1 J | 0.4 | 46 | 31 |
| ND<1.5 U | 1.1 J | 0.4 | 47 | 31 |
| ND<1.5 U | 1.1 J | 0.4 | 48 | 31 |
| 0.43 J1c | 1.1 J | -0.67 | 48 | 32 |
| ND<1.5 U2c | 1.1 J | 0.4 | 49 | 32 |
| ND<1.5 U | 1.1 J | 0.4 | 50 | 32 |
| ND<1.5 U | 1.1 J | 0.4 | 51 | 32 |

| | | | | |
|---|---|---|---|---|
| 0.55 J | 1.1 J | -0.55 | 51 | 33 |
| 1.8 J | 1.1 J | 0.7 | 52 | 33 |
| 1.7 J | 1.1 J | 0.6 | 53 | 33 |
| 0.99 J | 1.1 J | -0.11 | 53 | 34 |
| 0.62 J | 1.1 J | -0.48 | 53 | 35 |
| 0.38 J | 1.1 J | -0.72 | 53 | 36 |
| | | | | |
| ND<1.5 U | 1.1 J | 0.4 | 54 | 36 |
| ND<1.5 U | 1.1 J | 0.4 | 55 | 36 |
| ND<1.5 U | 1.1 J | 0.4 | 56 | 36 |
| ND<1.5 U | 1.1 J | 0.4 | 57 | 36 |
| 0.43 J1c | 1.1 J | -0.67 | 57 | 37 |
| ND<1.5 U2c | 1.1 J | 0.4 | 58 | 37 |
| ND<1.5 U | 1.1 J | 0.4 | 59 | 37 |
| ND<1.5 U | 1.1 J | 0.4 | 60 | 37 |
| 0.55 J | 1.1 J | -0.55 | 60 | 38 |
| 1.8 J | 1.1 J | 0.7 | 61 | 38 |
| 1.7 J | 1.1 J | 0.6 | 62 | 38 |
| 0.99 J | 1.1 J | -0.11 | 62 | 39 |
| 0.62 J | 1.1 J | -0.48 | 62 | 40 |
| 0.38 J | 1.1 J | -0.72 | 62 | 41 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 62 | 41 |
| ND<1.5 U | ND<1.5 U | 0 | 62 | 41 |
| ND<1.5 U | ND<1.5 U | 0 | 62 | 41 |
| 0.43 J1c | ND<1.5 U | -1.07 | 62 | 42 |
| ND<1.5 U2c | ND<1.5 U | 0 | 62 | 42 |
| ND<1.5 U | ND<1.5 U | 0 | 62 | 42 |
| ND<1.5 U | ND<1.5 U | 0 | 62 | 42 |
| 0.55 J | ND<1.5 U | -0.95 | 62 | 43 |
| 1.8 J | ND<1.5 U | 0.3 | 63 | 43 |
| 1.7 J | ND<1.5 U | 0.2 | 64 | 43 |
| 0.99 J | ND<1.5 U | -0.51 | 64 | 44 |
| 0.62 J | ND<1.5 U | -0.88 | 64 | 45 |
| 0.38 J | ND<1.5 U | -1.12 | 64 | 46 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 64 | 46 |
| ND<1.5 U | ND<1.5 U | 0 | 64 | 46 |
| 0.43 J1c | ND<1.5 U | -1.07 | 64 | 47 |
| ND<1.5 U2c | ND<1.5 U | 0 | 64 | 47 |
| ND<1.5 U | ND<1.5 U | 0 | 64 | 47 |
| ND<1.5 U | ND<1.5 U | 0 | 64 | 47 |
| 0.55 J | ND<1.5 U | -0.95 | 64 | 48 |
| 1.8 J | ND<1.5 U | 0.3 | 65 | 48 |
| 1.7 J | ND<1.5 U | 0.2 | 66 | 48 |
| 0.99 J | ND<1.5 U | -0.51 | 66 | 49 |
| 0.62 J | ND<1.5 U | -0.88 | 66 | 50 |
| 0.38 J | ND<1.5 U | -1.12 | 66 | 51 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 66 | 51 |
| 0.43 J1c | ND<1.5 U | -1.07 | 66 | 52 |
| ND<1.5 U2c | ND<1.5 U | 0 | 66 | 52 |
| ND<1.5 U | ND<1.5 U | 0 | 66 | 52 |
| ND<1.5 U | ND<1.5 U | 0 | 66 | 52 |
| 0.55 J | ND<1.5 U | -0.95 | 66 | 53 |
| 1.8 J | ND<1.5 U | 0.3 | 67 | 53 |
| 1.7 J | ND<1.5 U | 0.2 | 68 | 53 |

| | | | | |
|---|---|---|---|---|
| 0.99 J | ND<1.5 U | -0.51 | 68 | 54 |
| 0.62 J | ND<1.5 U | -0.88 | 68 | 55 |
| 0.38 J | ND<1.5 U | -1.12 | 68 | 56 |
| | | | | |
| 0.43 J1c | ND<1.5 U | -1.07 | 68 | 57 |
| ND<1.5 U2c | ND<1.5 U | 0 | 68 | 57 |
| ND<1.5 U | ND<1.5 U | 0 | 68 | 57 |
| ND<1.5 U | ND<1.5 U | 0 | 68 | 57 |
| 0.55 J | ND<1.5 U | -0.95 | 68 | 58 |
| 1.8 J | ND<1.5 U | 0.3 | 69 | 58 |
| 1.7 J | ND<1.5 U | 0.2 | 70 | 58 |
| 0.99 J | ND<1.5 U | -0.51 | 70 | 59 |
| 0.62 J | ND<1.5 U | -0.88 | 70 | 60 |
| 0.38 J | ND<1.5 U | -1.12 | 70 | 61 |
| | | | | |
| ND<1.5 U2c | 0.43 J1c | Same Date | 70 | 61 |
| ND<1.5 U | 0.43 J1c | 1.07 | 71 | 61 |
| ND<1.5 U | 0.43 J1c | 1.07 | 72 | 61 |
| 0.55 J | 0.43 J1c | 0.12 | 73 | 61 |
| 1.8 J | 0.43 J1c | 1.37 | 74 | 61 |
| 1.7 J | 0.43 J1c | 1.27 | 75 | 61 |
| 0.99 J | 0.43 J1c | 0.56 | 76 | 61 |
| 0.62 J | 0.43 J1c | 0.19 | 77 | 61 |
| 0.38 J | 0.43 J1c | -0.05 | 77 | 62 |
| | | | | |
| ND<1.5 U | ND<1.5 U2c | 0 | 77 | 62 |
| ND<1.5 U | ND<1.5 U2c | 0 | 77 | 62 |
| 0.55 J | ND<1.5 U2c | -0.95 | 77 | 63 |
| 1.8 J | ND<1.5 U2c | 0.3 | 78 | 63 |
| 1.7 J | ND<1.5 U2c | 0.2 | 79 | 63 |
| 0.99 J | ND<1.5 U2c | -0.51 | 79 | 64 |
| 0.62 J | ND<1.5 U2c | -0.88 | 79 | 65 |
| 0.38 J | ND<1.5 U2c | -1.12 | 79 | 66 |
| | | | | |
| ND<1.5 U | ND<1.5 U | Same Date | 79 | 66 |
| 0.55 J | ND<1.5 U | -0.95 | 79 | 67 |
| 1.8 J | ND<1.5 U | 0.3 | 80 | 67 |
| 1.7 J | ND<1.5 U | 0.2 | 81 | 67 |
| 0.99 J | ND<1.5 U | -0.51 | 81 | 68 |
| 0.62 J | ND<1.5 U | -0.88 | 81 | 69 |
| 0.38 J | ND<1.5 U | -1.12 | 81 | 70 |
| | | | | |
| 0.55 J | ND<1.5 U | -0.95 | 81 | 71 |
| 1.8 J | ND<1.5 U | 0.3 | 82 | 71 |
| 1.7 J | ND<1.5 U | 0.2 | 83 | 71 |
| 0.99 J | ND<1.5 U | -0.51 | 83 | 72 |
| 0.62 J | ND<1.5 U | -0.88 | 83 | 73 |
| 0.38 J | ND<1.5 U | -1.12 | 83 | 74 |
| | | | | |
| 1.8 J | 0.55 J | 1.25 | 84 | 74 |
| 1.7 J | 0.55 J | 1.15 | 85 | 74 |
| 0.99 J | 0.55 J | 0.44 | 86 | 74 |
| 0.62 J | 0.55 J | 0.07 | 87 | 74 |
| 0.38 J | 0.55 J | -0.17 | 87 | 75 |
| | | | | |
| 1.7 J | 1.8 J | -0.1 | 87 | 76 |
| 0.99 J | 1.8 J | -0.81 | 87 | 77 |

| | | | | |
|---|---|---|---|---|
| 0.62 J | 1.8 J | -1.18 | 87 | 78 |
| 0.38 J | 1.8 J | -1.42 | 87 | 79 |
| | | | | |
| 0.99 J | 1.7 J | -0.71 | 87 | 80 |
| 0.62 J | 1.7 J | -1.08 | 87 | 81 |
| 0.38 J | 1.7 J | -1.32 | 87 | 82 |
| | | | | |
| 0.62 J | 0.99 J | -0.37 | 87 | 83 |
| 0.38 J | 0.99 J | -0.61 | 87 | 84 |
| | | | | |
| 0.38 J | 0.62 J | -0.24 | 87 | 85 |

S Statistic = 87 - 85 = 2

| Tied Group | Value | Members |
|---|---|---|
| 1 | 1.5 | 9 |
| 2 | 1.1 | 2 |

| Time Period | Observations |
|---|---|
| 6/1/2017 | 1 |
| 7/1/2017 | 1 |
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |

There are 2 time periods with multiple data

A = 1674
B = 36
C = 504
D = 0
E = 74
F = 4
a = 19740
b = 71820
c = 840
Group Variance = 1002.02
Z-Score = 0.0315909
Comparison Level at 95% confidence level = -1.65463 (downward trend)
0.0315909 >= -1.65463 indicating no evidence of a downward trend

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RW05-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 0.37 J | 4.9 | -4.53 | 0 | 1 |
| 1.2 J | 4.9 | -3.7 | 0 | 2 |
| ND<1.5 U | 4.9 | -3.4 | 0 | 3 |
| 8.4 | 4.9 | 3.5 | 1 | 3 |
| ND<1.5 U | 4.9 | -3.4 | 1 | 4 |
| ND<1.5 U | 4.9 | -3.4 | 1 | 5 |
| ND<1.5 U | 4.9 | -3.4 | 1 | 6 |
| ND<1.5 U | 4.9 | -3.4 | 1 | 7 |
| ND<1.5 U1c | 4.9 | -3.4 | 1 | 8 |
| ND<1.5 U2c | 4.9 | -3.4 | 1 | 9 |
| ND<1.5 U | 4.9 | -3.4 | 1 | 10 |
| ND<1.5 U | 4.9 | -3.4 | 1 | 11 |
| ND<1.5 U2c | 4.9 | -3.4 | 1 | 12 |
| ND<1.5 U | 4.9 | -3.4 | 1 | 13 |
| 0.52 J | 4.9 | -4.38 | 1 | 14 |
| 0.53 J | 4.9 | -4.37 | 1 | 15 |
| ND<1.5 U | 4.9 | -3.4 | 1 | 16 |
| ND<1.5 U | 4.9 | -3.4 | 1 | 17 |
| ND<1.5 U | 4.9 | -3.4 | 1 | 18 |
| ND<0.5 U | 4.9 | -4.4 | 1 | 19 |
| ND<1 U | 4.9 | -3.9 | 1 | 20 |
| 0.1181 J | 4.9 | -4.7819 | 1 | 21 |
| 0.1892 J | 4.9 | -4.7108 | 1 | 22 |
| | | | | |
| 1.2 J | 0.37 J | 0.83 | 2 | 22 |
| ND<1.5 U | 0.37 J | 1.13 | 3 | 22 |
| 8.4 | 0.37 J | 8.03 | 4 | 22 |
| ND<1.5 U | 0.37 J | 1.13 | 5 | 22 |
| ND<1.5 U | 0.37 J | 1.13 | 6 | 22 |
| ND<1.5 U | 0.37 J | 1.13 | 7 | 22 |
| ND<1.5 U | 0.37 J | 1.13 | 8 | 22 |
| ND<1.5 U1c | 0.37 J | 1.13 | 9 | 22 |
| ND<1.5 U2c | 0.37 J | 1.13 | 10 | 22 |
| ND<1.5 U | 0.37 J | 1.13 | 11 | 22 |
| ND<1.5 U | 0.37 J | 1.13 | 12 | 22 |
| ND<1.5 U2c | 0.37 J | 1.13 | 13 | 22 |
| ND<1.5 U | 0.37 J | 1.13 | 14 | 22 |
| 0.52 J | 0.37 J | 0.15 | 15 | 22 |
| 0.53 J | 0.37 J | 0.16 | 16 | 22 |
| ND<1.5 U | 0.37 J | 1.13 | 17 | 22 |
| ND<1.5 U | 0.37 J | 1.13 | 18 | 22 |
| ND<1.5 U | 0.37 J | 1.13 | 19 | 22 |
| ND<0.5 U | 0.37 J | 0.13 | 20 | 22 |
| ND<1 U | 0.37 J | 0.63 | 21 | 22 |
| 0.1181 J | 0.37 J | -0.2519 | 21 | 23 |
| 0.1892 J | 0.37 J | -0.1808 | 21 | 24 |

| | | | | |
|---|---|---|---|---|
| ND<1.5 U | 1.2 J | 0.3 | 22 | 24 |
| 8.4 | 1.2 J | 7.2 | 23 | 24 |
| ND<1.5 U | 1.2 J | 0.3 | 24 | 24 |
| ND<1.5 U | 1.2 J | 0.3 | 25 | 24 |
| ND<1.5 U | 1.2 J | 0.3 | 26 | 24 |
| ND<1.5 U | 1.2 J | 0.3 | 27 | 24 |
| ND<1.5 U1c | 1.2 J | 0.3 | 28 | 24 |
| ND<1.5 U2c | 1.2 J | 0.3 | 29 | 24 |
| ND<1.5 U | 1.2 J | 0.3 | 30 | 24 |
| ND<1.5 U | 1.2 J | 0.3 | 31 | 24 |
| ND<1.5 U2c | 1.2 J | 0.3 | 32 | 24 |
| ND<1.5 U | 1.2 J | 0.3 | 33 | 24 |
| 0.52 J | 1.2 J | -0.68 | 33 | 25 |
| 0.53 J | 1.2 J | -0.67 | 33 | 26 |
| ND<1.5 U | 1.2 J | 0.3 | 34 | 26 |
| ND<1.5 U | 1.2 J | 0.3 | 35 | 26 |
| ND<1.5 U | 1.2 J | 0.3 | 36 | 26 |
| ND<0.5 U | 1.2 J | -0.7 | 36 | 27 |
| ND<1 U | 1.2 J | -0.2 | 36 | 28 |
| 0.1181 J | 1.2 J | -1.0819 | 36 | 29 |
| 0.1892 J | 1.2 J | -1.0108 | 36 | 30 |
| | | | | |
| 8.4 | ND<1.5 U | 6.9 | 37 | 30 |
| ND<1.5 U | ND<1.5 U | 0 | 37 | 30 |
| ND<1.5 U | ND<1.5 U | 0 | 37 | 30 |
| ND<1.5 U | ND<1.5 U | 0 | 37 | 30 |
| ND<1.5 U | ND<1.5 U | 0 | 37 | 30 |
| ND<1.5 U1c | ND<1.5 U | 0 | 37 | 30 |
| ND<1.5 U2c | ND<1.5 U | 0 | 37 | 30 |
| ND<1.5 U | ND<1.5 U | 0 | 37 | 30 |
| ND<1.5 U | ND<1.5 U | 0 | 37 | 30 |
| ND<1.5 U2c | ND<1.5 U | 0 | 37 | 30 |
| ND<1.5 U | ND<1.5 U | 0 | 37 | 30 |
| 0.52 J | ND<1.5 U | -0.98 | 37 | 31 |
| 0.53 J | ND<1.5 U | -0.97 | 37 | 32 |
| ND<1.5 U | ND<1.5 U | 0 | 37 | 32 |
| ND<1.5 U | ND<1.5 U | 0 | 37 | 32 |
| ND<1.5 U | ND<1.5 U | 0 | 37 | 32 |
| ND<0.5 U | ND<1.5 U | -1 | 37 | 33 |
| ND<1 U | ND<1.5 U | -0.5 | 37 | 34 |
| 0.1181 J | ND<1.5 U | -1.3819 | 37 | 35 |
| 0.1892 J | ND<1.5 U | -1.3108 | 37 | 36 |
| | | | | |
| ND<1.5 U | 8.4 | -6.9 | 37 | 37 |
| ND<1.5 U | 8.4 | -6.9 | 37 | 38 |
| ND<1.5 U | 8.4 | -6.9 | 37 | 39 |
| ND<1.5 U | 8.4 | -6.9 | 37 | 40 |
| ND<1.5 U1c | 8.4 | -6.9 | 37 | 41 |
| ND<1.5 U2c | 8.4 | -6.9 | 37 | 42 |
| ND<1.5 U | 8.4 | -6.9 | 37 | 43 |
| ND<1.5 U | 8.4 | -6.9 | 37 | 44 |
| ND<1.5 U2c | 8.4 | -6.9 | 37 | 45 |
| ND<1.5 U | 8.4 | -6.9 | 37 | 46 |
| 0.52 J | 8.4 | -7.88 | 37 | 47 |
| 0.53 J | 8.4 | -7.87 | 37 | 48 |
| ND<1.5 U | 8.4 | -6.9 | 37 | 49 |
| ND<1.5 U | 8.4 | -6.9 | 37 | 50 |

| | | | | |
|---|---|---|---|---|
| ND<1.5 U | 8.4 | -6.9 | 37 | 51 |
| ND<0.5 U | 8.4 | -7.9 | 37 | 52 |
| ND<1 U | 8.4 | -7.4 | 37 | 53 |
| 0.1181 J | 8.4 | -8.2819 | 37 | 54 |
| 0.1892 J | 8.4 | -8.2108 | 37 | 55 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 37 | 55 |
| ND<1.5 U | ND<1.5 U | 0 | 37 | 55 |
| ND<1.5 U | ND<1.5 U | 0 | 37 | 55 |
| ND<1.5 U1c | ND<1.5 U | 0 | 37 | 55 |
| ND<1.5 U2c | ND<1.5 U | 0 | 37 | 55 |
| ND<1.5 U | ND<1.5 U | 0 | 37 | 55 |
| ND<1.5 U | ND<1.5 U | 0 | 37 | 55 |
| ND<1.5 U2c | ND<1.5 U | 0 | 37 | 55 |
| ND<1.5 U | ND<1.5 U | 0 | 37 | 55 |
| 0.52 J | ND<1.5 U | -0.98 | 37 | 56 |
| 0.53 J | ND<1.5 U | -0.97 | 37 | 57 |
| ND<1.5 U | ND<1.5 U | 0 | 37 | 57 |
| ND<1.5 U | ND<1.5 U | 0 | 37 | 57 |
| ND<1.5 U | ND<1.5 U | 0 | 37 | 57 |
| ND<0.5 U | ND<1.5 U | -1 | 37 | 58 |
| ND<1 U | ND<1.5 U | -0.5 | 37 | 59 |
| 0.1181 J | ND<1.5 U | -1.3819 | 37 | 60 |
| 0.1892 J | ND<1.5 U | -1.3108 | 37 | 61 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 37 | 61 |
| ND<1.5 U | ND<1.5 U | 0 | 37 | 61 |
| ND<1.5 U1c | ND<1.5 U | 0 | 37 | 61 |
| ND<1.5 U2c | ND<1.5 U | 0 | 37 | 61 |
| ND<1.5 U | ND<1.5 U | 0 | 37 | 61 |
| ND<1.5 U | ND<1.5 U | 0 | 37 | 61 |
| ND<1.5 U2c | ND<1.5 U | 0 | 37 | 61 |
| ND<1.5 U | ND<1.5 U | 0 | 37 | 61 |
| 0.52 J | ND<1.5 U | -0.98 | 37 | 62 |
| 0.53 J | ND<1.5 U | -0.97 | 37 | 63 |
| ND<1.5 U | ND<1.5 U | 0 | 37 | 63 |
| ND<1.5 U | ND<1.5 U | 0 | 37 | 63 |
| ND<1.5 U | ND<1.5 U | 0 | 37 | 63 |
| ND<0.5 U | ND<1.5 U | -1 | 37 | 64 |
| ND<1 U | ND<1.5 U | -0.5 | 37 | 65 |
| 0.1181 J | ND<1.5 U | -1.3819 | 37 | 66 |
| 0.1892 J | ND<1.5 U | -1.3108 | 37 | 67 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 37 | 67 |
| ND<1.5 U1c | ND<1.5 U | 0 | 37 | 67 |
| ND<1.5 U2c | ND<1.5 U | 0 | 37 | 67 |
| ND<1.5 U | ND<1.5 U | 0 | 37 | 67 |
| ND<1.5 U | ND<1.5 U | 0 | 37 | 67 |
| ND<1.5 U2c | ND<1.5 U | 0 | 37 | 67 |
| ND<1.5 U | ND<1.5 U | 0 | 37 | 67 |
| 0.52 J | ND<1.5 U | -0.98 | 37 | 68 |
| 0.53 J | ND<1.5 U | -0.97 | 37 | 69 |
| ND<1.5 U | ND<1.5 U | 0 | 37 | 69 |
| ND<1.5 U | ND<1.5 U | 0 | 37 | 69 |
| ND<1.5 U | ND<1.5 U | 0 | 37 | 69 |
| ND<0.5 U | ND<1.5 U | -1 | 37 | 70 |
| ND<1 U | ND<1.5 U | -0.5 | 37 | 71 |

| | | | | |
|---|---|---|---|---|
| 0.1181 J | ND<1.5 U | -1.3819 | 37 | 72 |
| 0.1892 J | ND<1.5 U | -1.3108 | 37 | 73 |
| | | | | |
| ND<1.5 U1c | ND<1.5 U | 0 | 37 | 73 |
| ND<1.5 U2c | ND<1.5 U | 0 | 37 | 73 |
| ND<1.5 U | ND<1.5 U | 0 | 37 | 73 |
| ND<1.5 U | ND<1.5 U | 0 | 37 | 73 |
| ND<1.5 U2c | ND<1.5 U | 0 | 37 | 73 |
| ND<1.5 U | ND<1.5 U | 0 | 37 | 73 |
| 0.52 J | ND<1.5 U | -0.98 | 37 | 74 |
| 0.53 J | ND<1.5 U | -0.97 | 37 | 75 |
| ND<1.5 U | ND<1.5 U | 0 | 37 | 75 |
| ND<1.5 U | ND<1.5 U | 0 | 37 | 75 |
| ND<1.5 U | ND<1.5 U | 0 | 37 | 75 |
| ND<0.5 U | ND<1.5 U | -1 | 37 | 76 |
| ND<1 U | ND<1.5 U | -0.5 | 37 | 77 |
| 0.1181 J | ND<1.5 U | -1.3819 | 37 | 78 |
| 0.1892 J | ND<1.5 U | -1.3108 | 37 | 79 |
| | | | | |
| ND<1.5 U2c | ND<1.5 U1c | Same Date | 37 | 79 |
| ND<1.5 U | ND<1.5 U1c | 0 | 37 | 79 |
| ND<1.5 U | ND<1.5 U1c | 0 | 37 | 79 |
| ND<1.5 U2c | ND<1.5 U1c | 0 | 37 | 79 |
| ND<1.5 U | ND<1.5 U1c | 0 | 37 | 79 |
| 0.52 J | ND<1.5 U1c | -0.98 | 37 | 80 |
| 0.53 J | ND<1.5 U1c | -0.97 | 37 | 81 |
| ND<1.5 U | ND<1.5 U1c | 0 | 37 | 81 |
| ND<1.5 U | ND<1.5 U1c | 0 | 37 | 81 |
| ND<1.5 U | ND<1.5 U1c | 0 | 37 | 81 |
| ND<0.5 U | ND<1.5 U1c | -1 | 37 | 82 |
| ND<1 U | ND<1.5 U1c | -0.5 | 37 | 83 |
| 0.1181 J | ND<1.5 U1c | -1.3819 | 37 | 84 |
| 0.1892 J | ND<1.5 U1c | -1.3108 | 37 | 85 |
| | | | | |
| ND<1.5 U | ND<1.5 U2c | 0 | 37 | 85 |
| ND<1.5 U | ND<1.5 U2c | 0 | 37 | 85 |
| ND<1.5 U2c | ND<1.5 U2c | 0 | 37 | 85 |
| ND<1.5 U | ND<1.5 U2c | 0 | 37 | 85 |
| 0.52 J | ND<1.5 U2c | -0.98 | 37 | 86 |
| 0.53 J | ND<1.5 U2c | -0.97 | 37 | 87 |
| ND<1.5 U | ND<1.5 U2c | 0 | 37 | 87 |
| ND<1.5 U | ND<1.5 U2c | 0 | 37 | 87 |
| ND<1.5 U | ND<1.5 U2c | 0 | 37 | 87 |
| ND<0.5 U | ND<1.5 U2c | -1 | 37 | 88 |
| ND<1 U | ND<1.5 U2c | -0.5 | 37 | 89 |
| 0.1181 J | ND<1.5 U2c | -1.3819 | 37 | 90 |
| 0.1892 J | ND<1.5 U2c | -1.3108 | 37 | 91 |
| | | | | |
| ND<1.5 U | ND<1.5 U | Same Date | 37 | 91 |
| ND<1.5 U2c | ND<1.5 U | 0 | 37 | 91 |
| ND<1.5 U | ND<1.5 U | 0 | 37 | 91 |
| 0.52 J | ND<1.5 U | -0.98 | 37 | 92 |
| 0.53 J | ND<1.5 U | -0.97 | 37 | 93 |
| ND<1.5 U | ND<1.5 U | 0 | 37 | 93 |
| ND<1.5 U | ND<1.5 U | 0 | 37 | 93 |
| ND<1.5 U | ND<1.5 U | 0 | 37 | 93 |
| ND<0.5 U | ND<1.5 U | -1 | 37 | 94 |

| | | | | |
|---|---|---|---|---|
| ND<1 U | ND<1.5 U | -0.5 | 37 | 95 |
| 0.1181 J | ND<1.5 U | -1.3819 | 37 | 96 |
| 0.1892 J | ND<1.5 U | -1.3108 | 37 | 97 |
| | | | | |
| ND<1.5 U2c | ND<1.5 U | 0 | 37 | 97 |
| ND<1.5 U | ND<1.5 U | 0 | 37 | 97 |
| 0.52 J | ND<1.5 U | -0.98 | 37 | 98 |
| 0.53 J | ND<1.5 U | -0.97 | 37 | 99 |
| ND<1.5 U | ND<1.5 U | 0 | 37 | 99 |
| ND<1.5 U | ND<1.5 U | 0 | 37 | 99 |
| ND<1.5 U | ND<1.5 U | 0 | 37 | 99 |
| ND<0.5 U | ND<1.5 U | -1 | 37 | 100 |
| ND<1 U | ND<1.5 U | -0.5 | 37 | 101 |
| 0.1181 J | ND<1.5 U | -1.3819 | 37 | 102 |
| 0.1892 J | ND<1.5 U | -1.3108 | 37 | 103 |
| | | | | |
| ND<1.5 U | ND<1.5 U2c | 0 | 37 | 103 |
| 0.52 J | ND<1.5 U2c | -0.98 | 37 | 104 |
| 0.53 J | ND<1.5 U2c | -0.97 | 37 | 105 |
| ND<1.5 U | ND<1.5 U2c | 0 | 37 | 105 |
| ND<1.5 U | ND<1.5 U2c | 0 | 37 | 105 |
| ND<1.5 U | ND<1.5 U2c | 0 | 37 | 105 |
| ND<0.5 U | ND<1.5 U2c | -1 | 37 | 106 |
| ND<1 U | ND<1.5 U2c | -0.5 | 37 | 107 |
| 0.1181 J | ND<1.5 U2c | -1.3819 | 37 | 108 |
| 0.1892 J | ND<1.5 U2c | -1.3108 | 37 | 109 |
| | | | | |
| 0.52 J | ND<1.5 U | -0.98 | 37 | 110 |
| 0.53 J | ND<1.5 U | -0.97 | 37 | 111 |
| ND<1.5 U | ND<1.5 U | 0 | 37 | 111 |
| ND<1.5 U | ND<1.5 U | 0 | 37 | 111 |
| ND<1.5 U | ND<1.5 U | 0 | 37 | 111 |
| ND<0.5 U | ND<1.5 U | -1 | 37 | 112 |
| ND<1 U | ND<1.5 U | -0.5 | 37 | 113 |
| 0.1181 J | ND<1.5 U | -1.3819 | 37 | 114 |
| 0.1892 J | ND<1.5 U | -1.3108 | 37 | 115 |
| | | | | |
| 0.53 J | 0.52 J | 0.01 | 38 | 115 |
| ND<1.5 U | 0.52 J | 0.98 | 39 | 115 |
| ND<1.5 U | 0.52 J | 0.98 | 40 | 115 |
| ND<1.5 U | 0.52 J | 0.98 | 41 | 115 |
| ND<0.5 U | 0.52 J | -0.02 | 41 | 116 |
| ND<1 U | 0.52 J | 0.48 | 42 | 116 |
| 0.1181 J | 0.52 J | -0.4019 | 42 | 117 |
| 0.1892 J | 0.52 J | -0.3308 | 42 | 118 |
| | | | | |
| ND<1.5 U | 0.53 J | 0.97 | 43 | 118 |
| ND<1.5 U | 0.53 J | 0.97 | 44 | 118 |
| ND<1.5 U | 0.53 J | 0.97 | 45 | 118 |
| ND<0.5 U | 0.53 J | -0.03 | 45 | 119 |
| ND<1 U | 0.53 J | 0.47 | 46 | 119 |
| 0.1181 J | 0.53 J | -0.4119 | 46 | 120 |
| 0.1892 J | 0.53 J | -0.3408 | 46 | 121 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 46 | 121 |
| ND<1.5 U | ND<1.5 U | 0 | 46 | 121 |
| ND<0.5 U | ND<1.5 U | -1 | 46 | 122 |

| | | | | |
|---|---|---|---|---|
| ND<1 U | ND<1.5 U | -0.5 | 46 | 123 |
| 0.1181 J | ND<1.5 U | -1.3819 | 46 | 124 |
| 0.1892 J | ND<1.5 U | -1.3108 | 46 | 125 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 46 | 125 |
| ND<0.5 U | ND<1.5 U | -1 | 46 | 126 |
| ND<1 U | ND<1.5 U | -0.5 | 46 | 127 |
| 0.1181 J | ND<1.5 U | -1.3819 | 46 | 128 |
| 0.1892 J | ND<1.5 U | -1.3108 | 46 | 129 |
| | | | | |
| ND<0.5 U | ND<1.5 U | -1 | 46 | 130 |
| ND<1 U | ND<1.5 U | -0.5 | 46 | 131 |
| 0.1181 J | ND<1.5 U | -1.3819 | 46 | 132 |
| 0.1892 J | ND<1.5 U | -1.3108 | 46 | 133 |
| | | | | |
| ND<1 U | ND<0.5 U | 0.5 | 47 | 133 |
| 0.1181 J | ND<0.5 U | -0.3819 | 47 | 134 |
| 0.1892 J | ND<0.5 U | -0.3108 | 47 | 135 |
| | | | | |
| 0.1181 J | ND<1 U | -0.8819 | 47 | 136 |
| 0.1892 J | ND<1 U | -0.8108 | 47 | 137 |
| | | | | |
| 0.1892 J | 0.1181 J | 0.0711 | 48 | 137 |

S Statistic = 48 - 137 = -89

| Tied Group | Value | Members |
|---|---|---|
| 1 | 1.5 | 14 |

| Time Period | Observations |
|---|---|
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |

There are 2 time periods with multiple data

A = 6006
B = 36

C = 2184
D = 0
E = 182
F = 4
a = 29256
b = 109296
c = 1104
Group Variance = 1290.33
Z-Score = -2.44981
Comparison Level at 95% confidence level = -1.65463 (downward trend)
**-2.44981 < -1.65463 indicating a downward trend**

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RW06R-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| ND<1.5 U | ND<1.5 U | 0 | 0 | 0 |
| ND<1.5 U2c | ND<1.5 U | 0 | 0 | 0 |
| ND<1.5 U1c | ND<1.5 U | 0 | 0 | 0 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 0 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 0 |
| 0.98 J | ND<1.5 U | -0.52 | 0 | 1 |
| 0.9 J | ND<1.5 U | -0.6 | 0 | 2 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 2 |
| ND<1 U | ND<1.5 U | -0.5 | 0 | 3 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 4 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 5 |
| | | | | |
| ND<1.5 U2c | ND<1.5 U | 0 | 0 | 5 |
| ND<1.5 U1c | ND<1.5 U | 0 | 0 | 5 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 5 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 5 |
| 0.98 J | ND<1.5 U | -0.52 | 0 | 6 |
| 0.9 J | ND<1.5 U | -0.6 | 0 | 7 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 7 |
| ND<1 U | ND<1.5 U | -0.5 | 0 | 8 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 9 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 10 |
| | | | | |
| ND<1.5 U1c | ND<1.5 U2c | Same Date | 0 | 10 |
| ND<1.5 U | ND<1.5 U2c | 0 | 0 | 10 |
| ND<1.5 U | ND<1.5 U2c | 0 | 0 | 10 |
| 0.98 J | ND<1.5 U2c | -0.52 | 0 | 11 |
| 0.9 J | ND<1.5 U2c | -0.6 | 0 | 12 |
| ND<1.5 U | ND<1.5 U2c | 0 | 0 | 12 |
| ND<1 U | ND<1.5 U2c | -0.5 | 0 | 13 |
| ND<0.1 U | ND<1.5 U2c | -1.4 | 0 | 14 |
| ND<0.1 U | ND<1.5 U2c | -1.4 | 0 | 15 |
| | | | | |
| ND<1.5 U | ND<1.5 U1c | 0 | 0 | 15 |
| ND<1.5 U | ND<1.5 U1c | 0 | 0 | 15 |
| 0.98 J | ND<1.5 U1c | -0.52 | 0 | 16 |
| 0.9 J | ND<1.5 U1c | -0.6 | 0 | 17 |
| ND<1.5 U | ND<1.5 U1c | 0 | 0 | 17 |
| ND<1 U | ND<1.5 U1c | -0.5 | 0 | 18 |
| ND<0.1 U | ND<1.5 U1c | -1.4 | 0 | 19 |
| ND<0.1 U | ND<1.5 U1c | -1.4 | 0 | 20 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 20 |
| 0.98 J | ND<1.5 U | -0.52 | 0 | 21 |
| 0.9 J | ND<1.5 U | -0.6 | 0 | 22 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 22 |
| ND<1 U | ND<1.5 U | -0.5 | 0 | 23 |

| | | | | |
|---|---|---|---|---|
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 24 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 25 |
| | | | | |
| 0.98 J | ND<1.5 U | -0.52 | 0 | 26 |
| 0.9 J | ND<1.5 U | -0.6 | 0 | 27 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 27 |
| ND<1 U | ND<1.5 U | -0.5 | 0 | 28 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 29 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 30 |
| | | | | |
| 0.9 J | 0.98 J | -0.08 | 0 | 31 |
| ND<1.5 U | 0.98 J | 0.52 | 1 | 31 |
| ND<1 U | 0.98 J | 0.02 | 2 | 31 |
| ND<0.1 U | 0.98 J | -0.88 | 2 | 32 |
| ND<0.1 U | 0.98 J | -0.88 | 2 | 33 |
| | | | | |
| ND<1.5 U | 0.9 J | 0.6 | 3 | 33 |
| ND<1 U | 0.9 J | 0.1 | 4 | 33 |
| ND<0.1 U | 0.9 J | -0.8 | 4 | 34 |
| ND<0.1 U | 0.9 J | -0.8 | 4 | 35 |
| | | | | |
| ND<1 U | ND<1.5 U | -0.5 | 4 | 36 |
| ND<0.1 U | ND<1.5 U | -1.4 | 4 | 37 |
| ND<0.1 U | ND<1.5 U | -1.4 | 4 | 38 |
| | | | | |
| ND<0.1 U | ND<1 U | -0.9 | 4 | 39 |
| ND<0.1 U | ND<1 U | -0.9 | 4 | 40 |
| | | | | |
| ND<0.1 U | ND<0.1 U | 0 | 4 | 40 |

S Statistic = 4 - 40 = -36

| Tied Group | Value | Members |
|---|---|---|
| 1 | 1.5 | 7 |
| 2 | 0.1 | 2 |

| Time Period | Observations |
|---|---|
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 9/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 3/1/2022 | 1 |
| 3/1/2023 | 1 |
| 3/1/2024 | 1 |

There are 1 time periods with multiple data

A = 816
B = 18
C = 210
D = 0
E = 44
F = 2

a = 3828
b = 11880
c = 264
Group Variance = 166.667
Z-Score = -2.71109
Comparison Level at 95% confidence level = -1.65463 (downward trend)
**-2.71109 < -1.65463 indicating a downward trend**

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RW07-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 1.7 J | 1.8 J | -0.1 | 0 | 1 |
| 1.4 J | 1.8 J | -0.4 | 0 | 2 |
| 1.9 J | 1.8 J | 0.1 | 1 | 2 |
| 2.3 J | 1.8 J | 0.5 | 2 | 2 |
| 2.8 J | 1.8 J | 1 | 3 | 2 |
| 3.1 | 1.8 J | 1.3 | 4 | 2 |
| 3.6 | 1.8 J | 1.8 | 5 | 2 |
| 3.2 | 1.8 J | 1.4 | 6 | 2 |
| 5.8 | 1.8 J | 4 | 7 | 2 |
| 6 | 1.8 J | 4.2 | 8 | 2 |
| 4.8 | 1.8 J | 3 | 9 | 2 |
| 4.6 | 1.8 J | 2.8 | 10 | 2 |
| 4.8 | 1.8 J | 3 | 11 | 2 |
| 4.7 | 1.8 J | 2.9 | 12 | 2 |
| 2.8 J | 1.8 J | 1 | 13 | 2 |
| 2.7 J | 1.8 J | 0.9 | 14 | 2 |
| 2.9 J | 1.8 J | 1.1 | 15 | 2 |
| 3 B | 1.8 J | 1.2 | 16 | 2 |
| 3.4 | 1.8 J | 1.6 | 17 | 2 |
| 3 J | 1.8 J | 1.2 | 18 | 2 |
| 2.5 J | 1.8 J | 0.7 | 19 | 2 |
| 4.5 | 1.8 J | 2.7 | 20 | 2 |
| 1.7 | 1.8 J | -0.1 | 20 | 3 |
| 16.6 | 1.8 J | 14.8 | 21 | 3 |
| 2.544 | 1.8 J | 0.744 | 22 | 3 |
| 4.38 | 1.8 J | 2.58 | 23 | 3 |
| | | | | |
| 1.4 J | 1.7 J | -0.3 | 23 | 4 |
| 1.9 J | 1.7 J | 0.2 | 24 | 4 |
| 2.3 J | 1.7 J | 0.6 | 25 | 4 |
| 2.8 J | 1.7 J | 1.1 | 26 | 4 |
| 3.1 | 1.7 J | 1.4 | 27 | 4 |
| 3.6 | 1.7 J | 1.9 | 28 | 4 |
| 3.2 | 1.7 J | 1.5 | 29 | 4 |
| 5.8 | 1.7 J | 4.1 | 30 | 4 |
| 6 | 1.7 J | 4.3 | 31 | 4 |
| 4.8 | 1.7 J | 3.1 | 32 | 4 |
| 4.6 | 1.7 J | 2.9 | 33 | 4 |
| 4.8 | 1.7 J | 3.1 | 34 | 4 |
| 4.7 | 1.7 J | 3 | 35 | 4 |
| 2.8 J | 1.7 J | 1.1 | 36 | 4 |
| 2.7 J | 1.7 J | 1 | 37 | 4 |
| 2.9 J | 1.7 J | 1.2 | 38 | 4 |
| 3 B | 1.7 J | 1.3 | 39 | 4 |
| 3.4 | 1.7 J | 1.7 | 40 | 4 |
| 3 J | 1.7 J | 1.3 | 41 | 4 |
| 2.5 J | 1.7 J | 0.8 | 42 | 4 |

| | | | | |
|---|---|---|---|---|
| 4.5 | 1.7 J | 2.8 | 43 | 4 |
| 1.7 | 1.7 J | 0 | 43 | 4 |
| 16.6 | 1.7 J | 14.9 | 44 | 4 |
| 2.544 | 1.7 J | 0.844 | 45 | 4 |
| 4.38 | 1.7 J | 2.68 | 46 | 4 |
| | | | | |
| 1.9 J | 1.4 J | 0.5 | 47 | 4 |
| 2.3 J | 1.4 J | 0.9 | 48 | 4 |
| 2.8 J | 1.4 J | 1.4 | 49 | 4 |
| 3.1 | 1.4 J | 1.7 | 50 | 4 |
| 3.6 | 1.4 J | 2.2 | 51 | 4 |
| 3.2 | 1.4 J | 1.8 | 52 | 4 |
| 5.8 | 1.4 J | 4.4 | 53 | 4 |
| 6 | 1.4 J | 4.6 | 54 | 4 |
| 4.8 | 1.4 J | 3.4 | 55 | 4 |
| 4.6 | 1.4 J | 3.2 | 56 | 4 |
| 4.8 | 1.4 J | 3.4 | 57 | 4 |
| 4.7 | 1.4 J | 3.3 | 58 | 4 |
| 2.8 J | 1.4 J | 1.4 | 59 | 4 |
| 2.7 J | 1.4 J | 1.3 | 60 | 4 |
| 2.9 J | 1.4 J | 1.5 | 61 | 4 |
| 3 B | 1.4 J | 1.6 | 62 | 4 |
| 3.4 | 1.4 J | 2 | 63 | 4 |
| 3 J | 1.4 J | 1.6 | 64 | 4 |
| 2.5 J | 1.4 J | 1.1 | 65 | 4 |
| 4.5 | 1.4 J | 3.1 | 66 | 4 |
| 1.7 | 1.4 J | 0.3 | 67 | 4 |
| 16.6 | 1.4 J | 15.2 | 68 | 4 |
| 2.544 | 1.4 J | 1.144 | 69 | 4 |
| 4.38 | 1.4 J | 2.98 | 70 | 4 |
| | | | | |
| 2.3 J | 1.9 J | 0.4 | 71 | 4 |
| 2.8 J | 1.9 J | 0.9 | 72 | 4 |
| 3.1 | 1.9 J | 1.2 | 73 | 4 |
| 3.6 | 1.9 J | 1.7 | 74 | 4 |
| 3.2 | 1.9 J | 1.3 | 75 | 4 |
| 5.8 | 1.9 J | 3.9 | 76 | 4 |
| 6 | 1.9 J | 4.1 | 77 | 4 |
| 4.8 | 1.9 J | 2.9 | 78 | 4 |
| 4.6 | 1.9 J | 2.7 | 79 | 4 |
| 4.8 | 1.9 J | 2.9 | 80 | 4 |
| 4.7 | 1.9 J | 2.8 | 81 | 4 |
| 2.8 J | 1.9 J | 0.9 | 82 | 4 |
| 2.7 J | 1.9 J | 0.8 | 83 | 4 |
| 2.9 J | 1.9 J | 1 | 84 | 4 |
| 3 B | 1.9 J | 1.1 | 85 | 4 |
| 3.4 | 1.9 J | 1.5 | 86 | 4 |
| 3 J | 1.9 J | 1.1 | 87 | 4 |
| 2.5 J | 1.9 J | 0.6 | 88 | 4 |
| 4.5 | 1.9 J | 2.6 | 89 | 4 |
| 1.7 | 1.9 J | -0.2 | 89 | 5 |
| 16.6 | 1.9 J | 14.7 | 90 | 5 |
| 2.544 | 1.9 J | 0.644 | 91 | 5 |
| 4.38 | 1.9 J | 2.48 | 92 | 5 |
| | | | | |
| 2.8 J | 2.3 J | 0.5 | 93 | 5 |
| 3.1 | 2.3 J | 0.8 | 94 | 5 |

| | | | | |
|---|---|---|---|---|
| 3.6 | 2.3 J | 1.3 | 95 | 5 |
| 3.2 | 2.3 J | 0.9 | 96 | 5 |
| 5.8 | 2.3 J | 3.5 | 97 | 5 |
| 6 | 2.3 J | 3.7 | 98 | 5 |
| 4.8 | 2.3 J | 2.5 | 99 | 5 |
| 4.6 | 2.3 J | 2.3 | 100 | 5 |
| 4.8 | 2.3 J | 2.5 | 101 | 5 |
| 4.7 | 2.3 J | 2.4 | 102 | 5 |
| 2.8 J | 2.3 J | 0.5 | 103 | 5 |
| 2.7 J | 2.3 J | 0.4 | 104 | 5 |
| 2.9 J | 2.3 J | 0.6 | 105 | 5 |
| 3 B | 2.3 J | 0.7 | 106 | 5 |
| 3.4 | 2.3 J | 1.1 | 107 | 5 |
| 3 J | 2.3 J | 0.7 | 108 | 5 |
| 2.5 J | 2.3 J | 0.2 | 109 | 5 |
| 4.5 | 2.3 J | 2.2 | 110 | 5 |
| 1.7 | 2.3 J | -0.6 | 110 | 6 |
| 16.6 | 2.3 J | 14.3 | 111 | 6 |
| 2.544 | 2.3 J | 0.244 | 112 | 6 |
| 4.38 | 2.3 J | 2.08 | 113 | 6 |
| | | | | |
| 3.1 | 2.8 J | 0.3 | 114 | 6 |
| 3.6 | 2.8 J | 0.8 | 115 | 6 |
| 3.2 | 2.8 J | 0.4 | 116 | 6 |
| 5.8 | 2.8 J | 3 | 117 | 6 |
| 6 | 2.8 J | 3.2 | 118 | 6 |
| 4.8 | 2.8 J | 2 | 119 | 6 |
| 4.6 | 2.8 J | 1.8 | 120 | 6 |
| 4.8 | 2.8 J | 2 | 121 | 6 |
| 4.7 | 2.8 J | 1.9 | 122 | 6 |
| 2.8 J | 2.8 J | 0 | 122 | 6 |
| 2.7 J | 2.8 J | -0.1 | 122 | 7 |
| 2.9 J | 2.8 J | 0.1 | 123 | 7 |
| 3 B | 2.8 J | 0.2 | 124 | 7 |
| 3.4 | 2.8 J | 0.6 | 125 | 7 |
| 3 J | 2.8 J | 0.2 | 126 | 7 |
| 2.5 J | 2.8 J | -0.3 | 126 | 8 |
| 4.5 | 2.8 J | 1.7 | 127 | 8 |
| 1.7 | 2.8 J | -1.1 | 127 | 9 |
| 16.6 | 2.8 J | 13.8 | 128 | 9 |
| 2.544 | 2.8 J | -0.256 | 128 | 10 |
| 4.38 | 2.8 J | 1.58 | 129 | 10 |
| | | | | |
| 3.6 | 3.1 | 0.5 | 130 | 10 |
| 3.2 | 3.1 | 0.1 | 131 | 10 |
| 5.8 | 3.1 | 2.7 | 132 | 10 |
| 6 | 3.1 | 2.9 | 133 | 10 |
| 4.8 | 3.1 | 1.7 | 134 | 10 |
| 4.6 | 3.1 | 1.5 | 135 | 10 |
| 4.8 | 3.1 | 1.7 | 136 | 10 |
| 4.7 | 3.1 | 1.6 | 137 | 10 |
| 2.8 J | 3.1 | -0.3 | 137 | 11 |
| 2.7 J | 3.1 | -0.4 | 137 | 12 |
| 2.9 J | 3.1 | -0.2 | 137 | 13 |
| 3 B | 3.1 | -0.1 | 137 | 14 |
| 3.4 | 3.1 | 0.3 | 138 | 14 |
| 3 J | 3.1 | -0.1 | 138 | 15 |

| | | | | |
|---|---|---|---|---|
| 2.5 J | 3.1 | -0.6 | 138 | 16 |
| 4.5 | 3.1 | 1.4 | 139 | 16 |
| 1.7 | 3.1 | -1.4 | 139 | 17 |
| 16.6 | 3.1 | 13.5 | 140 | 17 |
| 2.544 | 3.1 | -0.556 | 140 | 18 |
| 4.38 | 3.1 | 1.28 | 141 | 18 |
| | | | | |
| 3.2 | 3.6 | -0.4 | 141 | 19 |
| 5.8 | 3.6 | 2.2 | 142 | 19 |
| 6 | 3.6 | 2.4 | 143 | 19 |
| 4.8 | 3.6 | 1.2 | 144 | 19 |
| 4.6 | 3.6 | 1 | 145 | 19 |
| 4.8 | 3.6 | 1.2 | 146 | 19 |
| 4.7 | 3.6 | 1.1 | 147 | 19 |
| 2.8 J | 3.6 | -0.8 | 147 | 20 |
| 2.7 J | 3.6 | -0.9 | 147 | 21 |
| 2.9 J | 3.6 | -0.7 | 147 | 22 |
| 3 B | 3.6 | -0.6 | 147 | 23 |
| 3.4 | 3.6 | -0.2 | 147 | 24 |
| 3 J | 3.6 | -0.6 | 147 | 25 |
| 2.5 J | 3.6 | -1.1 | 147 | 26 |
| 4.5 | 3.6 | 0.9 | 148 | 26 |
| 1.7 | 3.6 | -1.9 | 148 | 27 |
| 16.6 | 3.6 | 13 | 149 | 27 |
| 2.544 | 3.6 | -1.056 | 149 | 28 |
| 4.38 | 3.6 | 0.78 | 150 | 28 |
| | | | | |
| 5.8 | 3.2 | 2.6 | 151 | 28 |
| 6 | 3.2 | 2.8 | 152 | 28 |
| 4.8 | 3.2 | 1.6 | 153 | 28 |
| 4.6 | 3.2 | 1.4 | 154 | 28 |
| 4.8 | 3.2 | 1.6 | 155 | 28 |
| 4.7 | 3.2 | 1.5 | 156 | 28 |
| 2.8 J | 3.2 | -0.4 | 156 | 29 |
| 2.7 J | 3.2 | -0.5 | 156 | 30 |
| 2.9 J | 3.2 | -0.3 | 156 | 31 |
| 3 B | 3.2 | -0.2 | 156 | 32 |
| 3.4 | 3.2 | 0.2 | 157 | 32 |
| 3 J | 3.2 | -0.2 | 157 | 33 |
| 2.5 J | 3.2 | -0.7 | 157 | 34 |
| 4.5 | 3.2 | 1.3 | 158 | 34 |
| 1.7 | 3.2 | -1.5 | 158 | 35 |
| 16.6 | 3.2 | 13.4 | 159 | 35 |
| 2.544 | 3.2 | -0.656 | 159 | 36 |
| 4.38 | 3.2 | 1.18 | 160 | 36 |
| | | | | |
| 6 | 5.8 | 0.2 | 161 | 36 |
| 4.8 | 5.8 | -1 | 161 | 37 |
| 4.6 | 5.8 | -1.2 | 161 | 38 |
| 4.8 | 5.8 | -1 | 161 | 39 |
| 4.7 | 5.8 | -1.1 | 161 | 40 |
| 2.8 J | 5.8 | -3 | 161 | 41 |
| 2.7 J | 5.8 | -3.1 | 161 | 42 |
| 2.9 J | 5.8 | -2.9 | 161 | 43 |
| 3 B | 5.8 | -2.8 | 161 | 44 |
| 3.4 | 5.8 | -2.4 | 161 | 45 |
| 3 J | 5.8 | -2.8 | 161 | 46 |

| | | | | |
|---|---|---|---|---|
| 2.5 J | 5.8 | -3.3 | 161 | 47 |
| 4.5 | 5.8 | -1.3 | 161 | 48 |
| 1.7 | 5.8 | -4.1 | 161 | 49 |
| 16.6 | 5.8 | 10.8 | 162 | 49 |
| 2.544 | 5.8 | -3.256 | 162 | 50 |
| 4.38 | 5.8 | -1.42 | 162 | 51 |
| | | | | |
| 4.8 | 6 | -1.2 | 162 | 52 |
| 4.6 | 6 | -1.4 | 162 | 53 |
| 4.8 | 6 | -1.2 | 162 | 54 |
| 4.7 | 6 | -1.3 | 162 | 55 |
| 2.8 J | 6 | -3.2 | 162 | 56 |
| 2.7 J | 6 | -3.3 | 162 | 57 |
| 2.9 J | 6 | -3.1 | 162 | 58 |
| 3 B | 6 | -3 | 162 | 59 |
| 3.4 | 6 | -2.6 | 162 | 60 |
| 3 J | 6 | -3 | 162 | 61 |
| 2.5 J | 6 | -3.5 | 162 | 62 |
| 4.5 | 6 | -1.5 | 162 | 63 |
| 1.7 | 6 | -4.3 | 162 | 64 |
| 16.6 | 6 | 10.6 | 163 | 64 |
| 2.544 | 6 | -3.456 | 163 | 65 |
| 4.38 | 6 | -1.62 | 163 | 66 |
| | | | | |
| 4.6 | 4.8 | -0.2 | 163 | 67 |
| 4.8 | 4.8 | 0 | 163 | 67 |
| 4.7 | 4.8 | -0.1 | 163 | 68 |
| 2.8 J | 4.8 | -2 | 163 | 69 |
| 2.7 J | 4.8 | -2.1 | 163 | 70 |
| 2.9 J | 4.8 | -1.9 | 163 | 71 |
| 3 B | 4.8 | -1.8 | 163 | 72 |
| 3.4 | 4.8 | -1.4 | 163 | 73 |
| 3 J | 4.8 | -1.8 | 163 | 74 |
| 2.5 J | 4.8 | -2.3 | 163 | 75 |
| 4.5 | 4.8 | -0.3 | 163 | 76 |
| 1.7 | 4.8 | -3.1 | 163 | 77 |
| 16.6 | 4.8 | 11.8 | 164 | 77 |
| 2.544 | 4.8 | -2.256 | 164 | 78 |
| 4.38 | 4.8 | -0.42 | 164 | 79 |
| | | | | |
| 4.8 | 4.6 | 0.2 | 165 | 79 |
| 4.7 | 4.6 | 0.1 | 166 | 79 |
| 2.8 J | 4.6 | -1.8 | 166 | 80 |
| 2.7 J | 4.6 | -1.9 | 166 | 81 |
| 2.9 J | 4.6 | -1.7 | 166 | 82 |
| 3 B | 4.6 | -1.6 | 166 | 83 |
| 3.4 | 4.6 | -1.2 | 166 | 84 |
| 3 J | 4.6 | -1.6 | 166 | 85 |
| 2.5 J | 4.6 | -2.1 | 166 | 86 |
| 4.5 | 4.6 | -0.1 | 166 | 87 |
| 1.7 | 4.6 | -2.9 | 166 | 88 |
| 16.6 | 4.6 | 12 | 167 | 88 |
| 2.544 | 4.6 | -2.056 | 167 | 89 |
| 4.38 | 4.6 | -0.22 | 167 | 90 |
| | | | | |
| 4.7 | 4.8 | -0.1 | 167 | 91 |
| 2.8 J | 4.8 | -2 | 167 | 92 |

| | | | | |
|---|---|---|---|---|
| 2.7 J | 4.8 | -2.1 | 167 | 93 |
| 2.9 J | 4.8 | -1.9 | 167 | 94 |
| 3 B | 4.8 | -1.8 | 167 | 95 |
| 3.4 | 4.8 | -1.4 | 167 | 96 |
| 3 J | 4.8 | -1.8 | 167 | 97 |
| 2.5 J | 4.8 | -2.3 | 167 | 98 |
| 4.5 | 4.8 | -0.3 | 167 | 99 |
| 1.7 | 4.8 | -3.1 | 167 | 100 |
| 16.6 | 4.8 | 11.8 | 168 | 100 |
| 2.544 | 4.8 | -2.256 | 168 | 101 |
| 4.38 | 4.8 | -0.42 | 168 | 102 |
| | | | | |
| 2.8 J | 4.7 | -1.9 | 168 | 103 |
| 2.7 J | 4.7 | -2 | 168 | 104 |
| 2.9 J | 4.7 | -1.8 | 168 | 105 |
| 3 B | 4.7 | -1.7 | 168 | 106 |
| 3.4 | 4.7 | -1.3 | 168 | 107 |
| 3 J | 4.7 | -1.7 | 168 | 108 |
| 2.5 J | 4.7 | -2.2 | 168 | 109 |
| 4.5 | 4.7 | -0.2 | 168 | 110 |
| 1.7 | 4.7 | -3 | 168 | 111 |
| 16.6 | 4.7 | 11.9 | 169 | 111 |
| 2.544 | 4.7 | -2.156 | 169 | 112 |
| 4.38 | 4.7 | -0.32 | 169 | 113 |
| | | | | |
| 2.7 J | 2.8 J | Same Date | 169 | 113 |
| 2.9 J | 2.8 J | 0.1 | 170 | 113 |
| 3 B | 2.8 J | 0.2 | 171 | 113 |
| 3.4 | 2.8 J | 0.6 | 172 | 113 |
| 3 J | 2.8 J | 0.2 | 173 | 113 |
| 2.5 J | 2.8 J | -0.3 | 173 | 114 |
| 4.5 | 2.8 J | 1.7 | 174 | 114 |
| 1.7 | 2.8 J | -1.1 | 174 | 115 |
| 16.6 | 2.8 J | 13.8 | 175 | 115 |
| 2.544 | 2.8 J | -0.256 | 175 | 116 |
| 4.38 | 2.8 J | 1.58 | 176 | 116 |
| | | | | |
| 2.9 J | 2.7 J | 0.2 | 177 | 116 |
| 3 B | 2.7 J | 0.3 | 178 | 116 |
| 3.4 | 2.7 J | 0.7 | 179 | 116 |
| 3 J | 2.7 J | 0.3 | 180 | 116 |
| 2.5 J | 2.7 J | -0.2 | 180 | 117 |
| 4.5 | 2.7 J | 1.8 | 181 | 117 |
| 1.7 | 2.7 J | -1 | 181 | 118 |
| 16.6 | 2.7 J | 13.9 | 182 | 118 |
| 2.544 | 2.7 J | -0.156 | 182 | 119 |
| 4.38 | 2.7 J | 1.68 | 183 | 119 |
| | | | | |
| 3 B | 2.9 J | Same Date | 183 | 119 |
| 3.4 | 2.9 J | 0.5 | 184 | 119 |
| 3 J | 2.9 J | 0.1 | 185 | 119 |
| 2.5 J | 2.9 J | -0.4 | 185 | 120 |
| 4.5 | 2.9 J | 1.6 | 186 | 120 |
| 1.7 | 2.9 J | -1.2 | 186 | 121 |
| 16.6 | 2.9 J | 13.7 | 187 | 121 |
| 2.544 | 2.9 J | -0.356 | 187 | 122 |
| 4.38 | 2.9 J | 1.48 | 188 | 122 |

| | | | | |
|---|---|---|---|---|
| 3.4 | 3 B | 0.4 | 189 | 122 |
| 3 J | 3 B | 0 | 189 | 122 |
| 2.5 J | 3 B | -0.5 | 189 | 123 |
| 4.5 | 3 B | 1.5 | 190 | 123 |
| 1.7 | 3 B | -1.3 | 190 | 124 |
| 16.6 | 3 B | 13.6 | 191 | 124 |
| 2.544 | 3 B | -0.456 | 191 | 125 |
| 4.38 | 3 B | 1.38 | 192 | 125 |
| | | | | |
| 3 J | 3.4 | -0.4 | 192 | 126 |
| 2.5 J | 3.4 | -0.9 | 192 | 127 |
| 4.5 | 3.4 | 1.1 | 193 | 127 |
| 1.7 | 3.4 | -1.7 | 193 | 128 |
| 16.6 | 3.4 | 13.2 | 194 | 128 |
| 2.544 | 3.4 | -0.856 | 194 | 129 |
| 4.38 | 3.4 | 0.98 | 195 | 129 |
| | | | | |
| 2.5 J | 3 J | -0.5 | 195 | 130 |
| 4.5 | 3 J | 1.5 | 196 | 130 |
| 1.7 | 3 J | -1.3 | 196 | 131 |
| 16.6 | 3 J | 13.6 | 197 | 131 |
| 2.544 | 3 J | -0.456 | 197 | 132 |
| 4.38 | 3 J | 1.38 | 198 | 132 |
| | | | | |
| 4.5 | 2.5 J | 2 | 199 | 132 |
| 1.7 | 2.5 J | -0.8 | 199 | 133 |
| 16.6 | 2.5 J | 14.1 | 200 | 133 |
| 2.544 | 2.5 J | 0.044 | 201 | 133 |
| 4.38 | 2.5 J | 1.88 | 202 | 133 |
| | | | | |
| 1.7 | 4.5 | -2.8 | 202 | 134 |
| 16.6 | 4.5 | 12.1 | 203 | 134 |
| 2.544 | 4.5 | -1.956 | 203 | 135 |
| 4.38 | 4.5 | -0.12 | 203 | 136 |
| | | | | |
| 16.6 | 1.7 | 14.9 | 204 | 136 |
| 2.544 | 1.7 | 0.844 | 205 | 136 |
| 4.38 | 1.7 | 2.68 | 206 | 136 |
| | | | | |
| 2.544 | 16.6 | -14.056 | 206 | 137 |
| 4.38 | 16.6 | -12.22 | 206 | 138 |
| | | | | |
| 4.38 | 2.544 | 1.836 | 207 | 138 |

S Statistic = 207 - 138 = 69

| Tied Group | Value | Members |
|---|---|---|
| 1 | 1.7 | 2 |
| 2 | 2.8 | 2 |
| 3 | 4.8 | 2 |
| 4 | 3 | 2 |

| Time Period | Observations |
|---|---|
| 2/1/2017 | 1 |
| 3/1/2017 | 1 |

| | |
|---|---|
| 4/1/2017 | 1 |
| 5/1/2017 | 1 |
| 6/1/2017 | 1 |
| 7/1/2017 | 1 |
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 11/1/2021 | 1 |
| 3/1/2022 | 1 |
| 3/1/2023 | 1 |
| 3/1/2024 | 1 |

There are 2 time periods with multiple data

---

A = 72
B = 36
C = 0
D = 0
E = 8
F = 4
a = 41418
b = 157950
c = 1404
Group Variance = 2295.02
Z-Score = 1.41943
Comparison Level at 95% confidence level = -1.65463 (downward trend)
1.41943 >= -1.65463 indicating no evidence of a downward trend

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RW08-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 11 | 3.8 | 7.2 | 1 | 0 |
| 7.8 | 3.8 | 4 | 2 | 0 |
| 3.2 | 3.8 | -0.6 | 2 | 1 |
| 1.7 J | 3.8 | -2.1 | 2 | 2 |
| 0.74 J | 3.8 | -3.06 | 2 | 3 |
| 2.7 J | 3.8 | -1.1 | 2 | 4 |
| 2.5 J | 3.8 | -1.3 | 2 | 5 |
| 0.96 J | 3.8 | -2.84 | 2 | 6 |
| ND<1.5 U | 3.8 | -2.3 | 2 | 7 |
| ND<1.5 U | 3.8 | -2.3 | 2 | 8 |
| ND<1.5 U | 3.8 | -2.3 | 2 | 9 |
| 2.2 J | 3.8 | -1.6 | 2 | 10 |
| ND<1.5 U | 3.8 | -2.3 | 2 | 11 |
| ND<1.5 U | 3.8 | -2.3 | 2 | 12 |
| 2.7 J1c | 3.8 | -1.1 | 2 | 13 |
| 2 J2c | 3.8 | -1.8 | 2 | 14 |
| 0.86 J | 3.8 | -2.94 | 2 | 15 |
| 1.2 JB | 3.8 | -2.6 | 2 | 16 |
| 0.39 J | 3.8 | -3.41 | 2 | 17 |
| ND<1.5 U | 3.8 | -2.3 | 2 | 18 |
| 2.7 J | 3.8 | -1.1 | 2 | 19 |
| 0.67 J | 3.8 | -3.13 | 2 | 20 |
| ND<1.5 U | 3.8 | -2.3 | 2 | 21 |
| 0.37 J | 3.8 | -3.43 | 2 | 22 |
| | | | | |
| 7.8 | 11 | -3.2 | 2 | 23 |
| 3.2 | 11 | -7.8 | 2 | 24 |
| 1.7 J | 11 | -9.3 | 2 | 25 |
| 0.74 J | 11 | -10.26 | 2 | 26 |
| 2.7 J | 11 | -8.3 | 2 | 27 |
| 2.5 J | 11 | -8.5 | 2 | 28 |
| 0.96 J | 11 | -10.04 | 2 | 29 |
| ND<1.5 U | 11 | -9.5 | 2 | 30 |
| ND<1.5 U | 11 | -9.5 | 2 | 31 |
| ND<1.5 U | 11 | -9.5 | 2 | 32 |
| 2.2 J | 11 | -8.8 | 2 | 33 |
| ND<1.5 U | 11 | -9.5 | 2 | 34 |
| ND<1.5 U | 11 | -9.5 | 2 | 35 |
| 2.7 J1c | 11 | -8.3 | 2 | 36 |
| 2 J2c | 11 | -9 | 2 | 37 |
| 0.86 J | 11 | -10.14 | 2 | 38 |
| 1.2 JB | 11 | -9.8 | 2 | 39 |
| 0.39 J | 11 | -10.61 | 2 | 40 |
| ND<1.5 U | 11 | -9.5 | 2 | 41 |
| 2.7 J | 11 | -8.3 | 2 | 42 |
| 0.67 J | 11 | -10.33 | 2 | 43 |
| ND<1.5 U | 11 | -9.5 | 2 | 44 |

| | | | | |
|---|---|---|---|---|
| 0.37 J | 11 | -10.63 | 2 | 45 |
| | | | | |
| 3.2 | 7.8 | -4.6 | 2 | 46 |
| 1.7 J | 7.8 | -6.1 | 2 | 47 |
| 0.74 J | 7.8 | -7.06 | 2 | 48 |
| 2.7 J | 7.8 | -5.1 | 2 | 49 |
| 2.5 J | 7.8 | -5.3 | 2 | 50 |
| 0.96 J | 7.8 | -6.84 | 2 | 51 |
| ND<1.5 U | 7.8 | -6.3 | 2 | 52 |
| ND<1.5 U | 7.8 | -6.3 | 2 | 53 |
| ND<1.5 U | 7.8 | -6.3 | 2 | 54 |
| 2.2 J | 7.8 | -5.6 | 2 | 55 |
| ND<1.5 U | 7.8 | -6.3 | 2 | 56 |
| ND<1.5 U | 7.8 | -6.3 | 2 | 57 |
| 2.7 J1c | 7.8 | -5.1 | 2 | 58 |
| 2 J2c | 7.8 | -5.8 | 2 | 59 |
| 0.86 J | 7.8 | -6.94 | 2 | 60 |
| 1.2 JB | 7.8 | -6.6 | 2 | 61 |
| 0.39 J | 7.8 | -7.41 | 2 | 62 |
| ND<1.5 U | 7.8 | -6.3 | 2 | 63 |
| 2.7 J | 7.8 | -5.1 | 2 | 64 |
| 0.67 J | 7.8 | -7.13 | 2 | 65 |
| ND<1.5 U | 7.8 | -6.3 | 2 | 66 |
| 0.37 J | 7.8 | -7.43 | 2 | 67 |
| | | | | |
| 1.7 J | 3.2 | -1.5 | 2 | 68 |
| 0.74 J | 3.2 | -2.46 | 2 | 69 |
| 2.7 J | 3.2 | -0.5 | 2 | 70 |
| 2.5 J | 3.2 | -0.7 | 2 | 71 |
| 0.96 J | 3.2 | -2.24 | 2 | 72 |
| ND<1.5 U | 3.2 | -1.7 | 2 | 73 |
| ND<1.5 U | 3.2 | -1.7 | 2 | 74 |
| ND<1.5 U | 3.2 | -1.7 | 2 | 75 |
| 2.2 J | 3.2 | -1 | 2 | 76 |
| ND<1.5 U | 3.2 | -1.7 | 2 | 77 |
| ND<1.5 U | 3.2 | -1.7 | 2 | 78 |
| 2.7 J1c | 3.2 | -0.5 | 2 | 79 |
| 2 J2c | 3.2 | -1.2 | 2 | 80 |
| 0.86 J | 3.2 | -2.34 | 2 | 81 |
| 1.2 JB | 3.2 | -2 | 2 | 82 |
| 0.39 J | 3.2 | -2.81 | 2 | 83 |
| ND<1.5 U | 3.2 | -1.7 | 2 | 84 |
| 2.7 J | 3.2 | -0.5 | 2 | 85 |
| 0.67 J | 3.2 | -2.53 | 2 | 86 |
| ND<1.5 U | 3.2 | -1.7 | 2 | 87 |
| 0.37 J | 3.2 | -2.83 | 2 | 88 |
| | | | | |
| 0.74 J | 1.7 J | -0.96 | 2 | 89 |
| 2.7 J | 1.7 J | 1 | 3 | 89 |
| 2.5 J | 1.7 J | 0.8 | 4 | 89 |
| 0.96 J | 1.7 J | -0.74 | 4 | 90 |
| ND<1.5 U | 1.7 J | -0.2 | 4 | 91 |
| ND<1.5 U | 1.7 J | -0.2 | 4 | 92 |
| ND<1.5 U | 1.7 J | -0.2 | 4 | 93 |
| 2.2 J | 1.7 J | 0.5 | 5 | 93 |
| ND<1.5 U | 1.7 J | -0.2 | 5 | 94 |
| ND<1.5 U | 1.7 J | -0.2 | 5 | 95 |

| | | | | |
|---|---|---|---|---|
| 2.7 J1c | 1.7 J | 1 | 6 | 95 |
| 2 J2c | 1.7 J | 0.3 | 7 | 95 |
| 0.86 J | 1.7 J | -0.84 | 7 | 96 |
| 1.2 JB | 1.7 J | -0.5 | 7 | 97 |
| 0.39 J | 1.7 J | -1.31 | 7 | 98 |
| ND<1.5 U | 1.7 J | -0.2 | 7 | 99 |
| 2.7 J | 1.7 J | 1 | 8 | 99 |
| 0.67 J | 1.7 J | -1.03 | 8 | 100 |
| ND<1.5 U | 1.7 J | -0.2 | 8 | 101 |
| 0.37 J | 1.7 J | -1.33 | 8 | 102 |
| | | | | |
| 2.7 J | 0.74 J | 1.96 | 9 | 102 |
| 2.5 J | 0.74 J | 1.76 | 10 | 102 |
| 0.96 J | 0.74 J | 0.22 | 11 | 102 |
| ND<1.5 U | 0.74 J | 0.76 | 12 | 102 |
| ND<1.5 U | 0.74 J | 0.76 | 13 | 102 |
| ND<1.5 U | 0.74 J | 0.76 | 14 | 102 |
| 2.2 J | 0.74 J | 1.46 | 15 | 102 |
| ND<1.5 U | 0.74 J | 0.76 | 16 | 102 |
| ND<1.5 U | 0.74 J | 0.76 | 17 | 102 |
| 2.7 J1c | 0.74 J | 1.96 | 18 | 102 |
| 2 J2c | 0.74 J | 1.26 | 19 | 102 |
| 0.86 J | 0.74 J | 0.12 | 20 | 102 |
| 1.2 JB | 0.74 J | 0.46 | 21 | 102 |
| 0.39 J | 0.74 J | -0.35 | 21 | 103 |
| ND<1.5 U | 0.74 J | 0.76 | 22 | 103 |
| 2.7 J | 0.74 J | 1.96 | 23 | 103 |
| 0.67 J | 0.74 J | -0.07 | 23 | 104 |
| ND<1.5 U | 0.74 J | 0.76 | 24 | 104 |
| 0.37 J | 0.74 J | -0.37 | 24 | 105 |
| | | | | |
| 2.5 J | 2.7 J | -0.2 | 24 | 106 |
| 0.96 J | 2.7 J | -1.74 | 24 | 107 |
| ND<1.5 U | 2.7 J | -1.2 | 24 | 108 |
| ND<1.5 U | 2.7 J | -1.2 | 24 | 109 |
| ND<1.5 U | 2.7 J | -1.2 | 24 | 110 |
| 2.2 J | 2.7 J | -0.5 | 24 | 111 |
| ND<1.5 U | 2.7 J | -1.2 | 24 | 112 |
| ND<1.5 U | 2.7 J | -1.2 | 24 | 113 |
| 2.7 J1c | 2.7 J | 0 | 24 | 113 |
| 2 J2c | 2.7 J | -0.7 | 24 | 114 |
| 0.86 J | 2.7 J | -1.84 | 24 | 115 |
| 1.2 JB | 2.7 J | -1.5 | 24 | 116 |
| 0.39 J | 2.7 J | -2.31 | 24 | 117 |
| ND<1.5 U | 2.7 J | -1.2 | 24 | 118 |
| 2.7 J | 2.7 J | 0 | 24 | 118 |
| 0.67 J | 2.7 J | -2.03 | 24 | 119 |
| ND<1.5 U | 2.7 J | -1.2 | 24 | 120 |
| 0.37 J | 2.7 J | -2.33 | 24 | 121 |
| | | | | |
| 0.96 J | 2.5 J | -1.54 | 24 | 122 |
| ND<1.5 U | 2.5 J | -1 | 24 | 123 |
| ND<1.5 U | 2.5 J | -1 | 24 | 124 |
| ND<1.5 U | 2.5 J | -1 | 24 | 125 |
| 2.2 J | 2.5 J | -0.3 | 24 | 126 |
| ND<1.5 U | 2.5 J | -1 | 24 | 127 |
| ND<1.5 U | 2.5 J | -1 | 24 | 128 |

| | | | | |
|---|---|---|---|---|
| 2.7 J1c | 2.5 J | 0.2 | 25 | 128 |
| 2 J2c | 2.5 J | -0.5 | 25 | 129 |
| 0.86 J | 2.5 J | -1.64 | 25 | 130 |
| 1.2 JB | 2.5 J | -1.3 | 25 | 131 |
| 0.39 J | 2.5 J | -2.11 | 25 | 132 |
| ND<1.5 U | 2.5 J | -1 | 25 | 133 |
| 2.7 J | 2.5 J | 0.2 | 26 | 133 |
| 0.67 J | 2.5 J | -1.83 | 26 | 134 |
| ND<1.5 U | 2.5 J | -1 | 26 | 135 |
| 0.37 J | 2.5 J | -2.13 | 26 | 136 |
| | | | | |
| ND<1.5 U | 0.96 J | 0.54 | 27 | 136 |
| ND<1.5 U | 0.96 J | 0.54 | 28 | 136 |
| ND<1.5 U | 0.96 J | 0.54 | 29 | 136 |
| 2.2 J | 0.96 J | 1.24 | 30 | 136 |
| ND<1.5 U | 0.96 J | 0.54 | 31 | 136 |
| ND<1.5 U | 0.96 J | 0.54 | 32 | 136 |
| 2.7 J1c | 0.96 J | 1.74 | 33 | 136 |
| 2 J2c | 0.96 J | 1.04 | 34 | 136 |
| 0.86 J | 0.96 J | -0.1 | 34 | 137 |
| 1.2 JB | 0.96 J | 0.24 | 35 | 137 |
| 0.39 J | 0.96 J | -0.57 | 35 | 138 |
| ND<1.5 U | 0.96 J | 0.54 | 36 | 138 |
| 2.7 J | 0.96 J | 1.74 | 37 | 138 |
| 0.67 J | 0.96 J | -0.29 | 37 | 139 |
| ND<1.5 U | 0.96 J | 0.54 | 38 | 139 |
| 0.37 J | 0.96 J | -0.59 | 38 | 140 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 38 | 140 |
| ND<1.5 U | ND<1.5 U | 0 | 38 | 140 |
| 2.2 J | ND<1.5 U | 0.7 | 39 | 140 |
| ND<1.5 U | ND<1.5 U | 0 | 39 | 140 |
| ND<1.5 U | ND<1.5 U | 0 | 39 | 140 |
| 2.7 J1c | ND<1.5 U | 1.2 | 40 | 140 |
| 2 J2c | ND<1.5 U | 0.5 | 41 | 140 |
| 0.86 J | ND<1.5 U | -0.64 | 41 | 141 |
| 1.2 JB | ND<1.5 U | -0.3 | 41 | 142 |
| 0.39 J | ND<1.5 U | -1.11 | 41 | 143 |
| ND<1.5 U | ND<1.5 U | 0 | 41 | 143 |
| 2.7 J | ND<1.5 U | 1.2 | 42 | 143 |
| 0.67 J | ND<1.5 U | -0.83 | 42 | 144 |
| ND<1.5 U | ND<1.5 U | 0 | 42 | 144 |
| 0.37 J | ND<1.5 U | -1.13 | 42 | 145 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 42 | 145 |
| 2.2 J | ND<1.5 U | 0.7 | 43 | 145 |
| ND<1.5 U | ND<1.5 U | 0 | 43 | 145 |
| ND<1.5 U | ND<1.5 U | 0 | 43 | 145 |
| 2.7 J1c | ND<1.5 U | 1.2 | 44 | 145 |
| 2 J2c | ND<1.5 U | 0.5 | 45 | 145 |
| 0.86 J | ND<1.5 U | -0.64 | 45 | 146 |
| 1.2 JB | ND<1.5 U | -0.3 | 45 | 147 |
| 0.39 J | ND<1.5 U | -1.11 | 45 | 148 |
| ND<1.5 U | ND<1.5 U | 0 | 45 | 148 |
| 2.7 J | ND<1.5 U | 1.2 | 46 | 148 |
| 0.67 J | ND<1.5 U | -0.83 | 46 | 149 |
| ND<1.5 U | ND<1.5 U | 0 | 46 | 149 |

| | | | | |
|---|---|---|---|---|
| 0.37 J | ND<1.5 U | -1.13 | 46 | 150 |
| | | | | |
| 2.2 J | ND<1.5 U | 0.7 | 47 | 150 |
| ND<1.5 U | ND<1.5 U | 0 | 47 | 150 |
| ND<1.5 U | ND<1.5 U | 0 | 47 | 150 |
| 2.7 J1c | ND<1.5 U | 1.2 | 48 | 150 |
| 2 J2c | ND<1.5 U | 0.5 | 49 | 150 |
| 0.86 J | ND<1.5 U | -0.64 | 49 | 151 |
| 1.2 JB | ND<1.5 U | -0.3 | 49 | 152 |
| 0.39 J | ND<1.5 U | -1.11 | 49 | 153 |
| ND<1.5 U | ND<1.5 U | 0 | 49 | 153 |
| 2.7 J | ND<1.5 U | 1.2 | 50 | 153 |
| 0.67 J | ND<1.5 U | -0.83 | 50 | 154 |
| ND<1.5 U | ND<1.5 U | 0 | 50 | 154 |
| 0.37 J | ND<1.5 U | -1.13 | 50 | 155 |
| | | | | |
| ND<1.5 U | 2.2 J | -0.7 | 50 | 156 |
| ND<1.5 U | 2.2 J | -0.7 | 50 | 157 |
| 2.7 J1c | 2.2 J | 0.5 | 51 | 157 |
| 2 J2c | 2.2 J | -0.2 | 51 | 158 |
| 0.86 J | 2.2 J | -1.34 | 51 | 159 |
| 1.2 JB | 2.2 J | -1 | 51 | 160 |
| 0.39 J | 2.2 J | -1.81 | 51 | 161 |
| ND<1.5 U | 2.2 J | -0.7 | 51 | 162 |
| 2.7 J | 2.2 J | 0.5 | 52 | 162 |
| 0.67 J | 2.2 J | -1.53 | 52 | 163 |
| ND<1.5 U | 2.2 J | -0.7 | 52 | 164 |
| 0.37 J | 2.2 J | -1.83 | 52 | 165 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 52 | 165 |
| 2.7 J1c | ND<1.5 U | 1.2 | 53 | 165 |
| 2 J2c | ND<1.5 U | 0.5 | 54 | 165 |
| 0.86 J | ND<1.5 U | -0.64 | 54 | 166 |
| 1.2 JB | ND<1.5 U | -0.3 | 54 | 167 |
| 0.39 J | ND<1.5 U | -1.11 | 54 | 168 |
| ND<1.5 U | ND<1.5 U | 0 | 54 | 168 |
| 2.7 J | ND<1.5 U | 1.2 | 55 | 168 |
| 0.67 J | ND<1.5 U | -0.83 | 55 | 169 |
| ND<1.5 U | ND<1.5 U | 0 | 55 | 169 |
| 0.37 J | ND<1.5 U | -1.13 | 55 | 170 |
| | | | | |
| 2.7 J1c | ND<1.5 U | 1.2 | 56 | 170 |
| 2 J2c | ND<1.5 U | 0.5 | 57 | 170 |
| 0.86 J | ND<1.5 U | -0.64 | 57 | 171 |
| 1.2 JB | ND<1.5 U | -0.3 | 57 | 172 |
| 0.39 J | ND<1.5 U | -1.11 | 57 | 173 |
| ND<1.5 U | ND<1.5 U | 0 | 57 | 173 |
| 2.7 J | ND<1.5 U | 1.2 | 58 | 173 |
| 0.67 J | ND<1.5 U | -0.83 | 58 | 174 |
| ND<1.5 U | ND<1.5 U | 0 | 58 | 174 |
| 0.37 J | ND<1.5 U | -1.13 | 58 | 175 |
| | | | | |
| 2 J2c | 2.7 J1c | Same Date | 58 | 175 |
| 0.86 J | 2.7 J1c | -1.84 | 58 | 176 |
| 1.2 JB | 2.7 J1c | -1.5 | 58 | 177 |
| 0.39 J | 2.7 J1c | -2.31 | 58 | 178 |
| ND<1.5 U | 2.7 J1c | -1.2 | 58 | 179 |

| | | | | |
|---|---|---|---|---|
| 2.7 J | 2.7 J1c | 0 | 58 | 179 |
| 0.67 J | 2.7 J1c | -2.03 | 58 | 180 |
| ND<1.5 U | 2.7 J1c | -1.2 | 58 | 181 |
| 0.37 J | 2.7 J1c | -2.33 | 58 | 182 |
| | | | | |
| 0.86 J | 2 J2c | -1.14 | 58 | 183 |
| 1.2 JB | 2 J2c | -0.8 | 58 | 184 |
| 0.39 J | 2 J2c | -1.61 | 58 | 185 |
| ND<1.5 U | 2 J2c | -0.5 | 58 | 186 |
| 2.7 J | 2 J2c | 0.7 | 59 | 186 |
| 0.67 J | 2 J2c | -1.33 | 59 | 187 |
| ND<1.5 U | 2 J2c | -0.5 | 59 | 188 |
| 0.37 J | 2 J2c | -1.63 | 59 | 189 |
| | | | | |
| 1.2 JB | 0.86 J | Same Date | 59 | 189 |
| 0.39 J | 0.86 J | -0.47 | 59 | 190 |
| ND<1.5 U | 0.86 J | 0.64 | 60 | 190 |
| 2.7 J | 0.86 J | 1.84 | 61 | 190 |
| 0.67 J | 0.86 J | -0.19 | 61 | 191 |
| ND<1.5 U | 0.86 J | 0.64 | 62 | 191 |
| 0.37 J | 0.86 J | -0.49 | 62 | 192 |
| | | | | |
| 0.39 J | 1.2 JB | -0.81 | 62 | 193 |
| ND<1.5 U | 1.2 JB | 0.3 | 63 | 193 |
| 2.7 J | 1.2 JB | 1.5 | 64 | 193 |
| 0.67 J | 1.2 JB | -0.53 | 64 | 194 |
| ND<1.5 U | 1.2 JB | 0.3 | 65 | 194 |
| 0.37 J | 1.2 JB | -0.83 | 65 | 195 |
| | | | | |
| ND<1.5 U | 0.39 J | 1.11 | 66 | 195 |
| 2.7 J | 0.39 J | 2.31 | 67 | 195 |
| 0.67 J | 0.39 J | 0.28 | 68 | 195 |
| ND<1.5 U | 0.39 J | 1.11 | 69 | 195 |
| 0.37 J | 0.39 J | -0.02 | 69 | 196 |
| | | | | |
| 2.7 J | ND<1.5 U | 1.2 | 70 | 196 |
| 0.67 J | ND<1.5 U | -0.83 | 70 | 197 |
| ND<1.5 U | ND<1.5 U | 0 | 70 | 197 |
| 0.37 J | ND<1.5 U | -1.13 | 70 | 198 |
| | | | | |
| 0.67 J | 2.7 J | -2.03 | 70 | 199 |
| ND<1.5 U | 2.7 J | -1.2 | 70 | 200 |
| 0.37 J | 2.7 J | -2.33 | 70 | 201 |
| | | | | |
| ND<1.5 U | 0.67 J | 0.83 | 71 | 201 |
| 0.37 J | 0.67 J | -0.3 | 71 | 202 |
| | | | | |
| 0.37 J | ND<1.5 U | -1.13 | 71 | 203 |

S Statistic = 71 - 203 = -132

| Tied Group | Value | Members |
|---|---|---|
| 1 | 2.7 | 3 |
| 2 | 1.5 | 7 |

| Time Period | Observations |
|---|---|

| | |
|---|---|
| 2/1/2017 | 1 |
| 3/1/2017 | 1 |
| 4/1/2017 | 1 |
| 5/1/2017 | 1 |
| 6/1/2017 | 1 |
| 7/1/2017 | 1 |
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |

There are 2 time periods with multiple data

---

A = 864
B = 36
C = 216
D = 0
E = 48
F = 4
a = 33000
b = 124200
c = 1200
Group Variance = 1783.49
Z-Score = -3.10196
Comparison Level at 95% confidence level = -1.65463 (downward trend)
**-3.10196 < -1.65463 indicating a downward trend**

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RW09-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 17.5 | 22.3 | -4.8 | 0 | 1 |
| 16.6 | 22.3 | -5.7 | 0 | 2 |
| 14.9 | 22.3 | -7.4 | 0 | 3 |
| 13.9 | 22.3 | -8.4 | 0 | 4 |
| 13.4 | 22.3 | -8.9 | 0 | 5 |
| 12.5 | 22.3 | -9.8 | 0 | 6 |
| 12.3 | 22.3 | -10 | 0 | 7 |
| 10.6 | 22.3 | -11.7 | 0 | 8 |
| 10.5 | 22.3 | -11.8 | 0 | 9 |
| 9.2 | 22.3 | -13.1 | 0 | 10 |
| 9.9 | 22.3 | -12.4 | 0 | 11 |
| 9.8 | 22.3 | -12.5 | 0 | 12 |
| 13.1 | 22.3 | -9.2 | 0 | 13 |
| 22.3 | 22.3 | 0 | 0 | 13 |
| 10.2 2c | 22.3 | -12.1 | 0 | 14 |
| 11.2 1c | 22.3 | -11.1 | 0 | 15 |
| 13.2 | 22.3 | -9.1 | 0 | 16 |
| 12 | 22.3 | -10.3 | 0 | 17 |
| 16.7 1c | 22.3 | -5.6 | 0 | 18 |
| 14.3 | 22.3 | -8 | 0 | 19 |
| 16.9 | 22.3 | -5.4 | 0 | 20 |
| 15.2 | 22.3 | -7.1 | 0 | 21 |
| 17 | 22.3 | -5.3 | 0 | 22 |
| 16 | 22.3 | -6.3 | 0 | 23 |
| | | | | |
| 16.6 | 17.5 | -0.9 | 0 | 24 |
| 14.9 | 17.5 | -2.6 | 0 | 25 |
| 13.9 | 17.5 | -3.6 | 0 | 26 |
| 13.4 | 17.5 | -4.1 | 0 | 27 |
| 12.5 | 17.5 | -5 | 0 | 28 |
| 12.3 | 17.5 | -5.2 | 0 | 29 |
| 10.6 | 17.5 | -6.9 | 0 | 30 |
| 10.5 | 17.5 | -7 | 0 | 31 |
| 9.2 | 17.5 | -8.3 | 0 | 32 |
| 9.9 | 17.5 | -7.6 | 0 | 33 |
| 9.8 | 17.5 | -7.7 | 0 | 34 |
| 13.1 | 17.5 | -4.4 | 0 | 35 |
| 22.3 | 17.5 | 4.8 | 1 | 35 |
| 10.2 2c | 17.5 | -7.3 | 1 | 36 |
| 11.2 1c | 17.5 | -6.3 | 1 | 37 |
| 13.2 | 17.5 | -4.3 | 1 | 38 |
| 12 | 17.5 | -5.5 | 1 | 39 |
| 16.7 1c | 17.5 | -0.8 | 1 | 40 |
| 14.3 | 17.5 | -3.2 | 1 | 41 |
| 16.9 | 17.5 | -0.6 | 1 | 42 |
| 15.2 | 17.5 | -2.3 | 1 | 43 |
| 17 | 17.5 | -0.5 | 1 | 44 |

| | | | | |
|---|---|---|---|---|
| 16 | 17.5 | -1.5 | 1 | 45 |
| | | | | |
| 14.9 | 16.6 | -1.7 | 1 | 46 |
| 13.9 | 16.6 | -2.7 | 1 | 47 |
| 13.4 | 16.6 | -3.2 | 1 | 48 |
| 12.5 | 16.6 | -4.1 | 1 | 49 |
| 12.3 | 16.6 | -4.3 | 1 | 50 |
| 10.6 | 16.6 | -6 | 1 | 51 |
| 10.5 | 16.6 | -6.1 | 1 | 52 |
| 9.2 | 16.6 | -7.4 | 1 | 53 |
| 9.9 | 16.6 | -6.7 | 1 | 54 |
| 9.8 | 16.6 | -6.8 | 1 | 55 |
| 13.1 | 16.6 | -3.5 | 1 | 56 |
| 22.3 | 16.6 | 5.7 | 2 | 56 |
| 10.2 2c | 16.6 | -6.4 | 2 | 57 |
| 11.2 1c | 16.6 | -5.4 | 2 | 58 |
| 13.2 | 16.6 | -3.4 | 2 | 59 |
| 12 | 16.6 | -4.6 | 2 | 60 |
| 16.7 1c | 16.6 | 0.1 | 3 | 60 |
| 14.3 | 16.6 | -2.3 | 3 | 61 |
| 16.9 | 16.6 | 0.3 | 4 | 61 |
| 15.2 | 16.6 | -1.4 | 4 | 62 |
| 17 | 16.6 | 0.4 | 5 | 62 |
| 16 | 16.6 | -0.6 | 5 | 63 |
| | | | | |
| 13.9 | 14.9 | -1 | 5 | 64 |
| 13.4 | 14.9 | -1.5 | 5 | 65 |
| 12.5 | 14.9 | -2.4 | 5 | 66 |
| 12.3 | 14.9 | -2.6 | 5 | 67 |
| 10.6 | 14.9 | -4.3 | 5 | 68 |
| 10.5 | 14.9 | -4.4 | 5 | 69 |
| 9.2 | 14.9 | -5.7 | 5 | 70 |
| 9.9 | 14.9 | -5 | 5 | 71 |
| 9.8 | 14.9 | -5.1 | 5 | 72 |
| 13.1 | 14.9 | -1.8 | 5 | 73 |
| 22.3 | 14.9 | 7.4 | 6 | 73 |
| 10.2 2c | 14.9 | -4.7 | 6 | 74 |
| 11.2 1c | 14.9 | -3.7 | 6 | 75 |
| 13.2 | 14.9 | -1.7 | 6 | 76 |
| 12 | 14.9 | -2.9 | 6 | 77 |
| 16.7 1c | 14.9 | 1.8 | 7 | 77 |
| 14.3 | 14.9 | -0.6 | 7 | 78 |
| 16.9 | 14.9 | 2 | 8 | 78 |
| 15.2 | 14.9 | 0.3 | 9 | 78 |
| 17 | 14.9 | 2.1 | 10 | 78 |
| 16 | 14.9 | 1.1 | 11 | 78 |
| | | | | |
| 13.4 | 13.9 | -0.5 | 11 | 79 |
| 12.5 | 13.9 | -1.4 | 11 | 80 |
| 12.3 | 13.9 | -1.6 | 11 | 81 |
| 10.6 | 13.9 | -3.3 | 11 | 82 |
| 10.5 | 13.9 | -3.4 | 11 | 83 |
| 9.2 | 13.9 | -4.7 | 11 | 84 |
| 9.9 | 13.9 | -4 | 11 | 85 |
| 9.8 | 13.9 | -4.1 | 11 | 86 |
| 13.1 | 13.9 | -0.8 | 11 | 87 |
| 22.3 | 13.9 | 8.4 | 12 | 87 |

| | | | | |
|---|---|---|---|---|
| 10.2 2c | 13.9 | -3.7 | 12 | 88 |
| 11.2 1c | 13.9 | -2.7 | 12 | 89 |
| 13.2 | 13.9 | -0.7 | 12 | 90 |
| 12 | 13.9 | -1.9 | 12 | 91 |
| 16.7 1c | 13.9 | 2.8 | 13 | 91 |
| 14.3 | 13.9 | 0.4 | 14 | 91 |
| 16.9 | 13.9 | 3 | 15 | 91 |
| 15.2 | 13.9 | 1.3 | 16 | 91 |
| 17 | 13.9 | 3.1 | 17 | 91 |
| 16 | 13.9 | 2.1 | 18 | 91 |
| | | | | |
| 12.5 | 13.4 | -0.9 | 18 | 92 |
| 12.3 | 13.4 | -1.1 | 18 | 93 |
| 10.6 | 13.4 | -2.8 | 18 | 94 |
| 10.5 | 13.4 | -2.9 | 18 | 95 |
| 9.2 | 13.4 | -4.2 | 18 | 96 |
| 9.9 | 13.4 | -3.5 | 18 | 97 |
| 9.8 | 13.4 | -3.6 | 18 | 98 |
| 13.1 | 13.4 | -0.3 | 18 | 99 |
| 22.3 | 13.4 | 8.9 | 19 | 99 |
| 10.2 2c | 13.4 | -3.2 | 19 | 100 |
| 11.2 1c | 13.4 | -2.2 | 19 | 101 |
| 13.2 | 13.4 | -0.2 | 19 | 102 |
| 12 | 13.4 | -1.4 | 19 | 103 |
| 16.7 1c | 13.4 | 3.3 | 20 | 103 |
| 14.3 | 13.4 | 0.9 | 21 | 103 |
| 16.9 | 13.4 | 3.5 | 22 | 103 |
| 15.2 | 13.4 | 1.8 | 23 | 103 |
| 17 | 13.4 | 3.6 | 24 | 103 |
| 16 | 13.4 | 2.6 | 25 | 103 |
| | | | | |
| 12.3 | 12.5 | -0.2 | 25 | 104 |
| 10.6 | 12.5 | -1.9 | 25 | 105 |
| 10.5 | 12.5 | -2 | 25 | 106 |
| 9.2 | 12.5 | -3.3 | 25 | 107 |
| 9.9 | 12.5 | -2.6 | 25 | 108 |
| 9.8 | 12.5 | -2.7 | 25 | 109 |
| 13.1 | 12.5 | 0.6 | 26 | 109 |
| 22.3 | 12.5 | 9.8 | 27 | 109 |
| 10.2 2c | 12.5 | -2.3 | 27 | 110 |
| 11.2 1c | 12.5 | -1.3 | 27 | 111 |
| 13.2 | 12.5 | 0.7 | 28 | 111 |
| 12 | 12.5 | -0.5 | 28 | 112 |
| 16.7 1c | 12.5 | 4.2 | 29 | 112 |
| 14.3 | 12.5 | 1.8 | 30 | 112 |
| 16.9 | 12.5 | 4.4 | 31 | 112 |
| 15.2 | 12.5 | 2.7 | 32 | 112 |
| 17 | 12.5 | 4.5 | 33 | 112 |
| 16 | 12.5 | 3.5 | 34 | 112 |
| | | | | |
| 10.6 | 12.3 | -1.7 | 34 | 113 |
| 10.5 | 12.3 | -1.8 | 34 | 114 |
| 9.2 | 12.3 | -3.1 | 34 | 115 |
| 9.9 | 12.3 | -2.4 | 34 | 116 |
| 9.8 | 12.3 | -2.5 | 34 | 117 |
| 13.1 | 12.3 | 0.8 | 35 | 117 |
| 22.3 | 12.3 | 10 | 36 | 117 |

| | | | | |
|---|---|---|---|---|
| 10.2 2c | 12.3 | -2.1 | 36 | 118 |
| 11.2 1c | 12.3 | -1.1 | 36 | 119 |
| 13.2 | 12.3 | 0.9 | 37 | 119 |
| 12 | 12.3 | -0.3 | 37 | 120 |
| 16.7 1c | 12.3 | 4.4 | 38 | 120 |
| 14.3 | 12.3 | 2 | 39 | 120 |
| 16.9 | 12.3 | 4.6 | 40 | 120 |
| 15.2 | 12.3 | 2.9 | 41 | 120 |
| 17 | 12.3 | 4.7 | 42 | 120 |
| 16 | 12.3 | 3.7 | 43 | 120 |
| | | | | |
| 10.5 | 10.6 | -0.1 | 43 | 121 |
| 9.2 | 10.6 | -1.4 | 43 | 122 |
| 9.9 | 10.6 | -0.7 | 43 | 123 |
| 9.8 | 10.6 | -0.8 | 43 | 124 |
| 13.1 | 10.6 | 2.5 | 44 | 124 |
| 22.3 | 10.6 | 11.7 | 45 | 124 |
| 10.2 2c | 10.6 | -0.4 | 45 | 125 |
| 11.2 1c | 10.6 | 0.6 | 46 | 125 |
| 13.2 | 10.6 | 2.6 | 47 | 125 |
| 12 | 10.6 | 1.4 | 48 | 125 |
| 16.7 1c | 10.6 | 6.1 | 49 | 125 |
| 14.3 | 10.6 | 3.7 | 50 | 125 |
| 16.9 | 10.6 | 6.3 | 51 | 125 |
| 15.2 | 10.6 | 4.6 | 52 | 125 |
| 17 | 10.6 | 6.4 | 53 | 125 |
| 16 | 10.6 | 5.4 | 54 | 125 |
| | | | | |
| 9.2 | 10.5 | -1.3 | 54 | 126 |
| 9.9 | 10.5 | -0.6 | 54 | 127 |
| 9.8 | 10.5 | -0.7 | 54 | 128 |
| 13.1 | 10.5 | 2.6 | 55 | 128 |
| 22.3 | 10.5 | 11.8 | 56 | 128 |
| 10.2 2c | 10.5 | -0.3 | 56 | 129 |
| 11.2 1c | 10.5 | 0.7 | 57 | 129 |
| 13.2 | 10.5 | 2.7 | 58 | 129 |
| 12 | 10.5 | 1.5 | 59 | 129 |
| 16.7 1c | 10.5 | 6.2 | 60 | 129 |
| 14.3 | 10.5 | 3.8 | 61 | 129 |
| 16.9 | 10.5 | 6.4 | 62 | 129 |
| 15.2 | 10.5 | 4.7 | 63 | 129 |
| 17 | 10.5 | 6.5 | 64 | 129 |
| 16 | 10.5 | 5.5 | 65 | 129 |
| | | | | |
| 9.9 | 9.2 | 0.7 | 66 | 129 |
| 9.8 | 9.2 | 0.6 | 67 | 129 |
| 13.1 | 9.2 | 3.9 | 68 | 129 |
| 22.3 | 9.2 | 13.1 | 69 | 129 |
| 10.2 2c | 9.2 | 1 | 70 | 129 |
| 11.2 1c | 9.2 | 2 | 71 | 129 |
| 13.2 | 9.2 | 4 | 72 | 129 |
| 12 | 9.2 | 2.8 | 73 | 129 |
| 16.7 1c | 9.2 | 7.5 | 74 | 129 |
| 14.3 | 9.2 | 5.1 | 75 | 129 |
| 16.9 | 9.2 | 7.7 | 76 | 129 |
| 15.2 | 9.2 | 6 | 77 | 129 |
| 17 | 9.2 | 7.8 | 78 | 129 |

| | | | | |
|---|---|---|---|---|
| 16 | 9.2 | 6.8 | 79 | 129 |
| | | | | |
| 9.8 | 9.9 | -0.1 | 79 | 130 |
| 13.1 | 9.9 | 3.2 | 80 | 130 |
| 22.3 | 9.9 | 12.4 | 81 | 130 |
| 10.2 2c | 9.9 | 0.3 | 82 | 130 |
| 11.2 1c | 9.9 | 1.3 | 83 | 130 |
| 13.2 | 9.9 | 3.3 | 84 | 130 |
| 12 | 9.9 | 2.1 | 85 | 130 |
| 16.7 1c | 9.9 | 6.8 | 86 | 130 |
| 14.3 | 9.9 | 4.4 | 87 | 130 |
| 16.9 | 9.9 | 7 | 88 | 130 |
| 15.2 | 9.9 | 5.3 | 89 | 130 |
| 17 | 9.9 | 7.1 | 90 | 130 |
| 16 | 9.9 | 6.1 | 91 | 130 |
| | | | | |
| 13.1 | 9.8 | 3.3 | 92 | 130 |
| 22.3 | 9.8 | 12.5 | 93 | 130 |
| 10.2 2c | 9.8 | 0.4 | 94 | 130 |
| 11.2 1c | 9.8 | 1.4 | 95 | 130 |
| 13.2 | 9.8 | 3.4 | 96 | 130 |
| 12 | 9.8 | 2.2 | 97 | 130 |
| 16.7 1c | 9.8 | 6.9 | 98 | 130 |
| 14.3 | 9.8 | 4.5 | 99 | 130 |
| 16.9 | 9.8 | 7.1 | 100 | 130 |
| 15.2 | 9.8 | 5.4 | 101 | 130 |
| 17 | 9.8 | 7.2 | 102 | 130 |
| 16 | 9.8 | 6.2 | 103 | 130 |
| | | | | |
| 22.3 | 13.1 | 9.2 | 104 | 130 |
| 10.2 2c | 13.1 | -2.9 | 104 | 131 |
| 11.2 1c | 13.1 | -1.9 | 104 | 132 |
| 13.2 | 13.1 | 0.1 | 105 | 132 |
| 12 | 13.1 | -1.1 | 105 | 133 |
| 16.7 1c | 13.1 | 3.6 | 106 | 133 |
| 14.3 | 13.1 | 1.2 | 107 | 133 |
| 16.9 | 13.1 | 3.8 | 108 | 133 |
| 15.2 | 13.1 | 2.1 | 109 | 133 |
| 17 | 13.1 | 3.9 | 110 | 133 |
| 16 | 13.1 | 2.9 | 111 | 133 |
| | | | | |
| 10.2 2c | 22.3 | -12.1 | 111 | 134 |
| 11.2 1c | 22.3 | -11.1 | 111 | 135 |
| 13.2 | 22.3 | -9.1 | 111 | 136 |
| 12 | 22.3 | -10.3 | 111 | 137 |
| 16.7 1c | 22.3 | -5.6 | 111 | 138 |
| 14.3 | 22.3 | -8 | 111 | 139 |
| 16.9 | 22.3 | -5.4 | 111 | 140 |
| 15.2 | 22.3 | -7.1 | 111 | 141 |
| 17 | 22.3 | -5.3 | 111 | 142 |
| 16 | 22.3 | -6.3 | 111 | 143 |
| | | | | |
| 11.2 1c | 10.2 2c | Same Date | 111 | 143 |
| 13.2 | 10.2 2c | 3 | 112 | 143 |
| 12 | 10.2 2c | 1.8 | 113 | 143 |
| 16.7 1c | 10.2 2c | 6.5 | 114 | 143 |
| 14.3 | 10.2 2c | 4.1 | 115 | 143 |

| | | | | |
|---|---|---|---|---|
| 16.9 | 10.2 2c | 6.7 | 116 | 143 |
| 15.2 | 10.2 2c | 5 | 117 | 143 |
| 17 | 10.2 2c | 6.8 | 118 | 143 |
| 16 | 10.2 2c | 5.8 | 119 | 143 |
| | | | | |
| 13.2 | 11.2 1c | 2 | 120 | 143 |
| 12 | 11.2 1c | 0.8 | 121 | 143 |
| 16.7 1c | 11.2 1c | 5.5 | 122 | 143 |
| 14.3 | 11.2 1c | 3.1 | 123 | 143 |
| 16.9 | 11.2 1c | 5.7 | 124 | 143 |
| 15.2 | 11.2 1c | 4 | 125 | 143 |
| 17 | 11.2 1c | 5.8 | 126 | 143 |
| 16 | 11.2 1c | 4.8 | 127 | 143 |
| | | | | |
| 12 | 13.2 | Same Date | 127 | 143 |
| 16.7 1c | 13.2 | 3.5 | 128 | 143 |
| 14.3 | 13.2 | 1.1 | 129 | 143 |
| 16.9 | 13.2 | 3.7 | 130 | 143 |
| 15.2 | 13.2 | 2 | 131 | 143 |
| 17 | 13.2 | 3.8 | 132 | 143 |
| 16 | 13.2 | 2.8 | 133 | 143 |
| | | | | |
| 16.7 1c | 12 | 4.7 | 134 | 143 |
| 14.3 | 12 | 2.3 | 135 | 143 |
| 16.9 | 12 | 4.9 | 136 | 143 |
| 15.2 | 12 | 3.2 | 137 | 143 |
| 17 | 12 | 5 | 138 | 143 |
| 16 | 12 | 4 | 139 | 143 |
| | | | | |
| 14.3 | 16.7 1c | -2.4 | 139 | 144 |
| 16.9 | 16.7 1c | 0.2 | 140 | 144 |
| 15.2 | 16.7 1c | -1.5 | 140 | 145 |
| 17 | 16.7 1c | 0.3 | 141 | 145 |
| 16 | 16.7 1c | -0.7 | 141 | 146 |
| | | | | |
| 16.9 | 14.3 | 2.6 | 142 | 146 |
| 15.2 | 14.3 | 0.9 | 143 | 146 |
| 17 | 14.3 | 2.7 | 144 | 146 |
| 16 | 14.3 | 1.7 | 145 | 146 |
| | | | | |
| 15.2 | 16.9 | -1.7 | 145 | 147 |
| 17 | 16.9 | 0.1 | 146 | 147 |
| 16 | 16.9 | -0.9 | 146 | 148 |
| | | | | |
| 17 | 15.2 | 1.8 | 147 | 148 |
| 16 | 15.2 | 0.8 | 148 | 148 |
| | | | | |
| 16 | 17 | -1 | 148 | 149 |

S Statistic = 148 - 149 = -1

| Tied Group | Value | Members |
|---|---|---|
| 1 | 22.3 | 2 |

| Time Period | Observations |
|---|---|
| 2/1/2017 | 1 |

| | |
|---|---|
| 3/1/2017 | 1 |
| 4/1/2017 | 1 |
| 5/1/2017 | 1 |
| 6/1/2017 | 1 |
| 7/1/2017 | 1 |
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |

There are 2 time periods with multiple data

---

A = 18
B = 36
C = 0
D = 0
E = 2
F = 4
a = 33000
b = 124200
c = 1200
Group Variance = 1830.34
Z-Score = 0
Comparison Level at 95% confidence level = -1.65463 (downward trend)
0 >= -1.65463 indicating no evidence of a downward trend

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RW11-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 1.8 J | 0.78 J | 1.02 | 1 | 0 |
| 5.3 | 0.78 J | 4.52 | 2 | 0 |
| 1.8 J | 0.78 J | 1.02 | 3 | 0 |
| 0.94 J | 0.78 J | 0.16 | 4 | 0 |
| 0.84 J | 0.78 J | 0.06 | 5 | 0 |
| 1.3 J | 0.78 J | 0.52 | 6 | 0 |
| 0.81 J | 0.78 J | 0.03 | 7 | 0 |
| ND<1.5 U | 0.78 J | 0.72 | 8 | 0 |
| 2.1 J | 0.78 J | 1.32 | 9 | 0 |
| 2.9 J | 0.78 J | 2.12 | 10 | 0 |
| 2.2 J | 0.78 J | 1.42 | 11 | 0 |
| 4.1 | 0.78 J | 3.32 | 12 | 0 |
| 66.3 | 0.78 J | 65.52 | 13 | 0 |
| 1.2 J | 0.78 J | 0.42 | 14 | 0 |
| 2.2 J2c | 0.78 J | 1.42 | 15 | 0 |
| 2.1 J1c | 0.78 J | 1.32 | 16 | 0 |
| 1 J | 0.78 J | 0.22 | 17 | 0 |
| 1.1 JB | 0.78 J | 0.32 | 18 | 0 |
| ND<1.5 U | 0.78 J | 0.72 | 19 | 0 |
| 1.9 J | 0.78 J | 1.12 | 20 | 0 |
| 2 J | 0.78 J | 1.22 | 21 | 0 |
| 2.5 J | 0.78 J | 1.72 | 22 | 0 |
| 2.2 J | 0.78 J | 1.42 | 23 | 0 |
| 2 J | 0.78 J | 1.22 | 24 | 0 |
| 3.4 | 0.78 J | 2.62 | 25 | 0 |
| ND<1 U | 0.78 J | 0.22 | 26 | 0 |
| 3.835 | 0.78 J | 3.055 | 27 | 0 |
| 0.0883 J | 0.78 J | -0.6917 | 27 | 1 |
| | | | | |
| 5.3 | 1.8 J | 3.5 | 28 | 1 |
| 1.8 J | 1.8 J | 0 | 28 | 1 |
| 0.94 J | 1.8 J | -0.86 | 28 | 2 |
| 0.84 J | 1.8 J | -0.96 | 28 | 3 |
| 1.3 J | 1.8 J | -0.5 | 28 | 4 |
| 0.81 J | 1.8 J | -0.99 | 28 | 5 |
| ND<1.5 U | 1.8 J | -0.3 | 28 | 6 |
| 2.1 J | 1.8 J | 0.3 | 29 | 6 |
| 2.9 J | 1.8 J | 1.1 | 30 | 6 |
| 2.2 J | 1.8 J | 0.4 | 31 | 6 |
| 4.1 | 1.8 J | 2.3 | 32 | 6 |
| 66.3 | 1.8 J | 64.5 | 33 | 6 |
| 1.2 J | 1.8 J | -0.6 | 33 | 7 |
| 2.2 J2c | 1.8 J | 0.4 | 34 | 7 |
| 2.1 J1c | 1.8 J | 0.3 | 35 | 7 |
| 1 J | 1.8 J | -0.8 | 35 | 8 |
| 1.1 JB | 1.8 J | -0.7 | 35 | 9 |
| ND<1.5 U | 1.8 J | -0.3 | 35 | 10 |

| | | | | |
|---|---|---|---|---|
| 1.9 J | 1.8 J | 0.1 | 36 | 10 |
| 2 J | 1.8 J | 0.2 | 37 | 10 |
| 2.5 J | 1.8 J | 0.7 | 38 | 10 |
| 2.2 J | 1.8 J | 0.4 | 39 | 10 |
| 2 J | 1.8 J | 0.2 | 40 | 10 |
| 3.4 | 1.8 J | 1.6 | 41 | 10 |
| ND<1 U | 1.8 J | -0.8 | 41 | 11 |
| 3.835 | 1.8 J | 2.035 | 42 | 11 |
| 0.0883 J | 1.8 J | -1.7117 | 42 | 12 |
| | | | | |
| 1.8 J | 5.3 | -3.5 | 42 | 13 |
| 0.94 J | 5.3 | -4.36 | 42 | 14 |
| 0.84 J | 5.3 | -4.46 | 42 | 15 |
| 1.3 J | 5.3 | -4 | 42 | 16 |
| 0.81 J | 5.3 | -4.49 | 42 | 17 |
| ND<1.5 U | 5.3 | -3.8 | 42 | 18 |
| 2.1 J | 5.3 | -3.2 | 42 | 19 |
| 2.9 J | 5.3 | -2.4 | 42 | 20 |
| 2.2 J | 5.3 | -3.1 | 42 | 21 |
| 4.1 | 5.3 | -1.2 | 42 | 22 |
| 66.3 | 5.3 | 61 | 43 | 22 |
| 1.2 J | 5.3 | -4.1 | 43 | 23 |
| 2.2 J2c | 5.3 | -3.1 | 43 | 24 |
| 2.1 J1c | 5.3 | -3.2 | 43 | 25 |
| 1 J | 5.3 | -4.3 | 43 | 26 |
| 1.1 JB | 5.3 | -4.2 | 43 | 27 |
| ND<1.5 U | 5.3 | -3.8 | 43 | 28 |
| 1.9 J | 5.3 | -3.4 | 43 | 29 |
| 2 J | 5.3 | -3.3 | 43 | 30 |
| 2.5 J | 5.3 | -2.8 | 43 | 31 |
| 2.2 J | 5.3 | -3.1 | 43 | 32 |
| 2 J | 5.3 | -3.3 | 43 | 33 |
| 3.4 | 5.3 | -1.9 | 43 | 34 |
| ND<1 U | 5.3 | -4.3 | 43 | 35 |
| 3.835 | 5.3 | -1.465 | 43 | 36 |
| 0.0883 J | 5.3 | -5.2117 | 43 | 37 |
| | | | | |
| 0.94 J | 1.8 J | -0.86 | 43 | 38 |
| 0.84 J | 1.8 J | -0.96 | 43 | 39 |
| 1.3 J | 1.8 J | -0.5 | 43 | 40 |
| 0.81 J | 1.8 J | -0.99 | 43 | 41 |
| ND<1.5 U | 1.8 J | -0.3 | 43 | 42 |
| 2.1 J | 1.8 J | 0.3 | 44 | 42 |
| 2.9 J | 1.8 J | 1.1 | 45 | 42 |
| 2.2 J | 1.8 J | 0.4 | 46 | 42 |
| 4.1 | 1.8 J | 2.3 | 47 | 42 |
| 66.3 | 1.8 J | 64.5 | 48 | 42 |
| 1.2 J | 1.8 J | -0.6 | 48 | 43 |
| 2.2 J2c | 1.8 J | 0.4 | 49 | 43 |
| 2.1 J1c | 1.8 J | 0.3 | 50 | 43 |
| 1 J | 1.8 J | -0.8 | 50 | 44 |
| 1.1 JB | 1.8 J | -0.7 | 50 | 45 |
| ND<1.5 U | 1.8 J | -0.3 | 50 | 46 |
| 1.9 J | 1.8 J | 0.1 | 51 | 46 |
| 2 J | 1.8 J | 0.2 | 52 | 46 |
| 2.5 J | 1.8 J | 0.7 | 53 | 46 |
| 2.2 J | 1.8 J | 0.4 | 54 | 46 |

| | | | | |
|---|---|---|---|---|
| 2 J | 1.8 J | 0.2 | 55 | 46 |
| 3.4 | 1.8 J | 1.6 | 56 | 46 |
| ND<1 U | 1.8 J | -0.8 | 56 | 47 |
| 3.835 | 1.8 J | 2.035 | 57 | 47 |
| 0.0883 J | 1.8 J | -1.7117 | 57 | 48 |
| | | | | |
| 0.84 J | 0.94 J | -0.1 | 57 | 49 |
| 1.3 J | 0.94 J | 0.36 | 58 | 49 |
| 0.81 J | 0.94 J | -0.13 | 58 | 50 |
| ND<1.5 U | 0.94 J | 0.56 | 59 | 50 |
| 2.1 J | 0.94 J | 1.16 | 60 | 50 |
| 2.9 J | 0.94 J | 1.96 | 61 | 50 |
| 2.2 J | 0.94 J | 1.26 | 62 | 50 |
| 4.1 | 0.94 J | 3.16 | 63 | 50 |
| 66.3 | 0.94 J | 65.36 | 64 | 50 |
| 1.2 J | 0.94 J | 0.26 | 65 | 50 |
| 2.2 J2c | 0.94 J | 1.26 | 66 | 50 |
| 2.1 J1c | 0.94 J | 1.16 | 67 | 50 |
| 1 J | 0.94 J | 0.06 | 68 | 50 |
| 1.1 JB | 0.94 J | 0.16 | 69 | 50 |
| ND<1.5 U | 0.94 J | 0.56 | 70 | 50 |
| 1.9 J | 0.94 J | 0.96 | 71 | 50 |
| 2 J | 0.94 J | 1.06 | 72 | 50 |
| 2.5 J | 0.94 J | 1.56 | 73 | 50 |
| 2.2 J | 0.94 J | 1.26 | 74 | 50 |
| 2 J | 0.94 J | 1.06 | 75 | 50 |
| 3.4 | 0.94 J | 2.46 | 76 | 50 |
| ND<1 U | 0.94 J | 0.06 | 77 | 50 |
| 3.835 | 0.94 J | 2.895 | 78 | 50 |
| 0.0883 J | 0.94 J | -0.8517 | 78 | 51 |
| | | | | |
| 1.3 J | 0.84 J | 0.46 | 79 | 51 |
| 0.81 J | 0.84 J | -0.03 | 79 | 52 |
| ND<1.5 U | 0.84 J | 0.66 | 80 | 52 |
| 2.1 J | 0.84 J | 1.26 | 81 | 52 |
| 2.9 J | 0.84 J | 2.06 | 82 | 52 |
| 2.2 J | 0.84 J | 1.36 | 83 | 52 |
| 4.1 | 0.84 J | 3.26 | 84 | 52 |
| 66.3 | 0.84 J | 65.46 | 85 | 52 |
| 1.2 J | 0.84 J | 0.36 | 86 | 52 |
| 2.2 J2c | 0.84 J | 1.36 | 87 | 52 |
| 2.1 J1c | 0.84 J | 1.26 | 88 | 52 |
| 1 J | 0.84 J | 0.16 | 89 | 52 |
| 1.1 JB | 0.84 J | 0.26 | 90 | 52 |
| ND<1.5 U | 0.84 J | 0.66 | 91 | 52 |
| 1.9 J | 0.84 J | 1.06 | 92 | 52 |
| 2 J | 0.84 J | 1.16 | 93 | 52 |
| 2.5 J | 0.84 J | 1.66 | 94 | 52 |
| 2.2 J | 0.84 J | 1.36 | 95 | 52 |
| 2 J | 0.84 J | 1.16 | 96 | 52 |
| 3.4 | 0.84 J | 2.56 | 97 | 52 |
| ND<1 U | 0.84 J | 0.16 | 98 | 52 |
| 3.835 | 0.84 J | 2.995 | 99 | 52 |
| 0.0883 J | 0.84 J | -0.7517 | 99 | 53 |
| | | | | |
| 0.81 J | 1.3 J | -0.49 | 99 | 54 |
| ND<1.5 U | 1.3 J | 0.2 | 100 | 54 |

| | | | | |
|---|---|---|---|---|
| 2.1 J | 1.3 J | 0.8 | 101 | 54 |
| 2.9 J | 1.3 J | 1.6 | 102 | 54 |
| 2.2 J | 1.3 J | 0.9 | 103 | 54 |
| 4.1 | 1.3 J | 2.8 | 104 | 54 |
| 66.3 | 1.3 J | 65 | 105 | 54 |
| 1.2 J | 1.3 J | -0.1 | 105 | 55 |
| 2.2 J2c | 1.3 J | 0.9 | 106 | 55 |
| 2.1 J1c | 1.3 J | 0.8 | 107 | 55 |
| 1 J | 1.3 J | -0.3 | 107 | 56 |
| 1.1 JB | 1.3 J | -0.2 | 107 | 57 |
| ND<1.5 U | 1.3 J | 0.2 | 108 | 57 |
| 1.9 J | 1.3 J | 0.6 | 109 | 57 |
| 2 J | 1.3 J | 0.7 | 110 | 57 |
| 2.5 J | 1.3 J | 1.2 | 111 | 57 |
| 2.2 J | 1.3 J | 0.9 | 112 | 57 |
| 2 J | 1.3 J | 0.7 | 113 | 57 |
| 3.4 | 1.3 J | 2.1 | 114 | 57 |
| ND<1 U | 1.3 J | -0.3 | 114 | 58 |
| 3.835 | 1.3 J | 2.535 | 115 | 58 |
| 0.0883 J | 1.3 J | -1.2117 | 115 | 59 |
| | | | | |
| ND<1.5 U | 0.81 J | 0.69 | 116 | 59 |
| 2.1 J | 0.81 J | 1.29 | 117 | 59 |
| 2.9 J | 0.81 J | 2.09 | 118 | 59 |
| 2.2 J | 0.81 J | 1.39 | 119 | 59 |
| 4.1 | 0.81 J | 3.29 | 120 | 59 |
| 66.3 | 0.81 J | 65.49 | 121 | 59 |
| 1.2 J | 0.81 J | 0.39 | 122 | 59 |
| 2.2 J2c | 0.81 J | 1.39 | 123 | 59 |
| 2.1 J1c | 0.81 J | 1.29 | 124 | 59 |
| 1 J | 0.81 J | 0.19 | 125 | 59 |
| 1.1 JB | 0.81 J | 0.29 | 126 | 59 |
| ND<1.5 U | 0.81 J | 0.69 | 127 | 59 |
| 1.9 J | 0.81 J | 1.09 | 128 | 59 |
| 2 J | 0.81 J | 1.19 | 129 | 59 |
| 2.5 J | 0.81 J | 1.69 | 130 | 59 |
| 2.2 J | 0.81 J | 1.39 | 131 | 59 |
| 2 J | 0.81 J | 1.19 | 132 | 59 |
| 3.4 | 0.81 J | 2.59 | 133 | 59 |
| ND<1 U | 0.81 J | 0.19 | 134 | 59 |
| 3.835 | 0.81 J | 3.025 | 135 | 59 |
| 0.0883 J | 0.81 J | -0.7217 | 135 | 60 |
| | | | | |
| 2.1 J | ND<1.5 U | 0.6 | 136 | 60 |
| 2.9 J | ND<1.5 U | 1.4 | 137 | 60 |
| 2.2 J | ND<1.5 U | 0.7 | 138 | 60 |
| 4.1 | ND<1.5 U | 2.6 | 139 | 60 |
| 66.3 | ND<1.5 U | 64.8 | 140 | 60 |
| 1.2 J | ND<1.5 U | -0.3 | 140 | 61 |
| 2.2 J2c | ND<1.5 U | 0.7 | 141 | 61 |
| 2.1 J1c | ND<1.5 U | 0.6 | 142 | 61 |
| 1 J | ND<1.5 U | -0.5 | 142 | 62 |
| 1.1 JB | ND<1.5 U | -0.4 | 142 | 63 |
| ND<1.5 U | ND<1.5 U | 0 | 142 | 63 |
| 1.9 J | ND<1.5 U | 0.4 | 143 | 63 |
| 2 J | ND<1.5 U | 0.5 | 144 | 63 |
| 2.5 J | ND<1.5 U | 1 | 145 | 63 |

| | | | | |
|---|---|---|---|---|
| 2.2 J | ND<1.5 U | 0.7 | 146 | 63 |
| 2 J | ND<1.5 U | 0.5 | 147 | 63 |
| 3.4 | ND<1.5 U | 1.9 | 148 | 63 |
| ND<1 U | ND<1.5 U | -0.5 | 148 | 64 |
| 3.835 | ND<1.5 U | 2.335 | 149 | 64 |
| 0.0883 J | ND<1.5 U | -1.4117 | 149 | 65 |
| | | | | |
| 2.9 J | 2.1 J | 0.8 | 150 | 65 |
| 2.2 J | 2.1 J | 0.1 | 151 | 65 |
| 4.1 | 2.1 J | 2 | 152 | 65 |
| 66.3 | 2.1 J | 64.2 | 153 | 65 |
| 1.2 J | 2.1 J | -0.9 | 153 | 66 |
| 2.2 J2c | 2.1 J | 0.1 | 154 | 66 |
| 2.1 J1c | 2.1 J | 0 | 154 | 66 |
| 1 J | 2.1 J | -1.1 | 154 | 67 |
| 1.1 JB | 2.1 J | -1 | 154 | 68 |
| ND<1.5 U | 2.1 J | -0.6 | 154 | 69 |
| 1.9 J | 2.1 J | -0.2 | 154 | 70 |
| 2 J | 2.1 J | -0.1 | 154 | 71 |
| 2.5 J | 2.1 J | 0.4 | 155 | 71 |
| 2.2 J | 2.1 J | 0.1 | 156 | 71 |
| 2 J | 2.1 J | -0.1 | 156 | 72 |
| 3.4 | 2.1 J | 1.3 | 157 | 72 |
| ND<1 U | 2.1 J | -1.1 | 157 | 73 |
| 3.835 | 2.1 J | 1.735 | 158 | 73 |
| 0.0883 J | 2.1 J | -2.0117 | 158 | 74 |
| | | | | |
| 2.2 J | 2.9 J | -0.7 | 158 | 75 |
| 4.1 | 2.9 J | 1.2 | 159 | 75 |
| 66.3 | 2.9 J | 63.4 | 160 | 75 |
| 1.2 J | 2.9 J | -1.7 | 160 | 76 |
| 2.2 J2c | 2.9 J | -0.7 | 160 | 77 |
| 2.1 J1c | 2.9 J | -0.8 | 160 | 78 |
| 1 J | 2.9 J | -1.9 | 160 | 79 |
| 1.1 JB | 2.9 J | -1.8 | 160 | 80 |
| ND<1.5 U | 2.9 J | -1.4 | 160 | 81 |
| 1.9 J | 2.9 J | -1 | 160 | 82 |
| 2 J | 2.9 J | -0.9 | 160 | 83 |
| 2.5 J | 2.9 J | -0.4 | 160 | 84 |
| 2.2 J | 2.9 J | -0.7 | 160 | 85 |
| 2 J | 2.9 J | -0.9 | 160 | 86 |
| 3.4 | 2.9 J | 0.5 | 161 | 86 |
| ND<1 U | 2.9 J | -1.9 | 161 | 87 |
| 3.835 | 2.9 J | 0.935 | 162 | 87 |
| 0.0883 J | 2.9 J | -2.8117 | 162 | 88 |
| | | | | |
| 4.1 | 2.2 J | 1.9 | 163 | 88 |
| 66.3 | 2.2 J | 64.1 | 164 | 88 |
| 1.2 J | 2.2 J | -1 | 164 | 89 |
| 2.2 J2c | 2.2 J | 0 | 164 | 89 |
| 2.1 J1c | 2.2 J | -0.1 | 164 | 90 |
| 1 J | 2.2 J | -1.2 | 164 | 91 |
| 1.1 JB | 2.2 J | -1.1 | 164 | 92 |
| ND<1.5 U | 2.2 J | -0.7 | 164 | 93 |
| 1.9 J | 2.2 J | -0.3 | 164 | 94 |
| 2 J | 2.2 J | -0.2 | 164 | 95 |
| 2.5 J | 2.2 J | 0.3 | 165 | 95 |

| | | | | |
|---|---|---|---|---|
| 2.2 J | 2.2 J | 0 | 165 | 95 |
| 2 J | 2.2 J | -0.2 | 165 | 96 |
| 3.4 | 2.2 J | 1.2 | 166 | 96 |
| ND<1 U | 2.2 J | -1.2 | 166 | 97 |
| 3.835 | 2.2 J | 1.635 | 167 | 97 |
| 0.0883 J | 2.2 J | -2.1117 | 167 | 98 |
| | | | | |
| 66.3 | 4.1 | 62.2 | 168 | 98 |
| 1.2 J | 4.1 | -2.9 | 168 | 99 |
| 2.2 J2c | 4.1 | -1.9 | 168 | 100 |
| 2.1 J1c | 4.1 | -2 | 168 | 101 |
| 1 J | 4.1 | -3.1 | 168 | 102 |
| 1.1 JB | 4.1 | -3 | 168 | 103 |
| ND<1.5 U | 4.1 | -2.6 | 168 | 104 |
| 1.9 J | 4.1 | -2.2 | 168 | 105 |
| 2 J | 4.1 | -2.1 | 168 | 106 |
| 2.5 J | 4.1 | -1.6 | 168 | 107 |
| 2.2 J | 4.1 | -1.9 | 168 | 108 |
| 2 J | 4.1 | -2.1 | 168 | 109 |
| 3.4 | 4.1 | -0.7 | 168 | 110 |
| ND<1 U | 4.1 | -3.1 | 168 | 111 |
| 3.835 | 4.1 | -0.265 | 168 | 112 |
| 0.0883 J | 4.1 | -4.0117 | 168 | 113 |
| | | | | |
| 1.2 J | 66.3 | -65.1 | 168 | 114 |
| 2.2 J2c | 66.3 | -64.1 | 168 | 115 |
| 2.1 J1c | 66.3 | -64.2 | 168 | 116 |
| 1 J | 66.3 | -65.3 | 168 | 117 |
| 1.1 JB | 66.3 | -65.2 | 168 | 118 |
| ND<1.5 U | 66.3 | -64.8 | 168 | 119 |
| 1.9 J | 66.3 | -64.4 | 168 | 120 |
| 2 J | 66.3 | -64.3 | 168 | 121 |
| 2.5 J | 66.3 | -63.8 | 168 | 122 |
| 2.2 J | 66.3 | -64.1 | 168 | 123 |
| 2 J | 66.3 | -64.3 | 168 | 124 |
| 3.4 | 66.3 | -62.9 | 168 | 125 |
| ND<1 U | 66.3 | -65.3 | 168 | 126 |
| 3.835 | 66.3 | -62.465 | 168 | 127 |
| 0.0883 J | 66.3 | -66.2117 | 168 | 128 |
| | | | | |
| 2.2 J2c | 1.2 J | 1 | 169 | 128 |
| 2.1 J1c | 1.2 J | 0.9 | 170 | 128 |
| 1 J | 1.2 J | -0.2 | 170 | 129 |
| 1.1 JB | 1.2 J | -0.1 | 170 | 130 |
| ND<1.5 U | 1.2 J | 0.3 | 171 | 130 |
| 1.9 J | 1.2 J | 0.7 | 172 | 130 |
| 2 J | 1.2 J | 0.8 | 173 | 130 |
| 2.5 J | 1.2 J | 1.3 | 174 | 130 |
| 2.2 J | 1.2 J | 1 | 175 | 130 |
| 2 J | 1.2 J | 0.8 | 176 | 130 |
| 3.4 | 1.2 J | 2.2 | 177 | 130 |
| ND<1 U | 1.2 J | -0.2 | 177 | 131 |
| 3.835 | 1.2 J | 2.635 | 178 | 131 |
| 0.0883 J | 1.2 J | -1.1117 | 178 | 132 |
| | | | | |
| 2.1 J1c | 2.2 J2c | Same Date | 178 | 132 |
| 1 J | 2.2 J2c | -1.2 | 178 | 133 |

| | | | | |
|---|---|---|---|---|
| 1.1 JB | 2.2 J2c | -1.1 | 178 | 134 |
| ND<1.5 U | 2.2 J2c | -0.7 | 178 | 135 |
| 1.9 J | 2.2 J2c | -0.3 | 178 | 136 |
| 2 J | 2.2 J2c | -0.2 | 178 | 137 |
| 2.5 J | 2.2 J2c | 0.3 | 179 | 137 |
| 2.2 J | 2.2 J2c | 0 | 179 | 137 |
| 2 J | 2.2 J2c | -0.2 | 179 | 138 |
| 3.4 | 2.2 J2c | 1.2 | 180 | 138 |
| ND<1 U | 2.2 J2c | -1.2 | 180 | 139 |
| 3.835 | 2.2 J2c | 1.635 | 181 | 139 |
| 0.0883 J | 2.2 J2c | -2.1117 | 181 | 140 |
| | | | | |
| 1 J | 2.1 J1c | -1.1 | 181 | 141 |
| 1.1 JB | 2.1 J1c | -1 | 181 | 142 |
| ND<1.5 U | 2.1 J1c | -0.6 | 181 | 143 |
| 1.9 J | 2.1 J1c | -0.2 | 181 | 144 |
| 2 J | 2.1 J1c | -0.1 | 181 | 145 |
| 2.5 J | 2.1 J1c | 0.4 | 182 | 145 |
| 2.2 J | 2.1 J1c | 0.1 | 183 | 145 |
| 2 J | 2.1 J1c | -0.1 | 183 | 146 |
| 3.4 | 2.1 J1c | 1.3 | 184 | 146 |
| ND<1 U | 2.1 J1c | -1.1 | 184 | 147 |
| 3.835 | 2.1 J1c | 1.735 | 185 | 147 |
| 0.0883 J | 2.1 J1c | -2.0117 | 185 | 148 |
| | | | | |
| 1.1 JB | 1 J | Same Date | 185 | 148 |
| ND<1.5 U | 1 J | 0.5 | 186 | 148 |
| 1.9 J | 1 J | 0.9 | 187 | 148 |
| 2 J | 1 J | 1 | 188 | 148 |
| 2.5 J | 1 J | 1.5 | 189 | 148 |
| 2.2 J | 1 J | 1.2 | 190 | 148 |
| 2 J | 1 J | 1 | 191 | 148 |
| 3.4 | 1 J | 2.4 | 192 | 148 |
| ND<1 U | 1 J | 0 | 192 | 148 |
| 3.835 | 1 J | 2.835 | 193 | 148 |
| 0.0883 J | 1 J | -0.9117 | 193 | 149 |
| | | | | |
| ND<1.5 U | 1.1 JB | 0.4 | 194 | 149 |
| 1.9 J | 1.1 JB | 0.8 | 195 | 149 |
| 2 J | 1.1 JB | 0.9 | 196 | 149 |
| 2.5 J | 1.1 JB | 1.4 | 197 | 149 |
| 2.2 J | 1.1 JB | 1.1 | 198 | 149 |
| 2 J | 1.1 JB | 0.9 | 199 | 149 |
| 3.4 | 1.1 JB | 2.3 | 200 | 149 |
| ND<1 U | 1.1 JB | -0.1 | 200 | 150 |
| 3.835 | 1.1 JB | 2.735 | 201 | 150 |
| 0.0883 J | 1.1 JB | -1.0117 | 201 | 151 |
| | | | | |
| 1.9 J | ND<1.5 U | 0.4 | 202 | 151 |
| 2 J | ND<1.5 U | 0.5 | 203 | 151 |
| 2.5 J | ND<1.5 U | 1 | 204 | 151 |
| 2.2 J | ND<1.5 U | 0.7 | 205 | 151 |
| 2 J | ND<1.5 U | 0.5 | 206 | 151 |
| 3.4 | ND<1.5 U | 1.9 | 207 | 151 |
| ND<1 U | ND<1.5 U | -0.5 | 207 | 152 |
| 3.835 | ND<1.5 U | 2.335 | 208 | 152 |
| 0.0883 J | ND<1.5 U | -1.4117 | 208 | 153 |

| | | | | |
|---|---|---|---|---|
| 2 J | 1.9 J | 0.1 | 209 | 153 |
| 2.5 J | 1.9 J | 0.6 | 210 | 153 |
| 2.2 J | 1.9 J | 0.3 | 211 | 153 |
| 2 J | 1.9 J | 0.1 | 212 | 153 |
| 3.4 | 1.9 J | 1.5 | 213 | 153 |
| ND<1 U | 1.9 J | -0.9 | 213 | 154 |
| 3.835 | 1.9 J | 1.935 | 214 | 154 |
| 0.0883 J | 1.9 J | -1.8117 | 214 | 155 |
| 2.5 J | 2 J | 0.5 | 215 | 155 |
| 2.2 J | 2 J | 0.2 | 216 | 155 |
| 2 J | 2 J | 0 | 216 | 155 |
| 3.4 | 2 J | 1.4 | 217 | 155 |
| ND<1 U | 2 J | -1 | 217 | 156 |
| 3.835 | 2 J | 1.835 | 218 | 156 |
| 0.0883 J | 2 J | -1.9117 | 218 | 157 |
| 2.2 J | 2.5 J | -0.3 | 218 | 158 |
| 2 J | 2.5 J | -0.5 | 218 | 159 |
| 3.4 | 2.5 J | 0.9 | 219 | 159 |
| ND<1 U | 2.5 J | -1.5 | 219 | 160 |
| 3.835 | 2.5 J | 1.335 | 220 | 160 |
| 0.0883 J | 2.5 J | -2.4117 | 220 | 161 |
| 2 J | 2.2 J | -0.2 | 220 | 162 |
| 3.4 | 2.2 J | 1.2 | 221 | 162 |
| ND<1 U | 2.2 J | -1.2 | 221 | 163 |
| 3.835 | 2.2 J | 1.635 | 222 | 163 |
| 0.0883 J | 2.2 J | -2.1117 | 222 | 164 |
| 3.4 | 2 J | 1.4 | 223 | 164 |
| ND<1 U | 2 J | -1 | 223 | 165 |
| 3.835 | 2 J | 1.835 | 224 | 165 |
| 0.0883 J | 2 J | -1.9117 | 224 | 166 |
| ND<1 U | 3.4 | -2.4 | 224 | 167 |
| 3.835 | 3.4 | 0.435 | 225 | 167 |
| 0.0883 J | 3.4 | -3.3117 | 225 | 168 |
| 3.835 | ND<1 U | 2.835 | 226 | 168 |
| 0.0883 J | ND<1 U | -0.9117 | 226 | 169 |
| 0.0883 J | 3.835 | -3.7467 | 226 | 170 |

S Statistic = 226 - 170 = 56

| Tied Group | Value | Members |
|---|---|---|
| 1 | 1.8 | 2 |
| 2 | 1.5 | 2 |
| 3 | 2.1 | 2 |
| 4 | 2.2 | 3 |
| 5 | 1 | 2 |
| 6 | 2 | 2 |

| Time Period | Observations |
|---|---|

| | |
|---|---|
| 2/1/2017 | 1 |
| 3/1/2017 | 1 |
| 4/1/2017 | 1 |
| 5/1/2017 | 1 |
| 6/1/2017 | 1 |
| 7/1/2017 | 1 |
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 3/1/2022 | 1 |
| 3/1/2023 | 1 |
| 3/1/2024 | 1 |

There are 2 time periods with multiple data

---

A = 156
B = 36
C = 6
D = 0
E = 16
F = 4
a = 51156
b = 197316
c = 1624
Group Variance = 2831.37
Z-Score = 1.03363
Comparison Level at 95% confidence level = -1.65463 (downward trend)
1.03363 >= -1.65463 indicating no evidence of a downward trend

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RW12-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 12.6 | 29.7 | -17.1 | 0 | 1 |
| 7 | 29.7 | -22.7 | 0 | 2 |
| 5.1 | 29.7 | -24.6 | 0 | 3 |
| 11.3 | 29.7 | -18.4 | 0 | 4 |
| 193 | 29.7 | 163.3 | 1 | 4 |
| 4.2 | 29.7 | -25.5 | 1 | 5 |
| 11.7 | 29.7 | -18 | 1 | 6 |
| 11 | 29.7 | -18.7 | 1 | 7 |
| 5.2 | 29.7 | -24.5 | 1 | 8 |
| 2.3 J | 29.7 | -27.4 | 1 | 9 |
| 6.6 | 29.7 | -23.1 | 1 | 10 |
| 7.3 | 29.7 | -22.4 | 1 | 11 |
| 4.4 | 29.7 | -25.3 | 1 | 12 |
| 2.1 J | 29.7 | -27.6 | 1 | 13 |
| 3.2 | 29.7 | -26.5 | 1 | 14 |
| 2.5 J | 29.7 | -27.2 | 1 | 15 |
| 5.2 | 29.7 | -24.5 | 1 | 16 |
| ND<0.5 U | 29.7 | -29.2 | 1 | 17 |
| ND<1 UR1M1 | 29.7 | -28.7 | 1 | 18 |
| 3.048 | 29.7 | -26.652 | 1 | 19 |
| 10.99 | 29.7 | -18.71 | 1 | 20 |
| 8.661 | 29.7 | -21.039 | 1 | 21 |
| 5.974 | 29.7 | -23.726 | 1 | 22 |
| 2.8 | 29.7 | -26.9 | 1 | 23 |
| | | | | |
| 7 | 12.6 | -5.6 | 1 | 24 |
| 5.1 | 12.6 | -7.5 | 1 | 25 |
| 11.3 | 12.6 | -1.3 | 1 | 26 |
| 193 | 12.6 | 180.4 | 2 | 26 |
| 4.2 | 12.6 | -8.4 | 2 | 27 |
| 11.7 | 12.6 | -0.9 | 2 | 28 |
| 11 | 12.6 | -1.6 | 2 | 29 |
| 5.2 | 12.6 | -7.4 | 2 | 30 |
| 2.3 J | 12.6 | -10.3 | 2 | 31 |
| 6.6 | 12.6 | -6 | 2 | 32 |
| 7.3 | 12.6 | -5.3 | 2 | 33 |
| 4.4 | 12.6 | -8.2 | 2 | 34 |
| 2.1 J | 12.6 | -10.5 | 2 | 35 |
| 3.2 | 12.6 | -9.4 | 2 | 36 |
| 2.5 J | 12.6 | -10.1 | 2 | 37 |
| 5.2 | 12.6 | -7.4 | 2 | 38 |
| ND<0.5 U | 12.6 | -12.1 | 2 | 39 |
| ND<1 UR1M1 | 12.6 | -11.6 | 2 | 40 |
| 3.048 | 12.6 | -9.552 | 2 | 41 |
| 10.99 | 12.6 | -1.61 | 2 | 42 |
| 8.661 | 12.6 | -3.939 | 2 | 43 |
| 5.974 | 12.6 | -6.626 | 2 | 44 |

| | | | | |
|---|---|---|---|---|
| 2.8 | 12.6 | -9.8 | 2 | 45 |
| | | | | |
| 5.1 | 7 | -1.9 | 2 | 46 |
| 11.3 | 7 | 4.3 | 3 | 46 |
| 193 | 7 | 186 | 4 | 46 |
| 4.2 | 7 | -2.8 | 4 | 47 |
| 11.7 | 7 | 4.7 | 5 | 47 |
| 11 | 7 | 4 | 6 | 47 |
| 5.2 | 7 | -1.8 | 6 | 48 |
| 2.3 J | 7 | -4.7 | 6 | 49 |
| 6.6 | 7 | -0.4 | 6 | 50 |
| 7.3 | 7 | 0.3 | 7 | 50 |
| 4.4 | 7 | -2.6 | 7 | 51 |
| 2.1 J | 7 | -4.9 | 7 | 52 |
| 3.2 | 7 | -3.8 | 7 | 53 |
| 2.5 J | 7 | -4.5 | 7 | 54 |
| 5.2 | 7 | -1.8 | 7 | 55 |
| ND<0.5 U | 7 | -6.5 | 7 | 56 |
| ND<1 UR1M1 | 7 | -6 | 7 | 57 |
| 3.048 | 7 | -3.952 | 7 | 58 |
| 10.99 | 7 | 3.99 | 8 | 58 |
| 8.661 | 7 | 1.661 | 9 | 58 |
| 5.974 | 7 | -1.026 | 9 | 59 |
| 2.8 | 7 | -4.2 | 9 | 60 |
| | | | | |
| 11.3 | 5.1 | 6.2 | 10 | 60 |
| 193 | 5.1 | 187.9 | 11 | 60 |
| 4.2 | 5.1 | -0.9 | 11 | 61 |
| 11.7 | 5.1 | 6.6 | 12 | 61 |
| 11 | 5.1 | 5.9 | 13 | 61 |
| 5.2 | 5.1 | 0.1 | 14 | 61 |
| 2.3 J | 5.1 | -2.8 | 14 | 62 |
| 6.6 | 5.1 | 1.5 | 15 | 62 |
| 7.3 | 5.1 | 2.2 | 16 | 62 |
| 4.4 | 5.1 | -0.7 | 16 | 63 |
| 2.1 J | 5.1 | -3 | 16 | 64 |
| 3.2 | 5.1 | -1.9 | 16 | 65 |
| 2.5 J | 5.1 | -2.6 | 16 | 66 |
| 5.2 | 5.1 | 0.1 | 17 | 66 |
| ND<0.5 U | 5.1 | -4.6 | 17 | 67 |
| ND<1 UR1M1 | 5.1 | -4.1 | 17 | 68 |
| 3.048 | 5.1 | -2.052 | 17 | 69 |
| 10.99 | 5.1 | 5.89 | 18 | 69 |
| 8.661 | 5.1 | 3.561 | 19 | 69 |
| 5.974 | 5.1 | 0.874 | 20 | 69 |
| 2.8 | 5.1 | -2.3 | 20 | 70 |
| | | | | |
| 193 | 11.3 | 181.7 | 21 | 70 |
| 4.2 | 11.3 | -7.1 | 21 | 71 |
| 11.7 | 11.3 | 0.4 | 22 | 71 |
| 11 | 11.3 | -0.3 | 22 | 72 |
| 5.2 | 11.3 | -6.1 | 22 | 73 |
| 2.3 J | 11.3 | -9 | 22 | 74 |
| 6.6 | 11.3 | -4.7 | 22 | 75 |
| 7.3 | 11.3 | -4 | 22 | 76 |
| 4.4 | 11.3 | -6.9 | 22 | 77 |
| 2.1 J | 11.3 | -9.2 | 22 | 78 |

| | | | | |
|---|---|---|---|---|
| 3.2 | 11.3 | -8.1 | 22 | 79 |
| 2.5 J | 11.3 | -8.8 | 22 | 80 |
| 5.2 | 11.3 | -6.1 | 22 | 81 |
| ND<0.5 U | 11.3 | -10.8 | 22 | 82 |
| ND<1 UR1M1 | 11.3 | -10.3 | 22 | 83 |
| 3.048 | 11.3 | -8.252 | 22 | 84 |
| 10.99 | 11.3 | -0.31 | 22 | 85 |
| 8.661 | 11.3 | -2.639 | 22 | 86 |
| 5.974 | 11.3 | -5.326 | 22 | 87 |
| 2.8 | 11.3 | -8.5 | 22 | 88 |
| | | | | |
| 4.2 | 193 | -188.8 | 22 | 89 |
| 11.7 | 193 | -181.3 | 22 | 90 |
| 11 | 193 | -182 | 22 | 91 |
| 5.2 | 193 | -187.8 | 22 | 92 |
| 2.3 J | 193 | -190.7 | 22 | 93 |
| 6.6 | 193 | -186.4 | 22 | 94 |
| 7.3 | 193 | -185.7 | 22 | 95 |
| 4.4 | 193 | -188.6 | 22 | 96 |
| 2.1 J | 193 | -190.9 | 22 | 97 |
| 3.2 | 193 | -189.8 | 22 | 98 |
| 2.5 J | 193 | -190.5 | 22 | 99 |
| 5.2 | 193 | -187.8 | 22 | 100 |
| ND<0.5 U | 193 | -192.5 | 22 | 101 |
| ND<1 UR1M1 | 193 | -192 | 22 | 102 |
| 3.048 | 193 | -189.952 | 22 | 103 |
| 10.99 | 193 | -182.01 | 22 | 104 |
| 8.661 | 193 | -184.339 | 22 | 105 |
| 5.974 | 193 | -187.026 | 22 | 106 |
| 2.8 | 193 | -190.2 | 22 | 107 |
| | | | | |
| 11.7 | 4.2 | 7.5 | 23 | 107 |
| 11 | 4.2 | 6.8 | 24 | 107 |
| 5.2 | 4.2 | 1 | 25 | 107 |
| 2.3 J | 4.2 | -1.9 | 25 | 108 |
| 6.6 | 4.2 | 2.4 | 26 | 108 |
| 7.3 | 4.2 | 3.1 | 27 | 108 |
| 4.4 | 4.2 | 0.2 | 28 | 108 |
| 2.1 J | 4.2 | -2.1 | 28 | 109 |
| 3.2 | 4.2 | -1 | 28 | 110 |
| 2.5 J | 4.2 | -1.7 | 28 | 111 |
| 5.2 | 4.2 | 1 | 29 | 111 |
| ND<0.5 U | 4.2 | -3.7 | 29 | 112 |
| ND<1 UR1M1 | 4.2 | -3.2 | 29 | 113 |
| 3.048 | 4.2 | -1.152 | 29 | 114 |
| 10.99 | 4.2 | 6.79 | 30 | 114 |
| 8.661 | 4.2 | 4.461 | 31 | 114 |
| 5.974 | 4.2 | 1.774 | 32 | 114 |
| 2.8 | 4.2 | -1.4 | 32 | 115 |
| | | | | |
| 11 | 11.7 | -0.7 | 32 | 116 |
| 5.2 | 11.7 | -6.5 | 32 | 117 |
| 2.3 J | 11.7 | -9.4 | 32 | 118 |
| 6.6 | 11.7 | -5.1 | 32 | 119 |
| 7.3 | 11.7 | -4.4 | 32 | 120 |
| 4.4 | 11.7 | -7.3 | 32 | 121 |
| 2.1 J | 11.7 | -9.6 | 32 | 122 |

| | | | | |
|---|---|---|---|---|
| 3.2 | 11.7 | -8.5 | 32 | 123 |
| 2.5 J | 11.7 | -9.2 | 32 | 124 |
| 5.2 | 11.7 | -6.5 | 32 | 125 |
| ND<0.5 U | 11.7 | -11.2 | 32 | 126 |
| ND<1 UR1M1 | 11.7 | -10.7 | 32 | 127 |
| 3.048 | 11.7 | -8.652 | 32 | 128 |
| 10.99 | 11.7 | -0.71 | 32 | 129 |
| 8.661 | 11.7 | -3.039 | 32 | 130 |
| 5.974 | 11.7 | -5.726 | 32 | 131 |
| 2.8 | 11.7 | -8.9 | 32 | 132 |
| | | | | |
| 5.2 | 11 | -5.8 | 32 | 133 |
| 2.3 J | 11 | -8.7 | 32 | 134 |
| 6.6 | 11 | -4.4 | 32 | 135 |
| 7.3 | 11 | -3.7 | 32 | 136 |
| 4.4 | 11 | -6.6 | 32 | 137 |
| 2.1 J | 11 | -8.9 | 32 | 138 |
| 3.2 | 11 | -7.8 | 32 | 139 |
| 2.5 J | 11 | -8.5 | 32 | 140 |
| 5.2 | 11 | -5.8 | 32 | 141 |
| ND<0.5 U | 11 | -10.5 | 32 | 142 |
| ND<1 UR1M1 | 11 | -10 | 32 | 143 |
| 3.048 | 11 | -7.952 | 32 | 144 |
| 10.99 | 11 | -0.01 | 32 | 145 |
| 8.661 | 11 | -2.339 | 32 | 146 |
| 5.974 | 11 | -5.026 | 32 | 147 |
| 2.8 | 11 | -8.2 | 32 | 148 |
| | | | | |
| 2.3 J | 5.2 | -2.9 | 32 | 149 |
| 6.6 | 5.2 | 1.4 | 33 | 149 |
| 7.3 | 5.2 | 2.1 | 34 | 149 |
| 4.4 | 5.2 | -0.8 | 34 | 150 |
| 2.1 J | 5.2 | -3.1 | 34 | 151 |
| 3.2 | 5.2 | -2 | 34 | 152 |
| 2.5 J | 5.2 | -2.7 | 34 | 153 |
| 5.2 | 5.2 | 0 | 34 | 153 |
| ND<0.5 U | 5.2 | -4.7 | 34 | 154 |
| ND<1 UR1M1 | 5.2 | -4.2 | 34 | 155 |
| 3.048 | 5.2 | -2.152 | 34 | 156 |
| 10.99 | 5.2 | 5.79 | 35 | 156 |
| 8.661 | 5.2 | 3.461 | 36 | 156 |
| 5.974 | 5.2 | 0.774 | 37 | 156 |
| 2.8 | 5.2 | -2.4 | 37 | 157 |
| | | | | |
| 6.6 | 2.3 J | 4.3 | 38 | 157 |
| 7.3 | 2.3 J | 5 | 39 | 157 |
| 4.4 | 2.3 J | 2.1 | 40 | 157 |
| 2.1 J | 2.3 J | -0.2 | 40 | 158 |
| 3.2 | 2.3 J | 0.9 | 41 | 158 |
| 2.5 J | 2.3 J | 0.2 | 42 | 158 |
| 5.2 | 2.3 J | 2.9 | 43 | 158 |
| ND<0.5 U | 2.3 J | -1.8 | 43 | 159 |
| ND<1 UR1M1 | 2.3 J | -1.3 | 43 | 160 |
| 3.048 | 2.3 J | 0.748 | 44 | 160 |
| 10.99 | 2.3 J | 8.69 | 45 | 160 |
| 8.661 | 2.3 J | 6.361 | 46 | 160 |
| 5.974 | 2.3 J | 3.674 | 47 | 160 |

| | | | | |
|---|---|---|---|---|
| 2.8 | 2.3 J | 0.5 | 48 | 160 |
| | | | | |
| 7.3 | 6.6 | Same Date | 48 | 160 |
| 4.4 | 6.6 | -2.2 | 48 | 161 |
| 2.1 J | 6.6 | -4.5 | 48 | 162 |
| 3.2 | 6.6 | -3.4 | 48 | 163 |
| 2.5 J | 6.6 | -4.1 | 48 | 164 |
| 5.2 | 6.6 | -1.4 | 48 | 165 |
| ND<0.5 U | 6.6 | -6.1 | 48 | 166 |
| ND<1 UR1M1 | 6.6 | -5.6 | 48 | 167 |
| 3.048 | 6.6 | -3.552 | 48 | 168 |
| 10.99 | 6.6 | 4.39 | 49 | 168 |
| 8.661 | 6.6 | 2.061 | 50 | 168 |
| 5.974 | 6.6 | -0.626 | 50 | 169 |
| 2.8 | 6.6 | -3.8 | 50 | 170 |
| | | | | |
| 4.4 | 7.3 | -2.9 | 50 | 171 |
| 2.1 J | 7.3 | -5.2 | 50 | 172 |
| 3.2 | 7.3 | -4.1 | 50 | 173 |
| 2.5 J | 7.3 | -4.8 | 50 | 174 |
| 5.2 | 7.3 | -2.1 | 50 | 175 |
| ND<0.5 U | 7.3 | -6.8 | 50 | 176 |
| ND<1 UR1M1 | 7.3 | -6.3 | 50 | 177 |
| 3.048 | 7.3 | -4.252 | 50 | 178 |
| 10.99 | 7.3 | 3.69 | 51 | 178 |
| 8.661 | 7.3 | 1.361 | 52 | 178 |
| 5.974 | 7.3 | -1.326 | 52 | 179 |
| 2.8 | 7.3 | -4.5 | 52 | 180 |
| | | | | |
| 2.1 J | 4.4 | Same Date | 52 | 180 |
| 3.2 | 4.4 | -1.2 | 52 | 181 |
| 2.5 J | 4.4 | -1.9 | 52 | 182 |
| 5.2 | 4.4 | 0.8 | 53 | 182 |
| ND<0.5 U | 4.4 | -3.9 | 53 | 183 |
| ND<1 UR1M1 | 4.4 | -3.4 | 53 | 184 |
| 3.048 | 4.4 | -1.352 | 53 | 185 |
| 10.99 | 4.4 | 6.59 | 54 | 185 |
| 8.661 | 4.4 | 4.261 | 55 | 185 |
| 5.974 | 4.4 | 1.574 | 56 | 185 |
| 2.8 | 4.4 | -1.6 | 56 | 186 |
| | | | | |
| 3.2 | 2.1 J | 1.1 | 57 | 186 |
| 2.5 J | 2.1 J | 0.4 | 58 | 186 |
| 5.2 | 2.1 J | 3.1 | 59 | 186 |
| ND<0.5 U | 2.1 J | -1.6 | 59 | 187 |
| ND<1 UR1M1 | 2.1 J | -1.1 | 59 | 188 |
| 3.048 | 2.1 J | 0.948 | 60 | 188 |
| 10.99 | 2.1 J | 8.89 | 61 | 188 |
| 8.661 | 2.1 J | 6.561 | 62 | 188 |
| 5.974 | 2.1 J | 3.874 | 63 | 188 |
| 2.8 | 2.1 J | 0.7 | 64 | 188 |
| | | | | |
| 2.5 J | 3.2 | -0.7 | 64 | 189 |
| 5.2 | 3.2 | 2 | 65 | 189 |
| ND<0.5 U | 3.2 | -2.7 | 65 | 190 |
| ND<1 UR1M1 | 3.2 | -2.2 | 65 | 191 |
| 3.048 | 3.2 | -0.152 | 65 | 192 |

| | | | | |
|---|---|---|---|---|
| 10.99 | 3.2 | 7.79 | 66 | 192 |
| 8.661 | 3.2 | 5.461 | 67 | 192 |
| 5.974 | 3.2 | 2.774 | 68 | 192 |
| 2.8 | 3.2 | -0.4 | 68 | 193 |
| | | | | |
| 5.2 | 2.5 J | 2.7 | 69 | 193 |
| ND<0.5 U | 2.5 J | -2 | 69 | 194 |
| ND<1 UR1M1 | 2.5 J | -1.5 | 69 | 195 |
| 3.048 | 2.5 J | 0.548 | 70 | 195 |
| 10.99 | 2.5 J | 8.49 | 71 | 195 |
| 8.661 | 2.5 J | 6.161 | 72 | 195 |
| 5.974 | 2.5 J | 3.474 | 73 | 195 |
| 2.8 | 2.5 J | 0.3 | 74 | 195 |
| | | | | |
| ND<0.5 U | 5.2 | -4.7 | 74 | 196 |
| ND<1 UR1M1 | 5.2 | -4.2 | 74 | 197 |
| 3.048 | 5.2 | -2.152 | 74 | 198 |
| 10.99 | 5.2 | 5.79 | 75 | 198 |
| 8.661 | 5.2 | 3.461 | 76 | 198 |
| 5.974 | 5.2 | 0.774 | 77 | 198 |
| 2.8 | 5.2 | -2.4 | 77 | 199 |
| | | | | |
| ND<1 UR1M1 | ND<0.5 U | 0.5 | 78 | 199 |
| 3.048 | ND<0.5 U | 2.548 | 79 | 199 |
| 10.99 | ND<0.5 U | 10.49 | 80 | 199 |
| 8.661 | ND<0.5 U | 8.161 | 81 | 199 |
| 5.974 | ND<0.5 U | 5.474 | 82 | 199 |
| 2.8 | ND<0.5 U | 2.3 | 83 | 199 |
| | | | | |
| 3.048 | ND<1 UR1M1 | 2.048 | 84 | 199 |
| 10.99 | ND<1 UR1M1 | 9.99 | 85 | 199 |
| 8.661 | ND<1 UR1M1 | 7.661 | 86 | 199 |
| 5.974 | ND<1 UR1M1 | 4.974 | 87 | 199 |
| 2.8 | ND<1 UR1M1 | 1.8 | 88 | 199 |
| | | | | |
| 10.99 | 3.048 | 7.942 | 89 | 199 |
| 8.661 | 3.048 | 5.613 | 90 | 199 |
| 5.974 | 3.048 | 2.926 | 91 | 199 |
| 2.8 | 3.048 | -0.248 | 91 | 200 |
| | | | | |
| 8.661 | 10.99 | -2.329 | 91 | 201 |
| 5.974 | 10.99 | -5.016 | 91 | 202 |
| 2.8 | 10.99 | -8.19 | 91 | 203 |
| | | | | |
| 5.974 | 8.661 | -2.687 | 91 | 204 |
| 2.8 | 8.661 | -5.861 | 91 | 205 |
| | | | | |
| 2.8 | 5.974 | -3.174 | 91 | 206 |

S Statistic = 91 - 206 = -115

| Tied Group | Value | Members |
|---|---|---|
| 1 | 5.2 | 2 |

| Time Period | Observations |
|---|---|
| 6/1/2017 | 1 |

| | |
|---|---|
| 7/1/2017 | 1 |
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 6/1/2020 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 2 time periods with multiple data

---

A = 18
B = 36
C = 0
D = 0
E = 2
F = 4
a = 33000
b = 124200
c = 1200
Group Variance = 1830.34
Z-Score = -2.66464
Comparison Level at 95% confidence level = -1.65463 (downward trend)
**-2.66464 < -1.65463 indicating a downward trend**

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RW14-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 1780 | 1520 | 260 | 1 | 0 |
| 1700 | 1520 | 180 | 2 | 0 |
| 1750 | 1520 | 230 | 3 | 0 |
| 2390 | 1520 | 870 | 4 | 0 |
| 2820 | 1520 | 1300 | 5 | 0 |
| 2800 | 1520 | 1280 | 6 | 0 |
| 3220 | 1520 | 1700 | 7 | 0 |
| 3630 | 1520 | 2110 | 8 | 0 |
| 3840 | 1520 | 2320 | 9 | 0 |
| 2960 | 1520 | 1440 | 10 | 0 |
| 2980 | 1520 | 1460 | 11 | 0 |
| 3000 | 1520 | 1480 | 12 | 0 |
| 3000 | 1520 | 1480 | 13 | 0 |
| 3450 | 1520 | 1930 | 14 | 0 |
| 3990 | 1520 | 2470 | 15 | 0 |
| 3020 | 1520 | 1500 | 16 | 0 |
| 3590 | 1520 | 2070 | 17 | 0 |
| 3240 | 1520 | 1720 | 18 | 0 |
| 3020 | 1520 | 1500 | 19 | 0 |
| | | | | |
| 1700 | 1780 | -80 | 19 | 1 |
| 1750 | 1780 | -30 | 19 | 2 |
| 2390 | 1780 | 610 | 20 | 2 |
| 2820 | 1780 | 1040 | 21 | 2 |
| 2800 | 1780 | 1020 | 22 | 2 |
| 3220 | 1780 | 1440 | 23 | 2 |
| 3630 | 1780 | 1850 | 24 | 2 |
| 3840 | 1780 | 2060 | 25 | 2 |
| 2960 | 1780 | 1180 | 26 | 2 |
| 2980 | 1780 | 1200 | 27 | 2 |
| 3000 | 1780 | 1220 | 28 | 2 |
| 3000 | 1780 | 1220 | 29 | 2 |
| 3450 | 1780 | 1670 | 30 | 2 |
| 3990 | 1780 | 2210 | 31 | 2 |
| 3020 | 1780 | 1240 | 32 | 2 |
| 3590 | 1780 | 1810 | 33 | 2 |
| 3240 | 1780 | 1460 | 34 | 2 |
| 3020 | 1780 | 1240 | 35 | 2 |
| | | | | |
| 1750 | 1700 | 50 | 36 | 2 |
| 2390 | 1700 | 690 | 37 | 2 |
| 2820 | 1700 | 1120 | 38 | 2 |
| 2800 | 1700 | 1100 | 39 | 2 |
| 3220 | 1700 | 1520 | 40 | 2 |
| 3630 | 1700 | 1930 | 41 | 2 |
| 3840 | 1700 | 2140 | 42 | 2 |
| 2960 | 1700 | 1260 | 43 | 2 |

| | | | | |
|---|---|---|---|---|
| 2980 | 1700 | 1280 | 44 | 2 |
| 3000 | 1700 | 1300 | 45 | 2 |
| 3000 | 1700 | 1300 | 46 | 2 |
| 3450 | 1700 | 1750 | 47 | 2 |
| 3990 | 1700 | 2290 | 48 | 2 |
| 3020 | 1700 | 1320 | 49 | 2 |
| 3590 | 1700 | 1890 | 50 | 2 |
| 3240 | 1700 | 1540 | 51 | 2 |
| 3020 | 1700 | 1320 | 52 | 2 |
| | | | | |
| 2390 | 1750 | 640 | 53 | 2 |
| 2820 | 1750 | 1070 | 54 | 2 |
| 2800 | 1750 | 1050 | 55 | 2 |
| 3220 | 1750 | 1470 | 56 | 2 |
| 3630 | 1750 | 1880 | 57 | 2 |
| 3840 | 1750 | 2090 | 58 | 2 |
| 2960 | 1750 | 1210 | 59 | 2 |
| 2980 | 1750 | 1230 | 60 | 2 |
| 3000 | 1750 | 1250 | 61 | 2 |
| 3000 | 1750 | 1250 | 62 | 2 |
| 3450 | 1750 | 1700 | 63 | 2 |
| 3990 | 1750 | 2240 | 64 | 2 |
| 3020 | 1750 | 1270 | 65 | 2 |
| 3590 | 1750 | 1840 | 66 | 2 |
| 3240 | 1750 | 1490 | 67 | 2 |
| 3020 | 1750 | 1270 | 68 | 2 |
| | | | | |
| 2820 | 2390 | 430 | 69 | 2 |
| 2800 | 2390 | 410 | 70 | 2 |
| 3220 | 2390 | 830 | 71 | 2 |
| 3630 | 2390 | 1240 | 72 | 2 |
| 3840 | 2390 | 1450 | 73 | 2 |
| 2960 | 2390 | 570 | 74 | 2 |
| 2980 | 2390 | 590 | 75 | 2 |
| 3000 | 2390 | 610 | 76 | 2 |
| 3000 | 2390 | 610 | 77 | 2 |
| 3450 | 2390 | 1060 | 78 | 2 |
| 3990 | 2390 | 1600 | 79 | 2 |
| 3020 | 2390 | 630 | 80 | 2 |
| 3590 | 2390 | 1200 | 81 | 2 |
| 3240 | 2390 | 850 | 82 | 2 |
| 3020 | 2390 | 630 | 83 | 2 |
| | | | | |
| 2800 | 2820 | -20 | 83 | 3 |
| 3220 | 2820 | 400 | 84 | 3 |
| 3630 | 2820 | 810 | 85 | 3 |
| 3840 | 2820 | 1020 | 86 | 3 |
| 2960 | 2820 | 140 | 87 | 3 |
| 2980 | 2820 | 160 | 88 | 3 |
| 3000 | 2820 | 180 | 89 | 3 |
| 3000 | 2820 | 180 | 90 | 3 |
| 3450 | 2820 | 630 | 91 | 3 |
| 3990 | 2820 | 1170 | 92 | 3 |
| 3020 | 2820 | 200 | 93 | 3 |
| 3590 | 2820 | 770 | 94 | 3 |
| 3240 | 2820 | 420 | 95 | 3 |
| 3020 | 2820 | 200 | 96 | 3 |

| | | | | |
|---|---|---|---|---|
| 3220 | 2800 | 420 | 97 | 3 |
| 3630 | 2800 | 830 | 98 | 3 |
| 3840 | 2800 | 1040 | 99 | 3 |
| 2960 | 2800 | 160 | 100 | 3 |
| 2980 | 2800 | 180 | 101 | 3 |
| 3000 | 2800 | 200 | 102 | 3 |
| 3000 | 2800 | 200 | 103 | 3 |
| 3450 | 2800 | 650 | 104 | 3 |
| 3990 | 2800 | 1190 | 105 | 3 |
| 3020 | 2800 | 220 | 106 | 3 |
| 3590 | 2800 | 790 | 107 | 3 |
| 3240 | 2800 | 440 | 108 | 3 |
| 3020 | 2800 | 220 | 109 | 3 |
| | | | | |
| 3630 | 3220 | 410 | 110 | 3 |
| 3840 | 3220 | 620 | 111 | 3 |
| 2960 | 3220 | -260 | 111 | 4 |
| 2980 | 3220 | -240 | 111 | 5 |
| 3000 | 3220 | -220 | 111 | 6 |
| 3000 | 3220 | -220 | 111 | 7 |
| 3450 | 3220 | 230 | 112 | 7 |
| 3990 | 3220 | 770 | 113 | 7 |
| 3020 | 3220 | -200 | 113 | 8 |
| 3590 | 3220 | 370 | 114 | 8 |
| 3240 | 3220 | 20 | 115 | 8 |
| 3020 | 3220 | -200 | 115 | 9 |
| | | | | |
| 3840 | 3630 | 210 | 116 | 9 |
| 2960 | 3630 | -670 | 116 | 10 |
| 2980 | 3630 | -650 | 116 | 11 |
| 3000 | 3630 | -630 | 116 | 12 |
| 3000 | 3630 | -630 | 116 | 13 |
| 3450 | 3630 | -180 | 116 | 14 |
| 3990 | 3630 | 360 | 117 | 14 |
| 3020 | 3630 | -610 | 117 | 15 |
| 3590 | 3630 | -40 | 117 | 16 |
| 3240 | 3630 | -390 | 117 | 17 |
| 3020 | 3630 | -610 | 117 | 18 |
| | | | | |
| 2960 | 3840 | -880 | 117 | 19 |
| 2980 | 3840 | -860 | 117 | 20 |
| 3000 | 3840 | -840 | 117 | 21 |
| 3000 | 3840 | -840 | 117 | 22 |
| 3450 | 3840 | -390 | 117 | 23 |
| 3990 | 3840 | 150 | 118 | 23 |
| 3020 | 3840 | -820 | 118 | 24 |
| 3590 | 3840 | -250 | 118 | 25 |
| 3240 | 3840 | -600 | 118 | 26 |
| 3020 | 3840 | -820 | 118 | 27 |
| | | | | |
| 2980 | 2960 | Same Date | 118 | 27 |
| 3000 | 2960 | 40 | 119 | 27 |
| 3000 | 2960 | 40 | 120 | 27 |
| 3450 | 2960 | 490 | 121 | 27 |
| 3990 | 2960 | 1030 | 122 | 27 |
| 3020 | 2960 | 60 | 123 | 27 |

| | | | | |
|---|---|---|---|---|
| 3590 | 2960 | 630 | 124 | 27 |
| 3240 | 2960 | 280 | 125 | 27 |
| 3020 | 2960 | 60 | 126 | 27 |
| | | | | |
| 3000 | 2980 | 20 | 127 | 27 |
| 3000 | 2980 | 20 | 128 | 27 |
| 3450 | 2980 | 470 | 129 | 27 |
| 3990 | 2980 | 1010 | 130 | 27 |
| 3020 | 2980 | 40 | 131 | 27 |
| 3590 | 2980 | 610 | 132 | 27 |
| 3240 | 2980 | 260 | 133 | 27 |
| 3020 | 2980 | 40 | 134 | 27 |
| | | | | |
| 3000 | 3000 | Same Date | 134 | 27 |
| 3450 | 3000 | 450 | 135 | 27 |
| 3990 | 3000 | 990 | 136 | 27 |
| 3020 | 3000 | 20 | 137 | 27 |
| 3590 | 3000 | 590 | 138 | 27 |
| 3240 | 3000 | 240 | 139 | 27 |
| 3020 | 3000 | 20 | 140 | 27 |
| | | | | |
| 3450 | 3000 | 450 | 141 | 27 |
| 3990 | 3000 | 990 | 142 | 27 |
| 3020 | 3000 | 20 | 143 | 27 |
| 3590 | 3000 | 590 | 144 | 27 |
| 3240 | 3000 | 240 | 145 | 27 |
| 3020 | 3000 | 20 | 146 | 27 |
| | | | | |
| 3990 | 3450 | 540 | 147 | 27 |
| 3020 | 3450 | -430 | 147 | 28 |
| 3590 | 3450 | 140 | 148 | 28 |
| 3240 | 3450 | -210 | 148 | 29 |
| 3020 | 3450 | -430 | 148 | 30 |
| | | | | |
| 3020 | 3990 | -970 | 148 | 31 |
| 3590 | 3990 | -400 | 148 | 32 |
| 3240 | 3990 | -750 | 148 | 33 |
| 3020 | 3990 | -970 | 148 | 34 |
| | | | | |
| 3590 | 3020 | 570 | 149 | 34 |
| 3240 | 3020 | 220 | 150 | 34 |
| 3020 | 3020 | 0 | 150 | 34 |
| | | | | |
| 3240 | 3590 | -350 | 150 | 35 |
| 3020 | 3590 | -570 | 150 | 36 |
| | | | | |
| 3020 | 3240 | -220 | 150 | 37 |

S Statistic = 150 - 37 = 113

| Tied Group | Value | Members |
|---|---|---|
| 1 | 3000 | 2 |
| 2 | 3020 | 2 |

| Time Period | Observations |
|---|---|
| 6/1/2017 | 1 |

| | |
|---|---|
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |

There are 2 time periods with multiple data

---

A = 36
B = 36
C = 0
D = 0
E = 4
F = 4
a = 17100
b = 61560
c = 760
Group Variance = 946.021
Z-Score = 3.64139
Comparison Level at 95% confidence level = -1.65463 (downward trend)
3.64139 >= -1.65463 indicating no evidence of a downward trend

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RW15-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 29.9 | 12.2 | 17.7 | 1 | 0 |
| 25.3 | 12.2 | 13.1 | 2 | 0 |
| 63 | 12.2 | 50.8 | 3 | 0 |
| 55 | 12.2 | 42.8 | 4 | 0 |
| 40.7 | 12.2 | 28.5 | 5 | 0 |
| 41.2 | 12.2 | 29 | 6 | 0 |
| 38.5 | 12.2 | 26.3 | 7 | 0 |
| 78.1 1c | 12.2 | 65.9 | 8 | 0 |
| 15.4 | 12.2 | 3.2 | 9 | 0 |
| 22.7 | 12.2 | 10.5 | 10 | 0 |
| 20.6 | 12.2 | 8.4 | 11 | 0 |
| 19.1 | 12.2 | 6.9 | 12 | 0 |
| 7.4 | 12.2 | -4.8 | 12 | 1 |
| 8.5 | 12.2 | -3.7 | 12 | 2 |
| 4.3 | 12.2 | -7.9 | 12 | 3 |
| ND<1.5 U | 12.2 | -10.7 | 12 | 4 |
| 0.51 J | 12.2 | -11.69 | 12 | 5 |
| ND<1.5 U | 12.2 | -10.7 | 12 | 6 |
| | | | | |
| 25.3 | 29.9 | -4.6 | 12 | 7 |
| 63 | 29.9 | 33.1 | 13 | 7 |
| 55 | 29.9 | 25.1 | 14 | 7 |
| 40.7 | 29.9 | 10.8 | 15 | 7 |
| 41.2 | 29.9 | 11.3 | 16 | 7 |
| 38.5 | 29.9 | 8.6 | 17 | 7 |
| 78.1 1c | 29.9 | 48.2 | 18 | 7 |
| 15.4 | 29.9 | -14.5 | 18 | 8 |
| 22.7 | 29.9 | -7.2 | 18 | 9 |
| 20.6 | 29.9 | -9.3 | 18 | 10 |
| 19.1 | 29.9 | -10.8 | 18 | 11 |
| 7.4 | 29.9 | -22.5 | 18 | 12 |
| 8.5 | 29.9 | -21.4 | 18 | 13 |
| 4.3 | 29.9 | -25.6 | 18 | 14 |
| ND<1.5 U | 29.9 | -28.4 | 18 | 15 |
| 0.51 J | 29.9 | -29.39 | 18 | 16 |
| ND<1.5 U | 29.9 | -28.4 | 18 | 17 |
| | | | | |
| 63 | 25.3 | 37.7 | 19 | 17 |
| 55 | 25.3 | 29.7 | 20 | 17 |
| 40.7 | 25.3 | 15.4 | 21 | 17 |
| 41.2 | 25.3 | 15.9 | 22 | 17 |
| 38.5 | 25.3 | 13.2 | 23 | 17 |
| 78.1 1c | 25.3 | 52.8 | 24 | 17 |
| 15.4 | 25.3 | -9.9 | 24 | 18 |
| 22.7 | 25.3 | -2.6 | 24 | 19 |
| 20.6 | 25.3 | -4.7 | 24 | 20 |
| 19.1 | 25.3 | -6.2 | 24 | 21 |

| | | | | |
|---|---|---|---|---|
| 7.4 | 25.3 | -17.9 | 24 | 22 |
| 8.5 | 25.3 | -16.8 | 24 | 23 |
| 4.3 | 25.3 | -21 | 24 | 24 |
| ND<1.5 U | 25.3 | -23.8 | 24 | 25 |
| 0.51 J | 25.3 | -24.79 | 24 | 26 |
| ND<1.5 U | 25.3 | -23.8 | 24 | 27 |
| | | | | |
| 55 | 63 | -8 | 24 | 28 |
| 40.7 | 63 | -22.3 | 24 | 29 |
| 41.2 | 63 | -21.8 | 24 | 30 |
| 38.5 | 63 | -24.5 | 24 | 31 |
| 78.1 1c | 63 | 15.1 | 25 | 31 |
| 15.4 | 63 | -47.6 | 25 | 32 |
| 22.7 | 63 | -40.3 | 25 | 33 |
| 20.6 | 63 | -42.4 | 25 | 34 |
| 19.1 | 63 | -43.9 | 25 | 35 |
| 7.4 | 63 | -55.6 | 25 | 36 |
| 8.5 | 63 | -54.5 | 25 | 37 |
| 4.3 | 63 | -58.7 | 25 | 38 |
| ND<1.5 U | 63 | -61.5 | 25 | 39 |
| 0.51 J | 63 | -62.49 | 25 | 40 |
| ND<1.5 U | 63 | -61.5 | 25 | 41 |
| | | | | |
| 40.7 | 55 | -14.3 | 25 | 42 |
| 41.2 | 55 | -13.8 | 25 | 43 |
| 38.5 | 55 | -16.5 | 25 | 44 |
| 78.1 1c | 55 | 23.1 | 26 | 44 |
| 15.4 | 55 | -39.6 | 26 | 45 |
| 22.7 | 55 | -32.3 | 26 | 46 |
| 20.6 | 55 | -34.4 | 26 | 47 |
| 19.1 | 55 | -35.9 | 26 | 48 |
| 7.4 | 55 | -47.6 | 26 | 49 |
| 8.5 | 55 | -46.5 | 26 | 50 |
| 4.3 | 55 | -50.7 | 26 | 51 |
| ND<1.5 U | 55 | -53.5 | 26 | 52 |
| 0.51 J | 55 | -54.49 | 26 | 53 |
| ND<1.5 U | 55 | -53.5 | 26 | 54 |
| | | | | |
| 41.2 | 40.7 | 0.5 | 27 | 54 |
| 38.5 | 40.7 | -2.2 | 27 | 55 |
| 78.1 1c | 40.7 | 37.4 | 28 | 55 |
| 15.4 | 40.7 | -25.3 | 28 | 56 |
| 22.7 | 40.7 | -18 | 28 | 57 |
| 20.6 | 40.7 | -20.1 | 28 | 58 |
| 19.1 | 40.7 | -21.6 | 28 | 59 |
| 7.4 | 40.7 | -33.3 | 28 | 60 |
| 8.5 | 40.7 | -32.2 | 28 | 61 |
| 4.3 | 40.7 | -36.4 | 28 | 62 |
| ND<1.5 U | 40.7 | -39.2 | 28 | 63 |
| 0.51 J | 40.7 | -40.19 | 28 | 64 |
| ND<1.5 U | 40.7 | -39.2 | 28 | 65 |
| | | | | |
| 38.5 | 41.2 | -2.7 | 28 | 66 |
| 78.1 1c | 41.2 | 36.9 | 29 | 66 |
| 15.4 | 41.2 | -25.8 | 29 | 67 |
| 22.7 | 41.2 | -18.5 | 29 | 68 |
| 20.6 | 41.2 | -20.6 | 29 | 69 |

| | | | | |
|---|---|---|---|---|
| 19.1 | 41.2 | -22.1 | 29 | 70 |
| 7.4 | 41.2 | -33.8 | 29 | 71 |
| 8.5 | 41.2 | -32.7 | 29 | 72 |
| 4.3 | 41.2 | -36.9 | 29 | 73 |
| ND<1.5 U | 41.2 | -39.7 | 29 | 74 |
| 0.51 J | 41.2 | -40.69 | 29 | 75 |
| ND<1.5 U | 41.2 | -39.7 | 29 | 76 |
| | | | | |
| 78.1 1c | 38.5 | 39.6 | 30 | 76 |
| 15.4 | 38.5 | -23.1 | 30 | 77 |
| 22.7 | 38.5 | -15.8 | 30 | 78 |
| 20.6 | 38.5 | -17.9 | 30 | 79 |
| 19.1 | 38.5 | -19.4 | 30 | 80 |
| 7.4 | 38.5 | -31.1 | 30 | 81 |
| 8.5 | 38.5 | -30 | 30 | 82 |
| 4.3 | 38.5 | -34.2 | 30 | 83 |
| ND<1.5 U | 38.5 | -37 | 30 | 84 |
| 0.51 J | 38.5 | -37.99 | 30 | 85 |
| ND<1.5 U | 38.5 | -37 | 30 | 86 |
| | | | | |
| 15.4 | 78.1 1c | -62.7 | 30 | 87 |
| 22.7 | 78.1 1c | -55.4 | 30 | 88 |
| 20.6 | 78.1 1c | -57.5 | 30 | 89 |
| 19.1 | 78.1 1c | -59 | 30 | 90 |
| 7.4 | 78.1 1c | -70.7 | 30 | 91 |
| 8.5 | 78.1 1c | -69.6 | 30 | 92 |
| 4.3 | 78.1 1c | -73.8 | 30 | 93 |
| ND<1.5 U | 78.1 1c | -76.6 | 30 | 94 |
| 0.51 J | 78.1 1c | -77.59 | 30 | 95 |
| ND<1.5 U | 78.1 1c | -76.6 | 30 | 96 |
| | | | | |
| 22.7 | 15.4 | Same Date | 30 | 96 |
| 20.6 | 15.4 | 5.2 | 31 | 96 |
| 19.1 | 15.4 | 3.7 | 32 | 96 |
| 7.4 | 15.4 | -8 | 32 | 97 |
| 8.5 | 15.4 | -6.9 | 32 | 98 |
| 4.3 | 15.4 | -11.1 | 32 | 99 |
| ND<1.5 U | 15.4 | -13.9 | 32 | 100 |
| 0.51 J | 15.4 | -14.89 | 32 | 101 |
| ND<1.5 U | 15.4 | -13.9 | 32 | 102 |
| | | | | |
| 20.6 | 22.7 | -2.1 | 32 | 103 |
| 19.1 | 22.7 | -3.6 | 32 | 104 |
| 7.4 | 22.7 | -15.3 | 32 | 105 |
| 8.5 | 22.7 | -14.2 | 32 | 106 |
| 4.3 | 22.7 | -18.4 | 32 | 107 |
| ND<1.5 U | 22.7 | -21.2 | 32 | 108 |
| 0.51 J | 22.7 | -22.19 | 32 | 109 |
| ND<1.5 U | 22.7 | -21.2 | 32 | 110 |
| | | | | |
| 19.1 | 20.6 | Same Date | 32 | 110 |
| 7.4 | 20.6 | -13.2 | 32 | 111 |
| 8.5 | 20.6 | -12.1 | 32 | 112 |
| 4.3 | 20.6 | -16.3 | 32 | 113 |
| ND<1.5 U | 20.6 | -19.1 | 32 | 114 |
| 0.51 J | 20.6 | -20.09 | 32 | 115 |
| ND<1.5 U | 20.6 | -19.1 | 32 | 116 |

| | | | | |
|---|---|---|---|---|
| 7.4 | 19.1 | -11.7 | 32 | 117 |
| 8.5 | 19.1 | -10.6 | 32 | 118 |
| 4.3 | 19.1 | -14.8 | 32 | 119 |
| ND<1.5 U | 19.1 | -17.6 | 32 | 120 |
| 0.51 J | 19.1 | -18.59 | 32 | 121 |
| ND<1.5 U | 19.1 | -17.6 | 32 | 122 |
| | | | | |
| 8.5 | 7.4 | 1.1 | 33 | 122 |
| 4.3 | 7.4 | -3.1 | 33 | 123 |
| ND<1.5 U | 7.4 | -5.9 | 33 | 124 |
| 0.51 J | 7.4 | -6.89 | 33 | 125 |
| ND<1.5 U | 7.4 | -5.9 | 33 | 126 |
| | | | | |
| 4.3 | 8.5 | -4.2 | 33 | 127 |
| ND<1.5 U | 8.5 | -7 | 33 | 128 |
| 0.51 J | 8.5 | -7.99 | 33 | 129 |
| ND<1.5 U | 8.5 | -7 | 33 | 130 |
| | | | | |
| ND<1.5 U | 4.3 | -2.8 | 33 | 131 |
| 0.51 J | 4.3 | -3.79 | 33 | 132 |
| ND<1.5 U | 4.3 | -2.8 | 33 | 133 |
| | | | | |
| 0.51 J | ND<1.5 U | -0.99 | 33 | 134 |
| ND<1.5 U | ND<1.5 U | 0 | 33 | 134 |
| | | | | |
| ND<1.5 U | 0.51 J | 0.99 | 34 | 134 |

S Statistic = 34 - 134 = -100

| Tied Group | Value | Members |
|---|---|---|
| 1 | 1.5 | 2 |

| Time Period | Observations |
|---|---|
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |

There are 2 time periods with multiple data

A = 18
B = 36
C = 0

D = 0
E = 2
F = 4
a = 14706
b = 52326
c = 684
Group Variance = 814.012
Z-Score = -3.46992
Comparison Level at 95% confidence level = -1.65463 (downward trend)
**-3.46992 < -1.65463 indicating a downward trend**

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RW16-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 13.5 | 22.9 | -9.4 | 0 | 1 |
| 11.9 | 22.9 | -11 | 0 | 2 |
| 64.1 | 22.9 | 41.2 | 1 | 2 |
| ND<1.5 U | 22.9 | -21.4 | 1 | 3 |
| ND<1.5 U | 22.9 | -21.4 | 1 | 4 |
| ND<1.5 U | 22.9 | -21.4 | 1 | 5 |
| ND<1.5 U | 22.9 | -21.4 | 1 | 6 |
| ND<1.5 U | 22.9 | -21.4 | 1 | 7 |
| ND<1.5 U | 22.9 | -21.4 | 1 | 8 |
| ND<1.5 U | 22.9 | -21.4 | 1 | 9 |
| ND<1.5 U | 22.9 | -21.4 | 1 | 10 |
| ND<1.5 U | 22.9 | -21.4 | 1 | 11 |
| ND<1.5 U | 22.9 | -21.4 | 1 | 12 |
| ND<1.5 U | 22.9 | -21.4 | 1 | 13 |
| ND<1.5 U | 22.9 | -21.4 | 1 | 14 |
| ND<1.5 U | 22.9 | -21.4 | 1 | 15 |
| 0.36 J | 22.9 | -22.54 | 1 | 16 |
| ND<1.5 U | 22.9 | -21.4 | 1 | 17 |
| ND<1.5 U | 22.9 | -21.4 | 1 | 18 |
| ND<1.5 U | 22.9 | -21.4 | 1 | 19 |
| ND<1.5 U | 22.9 | -21.4 | 1 | 20 |
| ND<1.5 U | 22.9 | -21.4 | 1 | 21 |
| ND<1 U | 22.9 | -21.9 | 1 | 22 |
| ND<0.1 U | 22.9 | -22.8 | 1 | 23 |
| 0.0662 J | 22.9 | -22.8338 | 1 | 24 |
| | | | | |
| 11.9 | 13.5 | -1.6 | 1 | 25 |
| 64.1 | 13.5 | 50.6 | 2 | 25 |
| ND<1.5 U | 13.5 | -12 | 2 | 26 |
| ND<1.5 U | 13.5 | -12 | 2 | 27 |
| ND<1.5 U | 13.5 | -12 | 2 | 28 |
| ND<1.5 U | 13.5 | -12 | 2 | 29 |
| ND<1.5 U | 13.5 | -12 | 2 | 30 |
| ND<1.5 U | 13.5 | -12 | 2 | 31 |
| ND<1.5 U | 13.5 | -12 | 2 | 32 |
| ND<1.5 U | 13.5 | -12 | 2 | 33 |
| ND<1.5 U | 13.5 | -12 | 2 | 34 |
| ND<1.5 U | 13.5 | -12 | 2 | 35 |
| ND<1.5 U | 13.5 | -12 | 2 | 36 |
| ND<1.5 U | 13.5 | -12 | 2 | 37 |
| ND<1.5 U | 13.5 | -12 | 2 | 38 |
| 0.36 J | 13.5 | -13.14 | 2 | 39 |
| ND<1.5 U | 13.5 | -12 | 2 | 40 |
| ND<1.5 U | 13.5 | -12 | 2 | 41 |
| ND<1.5 U | 13.5 | -12 | 2 | 42 |
| ND<1.5 U | 13.5 | -12 | 2 | 43 |
| ND<1.5 U | 13.5 | -12 | 2 | 44 |

| | | | | |
|---|---|---|---|---|
| ND<1 U | 13.5 | -12.5 | 2 | 45 |
| ND<0.1 U | 13.5 | -13.4 | 2 | 46 |
| 0.0662 J | 13.5 | -13.4338 | 2 | 47 |
| | | | | |
| 64.1 | 11.9 | 52.2 | 3 | 47 |
| ND<1.5 U | 11.9 | -10.4 | 3 | 48 |
| ND<1.5 U | 11.9 | -10.4 | 3 | 49 |
| ND<1.5 U | 11.9 | -10.4 | 3 | 50 |
| ND<1.5 U | 11.9 | -10.4 | 3 | 51 |
| ND<1.5 U | 11.9 | -10.4 | 3 | 52 |
| ND<1.5 U | 11.9 | -10.4 | 3 | 53 |
| ND<1.5 U | 11.9 | -10.4 | 3 | 54 |
| ND<1.5 U | 11.9 | -10.4 | 3 | 55 |
| ND<1.5 U | 11.9 | -10.4 | 3 | 56 |
| ND<1.5 U | 11.9 | -10.4 | 3 | 57 |
| ND<1.5 U | 11.9 | -10.4 | 3 | 58 |
| ND<1.5 U | 11.9 | -10.4 | 3 | 59 |
| ND<1.5 U | 11.9 | -10.4 | 3 | 60 |
| 0.36 J | 11.9 | -11.54 | 3 | 61 |
| ND<1.5 U | 11.9 | -10.4 | 3 | 62 |
| ND<1.5 U | 11.9 | -10.4 | 3 | 63 |
| ND<1.5 U | 11.9 | -10.4 | 3 | 64 |
| ND<1.5 U | 11.9 | -10.4 | 3 | 65 |
| ND<1.5 U | 11.9 | -10.4 | 3 | 66 |
| ND<1 U | 11.9 | -10.9 | 3 | 67 |
| ND<0.1 U | 11.9 | -11.8 | 3 | 68 |
| 0.0662 J | 11.9 | -11.8338 | 3 | 69 |
| | | | | |
| ND<1.5 U | 64.1 | -62.6 | 3 | 70 |
| ND<1.5 U | 64.1 | -62.6 | 3 | 71 |
| ND<1.5 U | 64.1 | -62.6 | 3 | 72 |
| ND<1.5 U | 64.1 | -62.6 | 3 | 73 |
| ND<1.5 U | 64.1 | -62.6 | 3 | 74 |
| ND<1.5 U | 64.1 | -62.6 | 3 | 75 |
| ND<1.5 U | 64.1 | -62.6 | 3 | 76 |
| ND<1.5 U | 64.1 | -62.6 | 3 | 77 |
| ND<1.5 U | 64.1 | -62.6 | 3 | 78 |
| ND<1.5 U | 64.1 | -62.6 | 3 | 79 |
| ND<1.5 U | 64.1 | -62.6 | 3 | 80 |
| ND<1.5 U | 64.1 | -62.6 | 3 | 81 |
| ND<1.5 U | 64.1 | -62.6 | 3 | 82 |
| 0.36 J | 64.1 | -63.74 | 3 | 83 |
| ND<1.5 U | 64.1 | -62.6 | 3 | 84 |
| ND<1.5 U | 64.1 | -62.6 | 3 | 85 |
| ND<1.5 U | 64.1 | -62.6 | 3 | 86 |
| ND<1.5 U | 64.1 | -62.6 | 3 | 87 |
| ND<1.5 U | 64.1 | -62.6 | 3 | 88 |
| ND<1 U | 64.1 | -63.1 | 3 | 89 |
| ND<0.1 U | 64.1 | -64 | 3 | 90 |
| 0.0662 J | 64.1 | -64.0338 | 3 | 91 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 91 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 91 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 91 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 91 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 91 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 91 |

| | | | | |
|---|---|---|---|---|
| ND<1.5 U | ND<1.5 U | 0 | 3 | 91 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 91 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 91 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 91 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 91 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 91 |
| 0.36 J | ND<1.5 U | -1.14 | 3 | 92 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 92 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 92 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 92 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 92 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 92 |
| ND<1 U | ND<1.5 U | -0.5 | 3 | 93 |
| ND<0.1 U | ND<1.5 U | -1.4 | 3 | 94 |
| 0.0662 J | ND<1.5 U | -1.4338 | 3 | 95 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 95 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 95 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 95 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 95 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 95 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 95 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 95 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 95 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 95 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 95 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 95 |
| 0.36 J | ND<1.5 U | -1.14 | 3 | 96 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 96 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 96 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 96 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 96 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 96 |
| ND<1 U | ND<1.5 U | -0.5 | 3 | 97 |
| ND<0.1 U | ND<1.5 U | -1.4 | 3 | 98 |
| 0.0662 J | ND<1.5 U | -1.4338 | 3 | 99 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 99 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 99 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 99 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 99 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 99 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 99 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 99 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 99 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 99 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 99 |
| 0.36 J | ND<1.5 U | -1.14 | 3 | 100 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 100 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 100 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 100 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 100 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 100 |
| ND<1 U | ND<1.5 U | -0.5 | 3 | 101 |
| ND<0.1 U | ND<1.5 U | -1.4 | 3 | 102 |
| 0.0662 J | ND<1.5 U | -1.4338 | 3 | 103 |

| | | | | |
|---|---|---|---|---|
| ND<1.5 U | ND<1.5 U | 0 | 3 | 103 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 103 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 103 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 103 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 103 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 103 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 103 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 103 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 103 |
| 0.36 J | ND<1.5 U | -1.14 | 3 | 104 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 104 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 104 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 104 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 104 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 104 |
| ND<1 U | ND<1.5 U | -0.5 | 3 | 105 |
| ND<0.1 U | ND<1.5 U | -1.4 | 3 | 106 |
| 0.0662 J | ND<1.5 U | -1.4338 | 3 | 107 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 107 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 107 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 107 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 107 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 107 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 107 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 107 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 107 |
| 0.36 J | ND<1.5 U | -1.14 | 3 | 108 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 108 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 108 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 108 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 108 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 108 |
| ND<1 U | ND<1.5 U | -0.5 | 3 | 109 |
| ND<0.1 U | ND<1.5 U | -1.4 | 3 | 110 |
| 0.0662 J | ND<1.5 U | -1.4338 | 3 | 111 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 111 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 111 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 111 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 111 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 111 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 111 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 111 |
| 0.36 J | ND<1.5 U | -1.14 | 3 | 112 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 112 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 112 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 112 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 112 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 112 |
| ND<1 U | ND<1.5 U | -0.5 | 3 | 113 |
| ND<0.1 U | ND<1.5 U | -1.4 | 3 | 114 |
| 0.0662 J | ND<1.5 U | -1.4338 | 3 | 115 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 115 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 115 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 115 |

| | | | | |
|---|---|---|---|---|
| ND<1.5 U | ND<1.5 U | 0 | 3 | 115 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 115 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 115 |
| 0.36 J | ND<1.5 U | -1.14 | 3 | 116 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 116 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 116 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 116 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 116 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 116 |
| ND<1 U | ND<1.5 U | -0.5 | 3 | 117 |
| ND<0.1 U | ND<1.5 U | -1.4 | 3 | 118 |
| 0.0662 J | ND<1.5 U | -1.4338 | 3 | 119 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 119 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 119 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 119 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 119 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 119 |
| 0.36 J | ND<1.5 U | -1.14 | 3 | 120 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 120 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 120 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 120 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 120 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 120 |
| ND<1 U | ND<1.5 U | -0.5 | 3 | 121 |
| ND<0.1 U | ND<1.5 U | -1.4 | 3 | 122 |
| 0.0662 J | ND<1.5 U | -1.4338 | 3 | 123 |
| | | | | |
| ND<1.5 U | ND<1.5 U | Same Date | 3 | 123 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 123 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 123 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 123 |
| 0.36 J | ND<1.5 U | -1.14 | 3 | 124 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 124 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 124 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 124 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 124 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 124 |
| ND<1 U | ND<1.5 U | -0.5 | 3 | 125 |
| ND<0.1 U | ND<1.5 U | -1.4 | 3 | 126 |
| 0.0662 J | ND<1.5 U | -1.4338 | 3 | 127 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 127 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 127 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 127 |
| 0.36 J | ND<1.5 U | -1.14 | 3 | 128 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 128 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 128 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 128 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 128 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 128 |
| ND<1 U | ND<1.5 U | -0.5 | 3 | 129 |
| ND<0.1 U | ND<1.5 U | -1.4 | 3 | 130 |
| 0.0662 J | ND<1.5 U | -1.4338 | 3 | 131 |
| | | | | |
| ND<1.5 U | ND<1.5 U | Same Date | 3 | 131 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 131 |

| | | | | |
|---|---|---|---|---|
| 0.36 J | ND<1.5 U | -1.14 | 3 | 132 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 132 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 132 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 132 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 132 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 132 |
| ND<1 U | ND<1.5 U | -0.5 | 3 | 133 |
| ND<0.1 U | ND<1.5 U | -1.4 | 3 | 134 |
| 0.0662 J | ND<1.5 U | -1.4338 | 3 | 135 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 135 |
| 0.36 J | ND<1.5 U | -1.14 | 3 | 136 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 136 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 136 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 136 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 136 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 136 |
| ND<1 U | ND<1.5 U | -0.5 | 3 | 137 |
| ND<0.1 U | ND<1.5 U | -1.4 | 3 | 138 |
| 0.0662 J | ND<1.5 U | -1.4338 | 3 | 139 |
| | | | | |
| 0.36 J | ND<1.5 U | -1.14 | 3 | 140 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 140 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 140 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 140 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 140 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 140 |
| ND<1 U | ND<1.5 U | -0.5 | 3 | 141 |
| ND<0.1 U | ND<1.5 U | -1.4 | 3 | 142 |
| 0.0662 J | ND<1.5 U | -1.4338 | 3 | 143 |
| | | | | |
| ND<1.5 U | 0.36 J | 1.14 | 4 | 143 |
| ND<1.5 U | 0.36 J | 1.14 | 5 | 143 |
| ND<1.5 U | 0.36 J | 1.14 | 6 | 143 |
| ND<1.5 U | 0.36 J | 1.14 | 7 | 143 |
| ND<1.5 U | 0.36 J | 1.14 | 8 | 143 |
| ND<1 U | 0.36 J | 0.64 | 9 | 143 |
| ND<0.1 U | 0.36 J | -0.26 | 9 | 144 |
| 0.0662 J | 0.36 J | -0.2938 | 9 | 145 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 9 | 145 |
| ND<1.5 U | ND<1.5 U | 0 | 9 | 145 |
| ND<1.5 U | ND<1.5 U | 0 | 9 | 145 |
| ND<1.5 U | ND<1.5 U | 0 | 9 | 145 |
| ND<1 U | ND<1.5 U | -0.5 | 9 | 146 |
| ND<0.1 U | ND<1.5 U | -1.4 | 9 | 147 |
| 0.0662 J | ND<1.5 U | -1.4338 | 9 | 148 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 9 | 148 |
| ND<1.5 U | ND<1.5 U | 0 | 9 | 148 |
| ND<1.5 U | ND<1.5 U | 0 | 9 | 148 |
| ND<1 U | ND<1.5 U | -0.5 | 9 | 149 |
| ND<0.1 U | ND<1.5 U | -1.4 | 9 | 150 |
| 0.0662 J | ND<1.5 U | -1.4338 | 9 | 151 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 9 | 151 |
| ND<1.5 U | ND<1.5 U | 0 | 9 | 151 |

| | | | | |
|---|---|---|---|---|
| ND<1 U | ND<1.5 U | -0.5 | 9 | 152 |
| ND<0.1 U | ND<1.5 U | -1.4 | 9 | 153 |
| 0.0662 J | ND<1.5 U | -1.4338 | 9 | 154 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 9 | 154 |
| ND<1 U | ND<1.5 U | -0.5 | 9 | 155 |
| ND<0.1 U | ND<1.5 U | -1.4 | 9 | 156 |
| 0.0662 J | ND<1.5 U | -1.4338 | 9 | 157 |
| | | | | |
| ND<1 U | ND<1.5 U | -0.5 | 9 | 158 |
| ND<0.1 U | ND<1.5 U | -1.4 | 9 | 159 |
| 0.0662 J | ND<1.5 U | -1.4338 | 9 | 160 |
| | | | | |
| ND<0.1 U | ND<1 U | -0.9 | 9 | 161 |
| 0.0662 J | ND<1 U | -0.9338 | 9 | 162 |
| | | | | |
| 0.0662 J | ND<0.1 U | -0.0338 | 9 | 163 |

S Statistic = 9 - 163 = -154

| Tied Group | Value | Members |
|---|---|---|
| 1 | 1.5 | 18 |

| Time Period | Observations |
|---|---|
| 2/1/2017 | 1 |
| 3/1/2017 | 1 |
| 4/1/2017 | 1 |
| 5/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 3/1/2022 | 1 |
| 3/1/2023 | 1 |
| 3/1/2024 | 1 |

There are 2 time periods with multiple data

A = 12546
B = 36
C = 4896
D = 0
E = 306
F = 4

a = 37050
b = 140400
c = 1300
Group Variance = 1360.27
Z-Score = -4.14838
Comparison Level at 95% confidence level = -1.65463 (downward trend)
**-4.14838 < -1.65463 indicating a downward trend**

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RW18-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 240 | 356 | -116 | 0 | 1 |
| 34.9 | 356 | -321.1 | 0 | 2 |
| 156 | 356 | -200 | 0 | 3 |
| 306 | 356 | -50 | 0 | 4 |
| 208 | 356 | -148 | 0 | 5 |
| 410 | 356 | 54 | 1 | 5 |
| 218 | 356 | -138 | 1 | 6 |
| 448 | 356 | 92 | 2 | 6 |
| 7.1 | 356 | -348.9 | 2 | 7 |
| 1.2 J | 356 | -354.8 | 2 | 8 |
| 0.69 J | 356 | -355.31 | 2 | 9 |
| ND<1.5 U | 356 | -354.5 | 2 | 10 |
| ND<1.5 U | 356 | -354.5 | 2 | 11 |
| ND<1.5 U | 356 | -354.5 | 2 | 12 |
| ND<1.5 U | 356 | -354.5 | 2 | 13 |
| 1.9 J | 356 | -354.1 | 2 | 14 |
| ND<1.5 U | 356 | -354.5 | 2 | 15 |
| ND<1.5 U | 356 | -354.5 | 2 | 16 |
| ND<1.5 U | 356 | -354.5 | 2 | 17 |
| ND<1.5 U | 356 | -354.5 | 2 | 18 |
| ND<1.5 U | 356 | -354.5 | 2 | 19 |
| ND<1 U | 356 | -355 | 2 | 20 |
| ND<0.1 U | 356 | -355.9 | 2 | 21 |
| 0.3824 | 356 | -355.618 | 2 | 22 |
| | | | | |
| 34.9 | 240 | -205.1 | 2 | 23 |
| 156 | 240 | -84 | 2 | 24 |
| 306 | 240 | 66 | 3 | 24 |
| 208 | 240 | -32 | 3 | 25 |
| 410 | 240 | 170 | 4 | 25 |
| 218 | 240 | -22 | 4 | 26 |
| 448 | 240 | 208 | 5 | 26 |
| 7.1 | 240 | -232.9 | 5 | 27 |
| 1.2 J | 240 | -238.8 | 5 | 28 |
| 0.69 J | 240 | -239.31 | 5 | 29 |
| ND<1.5 U | 240 | -238.5 | 5 | 30 |
| ND<1.5 U | 240 | -238.5 | 5 | 31 |
| ND<1.5 U | 240 | -238.5 | 5 | 32 |
| ND<1.5 U | 240 | -238.5 | 5 | 33 |
| 1.9 J | 240 | -238.1 | 5 | 34 |
| ND<1.5 U | 240 | -238.5 | 5 | 35 |
| ND<1.5 U | 240 | -238.5 | 5 | 36 |
| ND<1.5 U | 240 | -238.5 | 5 | 37 |
| ND<1.5 U | 240 | -238.5 | 5 | 38 |
| ND<1.5 U | 240 | -238.5 | 5 | 39 |
| ND<1 U | 240 | -239 | 5 | 40 |
| ND<0.1 U | 240 | -239.9 | 5 | 41 |

| | | | | |
|---|---|---|---|---|
| 0.3824 | 240 | -239.618 | 5 | 42 |
| | | | | |
| 156 | 34.9 | 121.1 | 6 | 42 |
| 306 | 34.9 | 271.1 | 7 | 42 |
| 208 | 34.9 | 173.1 | 8 | 42 |
| 410 | 34.9 | 375.1 | 9 | 42 |
| 218 | 34.9 | 183.1 | 10 | 42 |
| 448 | 34.9 | 413.1 | 11 | 42 |
| 7.1 | 34.9 | -27.8 | 11 | 43 |
| 1.2 J | 34.9 | -33.7 | 11 | 44 |
| 0.69 J | 34.9 | -34.21 | 11 | 45 |
| ND<1.5 U | 34.9 | -33.4 | 11 | 46 |
| ND<1.5 U | 34.9 | -33.4 | 11 | 47 |
| ND<1.5 U | 34.9 | -33.4 | 11 | 48 |
| ND<1.5 U | 34.9 | -33.4 | 11 | 49 |
| 1.9 J | 34.9 | -33 | 11 | 50 |
| ND<1.5 U | 34.9 | -33.4 | 11 | 51 |
| ND<1.5 U | 34.9 | -33.4 | 11 | 52 |
| ND<1.5 U | 34.9 | -33.4 | 11 | 53 |
| ND<1.5 U | 34.9 | -33.4 | 11 | 54 |
| ND<1.5 U | 34.9 | -33.4 | 11 | 55 |
| ND<1 U | 34.9 | -33.9 | 11 | 56 |
| ND<0.1 U | 34.9 | -34.8 | 11 | 57 |
| 0.3824 | 34.9 | -34.5176 | 11 | 58 |
| | | | | |
| 306 | 156 | 150 | 12 | 58 |
| 208 | 156 | 52 | 13 | 58 |
| 410 | 156 | 254 | 14 | 58 |
| 218 | 156 | 62 | 15 | 58 |
| 448 | 156 | 292 | 16 | 58 |
| 7.1 | 156 | -148.9 | 16 | 59 |
| 1.2 J | 156 | -154.8 | 16 | 60 |
| 0.69 J | 156 | -155.31 | 16 | 61 |
| ND<1.5 U | 156 | -154.5 | 16 | 62 |
| ND<1.5 U | 156 | -154.5 | 16 | 63 |
| ND<1.5 U | 156 | -154.5 | 16 | 64 |
| ND<1.5 U | 156 | -154.5 | 16 | 65 |
| 1.9 J | 156 | -154.1 | 16 | 66 |
| ND<1.5 U | 156 | -154.5 | 16 | 67 |
| ND<1.5 U | 156 | -154.5 | 16 | 68 |
| ND<1.5 U | 156 | -154.5 | 16 | 69 |
| ND<1.5 U | 156 | -154.5 | 16 | 70 |
| ND<1.5 U | 156 | -154.5 | 16 | 71 |
| ND<1 U | 156 | -155 | 16 | 72 |
| ND<0.1 U | 156 | -155.9 | 16 | 73 |
| 0.3824 | 156 | -155.618 | 16 | 74 |
| | | | | |
| 208 | 306 | -98 | 16 | 75 |
| 410 | 306 | 104 | 17 | 75 |
| 218 | 306 | -88 | 17 | 76 |
| 448 | 306 | 142 | 18 | 76 |
| 7.1 | 306 | -298.9 | 18 | 77 |
| 1.2 J | 306 | -304.8 | 18 | 78 |
| 0.69 J | 306 | -305.31 | 18 | 79 |
| ND<1.5 U | 306 | -304.5 | 18 | 80 |
| ND<1.5 U | 306 | -304.5 | 18 | 81 |
| ND<1.5 U | 306 | -304.5 | 18 | 82 |

| | | | | |
|---|---|---|---|---|
| ND<1.5 U | 306 | -304.5 | 18 | 83 |
| 1.9 J | 306 | -304.1 | 18 | 84 |
| ND<1.5 U | 306 | -304.5 | 18 | 85 |
| ND<1.5 U | 306 | -304.5 | 18 | 86 |
| ND<1.5 U | 306 | -304.5 | 18 | 87 |
| ND<1.5 U | 306 | -304.5 | 18 | 88 |
| ND<1.5 U | 306 | -304.5 | 18 | 89 |
| ND<1 U | 306 | -305 | 18 | 90 |
| ND<0.1 U | 306 | -305.9 | 18 | 91 |
| 0.3824 | 306 | -305.618 | 18 | 92 |
| | | | | |
| 410 | 208 | 202 | 19 | 92 |
| 218 | 208 | 10 | 20 | 92 |
| 448 | 208 | 240 | 21 | 92 |
| 7.1 | 208 | -200.9 | 21 | 93 |
| 1.2 J | 208 | -206.8 | 21 | 94 |
| 0.69 J | 208 | -207.31 | 21 | 95 |
| ND<1.5 U | 208 | -206.5 | 21 | 96 |
| ND<1.5 U | 208 | -206.5 | 21 | 97 |
| ND<1.5 U | 208 | -206.5 | 21 | 98 |
| ND<1.5 U | 208 | -206.5 | 21 | 99 |
| 1.9 J | 208 | -206.1 | 21 | 100 |
| ND<1.5 U | 208 | -206.5 | 21 | 101 |
| ND<1.5 U | 208 | -206.5 | 21 | 102 |
| ND<1.5 U | 208 | -206.5 | 21 | 103 |
| ND<1.5 U | 208 | -206.5 | 21 | 104 |
| ND<1.5 U | 208 | -206.5 | 21 | 105 |
| ND<1 U | 208 | -207 | 21 | 106 |
| ND<0.1 U | 208 | -207.9 | 21 | 107 |
| 0.3824 | 208 | -207.618 | 21 | 108 |
| | | | | |
| 218 | 410 | -192 | 21 | 109 |
| 448 | 410 | 38 | 22 | 109 |
| 7.1 | 410 | -402.9 | 22 | 110 |
| 1.2 J | 410 | -408.8 | 22 | 111 |
| 0.69 J | 410 | -409.31 | 22 | 112 |
| ND<1.5 U | 410 | -408.5 | 22 | 113 |
| ND<1.5 U | 410 | -408.5 | 22 | 114 |
| ND<1.5 U | 410 | -408.5 | 22 | 115 |
| ND<1.5 U | 410 | -408.5 | 22 | 116 |
| 1.9 J | 410 | -408.1 | 22 | 117 |
| ND<1.5 U | 410 | -408.5 | 22 | 118 |
| ND<1.5 U | 410 | -408.5 | 22 | 119 |
| ND<1.5 U | 410 | -408.5 | 22 | 120 |
| ND<1.5 U | 410 | -408.5 | 22 | 121 |
| ND<1.5 U | 410 | -408.5 | 22 | 122 |
| ND<1 U | 410 | -409 | 22 | 123 |
| ND<0.1 U | 410 | -409.9 | 22 | 124 |
| 0.3824 | 410 | -409.618 | 22 | 125 |
| | | | | |
| 448 | 218 | 230 | 23 | 125 |
| 7.1 | 218 | -210.9 | 23 | 126 |
| 1.2 J | 218 | -216.8 | 23 | 127 |
| 0.69 J | 218 | -217.31 | 23 | 128 |
| ND<1.5 U | 218 | -216.5 | 23 | 129 |
| ND<1.5 U | 218 | -216.5 | 23 | 130 |
| ND<1.5 U | 218 | -216.5 | 23 | 131 |

| | | | | |
|---|---|---|---|---|
| ND<1.5 U | 218 | -216.5 | 23 | 132 |
| 1.9 J | 218 | -216.1 | 23 | 133 |
| ND<1.5 U | 218 | -216.5 | 23 | 134 |
| ND<1.5 U | 218 | -216.5 | 23 | 135 |
| ND<1.5 U | 218 | -216.5 | 23 | 136 |
| ND<1.5 U | 218 | -216.5 | 23 | 137 |
| ND<1.5 U | 218 | -216.5 | 23 | 138 |
| ND<1 U | 218 | -217 | 23 | 139 |
| ND<0.1 U | 218 | -217.9 | 23 | 140 |
| 0.3824 | 218 | -217.618 | 23 | 141 |
| | | | | |
| 7.1 | 448 | -440.9 | 23 | 142 |
| 1.2 J | 448 | -446.8 | 23 | 143 |
| 0.69 J | 448 | -447.31 | 23 | 144 |
| ND<1.5 U | 448 | -446.5 | 23 | 145 |
| ND<1.5 U | 448 | -446.5 | 23 | 146 |
| ND<1.5 U | 448 | -446.5 | 23 | 147 |
| ND<1.5 U | 448 | -446.5 | 23 | 148 |
| 1.9 J | 448 | -446.1 | 23 | 149 |
| ND<1.5 U | 448 | -446.5 | 23 | 150 |
| ND<1.5 U | 448 | -446.5 | 23 | 151 |
| ND<1.5 U | 448 | -446.5 | 23 | 152 |
| ND<1.5 U | 448 | -446.5 | 23 | 153 |
| ND<1.5 U | 448 | -446.5 | 23 | 154 |
| ND<1 U | 448 | -447 | 23 | 155 |
| ND<0.1 U | 448 | -447.9 | 23 | 156 |
| 0.3824 | 448 | -447.618 | 23 | 157 |
| | | | | |
| 1.2 J | 7.1 | -5.9 | 23 | 158 |
| 0.69 J | 7.1 | -6.41 | 23 | 159 |
| ND<1.5 U | 7.1 | -5.6 | 23 | 160 |
| ND<1.5 U | 7.1 | -5.6 | 23 | 161 |
| ND<1.5 U | 7.1 | -5.6 | 23 | 162 |
| ND<1.5 U | 7.1 | -5.6 | 23 | 163 |
| 1.9 J | 7.1 | -5.2 | 23 | 164 |
| ND<1.5 U | 7.1 | -5.6 | 23 | 165 |
| ND<1.5 U | 7.1 | -5.6 | 23 | 166 |
| ND<1.5 U | 7.1 | -5.6 | 23 | 167 |
| ND<1.5 U | 7.1 | -5.6 | 23 | 168 |
| ND<1.5 U | 7.1 | -5.6 | 23 | 169 |
| ND<1 U | 7.1 | -6.1 | 23 | 170 |
| ND<0.1 U | 7.1 | -7 | 23 | 171 |
| 0.3824 | 7.1 | -6.7176 | 23 | 172 |
| | | | | |
| 0.69 J | 1.2 J | -0.51 | 23 | 173 |
| ND<1.5 U | 1.2 J | 0.3 | 24 | 173 |
| ND<1.5 U | 1.2 J | 0.3 | 25 | 173 |
| ND<1.5 U | 1.2 J | 0.3 | 26 | 173 |
| ND<1.5 U | 1.2 J | 0.3 | 27 | 173 |
| 1.9 J | 1.2 J | 0.7 | 28 | 173 |
| ND<1.5 U | 1.2 J | 0.3 | 29 | 173 |
| ND<1.5 U | 1.2 J | 0.3 | 30 | 173 |
| ND<1.5 U | 1.2 J | 0.3 | 31 | 173 |
| ND<1.5 U | 1.2 J | 0.3 | 32 | 173 |
| ND<1.5 U | 1.2 J | 0.3 | 33 | 173 |
| ND<1 U | 1.2 J | -0.2 | 33 | 174 |
| ND<0.1 U | 1.2 J | -1.1 | 33 | 175 |

| | | | | |
|---|---|---|---|---|
| 0.3824 | 1.2 J | -0.8176 | 33 | 176 |
| | | | | |
| ND<1.5 U | 0.69 J | Same Date | 33 | 176 |
| ND<1.5 U | 0.69 J | 0.81 | 34 | 176 |
| ND<1.5 U | 0.69 J | 0.81 | 35 | 176 |
| ND<1.5 U | 0.69 J | 0.81 | 36 | 176 |
| 1.9 J | 0.69 J | 1.21 | 37 | 176 |
| ND<1.5 U | 0.69 J | 0.81 | 38 | 176 |
| ND<1.5 U | 0.69 J | 0.81 | 39 | 176 |
| ND<1.5 U | 0.69 J | 0.81 | 40 | 176 |
| ND<1.5 U | 0.69 J | 0.81 | 41 | 176 |
| ND<1.5 U | 0.69 J | 0.81 | 42 | 176 |
| ND<1 U | 0.69 J | 0.31 | 43 | 176 |
| ND<0.1 U | 0.69 J | -0.59 | 43 | 177 |
| 0.3824 | 0.69 J | -0.3076 | 43 | 178 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 43 | 178 |
| ND<1.5 U | ND<1.5 U | 0 | 43 | 178 |
| ND<1.5 U | ND<1.5 U | 0 | 43 | 178 |
| 1.9 J | ND<1.5 U | 0.4 | 44 | 178 |
| ND<1.5 U | ND<1.5 U | 0 | 44 | 178 |
| ND<1.5 U | ND<1.5 U | 0 | 44 | 178 |
| ND<1.5 U | ND<1.5 U | 0 | 44 | 178 |
| ND<1.5 U | ND<1.5 U | 0 | 44 | 178 |
| ND<1.5 U | ND<1.5 U | 0 | 44 | 178 |
| ND<1 U | ND<1.5 U | -0.5 | 44 | 179 |
| ND<0.1 U | ND<1.5 U | -1.4 | 44 | 180 |
| 0.3824 | ND<1.5 U | -1.1176 | 44 | 181 |
| | | | | |
| ND<1.5 U | ND<1.5 U | Same Date | 44 | 181 |
| ND<1.5 U | ND<1.5 U | 0 | 44 | 181 |
| 1.9 J | ND<1.5 U | 0.4 | 45 | 181 |
| ND<1.5 U | ND<1.5 U | 0 | 45 | 181 |
| ND<1.5 U | ND<1.5 U | 0 | 45 | 181 |
| ND<1.5 U | ND<1.5 U | 0 | 45 | 181 |
| ND<1.5 U | ND<1.5 U | 0 | 45 | 181 |
| ND<1.5 U | ND<1.5 U | 0 | 45 | 181 |
| ND<1 U | ND<1.5 U | -0.5 | 45 | 182 |
| ND<0.1 U | ND<1.5 U | -1.4 | 45 | 183 |
| 0.3824 | ND<1.5 U | -1.1176 | 45 | 184 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 45 | 184 |
| 1.9 J | ND<1.5 U | 0.4 | 46 | 184 |
| ND<1.5 U | ND<1.5 U | 0 | 46 | 184 |
| ND<1.5 U | ND<1.5 U | 0 | 46 | 184 |
| ND<1.5 U | ND<1.5 U | 0 | 46 | 184 |
| ND<1.5 U | ND<1.5 U | 0 | 46 | 184 |
| ND<1.5 U | ND<1.5 U | 0 | 46 | 184 |
| ND<1 U | ND<1.5 U | -0.5 | 46 | 185 |
| ND<0.1 U | ND<1.5 U | -1.4 | 46 | 186 |
| 0.3824 | ND<1.5 U | -1.1176 | 46 | 187 |
| | | | | |
| 1.9 J | ND<1.5 U | 0.4 | 47 | 187 |
| ND<1.5 U | ND<1.5 U | 0 | 47 | 187 |
| ND<1.5 U | ND<1.5 U | 0 | 47 | 187 |
| ND<1.5 U | ND<1.5 U | 0 | 47 | 187 |
| ND<1.5 U | ND<1.5 U | 0 | 47 | 187 |

| | | | | |
|---|---|---|---|---|
| ND<1.5 U | ND<1.5 U | 0 | 47 | 187 |
| ND<1 U | ND<1.5 U | -0.5 | 47 | 188 |
| ND<0.1 U | ND<1.5 U | -1.4 | 47 | 189 |
| 0.3824 | ND<1.5 U | -1.1176 | 47 | 190 |
| | | | | |
| ND<1.5 U | 1.9 J | -0.4 | 47 | 191 |
| ND<1.5 U | 1.9 J | -0.4 | 47 | 192 |
| ND<1.5 U | 1.9 J | -0.4 | 47 | 193 |
| ND<1.5 U | 1.9 J | -0.4 | 47 | 194 |
| ND<1.5 U | 1.9 J | -0.4 | 47 | 195 |
| ND<1 U | 1.9 J | -0.9 | 47 | 196 |
| ND<0.1 U | 1.9 J | -1.8 | 47 | 197 |
| 0.3824 | 1.9 J | -1.5176 | 47 | 198 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 47 | 198 |
| ND<1.5 U | ND<1.5 U | 0 | 47 | 198 |
| ND<1.5 U | ND<1.5 U | 0 | 47 | 198 |
| ND<1.5 U | ND<1.5 U | 0 | 47 | 198 |
| ND<1 U | ND<1.5 U | -0.5 | 47 | 199 |
| ND<0.1 U | ND<1.5 U | -1.4 | 47 | 200 |
| 0.3824 | ND<1.5 U | -1.1176 | 47 | 201 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 47 | 201 |
| ND<1.5 U | ND<1.5 U | 0 | 47 | 201 |
| ND<1.5 U | ND<1.5 U | 0 | 47 | 201 |
| ND<1 U | ND<1.5 U | -0.5 | 47 | 202 |
| ND<0.1 U | ND<1.5 U | -1.4 | 47 | 203 |
| 0.3824 | ND<1.5 U | -1.1176 | 47 | 204 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 47 | 204 |
| ND<1.5 U | ND<1.5 U | 0 | 47 | 204 |
| ND<1 U | ND<1.5 U | -0.5 | 47 | 205 |
| ND<0.1 U | ND<1.5 U | -1.4 | 47 | 206 |
| 0.3824 | ND<1.5 U | -1.1176 | 47 | 207 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 47 | 207 |
| ND<1 U | ND<1.5 U | -0.5 | 47 | 208 |
| ND<0.1 U | ND<1.5 U | -1.4 | 47 | 209 |
| 0.3824 | ND<1.5 U | -1.1176 | 47 | 210 |
| | | | | |
| ND<1 U | ND<1.5 U | -0.5 | 47 | 211 |
| ND<0.1 U | ND<1.5 U | -1.4 | 47 | 212 |
| 0.3824 | ND<1.5 U | -1.1176 | 47 | 213 |
| | | | | |
| ND<0.1 U | ND<1 U | -0.9 | 47 | 214 |
| 0.3824 | ND<1 U | -0.6176 | 47 | 215 |
| | | | | |
| 0.3824 | ND<0.1 U | 0.2824 | 48 | 215 |

S Statistic = 48 - 215 = -167

| Tied Group | Value | Members |
|---|---|---|
| 1 | 1.5 | 9 |

| Time Period | Observations |
|---|---|
| 6/1/2017 | 1 |

| | |
|---|---|
| 7/1/2017 | 1 |
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 3/1/2022 | 1 |
| 3/1/2023 | 1 |
| 3/1/2024 | 1 |

There are 2 time periods with multiple data

---

A = 1656
B = 36
C = 504
D = 0
E = 72
F = 4
a = 33000
b = 124200
c = 1200
Group Variance = 1739.57
Z-Score = -3.98003
Comparison Level at 95% confidence level = -1.65463 (downward trend)
**-3.98003 < -1.65463 indicating a downward trend**

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RW19-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 6.9 | 14.8 | -7.9 | 0 | 1 |
| 8.5 | 14.8 | -6.3 | 0 | 2 |
| 3.6 | 14.8 | -11.2 | 0 | 3 |
| 2.4 J | 14.8 | -12.4 | 0 | 4 |
| 9.7 | 14.8 | -5.1 | 0 | 5 |
| 7.2 | 14.8 | -7.6 | 0 | 6 |
| 2.6 J | 14.8 | -12.2 | 0 | 7 |
| 5.2 | 14.8 | -9.6 | 0 | 8 |
| 4.4 | 14.8 | -10.4 | 0 | 9 |
| 4.6 | 14.8 | -10.2 | 0 | 10 |
| 4.8 | 14.8 | -10 | 0 | 11 |
| 6.6 | 14.8 | -8.2 | 0 | 12 |
| 1.2 J | 14.8 | -13.6 | 0 | 13 |
| 3.6 | 14.8 | -11.2 | 0 | 14 |
| ND<1.5 U | 14.8 | -13.3 | 0 | 15 |
| 3.7 | 14.8 | -11.1 | 0 | 16 |
| 0.69 J | 14.8 | -14.11 | 0 | 17 |
| ND<1.5 U | 14.8 | -13.3 | 0 | 18 |
| ND<1.5 U | 14.8 | -13.3 | 0 | 19 |
| 1.2 J | 14.8 | -13.6 | 0 | 20 |
| 0.66 J | 14.8 | -14.14 | 0 | 21 |
| 0.77 J | 14.8 | -14.03 | 0 | 22 |
| 4.3 | 14.8 | -10.5 | 0 | 23 |
| 1.3 J | 14.8 | -13.5 | 0 | 24 |
| | | | | |
| 8.5 | 6.9 | 1.6 | 1 | 24 |
| 3.6 | 6.9 | -3.3 | 1 | 25 |
| 2.4 J | 6.9 | -4.5 | 1 | 26 |
| 9.7 | 6.9 | 2.8 | 2 | 26 |
| 7.2 | 6.9 | 0.3 | 3 | 26 |
| 2.6 J | 6.9 | -4.3 | 3 | 27 |
| 5.2 | 6.9 | -1.7 | 3 | 28 |
| 4.4 | 6.9 | -2.5 | 3 | 29 |
| 4.6 | 6.9 | -2.3 | 3 | 30 |
| 4.8 | 6.9 | -2.1 | 3 | 31 |
| 6.6 | 6.9 | -0.3 | 3 | 32 |
| 1.2 J | 6.9 | -5.7 | 3 | 33 |
| 3.6 | 6.9 | -3.3 | 3 | 34 |
| ND<1.5 U | 6.9 | -5.4 | 3 | 35 |
| 3.7 | 6.9 | -3.2 | 3 | 36 |
| 0.69 J | 6.9 | -6.21 | 3 | 37 |
| ND<1.5 U | 6.9 | -5.4 | 3 | 38 |
| ND<1.5 U | 6.9 | -5.4 | 3 | 39 |
| 1.2 J | 6.9 | -5.7 | 3 | 40 |
| 0.66 J | 6.9 | -6.24 | 3 | 41 |
| 0.77 J | 6.9 | -6.13 | 3 | 42 |
| 4.3 | 6.9 | -2.6 | 3 | 43 |

| | | | | |
|---|---|---|---|---|
| 1.3 J | 6.9 | -5.6 | 3 | 44 |
| | | | | |
| 3.6 | 8.5 | -4.9 | 3 | 45 |
| 2.4 J | 8.5 | -6.1 | 3 | 46 |
| 9.7 | 8.5 | 1.2 | 4 | 46 |
| 7.2 | 8.5 | -1.3 | 4 | 47 |
| 2.6 J | 8.5 | -5.9 | 4 | 48 |
| 5.2 | 8.5 | -3.3 | 4 | 49 |
| 4.4 | 8.5 | -4.1 | 4 | 50 |
| 4.6 | 8.5 | -3.9 | 4 | 51 |
| 4.8 | 8.5 | -3.7 | 4 | 52 |
| 6.6 | 8.5 | -1.9 | 4 | 53 |
| 1.2 J | 8.5 | -7.3 | 4 | 54 |
| 3.6 | 8.5 | -4.9 | 4 | 55 |
| ND<1.5 U | 8.5 | -7 | 4 | 56 |
| 3.7 | 8.5 | -4.8 | 4 | 57 |
| 0.69 J | 8.5 | -7.81 | 4 | 58 |
| ND<1.5 U | 8.5 | -7 | 4 | 59 |
| ND<1.5 U | 8.5 | -7 | 4 | 60 |
| 1.2 J | 8.5 | -7.3 | 4 | 61 |
| 0.66 J | 8.5 | -7.84 | 4 | 62 |
| 0.77 J | 8.5 | -7.73 | 4 | 63 |
| 4.3 | 8.5 | -4.2 | 4 | 64 |
| 1.3 J | 8.5 | -7.2 | 4 | 65 |
| | | | | |
| 2.4 J | 3.6 | -1.2 | 4 | 66 |
| 9.7 | 3.6 | 6.1 | 5 | 66 |
| 7.2 | 3.6 | 3.6 | 6 | 66 |
| 2.6 J | 3.6 | -1 | 6 | 67 |
| 5.2 | 3.6 | 1.6 | 7 | 67 |
| 4.4 | 3.6 | 0.8 | 8 | 67 |
| 4.6 | 3.6 | 1 | 9 | 67 |
| 4.8 | 3.6 | 1.2 | 10 | 67 |
| 6.6 | 3.6 | 3 | 11 | 67 |
| 1.2 J | 3.6 | -2.4 | 11 | 68 |
| 3.6 | 3.6 | 0 | 11 | 68 |
| ND<1.5 U | 3.6 | -2.1 | 11 | 69 |
| 3.7 | 3.6 | 0.1 | 12 | 69 |
| 0.69 J | 3.6 | -2.91 | 12 | 70 |
| ND<1.5 U | 3.6 | -2.1 | 12 | 71 |
| ND<1.5 U | 3.6 | -2.1 | 12 | 72 |
| 1.2 J | 3.6 | -2.4 | 12 | 73 |
| 0.66 J | 3.6 | -2.94 | 12 | 74 |
| 0.77 J | 3.6 | -2.83 | 12 | 75 |
| 4.3 | 3.6 | 0.7 | 13 | 75 |
| 1.3 J | 3.6 | -2.3 | 13 | 76 |
| | | | | |
| 9.7 | 2.4 J | 7.3 | 14 | 76 |
| 7.2 | 2.4 J | 4.8 | 15 | 76 |
| 2.6 J | 2.4 J | 0.2 | 16 | 76 |
| 5.2 | 2.4 J | 2.8 | 17 | 76 |
| 4.4 | 2.4 J | 2 | 18 | 76 |
| 4.6 | 2.4 J | 2.2 | 19 | 76 |
| 4.8 | 2.4 J | 2.4 | 20 | 76 |
| 6.6 | 2.4 J | 4.2 | 21 | 76 |
| 1.2 J | 2.4 J | -1.2 | 21 | 77 |
| 3.6 | 2.4 J | 1.2 | 22 | 77 |

| | | | | |
|---|---|---|---|---|
| ND<1.5 U | 2.4 J | -0.9 | 22 | 78 |
| 3.7 | 2.4 J | 1.3 | 23 | 78 |
| 0.69 J | 2.4 J | -1.71 | 23 | 79 |
| ND<1.5 U | 2.4 J | -0.9 | 23 | 80 |
| ND<1.5 U | 2.4 J | -0.9 | 23 | 81 |
| 1.2 J | 2.4 J | -1.2 | 23 | 82 |
| 0.66 J | 2.4 J | -1.74 | 23 | 83 |
| 0.77 J | 2.4 J | -1.63 | 23 | 84 |
| 4.3 | 2.4 J | 1.9 | 24 | 84 |
| 1.3 J | 2.4 J | -1.1 | 24 | 85 |
| | | | | |
| 7.2 | 9.7 | -2.5 | 24 | 86 |
| 2.6 J | 9.7 | -7.1 | 24 | 87 |
| 5.2 | 9.7 | -4.5 | 24 | 88 |
| 4.4 | 9.7 | -5.3 | 24 | 89 |
| 4.6 | 9.7 | -5.1 | 24 | 90 |
| 4.8 | 9.7 | -4.9 | 24 | 91 |
| 6.6 | 9.7 | -3.1 | 24 | 92 |
| 1.2 J | 9.7 | -8.5 | 24 | 93 |
| 3.6 | 9.7 | -6.1 | 24 | 94 |
| ND<1.5 U | 9.7 | -8.2 | 24 | 95 |
| 3.7 | 9.7 | -6 | 24 | 96 |
| 0.69 J | 9.7 | -9.01 | 24 | 97 |
| ND<1.5 U | 9.7 | -8.2 | 24 | 98 |
| ND<1.5 U | 9.7 | -8.2 | 24 | 99 |
| 1.2 J | 9.7 | -8.5 | 24 | 100 |
| 0.66 J | 9.7 | -9.04 | 24 | 101 |
| 0.77 J | 9.7 | -8.93 | 24 | 102 |
| 4.3 | 9.7 | -5.4 | 24 | 103 |
| 1.3 J | 9.7 | -8.4 | 24 | 104 |
| | | | | |
| 2.6 J | 7.2 | -4.6 | 24 | 105 |
| 5.2 | 7.2 | -2 | 24 | 106 |
| 4.4 | 7.2 | -2.8 | 24 | 107 |
| 4.6 | 7.2 | -2.6 | 24 | 108 |
| 4.8 | 7.2 | -2.4 | 24 | 109 |
| 6.6 | 7.2 | -0.6 | 24 | 110 |
| 1.2 J | 7.2 | -6 | 24 | 111 |
| 3.6 | 7.2 | -3.6 | 24 | 112 |
| ND<1.5 U | 7.2 | -5.7 | 24 | 113 |
| 3.7 | 7.2 | -3.5 | 24 | 114 |
| 0.69 J | 7.2 | -6.51 | 24 | 115 |
| ND<1.5 U | 7.2 | -5.7 | 24 | 116 |
| ND<1.5 U | 7.2 | -5.7 | 24 | 117 |
| 1.2 J | 7.2 | -6 | 24 | 118 |
| 0.66 J | 7.2 | -6.54 | 24 | 119 |
| 0.77 J | 7.2 | -6.43 | 24 | 120 |
| 4.3 | 7.2 | -2.9 | 24 | 121 |
| 1.3 J | 7.2 | -5.9 | 24 | 122 |
| | | | | |
| 5.2 | 2.6 J | 2.6 | 25 | 122 |
| 4.4 | 2.6 J | 1.8 | 26 | 122 |
| 4.6 | 2.6 J | 2 | 27 | 122 |
| 4.8 | 2.6 J | 2.2 | 28 | 122 |
| 6.6 | 2.6 J | 4 | 29 | 122 |
| 1.2 J | 2.6 J | -1.4 | 29 | 123 |
| 3.6 | 2.6 J | 1 | 30 | 123 |

| | | | | |
|---|---|---|---|---|
| ND<1.5 U | 2.6 J | -1.1 | 30 | 124 |
| 3.7 | 2.6 J | 1.1 | 31 | 124 |
| 0.69 J | 2.6 J | -1.91 | 31 | 125 |
| ND<1.5 U | 2.6 J | -1.1 | 31 | 126 |
| ND<1.5 U | 2.6 J | -1.1 | 31 | 127 |
| 1.2 J | 2.6 J | -1.4 | 31 | 128 |
| 0.66 J | 2.6 J | -1.94 | 31 | 129 |
| 0.77 J | 2.6 J | -1.83 | 31 | 130 |
| 4.3 | 2.6 J | 1.7 | 32 | 130 |
| 1.3 J | 2.6 J | -1.3 | 32 | 131 |
| | | | | |
| 4.4 | 5.2 | -0.8 | 32 | 132 |
| 4.6 | 5.2 | -0.6 | 32 | 133 |
| 4.8 | 5.2 | -0.4 | 32 | 134 |
| 6.6 | 5.2 | 1.4 | 33 | 134 |
| 1.2 J | 5.2 | -4 | 33 | 135 |
| 3.6 | 5.2 | -1.6 | 33 | 136 |
| ND<1.5 U | 5.2 | -3.7 | 33 | 137 |
| 3.7 | 5.2 | -1.5 | 33 | 138 |
| 0.69 J | 5.2 | -4.51 | 33 | 139 |
| ND<1.5 U | 5.2 | -3.7 | 33 | 140 |
| ND<1.5 U | 5.2 | -3.7 | 33 | 141 |
| 1.2 J | 5.2 | -4 | 33 | 142 |
| 0.66 J | 5.2 | -4.54 | 33 | 143 |
| 0.77 J | 5.2 | -4.43 | 33 | 144 |
| 4.3 | 5.2 | -0.9 | 33 | 145 |
| 1.3 J | 5.2 | -3.9 | 33 | 146 |
| | | | | |
| 4.6 | 4.4 | 0.2 | 34 | 146 |
| 4.8 | 4.4 | 0.4 | 35 | 146 |
| 6.6 | 4.4 | 2.2 | 36 | 146 |
| 1.2 J | 4.4 | -3.2 | 36 | 147 |
| 3.6 | 4.4 | -0.8 | 36 | 148 |
| ND<1.5 U | 4.4 | -2.9 | 36 | 149 |
| 3.7 | 4.4 | -0.7 | 36 | 150 |
| 0.69 J | 4.4 | -3.71 | 36 | 151 |
| ND<1.5 U | 4.4 | -2.9 | 36 | 152 |
| ND<1.5 U | 4.4 | -2.9 | 36 | 153 |
| 1.2 J | 4.4 | -3.2 | 36 | 154 |
| 0.66 J | 4.4 | -3.74 | 36 | 155 |
| 0.77 J | 4.4 | -3.63 | 36 | 156 |
| 4.3 | 4.4 | -0.1 | 36 | 157 |
| 1.3 J | 4.4 | -3.1 | 36 | 158 |
| | | | | |
| 4.8 | 4.6 | 0.2 | 37 | 158 |
| 6.6 | 4.6 | 2 | 38 | 158 |
| 1.2 J | 4.6 | -3.4 | 38 | 159 |
| 3.6 | 4.6 | -1 | 38 | 160 |
| ND<1.5 U | 4.6 | -3.1 | 38 | 161 |
| 3.7 | 4.6 | -0.9 | 38 | 162 |
| 0.69 J | 4.6 | -3.91 | 38 | 163 |
| ND<1.5 U | 4.6 | -3.1 | 38 | 164 |
| ND<1.5 U | 4.6 | -3.1 | 38 | 165 |
| 1.2 J | 4.6 | -3.4 | 38 | 166 |
| 0.66 J | 4.6 | -3.94 | 38 | 167 |
| 0.77 J | 4.6 | -3.83 | 38 | 168 |
| 4.3 | 4.6 | -0.3 | 38 | 169 |

| | | | | |
|---|---|---|---|---|
| 1.3 J | 4.6 | -3.3 | 38 | 170 |
| | | | | |
| 6.6 | 4.8 | 1.8 | 39 | 170 |
| 1.2 J | 4.8 | -3.6 | 39 | 171 |
| 3.6 | 4.8 | -1.2 | 39 | 172 |
| ND<1.5 U | 4.8 | -3.3 | 39 | 173 |
| 3.7 | 4.8 | -1.1 | 39 | 174 |
| 0.69 J | 4.8 | -4.11 | 39 | 175 |
| ND<1.5 U | 4.8 | -3.3 | 39 | 176 |
| ND<1.5 U | 4.8 | -3.3 | 39 | 177 |
| 1.2 J | 4.8 | -3.6 | 39 | 178 |
| 0.66 J | 4.8 | -4.14 | 39 | 179 |
| 0.77 J | 4.8 | -4.03 | 39 | 180 |
| 4.3 | 4.8 | -0.5 | 39 | 181 |
| 1.3 J | 4.8 | -3.5 | 39 | 182 |
| | | | | |
| 1.2 J | 6.6 | -5.4 | 39 | 183 |
| 3.6 | 6.6 | -3 | 39 | 184 |
| ND<1.5 U | 6.6 | -5.1 | 39 | 185 |
| 3.7 | 6.6 | -2.9 | 39 | 186 |
| 0.69 J | 6.6 | -5.91 | 39 | 187 |
| ND<1.5 U | 6.6 | -5.1 | 39 | 188 |
| ND<1.5 U | 6.6 | -5.1 | 39 | 189 |
| 1.2 J | 6.6 | -5.4 | 39 | 190 |
| 0.66 J | 6.6 | -5.94 | 39 | 191 |
| 0.77 J | 6.6 | -5.83 | 39 | 192 |
| 4.3 | 6.6 | -2.3 | 39 | 193 |
| 1.3 J | 6.6 | -5.3 | 39 | 194 |
| | | | | |
| 3.6 | 1.2 J | 2.4 | 40 | 194 |
| ND<1.5 U | 1.2 J | 0.3 | 41 | 194 |
| 3.7 | 1.2 J | 2.5 | 42 | 194 |
| 0.69 J | 1.2 J | -0.51 | 42 | 195 |
| ND<1.5 U | 1.2 J | 0.3 | 43 | 195 |
| ND<1.5 U | 1.2 J | 0.3 | 44 | 195 |
| 1.2 J | 1.2 J | 0 | 44 | 195 |
| 0.66 J | 1.2 J | -0.54 | 44 | 196 |
| 0.77 J | 1.2 J | -0.43 | 44 | 197 |
| 4.3 | 1.2 J | 3.1 | 45 | 197 |
| 1.3 J | 1.2 J | 0.1 | 46 | 197 |
| | | | | |
| ND<1.5 U | 3.6 | -2.1 | 46 | 198 |
| 3.7 | 3.6 | 0.1 | 47 | 198 |
| 0.69 J | 3.6 | -2.91 | 47 | 199 |
| ND<1.5 U | 3.6 | -2.1 | 47 | 200 |
| ND<1.5 U | 3.6 | -2.1 | 47 | 201 |
| 1.2 J | 3.6 | -2.4 | 47 | 202 |
| 0.66 J | 3.6 | -2.94 | 47 | 203 |
| 0.77 J | 3.6 | -2.83 | 47 | 204 |
| 4.3 | 3.6 | 0.7 | 48 | 204 |
| 1.3 J | 3.6 | -2.3 | 48 | 205 |
| | | | | |
| 3.7 | ND<1.5 U | Same Date | 48 | 205 |
| 0.69 J | ND<1.5 U | -0.81 | 48 | 206 |
| ND<1.5 U | ND<1.5 U | 0 | 48 | 206 |
| ND<1.5 U | ND<1.5 U | 0 | 48 | 206 |
| 1.2 J | ND<1.5 U | -0.3 | 48 | 207 |

| | | | | |
|---|---|---|---|---|
| 0.66 J | ND<1.5 U | -0.84 | 48 | 208 |
| 0.77 J | ND<1.5 U | -0.73 | 48 | 209 |
| 4.3 | ND<1.5 U | 2.8 | 49 | 209 |
| 1.3 J | ND<1.5 U | -0.2 | 49 | 210 |
| | | | | |
| 0.69 J | 3.7 | -3.01 | 49 | 211 |
| ND<1.5 U | 3.7 | -2.2 | 49 | 212 |
| ND<1.5 U | 3.7 | -2.2 | 49 | 213 |
| 1.2 J | 3.7 | -2.5 | 49 | 214 |
| 0.66 J | 3.7 | -3.04 | 49 | 215 |
| 0.77 J | 3.7 | -2.93 | 49 | 216 |
| 4.3 | 3.7 | 0.6 | 50 | 216 |
| 1.3 J | 3.7 | -2.4 | 50 | 217 |
| | | | | |
| ND<1.5 U | 0.69 J | Same Date | 50 | 217 |
| ND<1.5 U | 0.69 J | 0.81 | 51 | 217 |
| 1.2 J | 0.69 J | 0.51 | 52 | 217 |
| 0.66 J | 0.69 J | -0.03 | 52 | 218 |
| 0.77 J | 0.69 J | 0.08 | 53 | 218 |
| 4.3 | 0.69 J | 3.61 | 54 | 218 |
| 1.3 J | 0.69 J | 0.61 | 55 | 218 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 55 | 218 |
| 1.2 J | ND<1.5 U | -0.3 | 55 | 219 |
| 0.66 J | ND<1.5 U | -0.84 | 55 | 220 |
| 0.77 J | ND<1.5 U | -0.73 | 55 | 221 |
| 4.3 | ND<1.5 U | 2.8 | 56 | 221 |
| 1.3 J | ND<1.5 U | -0.2 | 56 | 222 |
| | | | | |
| 1.2 J | ND<1.5 U | -0.3 | 56 | 223 |
| 0.66 J | ND<1.5 U | -0.84 | 56 | 224 |
| 0.77 J | ND<1.5 U | -0.73 | 56 | 225 |
| 4.3 | ND<1.5 U | 2.8 | 57 | 225 |
| 1.3 J | ND<1.5 U | -0.2 | 57 | 226 |
| | | | | |
| 0.66 J | 1.2 J | -0.54 | 57 | 227 |
| 0.77 J | 1.2 J | -0.43 | 57 | 228 |
| 4.3 | 1.2 J | 3.1 | 58 | 228 |
| 1.3 J | 1.2 J | 0.1 | 59 | 228 |
| | | | | |
| 0.77 J | 0.66 J | 0.11 | 60 | 228 |
| 4.3 | 0.66 J | 3.64 | 61 | 228 |
| 1.3 J | 0.66 J | 0.64 | 62 | 228 |
| | | | | |
| 4.3 | 0.77 J | 3.53 | 63 | 228 |
| 1.3 J | 0.77 J | 0.53 | 64 | 228 |
| | | | | |
| 1.3 J | 4.3 | -3 | 64 | 229 |

S Statistic = 64 - 229 = -165

| Tied Group | Value | Members |
|---|---|---|
| 1 | 3.6 | 2 |
| 2 | 1.2 | 2 |
| 3 | 1.5 | 3 |

| Time Period | Observations |
|---|---|
| 2/1/2017 | 1 |
| 3/1/2017 | 1 |
| 4/1/2017 | 1 |
| 5/1/2017 | 1 |
| 6/1/2017 | 1 |
| 7/1/2017 | 1 |
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |

There are 2 time periods with multiple data

---

A = 102
B = 36
C = 6
D = 0
E = 10
F = 4
a = 33000
b = 124200
c = 1200
Group Variance = 1825.7
Z-Score = -3.83821
Comparison Level at 95% confidence level = -1.65463 (downward trend)
**-3.83821 < -1.65463 indicating a downward trend**

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RW21-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 483 1c | 483 1c | Same Date | 0 | 0 |
| 486 1c | 483 1c | Same Date | 0 | 0 |
| 486 1c | 483 1c | Same Date | 0 | 0 |
| 354 1c | 483 1c | -129 | 0 | 1 |
| 433 | 483 1c | -50 | 0 | 2 |
| 378 | 483 1c | -105 | 0 | 3 |
| 322 | 483 1c | -161 | 0 | 4 |
| 294 1c | 483 1c | -189 | 0 | 5 |
| 30.7 | 483 1c | -452.3 | 0 | 6 |
| 367 | 483 1c | -116 | 0 | 7 |
| | | | | |
| 486 1c | 483 1c | Same Date | 0 | 7 |
| 486 1c | 483 1c | Same Date | 0 | 7 |
| 354 1c | 483 1c | -129 | 0 | 8 |
| 433 | 483 1c | -50 | 0 | 9 |
| 378 | 483 1c | -105 | 0 | 10 |
| 322 | 483 1c | -161 | 0 | 11 |
| 294 1c | 483 1c | -189 | 0 | 12 |
| 30.7 | 483 1c | -452.3 | 0 | 13 |
| 367 | 483 1c | -116 | 0 | 14 |
| | | | | |
| 486 1c | 486 1c | Same Date | 0 | 14 |
| 354 1c | 486 1c | -132 | 0 | 15 |
| 433 | 486 1c | -53 | 0 | 16 |
| 378 | 486 1c | -108 | 0 | 17 |
| 322 | 486 1c | -164 | 0 | 18 |
| 294 1c | 486 1c | -192 | 0 | 19 |
| 30.7 | 486 1c | -455.3 | 0 | 20 |
| 367 | 486 1c | -119 | 0 | 21 |
| | | | | |
| 354 1c | 486 1c | -132 | 0 | 22 |
| 433 | 486 1c | -53 | 0 | 23 |
| 378 | 486 1c | -108 | 0 | 24 |
| 322 | 486 1c | -164 | 0 | 25 |
| 294 1c | 486 1c | -192 | 0 | 26 |
| 30.7 | 486 1c | -455.3 | 0 | 27 |
| 367 | 486 1c | -119 | 0 | 28 |
| | | | | |
| 433 | 354 1c | 79 | 1 | 28 |
| 378 | 354 1c | 24 | 2 | 28 |
| 322 | 354 1c | -32 | 2 | 29 |
| 294 1c | 354 1c | -60 | 2 | 30 |
| 30.7 | 354 1c | -323.3 | 2 | 31 |
| 367 | 354 1c | 13 | 3 | 31 |
| | | | | |
| 378 | 433 | -55 | 3 | 32 |
| 322 | 433 | -111 | 3 | 33 |

| | | | | |
|---|---|---|---|---|
| 294 1c | 433 | -139 | 3 | 34 |
| 30.7 | 433 | -402.3 | 3 | 35 |
| 367 | 433 | -66 | 3 | 36 |
| | | | | |
| 322 | 378 | -56 | 3 | 37 |
| 294 1c | 378 | -84 | 3 | 38 |
| 30.7 | 378 | -347.3 | 3 | 39 |
| 367 | 378 | -11 | 3 | 40 |
| | | | | |
| 294 1c | 322 | -28 | 3 | 41 |
| 30.7 | 322 | -291.3 | 3 | 42 |
| 367 | 322 | 45 | 4 | 42 |
| | | | | |
| 30.7 | 294 1c | -263.3 | 4 | 43 |
| 367 | 294 1c | 73 | 5 | 43 |
| | | | | |
| 367 | 30.7 | Same Date | 5 | 43 |

S Statistic = 5 - 43 = -38

| Tied Group | Value | Members |
|---|---|---|
| 1 | 483 | 2 |
| 2 | 486 | 2 |

| Time Period | Observations |
|---|---|
| 6/1/2019 | 4 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 2 |

There are 2 time periods with multiple data

A = 36
B = 174
C = 0
D = 24
E = 4
F = 14
a = 2970
b = 8910
c = 220
Group Variance = 153.588
Z-Score = -2.98554
Comparison Level at 95% confidence level = -1.65463 (downward trend)
**-2.98554 < -1.65463 indicating a downward trend**

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RW22R-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 168 1c2c | 157 | Same Date | 0 | 0 |
| 153 | 157 | Same Date | 0 | 0 |
| 153 | 157 | Same Date | 0 | 0 |
| 151 | 157 | Same Date | 0 | 0 |
| 151 | 157 | Same Date | 0 | 0 |
| 151 | 157 | Same Date | 0 | 0 |
| 151 | 157 | Same Date | 0 | 0 |
| 153 | 157 | Same Date | 0 | 0 |
| 153 | 157 | Same Date | 0 | 0 |
| 105 | 157 | -52 | 0 | 1 |
| 70.4 | 157 | -86.6 | 0 | 2 |
| 62.9 | 157 | -94.1 | 0 | 3 |
| 51.4 | 157 | -105.6 | 0 | 4 |
| 52.1 | 157 | -104.9 | 0 | 5 |
| 78.5 | 157 | -78.5 | 0 | 6 |
| 117 | 157 | -40 | 0 | 7 |
| 29.4 | 157 | -127.6 | 0 | 8 |
| 56.91 | 157 | -100.09 | 0 | 9 |
| 56.91 | 157 | -100.09 | 0 | 10 |
| 21.95 | 157 | -135.05 | 0 | 11 |
| 24.13 | 157 | -132.87 | 0 | 12 |
| 28.1 | 157 | -128.9 | 0 | 13 |
| 26.72 | 157 | -130.28 | 0 | 14 |
| | | | | |
| 153 | 168 1c2c | Same Date | 0 | 14 |
| 153 | 168 1c2c | Same Date | 0 | 14 |
| 151 | 168 1c2c | Same Date | 0 | 14 |
| 151 | 168 1c2c | Same Date | 0 | 14 |
| 151 | 168 1c2c | Same Date | 0 | 14 |
| 151 | 168 1c2c | Same Date | 0 | 14 |
| 153 | 168 1c2c | Same Date | 0 | 14 |
| 153 | 168 1c2c | Same Date | 0 | 14 |
| 105 | 168 1c2c | -63 | 0 | 15 |
| 70.4 | 168 1c2c | -97.6 | 0 | 16 |
| 62.9 | 168 1c2c | -105.1 | 0 | 17 |
| 51.4 | 168 1c2c | -116.6 | 0 | 18 |
| 52.1 | 168 1c2c | -115.9 | 0 | 19 |
| 78.5 | 168 1c2c | -89.5 | 0 | 20 |
| 117 | 168 1c2c | -51 | 0 | 21 |
| 29.4 | 168 1c2c | -138.6 | 0 | 22 |
| 56.91 | 168 1c2c | -111.09 | 0 | 23 |
| 56.91 | 168 1c2c | -111.09 | 0 | 24 |
| 21.95 | 168 1c2c | -146.05 | 0 | 25 |
| 24.13 | 168 1c2c | -143.87 | 0 | 26 |
| 28.1 | 168 1c2c | -139.9 | 0 | 27 |
| 26.72 | 168 1c2c | -141.28 | 0 | 28 |

| | | | | |
|---|---|---|---|---|
| 153 | 153 | Same Date | 0 | 28 |
| 151 | 153 | Same Date | 0 | 28 |
| 151 | 153 | Same Date | 0 | 28 |
| 151 | 153 | Same Date | 0 | 28 |
| 151 | 153 | Same Date | 0 | 28 |
| 153 | 153 | Same Date | 0 | 28 |
| 153 | 153 | Same Date | 0 | 28 |
| 105 | 153 | -48 | 0 | 29 |
| 70.4 | 153 | -82.6 | 0 | 30 |
| 62.9 | 153 | -90.1 | 0 | 31 |
| 51.4 | 153 | -101.6 | 0 | 32 |
| 52.1 | 153 | -100.9 | 0 | 33 |
| 78.5 | 153 | -74.5 | 0 | 34 |
| 117 | 153 | -36 | 0 | 35 |
| 29.4 | 153 | -123.6 | 0 | 36 |
| 56.91 | 153 | -96.09 | 0 | 37 |
| 56.91 | 153 | -96.09 | 0 | 38 |
| 21.95 | 153 | -131.05 | 0 | 39 |
| 24.13 | 153 | -128.87 | 0 | 40 |
| 28.1 | 153 | -124.9 | 0 | 41 |
| 26.72 | 153 | -126.28 | 0 | 42 |
| | | | | |
| 151 | 153 | Same Date | 0 | 42 |
| 151 | 153 | Same Date | 0 | 42 |
| 151 | 153 | Same Date | 0 | 42 |
| 151 | 153 | Same Date | 0 | 42 |
| 153 | 153 | Same Date | 0 | 42 |
| 153 | 153 | Same Date | 0 | 42 |
| 105 | 153 | -48 | 0 | 43 |
| 70.4 | 153 | -82.6 | 0 | 44 |
| 62.9 | 153 | -90.1 | 0 | 45 |
| 51.4 | 153 | -101.6 | 0 | 46 |
| 52.1 | 153 | -100.9 | 0 | 47 |
| 78.5 | 153 | -74.5 | 0 | 48 |
| 117 | 153 | -36 | 0 | 49 |
| 29.4 | 153 | -123.6 | 0 | 50 |
| 56.91 | 153 | -96.09 | 0 | 51 |
| 56.91 | 153 | -96.09 | 0 | 52 |
| 21.95 | 153 | -131.05 | 0 | 53 |
| 24.13 | 153 | -128.87 | 0 | 54 |
| 28.1 | 153 | -124.9 | 0 | 55 |
| 26.72 | 153 | -126.28 | 0 | 56 |
| | | | | |
| 151 | 151 | Same Date | 0 | 56 |
| 151 | 151 | Same Date | 0 | 56 |
| 151 | 151 | Same Date | 0 | 56 |
| 153 | 151 | Same Date | 0 | 56 |
| 153 | 151 | Same Date | 0 | 56 |
| 105 | 151 | -46 | 0 | 57 |
| 70.4 | 151 | -80.6 | 0 | 58 |
| 62.9 | 151 | -88.1 | 0 | 59 |
| 51.4 | 151 | -99.6 | 0 | 60 |
| 52.1 | 151 | -98.9 | 0 | 61 |
| 78.5 | 151 | -72.5 | 0 | 62 |
| 117 | 151 | -34 | 0 | 63 |
| 29.4 | 151 | -121.6 | 0 | 64 |
| 56.91 | 151 | -94.09 | 0 | 65 |

| | | | | |
|---|---|---|---|---|
| 56.91 | 151 | -94.09 | 0 | 66 |
| 21.95 | 151 | -129.05 | 0 | 67 |
| 24.13 | 151 | -126.87 | 0 | 68 |
| 28.1 | 151 | -122.9 | 0 | 69 |
| 26.72 | 151 | -124.28 | 0 | 70 |
| | | | | |
| 151 | 151 | Same Date | 0 | 70 |
| 151 | 151 | Same Date | 0 | 70 |
| 153 | 151 | Same Date | 0 | 70 |
| 153 | 151 | Same Date | 0 | 70 |
| 105 | 151 | -46 | 0 | 71 |
| 70.4 | 151 | -80.6 | 0 | 72 |
| 62.9 | 151 | -88.1 | 0 | 73 |
| 51.4 | 151 | -99.6 | 0 | 74 |
| 52.1 | 151 | -98.9 | 0 | 75 |
| 78.5 | 151 | -72.5 | 0 | 76 |
| 117 | 151 | -34 | 0 | 77 |
| 29.4 | 151 | -121.6 | 0 | 78 |
| 56.91 | 151 | -94.09 | 0 | 79 |
| 56.91 | 151 | -94.09 | 0 | 80 |
| 21.95 | 151 | -129.05 | 0 | 81 |
| 24.13 | 151 | -126.87 | 0 | 82 |
| 28.1 | 151 | -122.9 | 0 | 83 |
| 26.72 | 151 | -124.28 | 0 | 84 |
| | | | | |
| 151 | 151 | Same Date | 0 | 84 |
| 153 | 151 | Same Date | 0 | 84 |
| 153 | 151 | Same Date | 0 | 84 |
| 105 | 151 | -46 | 0 | 85 |
| 70.4 | 151 | -80.6 | 0 | 86 |
| 62.9 | 151 | -88.1 | 0 | 87 |
| 51.4 | 151 | -99.6 | 0 | 88 |
| 52.1 | 151 | -98.9 | 0 | 89 |
| 78.5 | 151 | -72.5 | 0 | 90 |
| 117 | 151 | -34 | 0 | 91 |
| 29.4 | 151 | -121.6 | 0 | 92 |
| 56.91 | 151 | -94.09 | 0 | 93 |
| 56.91 | 151 | -94.09 | 0 | 94 |
| 21.95 | 151 | -129.05 | 0 | 95 |
| 24.13 | 151 | -126.87 | 0 | 96 |
| 28.1 | 151 | -122.9 | 0 | 97 |
| 26.72 | 151 | -124.28 | 0 | 98 |
| | | | | |
| 153 | 151 | Same Date | 0 | 98 |
| 153 | 151 | Same Date | 0 | 98 |
| 105 | 151 | -46 | 0 | 99 |
| 70.4 | 151 | -80.6 | 0 | 100 |
| 62.9 | 151 | -88.1 | 0 | 101 |
| 51.4 | 151 | -99.6 | 0 | 102 |
| 52.1 | 151 | -98.9 | 0 | 103 |
| 78.5 | 151 | -72.5 | 0 | 104 |
| 117 | 151 | -34 | 0 | 105 |
| 29.4 | 151 | -121.6 | 0 | 106 |
| 56.91 | 151 | -94.09 | 0 | 107 |
| 56.91 | 151 | -94.09 | 0 | 108 |
| 21.95 | 151 | -129.05 | 0 | 109 |
| 24.13 | 151 | -126.87 | 0 | 110 |

| | | | | |
|---|---|---|---|---|
| 28.1 | 151 | -122.9 | 0 | 111 |
| 26.72 | 151 | -124.28 | 0 | 112 |
| | | | | |
| 153 | 153 | Same Date | 0 | 112 |
| 105 | 153 | -48 | 0 | 113 |
| 70.4 | 153 | -82.6 | 0 | 114 |
| 62.9 | 153 | -90.1 | 0 | 115 |
| 51.4 | 153 | -101.6 | 0 | 116 |
| 52.1 | 153 | -100.9 | 0 | 117 |
| 78.5 | 153 | -74.5 | 0 | 118 |
| 117 | 153 | -36 | 0 | 119 |
| 29.4 | 153 | -123.6 | 0 | 120 |
| 56.91 | 153 | -96.09 | 0 | 121 |
| 56.91 | 153 | -96.09 | 0 | 122 |
| 21.95 | 153 | -131.05 | 0 | 123 |
| 24.13 | 153 | -128.87 | 0 | 124 |
| 28.1 | 153 | -124.9 | 0 | 125 |
| 26.72 | 153 | -126.28 | 0 | 126 |
| | | | | |
| 105 | 153 | -48 | 0 | 127 |
| 70.4 | 153 | -82.6 | 0 | 128 |
| 62.9 | 153 | -90.1 | 0 | 129 |
| 51.4 | 153 | -101.6 | 0 | 130 |
| 52.1 | 153 | -100.9 | 0 | 131 |
| 78.5 | 153 | -74.5 | 0 | 132 |
| 117 | 153 | -36 | 0 | 133 |
| 29.4 | 153 | -123.6 | 0 | 134 |
| 56.91 | 153 | -96.09 | 0 | 135 |
| 56.91 | 153 | -96.09 | 0 | 136 |
| 21.95 | 153 | -131.05 | 0 | 137 |
| 24.13 | 153 | -128.87 | 0 | 138 |
| 28.1 | 153 | -124.9 | 0 | 139 |
| 26.72 | 153 | -126.28 | 0 | 140 |
| | | | | |
| 70.4 | 105 | -34.6 | 0 | 141 |
| 62.9 | 105 | -42.1 | 0 | 142 |
| 51.4 | 105 | -53.6 | 0 | 143 |
| 52.1 | 105 | -52.9 | 0 | 144 |
| 78.5 | 105 | -26.5 | 0 | 145 |
| 117 | 105 | 12 | 1 | 145 |
| 29.4 | 105 | -75.6 | 1 | 146 |
| 56.91 | 105 | -48.09 | 1 | 147 |
| 56.91 | 105 | -48.09 | 1 | 148 |
| 21.95 | 105 | -83.05 | 1 | 149 |
| 24.13 | 105 | -80.87 | 1 | 150 |
| 28.1 | 105 | -76.9 | 1 | 151 |
| 26.72 | 105 | -78.28 | 1 | 152 |
| | | | | |
| 62.9 | 70.4 | -7.5 | 1 | 153 |
| 51.4 | 70.4 | -19 | 1 | 154 |
| 52.1 | 70.4 | -18.3 | 1 | 155 |
| 78.5 | 70.4 | 8.1 | 2 | 155 |
| 117 | 70.4 | 46.6 | 3 | 155 |
| 29.4 | 70.4 | -41 | 3 | 156 |
| 56.91 | 70.4 | -13.49 | 3 | 157 |
| 56.91 | 70.4 | -13.49 | 3 | 158 |
| 21.95 | 70.4 | -48.45 | 3 | 159 |

| | | | | |
|---|---|---|---|---|
| 24.13 | 70.4 | -46.27 | 3 | 160 |
| 28.1 | 70.4 | -42.3 | 3 | 161 |
| 26.72 | 70.4 | -43.68 | 3 | 162 |
| | | | | |
| 51.4 | 62.9 | -11.5 | 3 | 163 |
| 52.1 | 62.9 | -10.8 | 3 | 164 |
| 78.5 | 62.9 | 15.6 | 4 | 164 |
| 117 | 62.9 | 54.1 | 5 | 164 |
| 29.4 | 62.9 | -33.5 | 5 | 165 |
| 56.91 | 62.9 | -5.99 | 5 | 166 |
| 56.91 | 62.9 | -5.99 | 5 | 167 |
| 21.95 | 62.9 | -40.95 | 5 | 168 |
| 24.13 | 62.9 | -38.77 | 5 | 169 |
| 28.1 | 62.9 | -34.8 | 5 | 170 |
| 26.72 | 62.9 | -36.18 | 5 | 171 |
| | | | | |
| 52.1 | 51.4 | 0.7 | 6 | 171 |
| 78.5 | 51.4 | 27.1 | 7 | 171 |
| 117 | 51.4 | 65.6 | 8 | 171 |
| 29.4 | 51.4 | -22 | 8 | 172 |
| 56.91 | 51.4 | 5.51 | 9 | 172 |
| 56.91 | 51.4 | 5.51 | 10 | 172 |
| 21.95 | 51.4 | -29.45 | 10 | 173 |
| 24.13 | 51.4 | -27.27 | 10 | 174 |
| 28.1 | 51.4 | -23.3 | 10 | 175 |
| 26.72 | 51.4 | -24.68 | 10 | 176 |
| | | | | |
| 78.5 | 52.1 | 26.4 | 11 | 176 |
| 117 | 52.1 | 64.9 | 12 | 176 |
| 29.4 | 52.1 | -22.7 | 12 | 177 |
| 56.91 | 52.1 | 4.81 | 13 | 177 |
| 56.91 | 52.1 | 4.81 | 14 | 177 |
| 21.95 | 52.1 | -30.15 | 14 | 178 |
| 24.13 | 52.1 | -27.97 | 14 | 179 |
| 28.1 | 52.1 | -24 | 14 | 180 |
| 26.72 | 52.1 | -25.38 | 14 | 181 |
| | | | | |
| 117 | 78.5 | 38.5 | 15 | 181 |
| 29.4 | 78.5 | -49.1 | 15 | 182 |
| 56.91 | 78.5 | -21.59 | 15 | 183 |
| 56.91 | 78.5 | -21.59 | 15 | 184 |
| 21.95 | 78.5 | -56.55 | 15 | 185 |
| 24.13 | 78.5 | -54.37 | 15 | 186 |
| 28.1 | 78.5 | -50.4 | 15 | 187 |
| 26.72 | 78.5 | -51.78 | 15 | 188 |
| | | | | |
| 29.4 | 117 | -87.6 | 15 | 189 |
| 56.91 | 117 | -60.09 | 15 | 190 |
| 56.91 | 117 | -60.09 | 15 | 191 |
| 21.95 | 117 | -95.05 | 15 | 192 |
| 24.13 | 117 | -92.87 | 15 | 193 |
| 28.1 | 117 | -88.9 | 15 | 194 |
| 26.72 | 117 | -90.28 | 15 | 195 |
| | | | | |
| 56.91 | 29.4 | 27.51 | 16 | 195 |
| 56.91 | 29.4 | 27.51 | 17 | 195 |
| 21.95 | 29.4 | -7.45 | 17 | 196 |

| | | | | |
|---|---|---|---|---|
| 24.13 | 29.4 | -5.27 | 17 | 197 |
| 28.1 | 29.4 | -1.3 | 17 | 198 |
| 26.72 | 29.4 | -2.68 | 17 | 199 |
| | | | | |
| 56.91 | 56.91 | Same Date | 17 | 199 |
| 21.95 | 56.91 | -34.96 | 17 | 200 |
| 24.13 | 56.91 | -32.78 | 17 | 201 |
| 28.1 | 56.91 | -28.81 | 17 | 202 |
| 26.72 | 56.91 | -30.19 | 17 | 203 |
| | | | | |
| 21.95 | 56.91 | -34.96 | 17 | 204 |
| 24.13 | 56.91 | -32.78 | 17 | 205 |
| 28.1 | 56.91 | -28.81 | 17 | 206 |
| 26.72 | 56.91 | -30.19 | 17 | 207 |
| | | | | |
| 24.13 | 21.95 | 2.18 | 18 | 207 |
| 28.1 | 21.95 | 6.15 | 19 | 207 |
| 26.72 | 21.95 | 4.77 | 20 | 207 |
| | | | | |
| 28.1 | 24.13 | 3.97 | 21 | 207 |
| 26.72 | 24.13 | 2.59 | 22 | 207 |
| | | | | |
| 26.72 | 28.1 | -1.38 | 22 | 208 |

S Statistic = 22 - 208 = -186

| Tied Group | Value | Members |
|---|---|---|
| 1 | 153 | 4 |
| 2 | 151 | 4 |
| 3 | 56.91 | 2 |

| Time Period | Observations |
|---|---|
| 5/1/2019 | 10 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 2 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 2 time periods with multiple data

A = 330
B = 2268
C = 48
D = 720
E = 26
F = 92
a = 29256
b = 109296

c = 1104
Group Variance = 1483.48
Z-Score = -4.8032
Comparison Level at 95% confidence level = -1.65463 (downward trend)
**-4.8032 < -1.65463 indicating a downward trend**

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RW23-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| ND<1.5 U | ND<1.5 U | Same Date | 0 | 0 |
| 0.88 J | ND<1.5 U | -0.62 | 0 | 1 |
| 1.3 J | ND<1.5 U | -0.2 | 0 | 2 |
| 0.52 J | ND<1.5 U | -0.98 | 0 | 3 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 3 |
| ND<1.5 U1c | ND<1.5 U | 0 | 0 | 3 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 3 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 3 |
| ND<0.5 U | ND<1.5 U | -1 | 0 | 4 |
| ND<1 U | ND<1.5 U | -0.5 | 0 | 5 |
| 0.1371 J | ND<1.5 U | -1.3629 | 0 | 6 |
| 0.0966 J | ND<1.5 U | -1.4034 | 0 | 7 |
| 0.1232 J | ND<1.5 U | -1.3768 | 0 | 8 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 9 |
| 8.464 | ND<1.5 U | 6.964 | 1 | 9 |
| | | | | |
| 0.88 J | ND<1.5 U | -0.62 | 1 | 10 |
| 1.3 J | ND<1.5 U | -0.2 | 1 | 11 |
| 0.52 J | ND<1.5 U | -0.98 | 1 | 12 |
| ND<1.5 U | ND<1.5 U | 0 | 1 | 12 |
| ND<1.5 U1c | ND<1.5 U | 0 | 1 | 12 |
| ND<1.5 U | ND<1.5 U | 0 | 1 | 12 |
| ND<1.5 U | ND<1.5 U | 0 | 1 | 12 |
| ND<0.5 U | ND<1.5 U | -1 | 1 | 13 |
| ND<1 U | ND<1.5 U | -0.5 | 1 | 14 |
| 0.1371 J | ND<1.5 U | -1.3629 | 1 | 15 |
| 0.0966 J | ND<1.5 U | -1.4034 | 1 | 16 |
| 0.1232 J | ND<1.5 U | -1.3768 | 1 | 17 |
| ND<0.1 U | ND<1.5 U | -1.4 | 1 | 18 |
| 8.464 | ND<1.5 U | 6.964 | 2 | 18 |
| | | | | |
| 1.3 J | 0.88 J | 0.42 | 3 | 18 |
| 0.52 J | 0.88 J | -0.36 | 3 | 19 |
| ND<1.5 U | 0.88 J | 0.62 | 4 | 19 |
| ND<1.5 U1c | 0.88 J | 0.62 | 5 | 19 |
| ND<1.5 U | 0.88 J | 0.62 | 6 | 19 |
| ND<1.5 U | 0.88 J | 0.62 | 7 | 19 |
| ND<0.5 U | 0.88 J | -0.38 | 7 | 20 |
| ND<1 U | 0.88 J | 0.12 | 8 | 20 |
| 0.1371 J | 0.88 J | -0.7429 | 8 | 21 |
| 0.0966 J | 0.88 J | -0.7834 | 8 | 22 |
| 0.1232 J | 0.88 J | -0.7568 | 8 | 23 |
| ND<0.1 U | 0.88 J | -0.78 | 8 | 24 |
| 8.464 | 0.88 J | 7.584 | 9 | 24 |
| | | | | |
| 0.52 J | 1.3 J | -0.78 | 9 | 25 |
| ND<1.5 U | 1.3 J | 0.2 | 10 | 25 |

| | | | | |
|---|---|---|---|---|
| ND<1.5 U1c | 1.3 J | 0.2 | 11 | 25 |
| ND<1.5 U | 1.3 J | 0.2 | 12 | 25 |
| ND<1.5 U | 1.3 J | 0.2 | 13 | 25 |
| ND<0.5 U | 1.3 J | -0.8 | 13 | 26 |
| ND<1 U | 1.3 J | -0.3 | 13 | 27 |
| 0.1371 J | 1.3 J | -1.1629 | 13 | 28 |
| 0.0966 J | 1.3 J | -1.2034 | 13 | 29 |
| 0.1232 J | 1.3 J | -1.1768 | 13 | 30 |
| ND<0.1 U | 1.3 J | -1.2 | 13 | 31 |
| 8.464 | 1.3 J | 7.164 | 14 | 31 |
| | | | | |
| ND<1.5 U | 0.52 J | 0.98 | 15 | 31 |
| ND<1.5 U1c | 0.52 J | 0.98 | 16 | 31 |
| ND<1.5 U | 0.52 J | 0.98 | 17 | 31 |
| ND<1.5 U | 0.52 J | 0.98 | 18 | 31 |
| ND<0.5 U | 0.52 J | -0.02 | 18 | 32 |
| ND<1 U | 0.52 J | 0.48 | 19 | 32 |
| 0.1371 J | 0.52 J | -0.3829 | 19 | 33 |
| 0.0966 J | 0.52 J | -0.4234 | 19 | 34 |
| 0.1232 J | 0.52 J | -0.3968 | 19 | 35 |
| ND<0.1 U | 0.52 J | -0.42 | 19 | 36 |
| 8.464 | 0.52 J | 7.944 | 20 | 36 |
| | | | | |
| ND<1.5 U1c | ND<1.5 U | 0 | 20 | 36 |
| ND<1.5 U | ND<1.5 U | 0 | 20 | 36 |
| ND<1.5 U | ND<1.5 U | 0 | 20 | 36 |
| ND<0.5 U | ND<1.5 U | -1 | 20 | 37 |
| ND<1 U | ND<1.5 U | -0.5 | 20 | 38 |
| 0.1371 J | ND<1.5 U | -1.3629 | 20 | 39 |
| 0.0966 J | ND<1.5 U | -1.4034 | 20 | 40 |
| 0.1232 J | ND<1.5 U | -1.3768 | 20 | 41 |
| ND<0.1 U | ND<1.5 U | -1.4 | 20 | 42 |
| 8.464 | ND<1.5 U | 6.964 | 21 | 42 |
| | | | | |
| ND<1.5 U | ND<1.5 U1c | 0 | 21 | 42 |
| ND<1.5 U | ND<1.5 U1c | 0 | 21 | 42 |
| ND<0.5 U | ND<1.5 U1c | -1 | 21 | 43 |
| ND<1 U | ND<1.5 U1c | -0.5 | 21 | 44 |
| 0.1371 J | ND<1.5 U1c | -1.3629 | 21 | 45 |
| 0.0966 J | ND<1.5 U1c | -1.4034 | 21 | 46 |
| 0.1232 J | ND<1.5 U1c | -1.3768 | 21 | 47 |
| ND<0.1 U | ND<1.5 U1c | -1.4 | 21 | 48 |
| 8.464 | ND<1.5 U1c | 6.964 | 22 | 48 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 22 | 48 |
| ND<0.5 U | ND<1.5 U | -1 | 22 | 49 |
| ND<1 U | ND<1.5 U | -0.5 | 22 | 50 |
| 0.1371 J | ND<1.5 U | -1.3629 | 22 | 51 |
| 0.0966 J | ND<1.5 U | -1.4034 | 22 | 52 |
| 0.1232 J | ND<1.5 U | -1.3768 | 22 | 53 |
| ND<0.1 U | ND<1.5 U | -1.4 | 22 | 54 |
| 8.464 | ND<1.5 U | 6.964 | 23 | 54 |
| | | | | |
| ND<0.5 U | ND<1.5 U | -1 | 23 | 55 |
| ND<1 U | ND<1.5 U | -0.5 | 23 | 56 |
| 0.1371 J | ND<1.5 U | -1.3629 | 23 | 57 |
| 0.0966 J | ND<1.5 U | -1.4034 | 23 | 58 |

| | | | | |
|---|---|---|---|---|
| 0.1232 J | ND<1.5 U | -1.3768 | 23 | 59 |
| ND<0.1 U | ND<1.5 U | -1.4 | 23 | 60 |
| 8.464 | ND<1.5 U | 6.964 | 24 | 60 |
| | | | | |
| ND<1 U | ND<0.5 U | 0.5 | 25 | 60 |
| 0.1371 J | ND<0.5 U | -0.3629 | 25 | 61 |
| 0.0966 J | ND<0.5 U | -0.4034 | 25 | 62 |
| 0.1232 J | ND<0.5 U | -0.3768 | 25 | 63 |
| ND<0.1 U | ND<0.5 U | -0.4 | 25 | 64 |
| 8.464 | ND<0.5 U | 7.964 | 26 | 64 |
| | | | | |
| 0.1371 J | ND<1 U | -0.8629 | 26 | 65 |
| 0.0966 J | ND<1 U | -0.9034 | 26 | 66 |
| 0.1232 J | ND<1 U | -0.8768 | 26 | 67 |
| ND<0.1 U | ND<1 U | -0.9 | 26 | 68 |
| 8.464 | ND<1 U | 7.464 | 27 | 68 |
| | | | | |
| 0.0966 J | 0.1371 J | -0.0405 | 27 | 69 |
| 0.1232 J | 0.1371 J | -0.0139 | 27 | 70 |
| ND<0.1 U | 0.1371 J | -0.0371 | 27 | 71 |
| 8.464 | 0.1371 J | 8.3269 | 28 | 71 |
| | | | | |
| 0.1232 J | 0.0966 J | 0.0266 | 29 | 71 |
| ND<0.1 U | 0.0966 J | 0.0034 | 30 | 71 |
| 8.464 | 0.0966 J | 8.3674 | 31 | 71 |
| | | | | |
| ND<0.1 U | 0.1232 J | -0.0232 | 31 | 72 |
| 8.464 | 0.1232 J | 8.3408 | 32 | 72 |
| | | | | |
| 8.464 | ND<0.1 U | 8.364 | 33 | 72 |

S Statistic = 33 - 72 = -39

| Tied Group | Value | Members |
|---|---|---|
| 1 | 1.5 | 6 |

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 510
B = 18

C = 120
D = 0
E = 30
F = 2
a = 8880
b = 30240
c = 480
Group Variance = 464.125
Z-Score = -1.76387
Comparison Level at 95% confidence level = -1.65463 (downward trend)
**-1.76387 < -1.65463 indicating a downward trend**

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RW24-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 0.91 J | ND<1.5 U | Same Date | 0 | 0 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 0 |
| 0.43 J | ND<1.5 U | -1.07 | 0 | 1 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 1 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 1 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 1 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 1 |
| | | | | |
| ND<1.5 U | 0.91 J | 0.59 | 1 | 1 |
| 0.43 J | 0.91 J | -0.48 | 1 | 2 |
| ND<1.5 U | 0.91 J | 0.59 | 2 | 2 |
| ND<1.5 U | 0.91 J | 0.59 | 3 | 2 |
| ND<1.5 U | 0.91 J | 0.59 | 4 | 2 |
| ND<1.5 U | 0.91 J | 0.59 | 5 | 2 |
| | | | | |
| 0.43 J | ND<1.5 U | -1.07 | 5 | 3 |
| ND<1.5 U | ND<1.5 U | 0 | 5 | 3 |
| ND<1.5 U | ND<1.5 U | 0 | 5 | 3 |
| ND<1.5 U | ND<1.5 U | 0 | 5 | 3 |
| ND<1.5 U | ND<1.5 U | 0 | 5 | 3 |
| | | | | |
| ND<1.5 U | 0.43 J | 1.07 | 6 | 3 |
| ND<1.5 U | 0.43 J | 1.07 | 7 | 3 |
| ND<1.5 U | 0.43 J | 1.07 | 8 | 3 |
| ND<1.5 U | 0.43 J | 1.07 | 9 | 3 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 9 | 3 |
| ND<1.5 U | ND<1.5 U | 0 | 9 | 3 |
| ND<1.5 U | ND<1.5 U | 0 | 9 | 3 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 9 | 3 |
| ND<1.5 U | ND<1.5 U | 0 | 9 | 3 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 9 | 3 |

S Statistic = 9 - 3 = 6

| Tied Group | Value | Members |
|---|---|---|
| 1 | 1.5 | 6 |

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |

6/1/2020 1
9/1/2020 1
11/1/2020 1
There are 1 time periods with multiple data

---

A = 510
B = 18
C = 120
D = 0
E = 30
F = 2
a = 1176
b = 3024
c = 112
Group Variance = 36.5357
Z-Score = 0.827201
Comparison Level at 95% confidence level = -1.65463 (downward trend)
0.827201 >= -1.65463 indicating no evidence of a downward trend

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RW25-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 491 | 495 | Same Date | 0 | 0 |
| 599 | 495 | 104 | 1 | 0 |
| 9.9 | 495 | -485.1 | 1 | 1 |
| 2.7 J | 495 | -492.3 | 1 | 2 |
| 4.6 | 495 | -490.4 | 1 | 3 |
| 7 | 495 | -488 | 1 | 4 |
| 8.6 | 495 | -486.4 | 1 | 5 |
| | | | | |
| 599 | 491 | 108 | 2 | 5 |
| 9.9 | 491 | -481.1 | 2 | 6 |
| 2.7 J | 491 | -488.3 | 2 | 7 |
| 4.6 | 491 | -486.4 | 2 | 8 |
| 7 | 491 | -484 | 2 | 9 |
| 8.6 | 491 | -482.4 | 2 | 10 |
| | | | | |
| 9.9 | 599 | -589.1 | 2 | 11 |
| 2.7 J | 599 | -596.3 | 2 | 12 |
| 4.6 | 599 | -594.4 | 2 | 13 |
| 7 | 599 | -592 | 2 | 14 |
| 8.6 | 599 | -590.4 | 2 | 15 |
| | | | | |
| 2.7 J | 9.9 | -7.2 | 2 | 16 |
| 4.6 | 9.9 | -5.3 | 2 | 17 |
| 7 | 9.9 | -2.9 | 2 | 18 |
| 8.6 | 9.9 | -1.3 | 2 | 19 |
| | | | | |
| 4.6 | 2.7 J | 1.9 | 3 | 19 |
| 7 | 2.7 J | 4.3 | 4 | 19 |
| 8.6 | 2.7 J | 5.9 | 5 | 19 |
| | | | | |
| 7 | 4.6 | 2.4 | 6 | 19 |
| 8.6 | 4.6 | 4 | 7 | 19 |
| | | | | |
| 8.6 | 7 | 1.6 | 8 | 19 |

S Statistic = 8 - 19 = -11

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |

9/1/2020 1
11/1/2020 1
There are 1 time periods with multiple data

---

A = 0
B = 18
C = 0
D = 0
E = 0
F = 2
a = 1176
b = 3024
c = 112
Group Variance = 64.3333
Z-Score = -1.24676
Comparison Level at 95% confidence level = -1.65463 (downward trend)
-1.24676 >= -1.65463 indicating no evidence of a downward trend

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RWA-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 6.2 1c2c | 2.3 J | Same Date | 0 | 0 |
| 0.42 J | 2.3 J | Same Date | 0 | 0 |
| 0.42 J | 2.3 J | Same Date | 0 | 0 |
| 1.8 J | 2.3 J | Same Date | 0 | 0 |
| 1.8 J | 2.3 J | Same Date | 0 | 0 |
| 1.8 J | 2.3 J | Same Date | 0 | 0 |
| 1.8 J | 2.3 J | Same Date | 0 | 0 |
| 0.42 J | 2.3 J | Same Date | 0 | 0 |
| 0.42 J | 2.3 J | Same Date | 0 | 0 |
| 24 | 2.3 J | 21.7 | 1 | 0 |
| 4.4 | 2.3 J | 2.1 | 2 | 0 |
| 0.6 J | 2.3 J | -1.7 | 2 | 1 |
| 0.88 J | 2.3 J | -1.42 | 2 | 2 |
| 2.9 J | 2.3 J | 0.6 | 3 | 2 |
| 1.5 J | 2.3 J | -0.8 | 3 | 3 |
| 0.48 J | 2.3 J | -1.82 | 3 | 4 |
| ND<0.5 U | 2.3 J | -1.8 | 3 | 5 |
| ND<1 U | 2.3 J | -1.3 | 3 | 6 |
| 3.942 | 2.3 J | 1.642 | 4 | 6 |
| 5.859 | 2.3 J | 3.559 | 5 | 6 |
| 4.392 | 2.3 J | 2.092 | 6 | 6 |
| 1.784 | 2.3 J | -0.516 | 6 | 7 |
| 2.186 | 2.3 J | -0.114 | 6 | 8 |
| | | | | |
| 0.42 J | 6.2 1c2c | Same Date | 6 | 8 |
| 0.42 J | 6.2 1c2c | Same Date | 6 | 8 |
| 1.8 J | 6.2 1c2c | Same Date | 6 | 8 |
| 1.8 J | 6.2 1c2c | Same Date | 6 | 8 |
| 1.8 J | 6.2 1c2c | Same Date | 6 | 8 |
| 1.8 J | 6.2 1c2c | Same Date | 6 | 8 |
| 0.42 J | 6.2 1c2c | Same Date | 6 | 8 |
| 0.42 J | 6.2 1c2c | Same Date | 6 | 8 |
| 24 | 6.2 1c2c | 17.8 | 7 | 8 |
| 4.4 | 6.2 1c2c | -1.8 | 7 | 9 |
| 0.6 J | 6.2 1c2c | -5.6 | 7 | 10 |
| 0.88 J | 6.2 1c2c | -5.32 | 7 | 11 |
| 2.9 J | 6.2 1c2c | -3.3 | 7 | 12 |
| 1.5 J | 6.2 1c2c | -4.7 | 7 | 13 |
| 0.48 J | 6.2 1c2c | -5.72 | 7 | 14 |
| ND<0.5 U | 6.2 1c2c | -5.7 | 7 | 15 |
| ND<1 U | 6.2 1c2c | -5.2 | 7 | 16 |
| 3.942 | 6.2 1c2c | -2.258 | 7 | 17 |
| 5.859 | 6.2 1c2c | -0.341 | 7 | 18 |
| 4.392 | 6.2 1c2c | -1.808 | 7 | 19 |
| 1.784 | 6.2 1c2c | -4.416 | 7 | 20 |
| 2.186 | 6.2 1c2c | -4.014 | 7 | 21 |

| | | | | |
|---|---|---|---|---|
| 0.42 J | 0.42 J | Same Date | 7 | 21 |
| 1.8 J | 0.42 J | Same Date | 7 | 21 |
| 1.8 J | 0.42 J | Same Date | 7 | 21 |
| 1.8 J | 0.42 J | Same Date | 7 | 21 |
| 1.8 J | 0.42 J | Same Date | 7 | 21 |
| 0.42 J | 0.42 J | Same Date | 7 | 21 |
| 0.42 J | 0.42 J | Same Date | 7 | 21 |
| 24 | 0.42 J | 23.58 | 8 | 21 |
| 4.4 | 0.42 J | 3.98 | 9 | 21 |
| 0.6 J | 0.42 J | 0.18 | 10 | 21 |
| 0.88 J | 0.42 J | 0.46 | 11 | 21 |
| 2.9 J | 0.42 J | 2.48 | 12 | 21 |
| 1.5 J | 0.42 J | 1.08 | 13 | 21 |
| 0.48 J | 0.42 J | 0.06 | 14 | 21 |
| ND<0.5 U | 0.42 J | 0.08 | 15 | 21 |
| ND<1 U | 0.42 J | 0.58 | 16 | 21 |
| 3.942 | 0.42 J | 3.522 | 17 | 21 |
| 5.859 | 0.42 J | 5.439 | 18 | 21 |
| 4.392 | 0.42 J | 3.972 | 19 | 21 |
| 1.784 | 0.42 J | 1.364 | 20 | 21 |
| 2.186 | 0.42 J | 1.766 | 21 | 21 |
| | | | | |
| 1.8 J | 0.42 J | Same Date | 21 | 21 |
| 1.8 J | 0.42 J | Same Date | 21 | 21 |
| 1.8 J | 0.42 J | Same Date | 21 | 21 |
| 1.8 J | 0.42 J | Same Date | 21 | 21 |
| 0.42 J | 0.42 J | Same Date | 21 | 21 |
| 0.42 J | 0.42 J | Same Date | 21 | 21 |
| 24 | 0.42 J | 23.58 | 22 | 21 |
| 4.4 | 0.42 J | 3.98 | 23 | 21 |
| 0.6 J | 0.42 J | 0.18 | 24 | 21 |
| 0.88 J | 0.42 J | 0.46 | 25 | 21 |
| 2.9 J | 0.42 J | 2.48 | 26 | 21 |
| 1.5 J | 0.42 J | 1.08 | 27 | 21 |
| 0.48 J | 0.42 J | 0.06 | 28 | 21 |
| ND<0.5 U | 0.42 J | 0.08 | 29 | 21 |
| ND<1 U | 0.42 J | 0.58 | 30 | 21 |
| 3.942 | 0.42 J | 3.522 | 31 | 21 |
| 5.859 | 0.42 J | 5.439 | 32 | 21 |
| 4.392 | 0.42 J | 3.972 | 33 | 21 |
| 1.784 | 0.42 J | 1.364 | 34 | 21 |
| 2.186 | 0.42 J | 1.766 | 35 | 21 |
| | | | | |
| 1.8 J | 1.8 J | Same Date | 35 | 21 |
| 1.8 J | 1.8 J | Same Date | 35 | 21 |
| 1.8 J | 1.8 J | Same Date | 35 | 21 |
| 0.42 J | 1.8 J | Same Date | 35 | 21 |
| 0.42 J | 1.8 J | Same Date | 35 | 21 |
| 24 | 1.8 J | 22.2 | 36 | 21 |
| 4.4 | 1.8 J | 2.6 | 37 | 21 |
| 0.6 J | 1.8 J | -1.2 | 37 | 22 |
| 0.88 J | 1.8 J | -0.92 | 37 | 23 |
| 2.9 J | 1.8 J | 1.1 | 38 | 23 |
| 1.5 J | 1.8 J | -0.3 | 38 | 24 |
| 0.48 J | 1.8 J | -1.32 | 38 | 25 |
| ND<0.5 U | 1.8 J | -1.3 | 38 | 26 |
| ND<1 U | 1.8 J | -0.8 | 38 | 27 |

| | | | | |
|---|---|---|---|---|
| 3.942 | 1.8 J | 2.142 | 39 | 27 |
| 5.859 | 1.8 J | 4.059 | 40 | 27 |
| 4.392 | 1.8 J | 2.592 | 41 | 27 |
| 1.784 | 1.8 J | -0.016 | 41 | 28 |
| 2.186 | 1.8 J | 0.386 | 42 | 28 |
| | | | | |
| 1.8 J | 1.8 J | Same Date | 42 | 28 |
| 1.8 J | 1.8 J | Same Date | 42 | 28 |
| 0.42 J | 1.8 J | Same Date | 42 | 28 |
| 0.42 J | 1.8 J | Same Date | 42 | 28 |
| 24 | 1.8 J | 22.2 | 43 | 28 |
| 4.4 | 1.8 J | 2.6 | 44 | 28 |
| 0.6 J | 1.8 J | -1.2 | 44 | 29 |
| 0.88 J | 1.8 J | -0.92 | 44 | 30 |
| 2.9 J | 1.8 J | 1.1 | 45 | 30 |
| 1.5 J | 1.8 J | -0.3 | 45 | 31 |
| 0.48 J | 1.8 J | -1.32 | 45 | 32 |
| ND<0.5 U | 1.8 J | -1.3 | 45 | 33 |
| ND<1 U | 1.8 J | -0.8 | 45 | 34 |
| 3.942 | 1.8 J | 2.142 | 46 | 34 |
| 5.859 | 1.8 J | 4.059 | 47 | 34 |
| 4.392 | 1.8 J | 2.592 | 48 | 34 |
| 1.784 | 1.8 J | -0.016 | 48 | 35 |
| 2.186 | 1.8 J | 0.386 | 49 | 35 |
| | | | | |
| 1.8 J | 1.8 J | Same Date | 49 | 35 |
| 0.42 J | 1.8 J | Same Date | 49 | 35 |
| 0.42 J | 1.8 J | Same Date | 49 | 35 |
| 24 | 1.8 J | 22.2 | 50 | 35 |
| 4.4 | 1.8 J | 2.6 | 51 | 35 |
| 0.6 J | 1.8 J | -1.2 | 51 | 36 |
| 0.88 J | 1.8 J | -0.92 | 51 | 37 |
| 2.9 J | 1.8 J | 1.1 | 52 | 37 |
| 1.5 J | 1.8 J | -0.3 | 52 | 38 |
| 0.48 J | 1.8 J | -1.32 | 52 | 39 |
| ND<0.5 U | 1.8 J | -1.3 | 52 | 40 |
| ND<1 U | 1.8 J | -0.8 | 52 | 41 |
| 3.942 | 1.8 J | 2.142 | 53 | 41 |
| 5.859 | 1.8 J | 4.059 | 54 | 41 |
| 4.392 | 1.8 J | 2.592 | 55 | 41 |
| 1.784 | 1.8 J | -0.016 | 55 | 42 |
| 2.186 | 1.8 J | 0.386 | 56 | 42 |
| | | | | |
| 0.42 J | 1.8 J | Same Date | 56 | 42 |
| 0.42 J | 1.8 J | Same Date | 56 | 42 |
| 24 | 1.8 J | 22.2 | 57 | 42 |
| 4.4 | 1.8 J | 2.6 | 58 | 42 |
| 0.6 J | 1.8 J | -1.2 | 58 | 43 |
| 0.88 J | 1.8 J | -0.92 | 58 | 44 |
| 2.9 J | 1.8 J | 1.1 | 59 | 44 |
| 1.5 J | 1.8 J | -0.3 | 59 | 45 |
| 0.48 J | 1.8 J | -1.32 | 59 | 46 |
| ND<0.5 U | 1.8 J | -1.3 | 59 | 47 |
| ND<1 U | 1.8 J | -0.8 | 59 | 48 |
| 3.942 | 1.8 J | 2.142 | 60 | 48 |
| 5.859 | 1.8 J | 4.059 | 61 | 48 |
| 4.392 | 1.8 J | 2.592 | 62 | 48 |

| | | | | |
|---|---|---|---|---|
| 1.784 | 1.8 J | -0.016 | 62 | 49 |
| 2.186 | 1.8 J | 0.386 | 63 | 49 |
| | | | | |
| 0.42 J | 0.42 J | Same Date | 63 | 49 |
| 24 | 0.42 J | 23.58 | 64 | 49 |
| 4.4 | 0.42 J | 3.98 | 65 | 49 |
| 0.6 J | 0.42 J | 0.18 | 66 | 49 |
| 0.88 J | 0.42 J | 0.46 | 67 | 49 |
| 2.9 J | 0.42 J | 2.48 | 68 | 49 |
| 1.5 J | 0.42 J | 1.08 | 69 | 49 |
| 0.48 J | 0.42 J | 0.06 | 70 | 49 |
| ND<0.5 U | 0.42 J | 0.08 | 71 | 49 |
| ND<1 U | 0.42 J | 0.58 | 72 | 49 |
| 3.942 | 0.42 J | 3.522 | 73 | 49 |
| 5.859 | 0.42 J | 5.439 | 74 | 49 |
| 4.392 | 0.42 J | 3.972 | 75 | 49 |
| 1.784 | 0.42 J | 1.364 | 76 | 49 |
| 2.186 | 0.42 J | 1.766 | 77 | 49 |
| | | | | |
| 24 | 0.42 J | 23.58 | 78 | 49 |
| 4.4 | 0.42 J | 3.98 | 79 | 49 |
| 0.6 J | 0.42 J | 0.18 | 80 | 49 |
| 0.88 J | 0.42 J | 0.46 | 81 | 49 |
| 2.9 J | 0.42 J | 2.48 | 82 | 49 |
| 1.5 J | 0.42 J | 1.08 | 83 | 49 |
| 0.48 J | 0.42 J | 0.06 | 84 | 49 |
| ND<0.5 U | 0.42 J | 0.08 | 85 | 49 |
| ND<1 U | 0.42 J | 0.58 | 86 | 49 |
| 3.942 | 0.42 J | 3.522 | 87 | 49 |
| 5.859 | 0.42 J | 5.439 | 88 | 49 |
| 4.392 | 0.42 J | 3.972 | 89 | 49 |
| 1.784 | 0.42 J | 1.364 | 90 | 49 |
| 2.186 | 0.42 J | 1.766 | 91 | 49 |
| | | | | |
| 4.4 | 24 | -19.6 | 91 | 50 |
| 0.6 J | 24 | -23.4 | 91 | 51 |
| 0.88 J | 24 | -23.12 | 91 | 52 |
| 2.9 J | 24 | -21.1 | 91 | 53 |
| 1.5 J | 24 | -22.5 | 91 | 54 |
| 0.48 J | 24 | -23.52 | 91 | 55 |
| ND<0.5 U | 24 | -23.5 | 91 | 56 |
| ND<1 U | 24 | -23 | 91 | 57 |
| 3.942 | 24 | -20.058 | 91 | 58 |
| 5.859 | 24 | -18.141 | 91 | 59 |
| 4.392 | 24 | -19.608 | 91 | 60 |
| 1.784 | 24 | -22.216 | 91 | 61 |
| 2.186 | 24 | -21.814 | 91 | 62 |
| | | | | |
| 0.6 J | 4.4 | -3.8 | 91 | 63 |
| 0.88 J | 4.4 | -3.52 | 91 | 64 |
| 2.9 J | 4.4 | -1.5 | 91 | 65 |
| 1.5 J | 4.4 | -2.9 | 91 | 66 |
| 0.48 J | 4.4 | -3.92 | 91 | 67 |
| ND<0.5 U | 4.4 | -3.9 | 91 | 68 |
| ND<1 U | 4.4 | -3.4 | 91 | 69 |
| 3.942 | 4.4 | -0.458 | 91 | 70 |
| 5.859 | 4.4 | 1.459 | 92 | 70 |

| | | | | |
|---|---|---|---|---|
| 4.392 | 4.4 | -0.008 | 92 | 71 |
| 1.784 | 4.4 | -2.616 | 92 | 72 |
| 2.186 | 4.4 | -2.214 | 92 | 73 |
| | | | | |
| 0.88 J | 0.6 J | 0.28 | 93 | 73 |
| 2.9 J | 0.6 J | 2.3 | 94 | 73 |
| 1.5 J | 0.6 J | 0.9 | 95 | 73 |
| 0.48 J | 0.6 J | -0.12 | 95 | 74 |
| ND<0.5 U | 0.6 J | -0.1 | 95 | 75 |
| ND<1 U | 0.6 J | 0.4 | 96 | 75 |
| 3.942 | 0.6 J | 3.342 | 97 | 75 |
| 5.859 | 0.6 J | 5.259 | 98 | 75 |
| 4.392 | 0.6 J | 3.792 | 99 | 75 |
| 1.784 | 0.6 J | 1.184 | 100 | 75 |
| 2.186 | 0.6 J | 1.586 | 101 | 75 |
| | | | | |
| 2.9 J | 0.88 J | 2.02 | 102 | 75 |
| 1.5 J | 0.88 J | 0.62 | 103 | 75 |
| 0.48 J | 0.88 J | -0.4 | 103 | 76 |
| ND<0.5 U | 0.88 J | -0.38 | 103 | 77 |
| ND<1 U | 0.88 J | 0.12 | 104 | 77 |
| 3.942 | 0.88 J | 3.062 | 105 | 77 |
| 5.859 | 0.88 J | 4.979 | 106 | 77 |
| 4.392 | 0.88 J | 3.512 | 107 | 77 |
| 1.784 | 0.88 J | 0.904 | 108 | 77 |
| 2.186 | 0.88 J | 1.306 | 109 | 77 |
| | | | | |
| 1.5 J | 2.9 J | -1.4 | 109 | 78 |
| 0.48 J | 2.9 J | -2.42 | 109 | 79 |
| ND<0.5 U | 2.9 J | -2.4 | 109 | 80 |
| ND<1 U | 2.9 J | -1.9 | 109 | 81 |
| 3.942 | 2.9 J | 1.042 | 110 | 81 |
| 5.859 | 2.9 J | 2.959 | 111 | 81 |
| 4.392 | 2.9 J | 1.492 | 112 | 81 |
| 1.784 | 2.9 J | -1.116 | 112 | 82 |
| 2.186 | 2.9 J | -0.714 | 112 | 83 |
| | | | | |
| 0.48 J | 1.5 J | -1.02 | 112 | 84 |
| ND<0.5 U | 1.5 J | -1 | 112 | 85 |
| ND<1 U | 1.5 J | -0.5 | 112 | 86 |
| 3.942 | 1.5 J | 2.442 | 113 | 86 |
| 5.859 | 1.5 J | 4.359 | 114 | 86 |
| 4.392 | 1.5 J | 2.892 | 115 | 86 |
| 1.784 | 1.5 J | 0.284 | 116 | 86 |
| 2.186 | 1.5 J | 0.686 | 117 | 86 |
| | | | | |
| ND<0.5 U | 0.48 J | 0.02 | 118 | 86 |
| ND<1 U | 0.48 J | 0.52 | 119 | 86 |
| 3.942 | 0.48 J | 3.462 | 120 | 86 |
| 5.859 | 0.48 J | 5.379 | 121 | 86 |
| 4.392 | 0.48 J | 3.912 | 122 | 86 |
| 1.784 | 0.48 J | 1.304 | 123 | 86 |
| 2.186 | 0.48 J | 1.706 | 124 | 86 |
| | | | | |
| ND<1 U | ND<0.5 U | 0.5 | 125 | 86 |
| 3.942 | ND<0.5 U | 3.442 | 126 | 86 |
| 5.859 | ND<0.5 U | 5.359 | 127 | 86 |

| | | | | |
|---|---|---|---|---|
| 4.392 | ND<0.5 U | 3.892 | 128 | 86 |
| 1.784 | ND<0.5 U | 1.284 | 129 | 86 |
| 2.186 | ND<0.5 U | 1.686 | 130 | 86 |
| | | | | |
| 3.942 | ND<1 U | 2.942 | 131 | 86 |
| 5.859 | ND<1 U | 4.859 | 132 | 86 |
| 4.392 | ND<1 U | 3.392 | 133 | 86 |
| 1.784 | ND<1 U | 0.784 | 134 | 86 |
| 2.186 | ND<1 U | 1.186 | 135 | 86 |
| | | | | |
| 5.859 | 3.942 | 1.917 | 136 | 86 |
| 4.392 | 3.942 | 0.45 | 137 | 86 |
| 1.784 | 3.942 | -2.158 | 137 | 87 |
| 2.186 | 3.942 | -1.756 | 137 | 88 |
| | | | | |
| 4.392 | 5.859 | -1.467 | 137 | 89 |
| 1.784 | 5.859 | -4.075 | 137 | 90 |
| 2.186 | 5.859 | -3.673 | 137 | 91 |
| | | | | |
| 1.784 | 4.392 | -2.608 | 137 | 92 |
| 2.186 | 4.392 | -2.206 | 137 | 93 |
| | | | | |
| 2.186 | 1.784 | 0.402 | 138 | 93 |

S Statistic = 138 - 93 = 45

| Tied Group | Value | Members |
|---|---|---|
| 1 | 0.42 | 4 |
| 2 | 1.8 | 4 |

| Time Period | Observations |
|---|---|
| 5/1/2019 | 10 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 312
B = 2250
C = 48
D = 720
E = 24
F = 90
a = 29256
b = 109296

c = 1104
Group Variance = 1485.27
Z-Score = 1.14169
Comparison Level at 95% confidence level = -1.65463 (downward trend)
1.14169 >= -1.65463 indicating no evidence of a downward trend

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RWB-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| ND<1.5 U | 0.6 J1c2c | Same Date | 0 | 0 |
| ND<1.5 U | 0.6 J1c2c | Same Date | 0 | 0 |
| 2.2 J | 0.6 J1c2c | Same Date | 0 | 0 |
| 2.2 J | 0.6 J1c2c | Same Date | 0 | 0 |
| 2.2 J | 0.6 J1c2c | Same Date | 0 | 0 |
| 2.2 J | 0.6 J1c2c | Same Date | 0 | 0 |
| ND<1.5 U | 0.6 J1c2c | Same Date | 0 | 0 |
| ND<1.5 U | 0.6 J1c2c | Same Date | 0 | 0 |
| ND<1.5 U | 0.6 J1c2c | Same Date | 0 | 0 |
| ND<1.5 U | 0.6 J1c2c | 0.9 | 1 | 0 |
| ND<1.5 U | 0.6 J1c2c | 0.9 | 2 | 0 |
| ND<1.5 U | 0.6 J1c2c | 0.9 | 3 | 0 |
| ND<1.5 U | 0.6 J1c2c | 0.9 | 4 | 0 |
| ND<1.5 U | 0.6 J1c2c | 0.9 | 5 | 0 |
| ND<1.5 U | 0.6 J1c2c | 0.9 | 6 | 0 |
| ND<1.5 U | 0.6 J1c2c | 0.9 | 7 | 0 |
| ND<0.5 U | 0.6 J1c2c | -0.1 | 7 | 1 |
| ND<1 U | 0.6 J1c2c | 0.4 | 8 | 1 |
| ND<0.1 U | 0.6 J1c2c | -0.5 | 8 | 2 |
| ND<0.1 U | 0.6 J1c2c | -0.5 | 8 | 3 |
| ND<0.1 U | 0.6 J1c2c | -0.5 | 8 | 4 |
| 0.4092 | 0.6 J1c2c | -0.1908 | 8 | 5 |
| ND<0.1 U | 0.6 J1c2c | -0.5 | 8 | 6 |
| | | | | |
| ND<1.5 U | ND<1.5 U | Same Date | 8 | 6 |
| 2.2 J | ND<1.5 U | Same Date | 8 | 6 |
| 2.2 J | ND<1.5 U | Same Date | 8 | 6 |
| 2.2 J | ND<1.5 U | Same Date | 8 | 6 |
| 2.2 J | ND<1.5 U | Same Date | 8 | 6 |
| ND<1.5 U | ND<1.5 U | Same Date | 8 | 6 |
| ND<1.5 U | ND<1.5 U | Same Date | 8 | 6 |
| ND<1.5 U | ND<1.5 U | Same Date | 8 | 6 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 6 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 6 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 6 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 6 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 6 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 6 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 6 |
| ND<0.5 U | ND<1.5 U | -1 | 8 | 7 |
| ND<1 U | ND<1.5 U | -0.5 | 8 | 8 |
| ND<0.1 U | ND<1.5 U | -1.4 | 8 | 9 |
| ND<0.1 U | ND<1.5 U | -1.4 | 8 | 10 |
| ND<0.1 U | ND<1.5 U | -1.4 | 8 | 11 |
| 0.4092 | ND<1.5 U | -1.0908 | 8 | 12 |
| ND<0.1 U | ND<1.5 U | -1.4 | 8 | 13 |

| | | | | |
|---|---|---|---|---|
| 2.2 J | ND<1.5 U | Same Date | 8 | 13 |
| 2.2 J | ND<1.5 U | Same Date | 8 | 13 |
| 2.2 J | ND<1.5 U | Same Date | 8 | 13 |
| 2.2 J | ND<1.5 U | Same Date | 8 | 13 |
| ND<1.5 U | ND<1.5 U | Same Date | 8 | 13 |
| ND<1.5 U | ND<1.5 U | Same Date | 8 | 13 |
| ND<1.5 U | ND<1.5 U | Same Date | 8 | 13 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 13 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 13 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 13 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 13 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 13 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 13 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 13 |
| ND<0.5 U | ND<1.5 U | -1 | 8 | 14 |
| ND<1 U | ND<1.5 U | -0.5 | 8 | 15 |
| ND<0.1 U | ND<1.5 U | -1.4 | 8 | 16 |
| ND<0.1 U | ND<1.5 U | -1.4 | 8 | 17 |
| ND<0.1 U | ND<1.5 U | -1.4 | 8 | 18 |
| 0.4092 | ND<1.5 U | -1.0908 | 8 | 19 |
| ND<0.1 U | ND<1.5 U | -1.4 | 8 | 20 |
| | | | | |
| 2.2 J | 2.2 J | Same Date | 8 | 20 |
| 2.2 J | 2.2 J | Same Date | 8 | 20 |
| 2.2 J | 2.2 J | Same Date | 8 | 20 |
| ND<1.5 U | 2.2 J | Same Date | 8 | 20 |
| ND<1.5 U | 2.2 J | Same Date | 8 | 20 |
| ND<1.5 U | 2.2 J | Same Date | 8 | 20 |
| ND<1.5 U | 2.2 J | -0.7 | 8 | 21 |
| ND<1.5 U | 2.2 J | -0.7 | 8 | 22 |
| ND<1.5 U | 2.2 J | -0.7 | 8 | 23 |
| ND<1.5 U | 2.2 J | -0.7 | 8 | 24 |
| ND<1.5 U | 2.2 J | -0.7 | 8 | 25 |
| ND<1.5 U | 2.2 J | -0.7 | 8 | 26 |
| ND<1.5 U | 2.2 J | -0.7 | 8 | 27 |
| ND<0.5 U | 2.2 J | -1.7 | 8 | 28 |
| ND<1 U | 2.2 J | -1.2 | 8 | 29 |
| ND<0.1 U | 2.2 J | -2.1 | 8 | 30 |
| ND<0.1 U | 2.2 J | -2.1 | 8 | 31 |
| ND<0.1 U | 2.2 J | -2.1 | 8 | 32 |
| 0.4092 | 2.2 J | -1.7908 | 8 | 33 |
| ND<0.1 U | 2.2 J | -2.1 | 8 | 34 |
| | | | | |
| 2.2 J | 2.2 J | Same Date | 8 | 34 |
| 2.2 J | 2.2 J | Same Date | 8 | 34 |
| ND<1.5 U | 2.2 J | Same Date | 8 | 34 |
| ND<1.5 U | 2.2 J | Same Date | 8 | 34 |
| ND<1.5 U | 2.2 J | Same Date | 8 | 34 |
| ND<1.5 U | 2.2 J | -0.7 | 8 | 35 |
| ND<1.5 U | 2.2 J | -0.7 | 8 | 36 |
| ND<1.5 U | 2.2 J | -0.7 | 8 | 37 |
| ND<1.5 U | 2.2 J | -0.7 | 8 | 38 |
| ND<1.5 U | 2.2 J | -0.7 | 8 | 39 |
| ND<1.5 U | 2.2 J | -0.7 | 8 | 40 |
| ND<1.5 U | 2.2 J | -0.7 | 8 | 41 |
| ND<0.5 U | 2.2 J | -1.7 | 8 | 42 |
| ND<1 U | 2.2 J | -1.2 | 8 | 43 |

| | | | | |
|---|---|---|---|---|
| ND<0.1 U | 2.2 J | -2.1 | 8 | 44 |
| ND<0.1 U | 2.2 J | -2.1 | 8 | 45 |
| ND<0.1 U | 2.2 J | -2.1 | 8 | 46 |
| 0.4092 | 2.2 J | -1.7908 | 8 | 47 |
| ND<0.1 U | 2.2 J | -2.1 | 8 | 48 |
| | | | | |
| 2.2 J | 2.2 J | Same Date | 8 | 48 |
| ND<1.5 U | 2.2 J | Same Date | 8 | 48 |
| ND<1.5 U | 2.2 J | Same Date | 8 | 48 |
| ND<1.5 U | 2.2 J | Same Date | 8 | 48 |
| ND<1.5 U | 2.2 J | -0.7 | 8 | 49 |
| ND<1.5 U | 2.2 J | -0.7 | 8 | 50 |
| ND<1.5 U | 2.2 J | -0.7 | 8 | 51 |
| ND<1.5 U | 2.2 J | -0.7 | 8 | 52 |
| ND<1.5 U | 2.2 J | -0.7 | 8 | 53 |
| ND<1.5 U | 2.2 J | -0.7 | 8 | 54 |
| ND<1.5 U | 2.2 J | -0.7 | 8 | 55 |
| ND<0.5 U | 2.2 J | -1.7 | 8 | 56 |
| ND<1 U | 2.2 J | -1.2 | 8 | 57 |
| ND<0.1 U | 2.2 J | -2.1 | 8 | 58 |
| ND<0.1 U | 2.2 J | -2.1 | 8 | 59 |
| ND<0.1 U | 2.2 J | -2.1 | 8 | 60 |
| 0.4092 | 2.2 J | -1.7908 | 8 | 61 |
| ND<0.1 U | 2.2 J | -2.1 | 8 | 62 |
| | | | | |
| ND<1.5 U | 2.2 J | Same Date | 8 | 62 |
| ND<1.5 U | 2.2 J | Same Date | 8 | 62 |
| ND<1.5 U | 2.2 J | Same Date | 8 | 62 |
| ND<1.5 U | 2.2 J | -0.7 | 8 | 63 |
| ND<1.5 U | 2.2 J | -0.7 | 8 | 64 |
| ND<1.5 U | 2.2 J | -0.7 | 8 | 65 |
| ND<1.5 U | 2.2 J | -0.7 | 8 | 66 |
| ND<1.5 U | 2.2 J | -0.7 | 8 | 67 |
| ND<1.5 U | 2.2 J | -0.7 | 8 | 68 |
| ND<1.5 U | 2.2 J | -0.7 | 8 | 69 |
| ND<0.5 U | 2.2 J | -1.7 | 8 | 70 |
| ND<1 U | 2.2 J | -1.2 | 8 | 71 |
| ND<0.1 U | 2.2 J | -2.1 | 8 | 72 |
| ND<0.1 U | 2.2 J | -2.1 | 8 | 73 |
| ND<0.1 U | 2.2 J | -2.1 | 8 | 74 |
| 0.4092 | 2.2 J | -1.7908 | 8 | 75 |
| ND<0.1 U | 2.2 J | -2.1 | 8 | 76 |
| | | | | |
| ND<1.5 U | ND<1.5 U | Same Date | 8 | 76 |
| ND<1.5 U | ND<1.5 U | Same Date | 8 | 76 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 76 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 76 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 76 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 76 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 76 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 76 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 76 |
| ND<0.5 U | ND<1.5 U | -1 | 8 | 77 |
| ND<1 U | ND<1.5 U | -0.5 | 8 | 78 |
| ND<0.1 U | ND<1.5 U | -1.4 | 8 | 79 |
| ND<0.1 U | ND<1.5 U | -1.4 | 8 | 80 |
| ND<0.1 U | ND<1.5 U | -1.4 | 8 | 81 |

| | | | | |
|---|---|---|---|---|
| 0.4092 | ND<1.5 U | -1.0908 | 8 | 82 |
| ND<0.1 U | ND<1.5 U | -1.4 | 8 | 83 |
| | | | | |
| ND<1.5 U | ND<1.5 U | Same Date | 8 | 83 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 83 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 83 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 83 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 83 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 83 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 83 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 83 |
| ND<0.5 U | ND<1.5 U | -1 | 8 | 84 |
| ND<1 U | ND<1.5 U | -0.5 | 8 | 85 |
| ND<0.1 U | ND<1.5 U | -1.4 | 8 | 86 |
| ND<0.1 U | ND<1.5 U | -1.4 | 8 | 87 |
| ND<0.1 U | ND<1.5 U | -1.4 | 8 | 88 |
| 0.4092 | ND<1.5 U | -1.0908 | 8 | 89 |
| ND<0.1 U | ND<1.5 U | -1.4 | 8 | 90 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 90 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 90 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 90 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 90 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 90 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 90 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 90 |
| ND<0.5 U | ND<1.5 U | -1 | 8 | 91 |
| ND<1 U | ND<1.5 U | -0.5 | 8 | 92 |
| ND<0.1 U | ND<1.5 U | -1.4 | 8 | 93 |
| ND<0.1 U | ND<1.5 U | -1.4 | 8 | 94 |
| ND<0.1 U | ND<1.5 U | -1.4 | 8 | 95 |
| 0.4092 | ND<1.5 U | -1.0908 | 8 | 96 |
| ND<0.1 U | ND<1.5 U | -1.4 | 8 | 97 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 97 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 97 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 97 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 97 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 97 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 97 |
| ND<0.5 U | ND<1.5 U | -1 | 8 | 98 |
| ND<1 U | ND<1.5 U | -0.5 | 8 | 99 |
| ND<0.1 U | ND<1.5 U | -1.4 | 8 | 100 |
| ND<0.1 U | ND<1.5 U | -1.4 | 8 | 101 |
| ND<0.1 U | ND<1.5 U | -1.4 | 8 | 102 |
| 0.4092 | ND<1.5 U | -1.0908 | 8 | 103 |
| ND<0.1 U | ND<1.5 U | -1.4 | 8 | 104 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 104 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 104 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 104 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 104 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 104 |
| ND<0.5 U | ND<1.5 U | -1 | 8 | 105 |
| ND<1 U | ND<1.5 U | -0.5 | 8 | 106 |
| ND<0.1 U | ND<1.5 U | -1.4 | 8 | 107 |
| ND<0.1 U | ND<1.5 U | -1.4 | 8 | 108 |

| | | | | |
|---|---|---|---|---|
| ND<0.1 U | ND<1.5 U | -1.4 | 8 | 109 |
| 0.4092 | ND<1.5 U | -1.0908 | 8 | 110 |
| ND<0.1 U | ND<1.5 U | -1.4 | 8 | 111 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 111 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 111 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 111 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 111 |
| ND<0.5 U | ND<1.5 U | -1 | 8 | 112 |
| ND<1 U | ND<1.5 U | -0.5 | 8 | 113 |
| ND<0.1 U | ND<1.5 U | -1.4 | 8 | 114 |
| ND<0.1 U | ND<1.5 U | -1.4 | 8 | 115 |
| ND<0.1 U | ND<1.5 U | -1.4 | 8 | 116 |
| 0.4092 | ND<1.5 U | -1.0908 | 8 | 117 |
| ND<0.1 U | ND<1.5 U | -1.4 | 8 | 118 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 118 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 118 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 118 |
| ND<0.5 U | ND<1.5 U | -1 | 8 | 119 |
| ND<1 U | ND<1.5 U | -0.5 | 8 | 120 |
| ND<0.1 U | ND<1.5 U | -1.4 | 8 | 121 |
| ND<0.1 U | ND<1.5 U | -1.4 | 8 | 122 |
| ND<0.1 U | ND<1.5 U | -1.4 | 8 | 123 |
| 0.4092 | ND<1.5 U | -1.0908 | 8 | 124 |
| ND<0.1 U | ND<1.5 U | -1.4 | 8 | 125 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 125 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 125 |
| ND<0.5 U | ND<1.5 U | -1 | 8 | 126 |
| ND<1 U | ND<1.5 U | -0.5 | 8 | 127 |
| ND<0.1 U | ND<1.5 U | -1.4 | 8 | 128 |
| ND<0.1 U | ND<1.5 U | -1.4 | 8 | 129 |
| ND<0.1 U | ND<1.5 U | -1.4 | 8 | 130 |
| 0.4092 | ND<1.5 U | -1.0908 | 8 | 131 |
| ND<0.1 U | ND<1.5 U | -1.4 | 8 | 132 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 132 |
| ND<0.5 U | ND<1.5 U | -1 | 8 | 133 |
| ND<1 U | ND<1.5 U | -0.5 | 8 | 134 |
| ND<0.1 U | ND<1.5 U | -1.4 | 8 | 135 |
| ND<0.1 U | ND<1.5 U | -1.4 | 8 | 136 |
| ND<0.1 U | ND<1.5 U | -1.4 | 8 | 137 |
| 0.4092 | ND<1.5 U | -1.0908 | 8 | 138 |
| ND<0.1 U | ND<1.5 U | -1.4 | 8 | 139 |
| | | | | |
| ND<0.5 U | ND<1.5 U | -1 | 8 | 140 |
| ND<1 U | ND<1.5 U | -0.5 | 8 | 141 |
| ND<0.1 U | ND<1.5 U | -1.4 | 8 | 142 |
| ND<0.1 U | ND<1.5 U | -1.4 | 8 | 143 |
| ND<0.1 U | ND<1.5 U | -1.4 | 8 | 144 |
| 0.4092 | ND<1.5 U | -1.0908 | 8 | 145 |
| ND<0.1 U | ND<1.5 U | -1.4 | 8 | 146 |
| | | | | |
| ND<1 U | ND<0.5 U | 0.5 | 9 | 146 |
| ND<0.1 U | ND<0.5 U | -0.4 | 9 | 147 |
| ND<0.1 U | ND<0.5 U | -0.4 | 9 | 148 |

| | | | | |
|---|---|---|---|---|
| ND<0.1 U | ND<0.5 U | -0.4 | 9 | 149 |
| 0.4092 | ND<0.5 U | -0.0908 | 9 | 150 |
| ND<0.1 U | ND<0.5 U | -0.4 | 9 | 151 |
| | | | | |
| ND<0.1 U | ND<1 U | -0.9 | 9 | 152 |
| ND<0.1 U | ND<1 U | -0.9 | 9 | 153 |
| ND<0.1 U | ND<1 U | -0.9 | 9 | 154 |
| 0.4092 | ND<1 U | -0.5908 | 9 | 155 |
| ND<0.1 U | ND<1 U | -0.9 | 9 | 156 |
| | | | | |
| ND<0.1 U | ND<0.1 U | 0 | 9 | 156 |
| ND<0.1 U | ND<0.1 U | 0 | 9 | 156 |
| 0.4092 | ND<0.1 U | 0.3092 | 10 | 156 |
| ND<0.1 U | ND<0.1 U | 0 | 10 | 156 |
| | | | | |
| ND<0.1 U | ND<0.1 U | 0 | 10 | 156 |
| 0.4092 | ND<0.1 U | 0.3092 | 11 | 156 |
| ND<0.1 U | ND<0.1 U | 0 | 11 | 156 |
| | | | | |
| 0.4092 | ND<0.1 U | 0.3092 | 12 | 156 |
| ND<0.1 U | ND<0.1 U | 0 | 12 | 156 |
| | | | | |
| ND<0.1 U | 0.4092 | -0.3092 | 12 | 157 |

S Statistic = 12 - 157 = -145

| Tied Group | Value | Members |
|---|---|---|
| 1 | 1.5 | 12 |
| 2 | 2.2 | 4 |
| 3 | 0.1 | 4 |

| Time Period | Observations |
|---|---|
| 5/1/2019 | 10 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 4140
B = 2250
C = 1368
D = 720
E = 156
F = 90
a = 29256

b = 109296
c = 1104
Group Variance = 1292.06
Z-Score = -4.00609
Comparison Level at 95% confidence level = -1.65463 (downward trend)
**-4.00609 < -1.65463 indicating a downward trend**

## Mann-Kendall Trend Analysis
### Parameter: Cadmium
### Location: RWD-MWS
**Original Data (Not Transformed)**
**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| ND<1.5 U2c | ND<1.5 U1c3c | Same Date | 0 | 0 |
| ND<1.5 U | ND<1.5 U1c3c | 0 | 0 | 0 |
| ND<1.5 U | ND<1.5 U1c3c | 0 | 0 | 0 |
| ND<1.5 U | ND<1.5 U1c3c | 0 | 0 | 0 |
| 0.46 J | ND<1.5 U1c3c | -1.04 | 0 | 1 |
| 0.46 J | ND<1.5 U1c3c | -1.04 | 0 | 2 |
| ND<1.5 U | ND<1.5 U1c3c | 0 | 0 | 2 |
| ND<1.5 U | ND<1.5 U1c3c | 0 | 0 | 2 |
| ND<0.5 U | ND<1.5 U1c3c | -1 | 0 | 3 |
| ND<1 U | ND<1.5 U1c3c | -0.5 | 0 | 4 |
| 0.8141 | ND<1.5 U1c3c | -0.6859 | 0 | 5 |
| ND<0.1 U | ND<1.5 U1c3c | -1.4 | 0 | 6 |
| ND<0.1 U | ND<1.5 U1c3c | -1.4 | 0 | 7 |
| ND<0.1 U | ND<1.5 U1c3c | -1.4 | 0 | 8 |
| ND<0.1 U | ND<1.5 U1c3c | -1.4 | 0 | 9 |
| | | | | |
| ND<1.5 U | ND<1.5 U2c | 0 | 0 | 9 |
| ND<1.5 U | ND<1.5 U2c | 0 | 0 | 9 |
| ND<1.5 U | ND<1.5 U2c | 0 | 0 | 9 |
| 0.46 J | ND<1.5 U2c | -1.04 | 0 | 10 |
| 0.46 J | ND<1.5 U2c | -1.04 | 0 | 11 |
| ND<1.5 U | ND<1.5 U2c | 0 | 0 | 11 |
| ND<1.5 U | ND<1.5 U2c | 0 | 0 | 11 |
| ND<0.5 U | ND<1.5 U2c | -1 | 0 | 12 |
| ND<1 U | ND<1.5 U2c | -0.5 | 0 | 13 |
| 0.8141 | ND<1.5 U2c | -0.6859 | 0 | 14 |
| ND<0.1 U | ND<1.5 U2c | -1.4 | 0 | 15 |
| ND<0.1 U | ND<1.5 U2c | -1.4 | 0 | 16 |
| ND<0.1 U | ND<1.5 U2c | -1.4 | 0 | 17 |
| ND<0.1 U | ND<1.5 U2c | -1.4 | 0 | 18 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 18 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 18 |
| 0.46 J | ND<1.5 U | -1.04 | 0 | 19 |
| 0.46 J | ND<1.5 U | -1.04 | 0 | 20 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 20 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 20 |
| ND<0.5 U | ND<1.5 U | -1 | 0 | 21 |
| ND<1 U | ND<1.5 U | -0.5 | 0 | 22 |
| 0.8141 | ND<1.5 U | -0.6859 | 0 | 23 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 24 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 25 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 26 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 27 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 27 |
| 0.46 J | ND<1.5 U | -1.04 | 0 | 28 |

| | | | | |
|---|---|---|---|---|
| 0.46 J | ND<1.5 U | -1.04 | 0 | 29 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 29 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 29 |
| ND<0.5 U | ND<1.5 U | -1 | 0 | 30 |
| ND<1 U | ND<1.5 U | -0.5 | 0 | 31 |
| 0.8141 | ND<1.5 U | -0.6859 | 0 | 32 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 33 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 34 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 35 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 36 |
| | | | | |
| 0.46 J | ND<1.5 U | -1.04 | 0 | 37 |
| 0.46 J | ND<1.5 U | -1.04 | 0 | 38 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 38 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 38 |
| ND<0.5 U | ND<1.5 U | -1 | 0 | 39 |
| ND<1 U | ND<1.5 U | -0.5 | 0 | 40 |
| 0.8141 | ND<1.5 U | -0.6859 | 0 | 41 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 42 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 43 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 44 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 45 |
| | | | | |
| 0.46 J | 0.46 J | 0 | 0 | 45 |
| ND<1.5 U | 0.46 J | 1.04 | 1 | 45 |
| ND<1.5 U | 0.46 J | 1.04 | 2 | 45 |
| ND<0.5 U | 0.46 J | 0.04 | 3 | 45 |
| ND<1 U | 0.46 J | 0.54 | 4 | 45 |
| 0.8141 | 0.46 J | 0.3541 | 5 | 45 |
| ND<0.1 U | 0.46 J | -0.36 | 5 | 46 |
| ND<0.1 U | 0.46 J | -0.36 | 5 | 47 |
| ND<0.1 U | 0.46 J | -0.36 | 5 | 48 |
| ND<0.1 U | 0.46 J | -0.36 | 5 | 49 |
| | | | | |
| ND<1.5 U | 0.46 J | 1.04 | 6 | 49 |
| ND<1.5 U | 0.46 J | 1.04 | 7 | 49 |
| ND<0.5 U | 0.46 J | 0.04 | 8 | 49 |
| ND<1 U | 0.46 J | 0.54 | 9 | 49 |
| 0.8141 | 0.46 J | 0.3541 | 10 | 49 |
| ND<0.1 U | 0.46 J | -0.36 | 10 | 50 |
| ND<0.1 U | 0.46 J | -0.36 | 10 | 51 |
| ND<0.1 U | 0.46 J | -0.36 | 10 | 52 |
| ND<0.1 U | 0.46 J | -0.36 | 10 | 53 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 10 | 53 |
| ND<0.5 U | ND<1.5 U | -1 | 10 | 54 |
| ND<1 U | ND<1.5 U | -0.5 | 10 | 55 |
| 0.8141 | ND<1.5 U | -0.6859 | 10 | 56 |
| ND<0.1 U | ND<1.5 U | -1.4 | 10 | 57 |
| ND<0.1 U | ND<1.5 U | -1.4 | 10 | 58 |
| ND<0.1 U | ND<1.5 U | -1.4 | 10 | 59 |
| ND<0.1 U | ND<1.5 U | -1.4 | 10 | 60 |
| | | | | |
| ND<0.5 U | ND<1.5 U | -1 | 10 | 61 |
| ND<1 U | ND<1.5 U | -0.5 | 10 | 62 |
| 0.8141 | ND<1.5 U | -0.6859 | 10 | 63 |
| ND<0.1 U | ND<1.5 U | -1.4 | 10 | 64 |

| | | | | |
|---|---|---|---|---|
| ND<0.1 U | ND<1.5 U | -1.4 | 10 | 65 |
| ND<0.1 U | ND<1.5 U | -1.4 | 10 | 66 |
| ND<0.1 U | ND<1.5 U | -1.4 | 10 | 67 |
| | | | | |
| ND<1 U | ND<0.5 U | 0.5 | 11 | 67 |
| 0.8141 | ND<0.5 U | 0.3141 | 12 | 67 |
| ND<0.1 U | ND<0.5 U | -0.4 | 12 | 68 |
| ND<0.1 U | ND<0.5 U | -0.4 | 12 | 69 |
| ND<0.1 U | ND<0.5 U | -0.4 | 12 | 70 |
| ND<0.1 U | ND<0.5 U | -0.4 | 12 | 71 |
| | | | | |
| 0.8141 | ND<1 U | -0.1859 | 12 | 72 |
| ND<0.1 U | ND<1 U | -0.9 | 12 | 73 |
| ND<0.1 U | ND<1 U | -0.9 | 12 | 74 |
| ND<0.1 U | ND<1 U | -0.9 | 12 | 75 |
| ND<0.1 U | ND<1 U | -0.9 | 12 | 76 |
| | | | | |
| ND<0.1 U | 0.8141 | -0.7141 | 12 | 77 |
| ND<0.1 U | 0.8141 | -0.7141 | 12 | 78 |
| ND<0.1 U | 0.8141 | -0.7141 | 12 | 79 |
| ND<0.1 U | 0.8141 | -0.7141 | 12 | 80 |
| | | | | |
| ND<0.1 U | ND<0.1 U | 0 | 12 | 80 |
| ND<0.1 U | ND<0.1 U | 0 | 12 | 80 |
| ND<0.1 U | ND<0.1 U | 0 | 12 | 80 |
| | | | | |
| ND<0.1 U | ND<0.1 U | 0 | 12 | 80 |
| ND<0.1 U | ND<0.1 U | 0 | 12 | 80 |
| | | | | |
| ND<0.1 U | ND<0.1 U | 0 | 12 | 80 |

S Statistic = 12 - 80 = -68

| Tied Group | Value | Members |
|---|---|---|
| 1 | 1.5 | 7 |
| 2 | 0.46 | 2 |
| 3 | 0.1 | 4 |

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 972
B = 18
C = 234
D = 0
E = 56
F = 2
a = 8880
b = 30240
c = 480
Group Variance = 438.567
Z-Score = -3.19931
Comparison Level at 95% confidence level = -1.65463 (downward trend)
**-3.19931 < -1.65463 indicating a downward trend**

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RWE-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 0.59 J1c3c | 0.57 J2c | Same Date | 0 | 0 |
| 0.64 J | 0.57 J2c | 0.07 | 1 | 0 |
| 2 J | 0.57 J2c | 1.43 | 2 | 0 |
| 0.91 J | 0.57 J2c | 0.34 | 3 | 0 |
| 1.4 J | 0.57 J2c | 0.83 | 4 | 0 |
| 8.7 | 0.57 J2c | 8.13 | 5 | 0 |
| 0.44 J | 0.57 J2c | -0.13 | 5 | 1 |
| 10.9 | 0.57 J2c | 10.33 | 6 | 1 |
| 0.55 J | 0.57 J2c | -0.02 | 6 | 2 |
| ND<1 U | 0.57 J2c | 0.43 | 7 | 2 |
| 3.584 | 0.57 J2c | 3.014 | 8 | 2 |
| 3.584 | 0.57 J2c | 3.014 | 9 | 2 |
| 2.846 | 0.57 J2c | 2.276 | 10 | 2 |
| 2.055 | 0.57 J2c | 1.485 | 11 | 2 |
| 5.255 | 0.57 J2c | 4.685 | 12 | 2 |
| 3.184 | 0.57 J2c | 2.614 | 13 | 2 |
| | | | | |
| 0.64 J | 0.59 J1c3c | 0.05 | 14 | 2 |
| 2 J | 0.59 J1c3c | 1.41 | 15 | 2 |
| 0.91 J | 0.59 J1c3c | 0.32 | 16 | 2 |
| 1.4 J | 0.59 J1c3c | 0.81 | 17 | 2 |
| 8.7 | 0.59 J1c3c | 8.11 | 18 | 2 |
| 0.44 J | 0.59 J1c3c | -0.15 | 18 | 3 |
| 10.9 | 0.59 J1c3c | 10.31 | 19 | 3 |
| 0.55 J | 0.59 J1c3c | -0.04 | 19 | 4 |
| ND<1 U | 0.59 J1c3c | 0.41 | 20 | 4 |
| 3.584 | 0.59 J1c3c | 2.994 | 21 | 4 |
| 3.584 | 0.59 J1c3c | 2.994 | 22 | 4 |
| 2.846 | 0.59 J1c3c | 2.256 | 23 | 4 |
| 2.055 | 0.59 J1c3c | 1.465 | 24 | 4 |
| 5.255 | 0.59 J1c3c | 4.665 | 25 | 4 |
| 3.184 | 0.59 J1c3c | 2.594 | 26 | 4 |
| | | | | |
| 2 J | 0.64 J | 1.36 | 27 | 4 |
| 0.91 J | 0.64 J | 0.27 | 28 | 4 |
| 1.4 J | 0.64 J | 0.76 | 29 | 4 |
| 8.7 | 0.64 J | 8.06 | 30 | 4 |
| 0.44 J | 0.64 J | -0.2 | 30 | 5 |
| 10.9 | 0.64 J | 10.26 | 31 | 5 |
| 0.55 J | 0.64 J | -0.09 | 31 | 6 |
| ND<1 U | 0.64 J | 0.36 | 32 | 6 |
| 3.584 | 0.64 J | 2.944 | 33 | 6 |
| 3.584 | 0.64 J | 2.944 | 34 | 6 |
| 2.846 | 0.64 J | 2.206 | 35 | 6 |
| 2.055 | 0.64 J | 1.415 | 36 | 6 |
| 5.255 | 0.64 J | 4.615 | 37 | 6 |
| 3.184 | 0.64 J | 2.544 | 38 | 6 |

| | | | | |
|---|---|---|---|---|
| 0.91 J | 2 J | -1.09 | 38 | 7 |
| 1.4 J | 2 J | -0.6 | 38 | 8 |
| 8.7 | 2 J | 6.7 | 39 | 8 |
| 0.44 J | 2 J | -1.56 | 39 | 9 |
| 10.9 | 2 J | 8.9 | 40 | 9 |
| 0.55 J | 2 J | -1.45 | 40 | 10 |
| ND<1 U | 2 J | -1 | 40 | 11 |
| 3.584 | 2 J | 1.584 | 41 | 11 |
| 3.584 | 2 J | 1.584 | 42 | 11 |
| 2.846 | 2 J | 0.846 | 43 | 11 |
| 2.055 | 2 J | 0.055 | 44 | 11 |
| 5.255 | 2 J | 3.255 | 45 | 11 |
| 3.184 | 2 J | 1.184 | 46 | 11 |
| | | | | |
| 1.4 J | 0.91 J | 0.49 | 47 | 11 |
| 8.7 | 0.91 J | 7.79 | 48 | 11 |
| 0.44 J | 0.91 J | -0.47 | 48 | 12 |
| 10.9 | 0.91 J | 9.99 | 49 | 12 |
| 0.55 J | 0.91 J | -0.36 | 49 | 13 |
| ND<1 U | 0.91 J | 0.09 | 50 | 13 |
| 3.584 | 0.91 J | 2.674 | 51 | 13 |
| 3.584 | 0.91 J | 2.674 | 52 | 13 |
| 2.846 | 0.91 J | 1.936 | 53 | 13 |
| 2.055 | 0.91 J | 1.145 | 54 | 13 |
| 5.255 | 0.91 J | 4.345 | 55 | 13 |
| 3.184 | 0.91 J | 2.274 | 56 | 13 |
| | | | | |
| 8.7 | 1.4 J | 7.3 | 57 | 13 |
| 0.44 J | 1.4 J | -0.96 | 57 | 14 |
| 10.9 | 1.4 J | 9.5 | 58 | 14 |
| 0.55 J | 1.4 J | -0.85 | 58 | 15 |
| ND<1 U | 1.4 J | -0.4 | 58 | 16 |
| 3.584 | 1.4 J | 2.184 | 59 | 16 |
| 3.584 | 1.4 J | 2.184 | 60 | 16 |
| 2.846 | 1.4 J | 1.446 | 61 | 16 |
| 2.055 | 1.4 J | 0.655 | 62 | 16 |
| 5.255 | 1.4 J | 3.855 | 63 | 16 |
| 3.184 | 1.4 J | 1.784 | 64 | 16 |
| | | | | |
| 0.44 J | 8.7 | -8.26 | 64 | 17 |
| 10.9 | 8.7 | 2.2 | 65 | 17 |
| 0.55 J | 8.7 | -8.15 | 65 | 18 |
| ND<1 U | 8.7 | -7.7 | 65 | 19 |
| 3.584 | 8.7 | -5.116 | 65 | 20 |
| 3.584 | 8.7 | -5.116 | 65 | 21 |
| 2.846 | 8.7 | -5.854 | 65 | 22 |
| 2.055 | 8.7 | -6.645 | 65 | 23 |
| 5.255 | 8.7 | -3.445 | 65 | 24 |
| 3.184 | 8.7 | -5.516 | 65 | 25 |
| | | | | |
| 10.9 | 0.44 J | 10.46 | 66 | 25 |
| 0.55 J | 0.44 J | 0.11 | 67 | 25 |
| ND<1 U | 0.44 J | 0.56 | 68 | 25 |
| 3.584 | 0.44 J | 3.144 | 69 | 25 |
| 3.584 | 0.44 J | 3.144 | 70 | 25 |
| 2.846 | 0.44 J | 2.406 | 71 | 25 |

| | | | | |
|---|---|---|---|---|
| 2.055 | 0.44 J | 1.615 | 72 | 25 |
| 5.255 | 0.44 J | 4.815 | 73 | 25 |
| 3.184 | 0.44 J | 2.744 | 74 | 25 |
| | | | | |
| 0.55 J | 10.9 | -10.35 | 74 | 26 |
| ND<1 U | 10.9 | -9.9 | 74 | 27 |
| 3.584 | 10.9 | -7.316 | 74 | 28 |
| 3.584 | 10.9 | -7.316 | 74 | 29 |
| 2.846 | 10.9 | -8.054 | 74 | 30 |
| 2.055 | 10.9 | -8.845 | 74 | 31 |
| 5.255 | 10.9 | -5.645 | 74 | 32 |
| 3.184 | 10.9 | -7.716 | 74 | 33 |
| | | | | |
| ND<1 U | 0.55 J | 0.45 | 75 | 33 |
| 3.584 | 0.55 J | 3.034 | 76 | 33 |
| 3.584 | 0.55 J | 3.034 | 77 | 33 |
| 2.846 | 0.55 J | 2.296 | 78 | 33 |
| 2.055 | 0.55 J | 1.505 | 79 | 33 |
| 5.255 | 0.55 J | 4.705 | 80 | 33 |
| 3.184 | 0.55 J | 2.634 | 81 | 33 |
| | | | | |
| 3.584 | ND<1 U | 2.584 | 82 | 33 |
| 3.584 | ND<1 U | 2.584 | 83 | 33 |
| 2.846 | ND<1 U | 1.846 | 84 | 33 |
| 2.055 | ND<1 U | 1.055 | 85 | 33 |
| 5.255 | ND<1 U | 4.255 | 86 | 33 |
| 3.184 | ND<1 U | 2.184 | 87 | 33 |
| | | | | |
| 3.584 | 3.584 | Same Date | 87 | 33 |
| 2.846 | 3.584 | -0.738 | 87 | 34 |
| 2.055 | 3.584 | -1.529 | 87 | 35 |
| 5.255 | 3.584 | 1.671 | 88 | 35 |
| 3.184 | 3.584 | -0.4 | 88 | 36 |
| | | | | |
| 2.846 | 3.584 | -0.738 | 88 | 37 |
| 2.055 | 3.584 | -1.529 | 88 | 38 |
| 5.255 | 3.584 | 1.671 | 89 | 38 |
| 3.184 | 3.584 | -0.4 | 89 | 39 |
| | | | | |
| 2.055 | 2.846 | -0.791 | 89 | 40 |
| 5.255 | 2.846 | 2.409 | 90 | 40 |
| 3.184 | 2.846 | 0.338 | 91 | 40 |
| | | | | |
| 5.255 | 2.055 | 3.2 | 92 | 40 |
| 3.184 | 2.055 | 1.129 | 93 | 40 |
| | | | | |
| 3.184 | 5.255 | -2.071 | 93 | 41 |

S Statistic = 93 - 41 = 52

| Tied Group | Value | Members |
|---|---|---|
| 1 | 3.584 | 2 |

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |

| | |
|---|---|
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 2 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 2 time periods with multiple data

---

A = 18
B = 36
C = 0
D = 0
E = 2
F = 4
a = 10608
b = 36720
c = 544
Group Variance = 586.348
Z-Score = 2.10617
Comparison Level at 95% confidence level = -1.65463 (downward trend)
2.10617 >= -1.65463 indicating no evidence of a downward trend

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RWF-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 4.2 | 5.7 | Same Date | 0 | 0 |
| 6.1 | 5.7 | 0.4 | 1 | 0 |
| 7.3 | 5.7 | 1.6 | 2 | 0 |
| 7.7 | 5.7 | 2 | 3 | 0 |
| 5.7 | 5.7 | 0 | 3 | 0 |
| 6 | 5.7 | 0.3 | 4 | 0 |
| 4.6 | 5.7 | -1.1 | 4 | 1 |
| 4 | 5.7 | -1.7 | 4 | 2 |
| 3.4 | 5.7 | -2.3 | 4 | 3 |
| 4.9 | 5.7 | -0.8 | 4 | 4 |
| 2.545 | 5.7 | -3.155 | 4 | 5 |
| 2.166 | 5.7 | -3.534 | 4 | 6 |
| 1.51 | 5.7 | -4.19 | 4 | 7 |
| 1.024 | 5.7 | -4.676 | 4 | 8 |
| 0.68 | 5.7 | -5.02 | 4 | 9 |
| | | | | |
| 6.1 | 4.2 | 1.9 | 5 | 9 |
| 7.3 | 4.2 | 3.1 | 6 | 9 |
| 7.7 | 4.2 | 3.5 | 7 | 9 |
| 5.7 | 4.2 | 1.5 | 8 | 9 |
| 6 | 4.2 | 1.8 | 9 | 9 |
| 4.6 | 4.2 | 0.4 | 10 | 9 |
| 4 | 4.2 | -0.2 | 10 | 10 |
| 3.4 | 4.2 | -0.8 | 10 | 11 |
| 4.9 | 4.2 | 0.7 | 11 | 11 |
| 2.545 | 4.2 | -1.655 | 11 | 12 |
| 2.166 | 4.2 | -2.034 | 11 | 13 |
| 1.51 | 4.2 | -2.69 | 11 | 14 |
| 1.024 | 4.2 | -3.176 | 11 | 15 |
| 0.68 | 4.2 | -3.52 | 11 | 16 |
| | | | | |
| 7.3 | 6.1 | 1.2 | 12 | 16 |
| 7.7 | 6.1 | 1.6 | 13 | 16 |
| 5.7 | 6.1 | -0.4 | 13 | 17 |
| 6 | 6.1 | -0.1 | 13 | 18 |
| 4.6 | 6.1 | -1.5 | 13 | 19 |
| 4 | 6.1 | -2.1 | 13 | 20 |
| 3.4 | 6.1 | -2.7 | 13 | 21 |
| 4.9 | 6.1 | -1.2 | 13 | 22 |
| 2.545 | 6.1 | -3.555 | 13 | 23 |
| 2.166 | 6.1 | -3.934 | 13 | 24 |
| 1.51 | 6.1 | -4.59 | 13 | 25 |
| 1.024 | 6.1 | -5.076 | 13 | 26 |
| 0.68 | 6.1 | -5.42 | 13 | 27 |
| | | | | |
| 7.7 | 7.3 | 0.4 | 14 | 27 |
| 5.7 | 7.3 | -1.6 | 14 | 28 |

| | | | | |
|---|---|---|---|---|
| 6 | 7.3 | -1.3 | 14 | 29 |
| 4.6 | 7.3 | -2.7 | 14 | 30 |
| 4 | 7.3 | -3.3 | 14 | 31 |
| 3.4 | 7.3 | -3.9 | 14 | 32 |
| 4.9 | 7.3 | -2.4 | 14 | 33 |
| 2.545 | 7.3 | -4.755 | 14 | 34 |
| 2.166 | 7.3 | -5.134 | 14 | 35 |
| 1.51 | 7.3 | -5.79 | 14 | 36 |
| 1.024 | 7.3 | -6.276 | 14 | 37 |
| 0.68 | 7.3 | -6.62 | 14 | 38 |
| | | | | |
| 5.7 | 7.7 | -2 | 14 | 39 |
| 6 | 7.7 | -1.7 | 14 | 40 |
| 4.6 | 7.7 | -3.1 | 14 | 41 |
| 4 | 7.7 | -3.7 | 14 | 42 |
| 3.4 | 7.7 | -4.3 | 14 | 43 |
| 4.9 | 7.7 | -2.8 | 14 | 44 |
| 2.545 | 7.7 | -5.155 | 14 | 45 |
| 2.166 | 7.7 | -5.534 | 14 | 46 |
| 1.51 | 7.7 | -6.19 | 14 | 47 |
| 1.024 | 7.7 | -6.676 | 14 | 48 |
| 0.68 | 7.7 | -7.02 | 14 | 49 |
| | | | | |
| 6 | 5.7 | 0.3 | 15 | 49 |
| 4.6 | 5.7 | -1.1 | 15 | 50 |
| 4 | 5.7 | -1.7 | 15 | 51 |
| 3.4 | 5.7 | -2.3 | 15 | 52 |
| 4.9 | 5.7 | -0.8 | 15 | 53 |
| 2.545 | 5.7 | -3.155 | 15 | 54 |
| 2.166 | 5.7 | -3.534 | 15 | 55 |
| 1.51 | 5.7 | -4.19 | 15 | 56 |
| 1.024 | 5.7 | -4.676 | 15 | 57 |
| 0.68 | 5.7 | -5.02 | 15 | 58 |
| | | | | |
| 4.6 | 6 | -1.4 | 15 | 59 |
| 4 | 6 | -2 | 15 | 60 |
| 3.4 | 6 | -2.6 | 15 | 61 |
| 4.9 | 6 | -1.1 | 15 | 62 |
| 2.545 | 6 | -3.455 | 15 | 63 |
| 2.166 | 6 | -3.834 | 15 | 64 |
| 1.51 | 6 | -4.49 | 15 | 65 |
| 1.024 | 6 | -4.976 | 15 | 66 |
| 0.68 | 6 | -5.32 | 15 | 67 |
| | | | | |
| 4 | 4.6 | -0.6 | 15 | 68 |
| 3.4 | 4.6 | -1.2 | 15 | 69 |
| 4.9 | 4.6 | 0.3 | 16 | 69 |
| 2.545 | 4.6 | -2.055 | 16 | 70 |
| 2.166 | 4.6 | -2.434 | 16 | 71 |
| 1.51 | 4.6 | -3.09 | 16 | 72 |
| 1.024 | 4.6 | -3.576 | 16 | 73 |
| 0.68 | 4.6 | -3.92 | 16 | 74 |
| | | | | |
| 3.4 | 4 | -0.6 | 16 | 75 |
| 4.9 | 4 | 0.9 | 17 | 75 |
| 2.545 | 4 | -1.455 | 17 | 76 |
| 2.166 | 4 | -1.834 | 17 | 77 |

| | | | | |
|---|---|---|---|---|
| 1.51 | 4 | -2.49 | 17 | 78 |
| 1.024 | 4 | -2.976 | 17 | 79 |
| 0.68 | 4 | -3.32 | 17 | 80 |
| | | | | |
| 4.9 | 3.4 | 1.5 | 18 | 80 |
| 2.545 | 3.4 | -0.855 | 18 | 81 |
| 2.166 | 3.4 | -1.234 | 18 | 82 |
| 1.51 | 3.4 | -1.89 | 18 | 83 |
| 1.024 | 3.4 | -2.376 | 18 | 84 |
| 0.68 | 3.4 | -2.72 | 18 | 85 |
| | | | | |
| 2.545 | 4.9 | -2.355 | 18 | 86 |
| 2.166 | 4.9 | -2.734 | 18 | 87 |
| 1.51 | 4.9 | -3.39 | 18 | 88 |
| 1.024 | 4.9 | -3.876 | 18 | 89 |
| 0.68 | 4.9 | -4.22 | 18 | 90 |
| | | | | |
| 2.166 | 2.545 | -0.379 | 18 | 91 |
| 1.51 | 2.545 | -1.035 | 18 | 92 |
| 1.024 | 2.545 | -1.521 | 18 | 93 |
| 0.68 | 2.545 | -1.865 | 18 | 94 |
| | | | | |
| 1.51 | 2.166 | -0.656 | 18 | 95 |
| 1.024 | 2.166 | -1.142 | 18 | 96 |
| 0.68 | 2.166 | -1.486 | 18 | 97 |
| | | | | |
| 1.024 | 1.51 | -0.486 | 18 | 98 |
| 0.68 | 1.51 | -0.83 | 18 | 99 |
| | | | | |
| 0.68 | 1.024 | -0.344 | 18 | 100 |

S Statistic = 18 - 100 = -82

| Tied Group | Value | Members |
|---|---|---|
| 1 | 5.7 | 2 |

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 18
B = 18

C = 0
D = 0
E = 2
F = 2
a = 8880
b = 30240
c = 480
Group Variance = 491.342
Z-Score = -3.65421
Comparison Level at 95% confidence level = -1.65463 (downward trend)
**-3.65421 < -1.65463 indicating a downward trend**

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RWG-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| ND<1.5 U1c3c | ND<1.5 U2c | Same Date | 0 | 0 |
| ND<1.5 U | ND<1.5 U2c | 0 | 0 | 0 |
| ND<1.5 U | ND<1.5 U2c | 0 | 0 | 0 |
| ND<1.5 U | ND<1.5 U2c | 0 | 0 | 0 |
| 0.63 J | ND<1.5 U2c | -0.87 | 0 | 1 |
| ND<1.5 U | ND<1.5 U2c | 0 | 0 | 1 |
| ND<1.5 U | ND<1.5 U2c | 0 | 0 | 1 |
| | | | | |
| ND<1.5 U | ND<1.5 U1c3c | 0 | 0 | 1 |
| ND<1.5 U | ND<1.5 U1c3c | 0 | 0 | 1 |
| ND<1.5 U | ND<1.5 U1c3c | 0 | 0 | 1 |
| 0.63 J | ND<1.5 U1c3c | -0.87 | 0 | 2 |
| ND<1.5 U | ND<1.5 U1c3c | 0 | 0 | 2 |
| ND<1.5 U | ND<1.5 U1c3c | 0 | 0 | 2 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 2 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 2 |
| 0.63 J | ND<1.5 U | -0.87 | 0 | 3 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 3 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 3 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 3 |
| 0.63 J | ND<1.5 U | -0.87 | 0 | 4 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 4 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 4 |
| | | | | |
| 0.63 J | ND<1.5 U | -0.87 | 0 | 5 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 5 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 5 |
| | | | | |
| ND<1.5 U | 0.63 J | 0.87 | 1 | 5 |
| ND<1.5 U | 0.63 J | 0.87 | 2 | 5 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 2 | 5 |

S Statistic = 2 - 5 = -3

| Tied Group | Value | Members |
|---|---|---|
| 1 | 1.5 | 7 |

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |

6/1/2020 1
9/1/2020 1
11/1/2020 1
There are 1 time periods with multiple data

---

A = 798
B = 18
C = 210
D = 0
E = 42
F = 2
a = 1176
b = 3024
c = 112
Group Variance = 20.75
Z-Score = -0.439057
Comparison Level at 95% confidence level = -1.65463 (downward trend)
-0.439057 >= -1.65463 indicating no evidence of a downward trend

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RWH-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 20 | 30.6 | Same Date | 0 | 0 |
| 856 1c | 30.6 | 825.4 | 1 | 0 |
| 19.9 | 30.6 | -10.7 | 1 | 1 |
| 163 | 30.6 | 132.4 | 2 | 1 |
| 0.97 J | 30.6 | -29.63 | 2 | 2 |
| 22.4 | 30.6 | -8.2 | 2 | 3 |
| 7 | 30.6 | -23.6 | 2 | 4 |
| 9.9 | 30.6 | -20.7 | 2 | 5 |
| 6.8 | 30.6 | -23.8 | 2 | 6 |
| 7 | 30.6 | -23.6 | 2 | 7 |
| 26.3 | 30.6 | -4.3 | 2 | 8 |
| 5.374 | 30.6 | -25.226 | 2 | 9 |
| 173.4 | 30.6 | 142.8 | 3 | 9 |
| 11.47 | 30.6 | -19.13 | 3 | 10 |
| 2316 | 30.6 | 2285.4 | 4 | 10 |
| | | | | |
| 856 1c | 20 | 836 | 5 | 10 |
| 19.9 | 20 | -0.1 | 5 | 11 |
| 163 | 20 | 143 | 6 | 11 |
| 0.97 J | 20 | -19.03 | 6 | 12 |
| 22.4 | 20 | 2.4 | 7 | 12 |
| 7 | 20 | -13 | 7 | 13 |
| 9.9 | 20 | -10.1 | 7 | 14 |
| 6.8 | 20 | -13.2 | 7 | 15 |
| 7 | 20 | -13 | 7 | 16 |
| 26.3 | 20 | 6.3 | 8 | 16 |
| 5.374 | 20 | -14.626 | 8 | 17 |
| 173.4 | 20 | 153.4 | 9 | 17 |
| 11.47 | 20 | -8.53 | 9 | 18 |
| 2316 | 20 | 2296 | 10 | 18 |
| | | | | |
| 19.9 | 856 1c | -836.1 | 10 | 19 |
| 163 | 856 1c | -693 | 10 | 20 |
| 0.97 J | 856 1c | -855.03 | 10 | 21 |
| 22.4 | 856 1c | -833.6 | 10 | 22 |
| 7 | 856 1c | -849 | 10 | 23 |
| 9.9 | 856 1c | -846.1 | 10 | 24 |
| 6.8 | 856 1c | -849.2 | 10 | 25 |
| 7 | 856 1c | -849 | 10 | 26 |
| 26.3 | 856 1c | -829.7 | 10 | 27 |
| 5.374 | 856 1c | -850.626 | 10 | 28 |
| 173.4 | 856 1c | -682.6 | 10 | 29 |
| 11.47 | 856 1c | -844.53 | 10 | 30 |
| 2316 | 856 1c | 1460 | 11 | 30 |
| | | | | |
| 163 | 19.9 | 143.1 | 12 | 30 |
| 0.97 J | 19.9 | -18.93 | 12 | 31 |

| | | | | |
|---|---|---|---|---|
| 22.4 | 19.9 | 2.5 | 13 | 31 |
| 7 | 19.9 | -12.9 | 13 | 32 |
| 9.9 | 19.9 | -10 | 13 | 33 |
| 6.8 | 19.9 | -13.1 | 13 | 34 |
| 7 | 19.9 | -12.9 | 13 | 35 |
| 26.3 | 19.9 | 6.4 | 14 | 35 |
| 5.374 | 19.9 | -14.526 | 14 | 36 |
| 173.4 | 19.9 | 153.5 | 15 | 36 |
| 11.47 | 19.9 | -8.43 | 15 | 37 |
| 2316 | 19.9 | 2296.1 | 16 | 37 |
| | | | | |
| 0.97 J | 163 | -162.03 | 16 | 38 |
| 22.4 | 163 | -140.6 | 16 | 39 |
| 7 | 163 | -156 | 16 | 40 |
| 9.9 | 163 | -153.1 | 16 | 41 |
| 6.8 | 163 | -156.2 | 16 | 42 |
| 7 | 163 | -156 | 16 | 43 |
| 26.3 | 163 | -136.7 | 16 | 44 |
| 5.374 | 163 | -157.626 | 16 | 45 |
| 173.4 | 163 | 10.4 | 17 | 45 |
| 11.47 | 163 | -151.53 | 17 | 46 |
| 2316 | 163 | 2153 | 18 | 46 |
| | | | | |
| 22.4 | 0.97 J | 21.43 | 19 | 46 |
| 7 | 0.97 J | 6.03 | 20 | 46 |
| 9.9 | 0.97 J | 8.93 | 21 | 46 |
| 6.8 | 0.97 J | 5.83 | 22 | 46 |
| 7 | 0.97 J | 6.03 | 23 | 46 |
| 26.3 | 0.97 J | 25.33 | 24 | 46 |
| 5.374 | 0.97 J | 4.404 | 25 | 46 |
| 173.4 | 0.97 J | 172.43 | 26 | 46 |
| 11.47 | 0.97 J | 10.5 | 27 | 46 |
| 2316 | 0.97 J | 2315.03 | 28 | 46 |
| | | | | |
| 7 | 22.4 | -15.4 | 28 | 47 |
| 9.9 | 22.4 | -12.5 | 28 | 48 |
| 6.8 | 22.4 | -15.6 | 28 | 49 |
| 7 | 22.4 | -15.4 | 28 | 50 |
| 26.3 | 22.4 | 3.9 | 29 | 50 |
| 5.374 | 22.4 | -17.026 | 29 | 51 |
| 173.4 | 22.4 | 151 | 30 | 51 |
| 11.47 | 22.4 | -10.93 | 30 | 52 |
| 2316 | 22.4 | 2293.6 | 31 | 52 |
| | | | | |
| 9.9 | 7 | 2.9 | 32 | 52 |
| 6.8 | 7 | -0.2 | 32 | 53 |
| 7 | 7 | 0 | 32 | 53 |
| 26.3 | 7 | 19.3 | 33 | 53 |
| 5.374 | 7 | -1.626 | 33 | 54 |
| 173.4 | 7 | 166.4 | 34 | 54 |
| 11.47 | 7 | 4.47 | 35 | 54 |
| 2316 | 7 | 2309 | 36 | 54 |
| | | | | |
| 6.8 | 9.9 | -3.1 | 36 | 55 |
| 7 | 9.9 | -2.9 | 36 | 56 |
| 26.3 | 9.9 | 16.4 | 37 | 56 |
| 5.374 | 9.9 | -4.526 | 37 | 57 |

| | | | | |
|---|---|---|---|---|
| 173.4 | 9.9 | 163.5 | 38 | 57 |
| 11.47 | 9.9 | 1.57 | 39 | 57 |
| 2316 | 9.9 | 2306.1 | 40 | 57 |
| | | | | |
| 7 | 6.8 | 0.2 | 41 | 57 |
| 26.3 | 6.8 | 19.5 | 42 | 57 |
| 5.374 | 6.8 | -1.426 | 42 | 58 |
| 173.4 | 6.8 | 166.6 | 43 | 58 |
| 11.47 | 6.8 | 4.67 | 44 | 58 |
| 2316 | 6.8 | 2309.2 | 45 | 58 |
| | | | | |
| 26.3 | 7 | 19.3 | 46 | 58 |
| 5.374 | 7 | -1.626 | 46 | 59 |
| 173.4 | 7 | 166.4 | 47 | 59 |
| 11.47 | 7 | 4.47 | 48 | 59 |
| 2316 | 7 | 2309 | 49 | 59 |
| | | | | |
| 5.374 | 26.3 | -20.926 | 49 | 60 |
| 173.4 | 26.3 | 147.1 | 50 | 60 |
| 11.47 | 26.3 | -14.83 | 50 | 61 |
| 2316 | 26.3 | 2289.7 | 51 | 61 |
| | | | | |
| 173.4 | 5.374 | 168.026 | 52 | 61 |
| 11.47 | 5.374 | 6.096 | 53 | 61 |
| 2316 | 5.374 | 2310.63 | 54 | 61 |
| | | | | |
| 11.47 | 173.4 | -161.93 | 54 | 62 |
| 2316 | 173.4 | 2142.6 | 55 | 62 |
| | | | | |
| 2316 | 11.47 | 2304.53 | 56 | 62 |

S Statistic = 56 - 62 = -6

| Tied Group | Value | Members |
|---|---|---|
| 1 | 7 | 2 |

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 18
B = 18

C = 0
D = 0
E = 2
F = 2
a = 8880
b = 30240
c = 480
Group Variance = 491.342
Z-Score = -0.225568
Comparison Level at 95% confidence level = -1.65463 (downward trend)
-0.225568 >= -1.65463 indicating no evidence of a downward trend

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RWI-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 714 | 743 | Same Date | 0 | 0 |
| 840 1c | 743 | 97 | 1 | 0 |
| 1080 | 743 | 337 | 2 | 0 |
| 125 | 743 | -618 | 2 | 1 |
| 17.5 | 743 | -725.5 | 2 | 2 |
| 0.76 J | 743 | -742.24 | 2 | 3 |
| 1010 | 743 | 267 | 3 | 3 |
| 596 | 743 | -147 | 3 | 4 |
| 8.828 | 743 | -734.172 | 3 | 5 |
| | | | | |
| 840 1c | 714 | 126 | 4 | 5 |
| 1080 | 714 | 366 | 5 | 5 |
| 125 | 714 | -589 | 5 | 6 |
| 17.5 | 714 | -696.5 | 5 | 7 |
| 0.76 J | 714 | -713.24 | 5 | 8 |
| 1010 | 714 | 296 | 6 | 8 |
| 596 | 714 | -118 | 6 | 9 |
| 8.828 | 714 | -705.172 | 6 | 10 |
| | | | | |
| 1080 | 840 1c | 240 | 7 | 10 |
| 125 | 840 1c | -715 | 7 | 11 |
| 17.5 | 840 1c | -822.5 | 7 | 12 |
| 0.76 J | 840 1c | -839.24 | 7 | 13 |
| 1010 | 840 1c | 170 | 8 | 13 |
| 596 | 840 1c | -244 | 8 | 14 |
| 8.828 | 840 1c | -831.172 | 8 | 15 |
| | | | | |
| 125 | 1080 | -955 | 8 | 16 |
| 17.5 | 1080 | -1062.5 | 8 | 17 |
| 0.76 J | 1080 | -1079.24 | 8 | 18 |
| 1010 | 1080 | -70 | 8 | 19 |
| 596 | 1080 | -484 | 8 | 20 |
| 8.828 | 1080 | -1071.17 | 8 | 21 |
| | | | | |
| 17.5 | 125 | -107.5 | 8 | 22 |
| 0.76 J | 125 | -124.24 | 8 | 23 |
| 1010 | 125 | 885 | 9 | 23 |
| 596 | 125 | 471 | 10 | 23 |
| 8.828 | 125 | -116.172 | 10 | 24 |
| | | | | |
| 0.76 J | 17.5 | -16.74 | 10 | 25 |
| 1010 | 17.5 | 992.5 | 11 | 25 |
| 596 | 17.5 | 578.5 | 12 | 25 |
| 8.828 | 17.5 | -8.672 | 12 | 26 |
| | | | | |
| 1010 | 0.76 J | 1009.24 | 13 | 26 |
| 596 | 0.76 J | 595.24 | 14 | 26 |

| | | | | |
|---|---|---|---|---|
| 8.828 | 0.76 J | 8.068 | 15 | 26 |
| 596 | 1010 | -414 | 15 | 27 |
| 8.828 | 1010 | -1001.17 | 15 | 28 |
| 8.828 | 596 | -587.172 | 15 | 29 |

S Statistic = 15 - 29 = -14

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 11/1/2021 | 1 |
| 3/1/2022 | 1 |
| 3/1/2023 | 1 |
| 3/1/2024 | 1 |

There are 1 time periods with multiple data

A = 0
B = 18
C = 0
D = 0
E = 0
F = 2
a = 2250
b = 6480
c = 180
Group Variance = 124
Z-Score = -1.16743
Comparison Level at 95% confidence level = -1.65463 (downward trend)
-1.16743 >= -1.65463 indicating no evidence of a downward trend

## Mann-Kendall Trend Analysis
### Parameter: Cadmium
### Location: RWJ-MWS
**Original Data (Not Transformed)**
**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| ND<1.5 U1c | ND<1.5 U | Same Date | 0 | 0 |
| ND<1.5 U1c | ND<1.5 U | 0 | 0 | 0 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 0 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 0 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 0 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 0 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 0 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 0 |
| 0.22 J | ND<1.5 U | -1.28 | 0 | 1 |
| ND<1 U | ND<1.5 U | -0.5 | 0 | 2 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 3 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 4 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 5 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 6 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 7 |
| | | | | |
| ND<1.5 U1c | ND<1.5 U1c | 0 | 0 | 7 |
| ND<1.5 U | ND<1.5 U1c | 0 | 0 | 7 |
| ND<1.5 U | ND<1.5 U1c | 0 | 0 | 7 |
| ND<1.5 U | ND<1.5 U1c | 0 | 0 | 7 |
| ND<1.5 U | ND<1.5 U1c | 0 | 0 | 7 |
| ND<1.5 U | ND<1.5 U1c | 0 | 0 | 7 |
| ND<1.5 U | ND<1.5 U1c | 0 | 0 | 7 |
| 0.22 J | ND<1.5 U1c | -1.28 | 0 | 8 |
| ND<1 U | ND<1.5 U1c | -0.5 | 0 | 9 |
| ND<0.1 U | ND<1.5 U1c | -1.4 | 0 | 10 |
| ND<0.1 U | ND<1.5 U1c | -1.4 | 0 | 11 |
| ND<0.1 U | ND<1.5 U1c | -1.4 | 0 | 12 |
| ND<0.1 U | ND<1.5 U1c | -1.4 | 0 | 13 |
| ND<0.1 U | ND<1.5 U1c | -1.4 | 0 | 14 |
| | | | | |
| ND<1.5 U | ND<1.5 U1c | 0 | 0 | 14 |
| ND<1.5 U | ND<1.5 U1c | 0 | 0 | 14 |
| ND<1.5 U | ND<1.5 U1c | 0 | 0 | 14 |
| ND<1.5 U | ND<1.5 U1c | 0 | 0 | 14 |
| ND<1.5 U | ND<1.5 U1c | 0 | 0 | 14 |
| ND<1.5 U | ND<1.5 U1c | 0 | 0 | 14 |
| 0.22 J | ND<1.5 U1c | -1.28 | 0 | 15 |
| ND<1 U | ND<1.5 U1c | -0.5 | 0 | 16 |
| ND<0.1 U | ND<1.5 U1c | -1.4 | 0 | 17 |
| ND<0.1 U | ND<1.5 U1c | -1.4 | 0 | 18 |
| ND<0.1 U | ND<1.5 U1c | -1.4 | 0 | 19 |
| ND<0.1 U | ND<1.5 U1c | -1.4 | 0 | 20 |
| ND<0.1 U | ND<1.5 U1c | -1.4 | 0 | 21 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 21 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 21 |

| | | | | |
|---|---|---|---|---|
| ND<1.5 U | ND<1.5 U | 0 | 0 | 21 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 21 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 21 |
| 0.22 J | ND<1.5 U | -1.28 | 0 | 22 |
| ND<1 U | ND<1.5 U | -0.5 | 0 | 23 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 24 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 25 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 26 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 27 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 28 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 28 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 28 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 28 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 28 |
| 0.22 J | ND<1.5 U | -1.28 | 0 | 29 |
| ND<1 U | ND<1.5 U | -0.5 | 0 | 30 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 31 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 32 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 33 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 34 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 35 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 35 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 35 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 35 |
| 0.22 J | ND<1.5 U | -1.28 | 0 | 36 |
| ND<1 U | ND<1.5 U | -0.5 | 0 | 37 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 38 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 39 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 40 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 41 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 42 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 42 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 42 |
| 0.22 J | ND<1.5 U | -1.28 | 0 | 43 |
| ND<1 U | ND<1.5 U | -0.5 | 0 | 44 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 45 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 46 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 47 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 48 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 49 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 49 |
| 0.22 J | ND<1.5 U | -1.28 | 0 | 50 |
| ND<1 U | ND<1.5 U | -0.5 | 0 | 51 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 52 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 53 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 54 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 55 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 56 |
| | | | | |
| 0.22 J | ND<1.5 U | -1.28 | 0 | 57 |
| ND<1 U | ND<1.5 U | -0.5 | 0 | 58 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 59 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 60 |

| | | | | |
|---|---|---|---|---|
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 61 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 62 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 63 |
| | | | | |
| ND<1 U | 0.22 J | 0.78 | 1 | 63 |
| ND<0.1 U | 0.22 J | -0.12 | 1 | 64 |
| ND<0.1 U | 0.22 J | -0.12 | 1 | 65 |
| ND<0.1 U | 0.22 J | -0.12 | 1 | 66 |
| ND<0.1 U | 0.22 J | -0.12 | 1 | 67 |
| ND<0.1 U | 0.22 J | -0.12 | 1 | 68 |
| | | | | |
| ND<0.1 U | ND<1 U | -0.9 | 1 | 69 |
| ND<0.1 U | ND<1 U | -0.9 | 1 | 70 |
| ND<0.1 U | ND<1 U | -0.9 | 1 | 71 |
| ND<0.1 U | ND<1 U | -0.9 | 1 | 72 |
| ND<0.1 U | ND<1 U | -0.9 | 1 | 73 |
| | | | | |
| ND<0.1 U | ND<0.1 U | 0 | 1 | 73 |
| ND<0.1 U | ND<0.1 U | 0 | 1 | 73 |
| ND<0.1 U | ND<0.1 U | 0 | 1 | 73 |
| ND<0.1 U | ND<0.1 U | 0 | 1 | 73 |
| | | | | |
| ND<0.1 U | ND<0.1 U | 0 | 1 | 73 |
| ND<0.1 U | ND<0.1 U | 0 | 1 | 73 |
| ND<0.1 U | ND<0.1 U | 0 | 1 | 73 |
| | | | | |
| ND<0.1 U | ND<0.1 U | 0 | 1 | 73 |
| ND<0.1 U | ND<0.1 U | 0 | 1 | 73 |
| | | | | |
| ND<0.1 U | ND<0.1 U | 0 | 1 | 73 |

S Statistic = 1 - 73 = -72

| Tied Group | Value | Members |
|---|---|---|
| 1 | 1.5 | 9 |
| 2 | 0.1 | 5 |

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 1956

B = 18
C = 564
D = 0
E = 92
F = 2
a = 8880
b = 30240
c = 480
Group Variance = 384.05
Z-Score = -3.62297
Comparison Level at 95% confidence level = -1.65463 (downward trend)
**-3.62297 < -1.65463 indicating a downward trend**

## Mann-Kendall Trend Analysis
### Parameter: Cadmium
### Location: RWK-MWS
**Original Data (Not Transformed)**
**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| ND<1.5 U | ND<1.5 U1c | Same Date | 0 | 0 |
| ND<1.5 U1c | ND<1.5 U1c | 0 | 0 | 0 |
| ND<1.5 U | ND<1.5 U1c | 0 | 0 | 0 |
| ND<1.5 U | ND<1.5 U1c | 0 | 0 | 0 |
| ND<1.5 U | ND<1.5 U1c | 0 | 0 | 0 |
| 0.51 J | ND<1.5 U1c | -0.99 | 0 | 1 |
| 0.37 J | ND<1.5 U1c | -1.13 | 0 | 2 |
| ND<1.5 U | ND<1.5 U1c | 0 | 0 | 2 |
| ND<0.5 U | ND<1.5 U1c | -1 | 0 | 3 |
| ND<1 U | ND<1.5 U1c | -0.5 | 0 | 4 |
| ND<0.1 U | ND<1.5 U1c | -1.4 | 0 | 5 |
| ND<0.1 U | ND<1.5 U1c | -1.4 | 0 | 6 |
| 0.1115 J | ND<1.5 U1c | -1.3885 | 0 | 7 |
| 0.2839 | ND<1.5 U1c | -1.2161 | 0 | 8 |
| 0.3063 | ND<1.5 U1c | -1.1937 | 0 | 9 |
| | | | | |
| ND<1.5 U1c | ND<1.5 U | 0 | 0 | 9 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 9 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 9 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 9 |
| 0.51 J | ND<1.5 U | -0.99 | 0 | 10 |
| 0.37 J | ND<1.5 U | -1.13 | 0 | 11 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 11 |
| ND<0.5 U | ND<1.5 U | -1 | 0 | 12 |
| ND<1 U | ND<1.5 U | -0.5 | 0 | 13 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 14 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 15 |
| 0.1115 J | ND<1.5 U | -1.3885 | 0 | 16 |
| 0.2839 | ND<1.5 U | -1.2161 | 0 | 17 |
| 0.3063 | ND<1.5 U | -1.1937 | 0 | 18 |
| | | | | |
| ND<1.5 U | ND<1.5 U1c | 0 | 0 | 18 |
| ND<1.5 U | ND<1.5 U1c | 0 | 0 | 18 |
| ND<1.5 U | ND<1.5 U1c | 0 | 0 | 18 |
| 0.51 J | ND<1.5 U1c | -0.99 | 0 | 19 |
| 0.37 J | ND<1.5 U1c | -1.13 | 0 | 20 |
| ND<1.5 U | ND<1.5 U1c | 0 | 0 | 20 |
| ND<0.5 U | ND<1.5 U1c | -1 | 0 | 21 |
| ND<1 U | ND<1.5 U1c | -0.5 | 0 | 22 |
| ND<0.1 U | ND<1.5 U1c | -1.4 | 0 | 23 |
| ND<0.1 U | ND<1.5 U1c | -1.4 | 0 | 24 |
| 0.1115 J | ND<1.5 U1c | -1.3885 | 0 | 25 |
| 0.2839 | ND<1.5 U1c | -1.2161 | 0 | 26 |
| 0.3063 | ND<1.5 U1c | -1.1937 | 0 | 27 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 27 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 27 |

| | | | | |
|---|---|---|---|---|
| 0.51 J | ND<1.5 U | -0.99 | 0 | 28 |
| 0.37 J | ND<1.5 U | -1.13 | 0 | 29 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 29 |
| ND<0.5 U | ND<1.5 U | -1 | 0 | 30 |
| ND<1 U | ND<1.5 U | -0.5 | 0 | 31 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 32 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 33 |
| 0.1115 J | ND<1.5 U | -1.3885 | 0 | 34 |
| 0.2839 | ND<1.5 U | -1.2161 | 0 | 35 |
| 0.3063 | ND<1.5 U | -1.1937 | 0 | 36 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 36 |
| 0.51 J | ND<1.5 U | -0.99 | 0 | 37 |
| 0.37 J | ND<1.5 U | -1.13 | 0 | 38 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 38 |
| ND<0.5 U | ND<1.5 U | -1 | 0 | 39 |
| ND<1 U | ND<1.5 U | -0.5 | 0 | 40 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 41 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 42 |
| 0.1115 J | ND<1.5 U | -1.3885 | 0 | 43 |
| 0.2839 | ND<1.5 U | -1.2161 | 0 | 44 |
| 0.3063 | ND<1.5 U | -1.1937 | 0 | 45 |
| | | | | |
| 0.51 J | ND<1.5 U | -0.99 | 0 | 46 |
| 0.37 J | ND<1.5 U | -1.13 | 0 | 47 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 47 |
| ND<0.5 U | ND<1.5 U | -1 | 0 | 48 |
| ND<1 U | ND<1.5 U | -0.5 | 0 | 49 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 50 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 51 |
| 0.1115 J | ND<1.5 U | -1.3885 | 0 | 52 |
| 0.2839 | ND<1.5 U | -1.2161 | 0 | 53 |
| 0.3063 | ND<1.5 U | -1.1937 | 0 | 54 |
| | | | | |
| 0.37 J | 0.51 J | -0.14 | 0 | 55 |
| ND<1.5 U | 0.51 J | 0.99 | 1 | 55 |
| ND<0.5 U | 0.51 J | -0.01 | 1 | 56 |
| ND<1 U | 0.51 J | 0.49 | 2 | 56 |
| ND<0.1 U | 0.51 J | -0.41 | 2 | 57 |
| ND<0.1 U | 0.51 J | -0.41 | 2 | 58 |
| 0.1115 J | 0.51 J | -0.3985 | 2 | 59 |
| 0.2839 | 0.51 J | -0.2261 | 2 | 60 |
| 0.3063 | 0.51 J | -0.2037 | 2 | 61 |
| | | | | |
| ND<1.5 U | 0.37 J | 1.13 | 3 | 61 |
| ND<0.5 U | 0.37 J | 0.13 | 4 | 61 |
| ND<1 U | 0.37 J | 0.63 | 5 | 61 |
| ND<0.1 U | 0.37 J | -0.27 | 5 | 62 |
| ND<0.1 U | 0.37 J | -0.27 | 5 | 63 |
| 0.1115 J | 0.37 J | -0.2585 | 5 | 64 |
| 0.2839 | 0.37 J | -0.0861 | 5 | 65 |
| 0.3063 | 0.37 J | -0.0637 | 5 | 66 |
| | | | | |
| ND<0.5 U | ND<1.5 U | -1 | 5 | 67 |
| ND<1 U | ND<1.5 U | -0.5 | 5 | 68 |
| ND<0.1 U | ND<1.5 U | -1.4 | 5 | 69 |
| ND<0.1 U | ND<1.5 U | -1.4 | 5 | 70 |

| | | | | |
|---|---|---|---|---|
| 0.1115 J | ND<1.5 U | -1.3885 | 5 | 71 |
| 0.2839 | ND<1.5 U | -1.2161 | 5 | 72 |
| 0.3063 | ND<1.5 U | -1.1937 | 5 | 73 |
| | | | | |
| ND<1 U | ND<0.5 U | 0.5 | 6 | 73 |
| ND<0.1 U | ND<0.5 U | -0.4 | 6 | 74 |
| ND<0.1 U | ND<0.5 U | -0.4 | 6 | 75 |
| 0.1115 J | ND<0.5 U | -0.3885 | 6 | 76 |
| 0.2839 | ND<0.5 U | -0.2161 | 6 | 77 |
| 0.3063 | ND<0.5 U | -0.1937 | 6 | 78 |
| | | | | |
| ND<0.1 U | ND<1 U | -0.9 | 6 | 79 |
| ND<0.1 U | ND<1 U | -0.9 | 6 | 80 |
| 0.1115 J | ND<1 U | -0.8885 | 6 | 81 |
| 0.2839 | ND<1 U | -0.7161 | 6 | 82 |
| 0.3063 | ND<1 U | -0.6937 | 6 | 83 |
| | | | | |
| ND<0.1 U | ND<0.1 U | 0 | 6 | 83 |
| 0.1115 J | ND<0.1 U | 0.0115 | 7 | 83 |
| 0.2839 | ND<0.1 U | 0.1839 | 8 | 83 |
| 0.3063 | ND<0.1 U | 0.2063 | 9 | 83 |
| | | | | |
| 0.1115 J | ND<0.1 U | 0.0115 | 10 | 83 |
| 0.2839 | ND<0.1 U | 0.1839 | 11 | 83 |
| 0.3063 | ND<0.1 U | 0.2063 | 12 | 83 |
| | | | | |
| 0.2839 | 0.1115 J | 0.1724 | 13 | 83 |
| 0.3063 | 0.1115 J | 0.1948 | 14 | 83 |
| | | | | |
| 0.3063 | 0.2839 | 0.0224 | 15 | 83 |

S Statistic = 15 - 83 = -68

| Tied Group | Value | Members |
|---|---|---|
| 1 | 1.5 | 7 |
| 2 | 0.1 | 2 |

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 816

B = 18
C = 210
D = 0
E = 44
F = 2
a = 8880
b = 30240
c = 480
Group Variance = 447.183
Z-Score = -3.16834
Comparison Level at 95% confidence level = -1.65463 (downward trend)
**-3.16834 < -1.65463 indicating a downward trend**

## Mann-Kendall Trend Analysis
### Parameter: Cadmium
### Location: RWL-MWS
**Original Data (Not Transformed)**
**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| ND<1.5 U1c | ND<1.5 U | Same Date | 0 | 0 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 0 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 0 |
| 0.85 J | ND<1.5 U | -0.65 | 0 | 1 |
| 0.52 J | ND<1.5 U | -0.98 | 0 | 2 |
| 0.59 J | ND<1.5 U | -0.91 | 0 | 3 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 3 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 3 |
| 0.37 J | ND<1.5 U | -1.13 | 0 | 4 |
| ND<1 U | ND<1.5 U | -0.5 | 0 | 5 |
| 0.1408 J | ND<1.5 U | -1.3592 | 0 | 6 |
| 0.0722 J | ND<1.5 U | -1.4278 | 0 | 7 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 8 |
| 4.627 | ND<1.5 U | 3.127 | 1 | 8 |
| 1.45 | ND<1.5 U | -0.05 | 1 | 9 |
| | | | | |
| ND<1.5 U | ND<1.5 U1c | 0 | 1 | 9 |
| ND<1.5 U | ND<1.5 U1c | 0 | 1 | 9 |
| 0.85 J | ND<1.5 U1c | -0.65 | 1 | 10 |
| 0.52 J | ND<1.5 U1c | -0.98 | 1 | 11 |
| 0.59 J | ND<1.5 U1c | -0.91 | 1 | 12 |
| ND<1.5 U | ND<1.5 U1c | 0 | 1 | 12 |
| ND<1.5 U | ND<1.5 U1c | 0 | 1 | 12 |
| 0.37 J | ND<1.5 U1c | -1.13 | 1 | 13 |
| ND<1 U | ND<1.5 U1c | -0.5 | 1 | 14 |
| 0.1408 J | ND<1.5 U1c | -1.3592 | 1 | 15 |
| 0.0722 J | ND<1.5 U1c | -1.4278 | 1 | 16 |
| ND<0.1 U | ND<1.5 U1c | -1.4 | 1 | 17 |
| 4.627 | ND<1.5 U1c | 3.127 | 2 | 17 |
| 1.45 | ND<1.5 U1c | -0.05 | 2 | 18 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 2 | 18 |
| 0.85 J | ND<1.5 U | -0.65 | 2 | 19 |
| 0.52 J | ND<1.5 U | -0.98 | 2 | 20 |
| 0.59 J | ND<1.5 U | -0.91 | 2 | 21 |
| ND<1.5 U | ND<1.5 U | 0 | 2 | 21 |
| ND<1.5 U | ND<1.5 U | 0 | 2 | 21 |
| 0.37 J | ND<1.5 U | -1.13 | 2 | 22 |
| ND<1 U | ND<1.5 U | -0.5 | 2 | 23 |
| 0.1408 J | ND<1.5 U | -1.3592 | 2 | 24 |
| 0.0722 J | ND<1.5 U | -1.4278 | 2 | 25 |
| ND<0.1 U | ND<1.5 U | -1.4 | 2 | 26 |
| 4.627 | ND<1.5 U | 3.127 | 3 | 26 |
| 1.45 | ND<1.5 U | -0.05 | 3 | 27 |
| | | | | |
| 0.85 J | ND<1.5 U | -0.65 | 3 | 28 |
| 0.52 J | ND<1.5 U | -0.98 | 3 | 29 |

| | | | | |
|---|---|---|---|---|
| 0.59 J | ND<1.5 U | -0.91 | 3 | 30 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 30 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 30 |
| 0.37 J | ND<1.5 U | -1.13 | 3 | 31 |
| ND<1 U | ND<1.5 U | -0.5 | 3 | 32 |
| 0.1408 J | ND<1.5 U | -1.3592 | 3 | 33 |
| 0.0722 J | ND<1.5 U | -1.4278 | 3 | 34 |
| ND<0.1 U | ND<1.5 U | -1.4 | 3 | 35 |
| 4.627 | ND<1.5 U | 3.127 | 4 | 35 |
| 1.45 | ND<1.5 U | -0.05 | 4 | 36 |
| | | | | |
| 0.52 J | 0.85 J | -0.33 | 4 | 37 |
| 0.59 J | 0.85 J | -0.26 | 4 | 38 |
| ND<1.5 U | 0.85 J | 0.65 | 5 | 38 |
| ND<1.5 U | 0.85 J | 0.65 | 6 | 38 |
| 0.37 J | 0.85 J | -0.48 | 6 | 39 |
| ND<1 U | 0.85 J | 0.15 | 7 | 39 |
| 0.1408 J | 0.85 J | -0.7092 | 7 | 40 |
| 0.0722 J | 0.85 J | -0.7778 | 7 | 41 |
| ND<0.1 U | 0.85 J | -0.75 | 7 | 42 |
| 4.627 | 0.85 J | 3.777 | 8 | 42 |
| 1.45 | 0.85 J | 0.6 | 9 | 42 |
| | | | | |
| 0.59 J | 0.52 J | 0.07 | 10 | 42 |
| ND<1.5 U | 0.52 J | 0.98 | 11 | 42 |
| ND<1.5 U | 0.52 J | 0.98 | 12 | 42 |
| 0.37 J | 0.52 J | -0.15 | 12 | 43 |
| ND<1 U | 0.52 J | 0.48 | 13 | 43 |
| 0.1408 J | 0.52 J | -0.3792 | 13 | 44 |
| 0.0722 J | 0.52 J | -0.4478 | 13 | 45 |
| ND<0.1 U | 0.52 J | -0.42 | 13 | 46 |
| 4.627 | 0.52 J | 4.107 | 14 | 46 |
| 1.45 | 0.52 J | 0.93 | 15 | 46 |
| | | | | |
| ND<1.5 U | 0.59 J | 0.91 | 16 | 46 |
| ND<1.5 U | 0.59 J | 0.91 | 17 | 46 |
| 0.37 J | 0.59 J | -0.22 | 17 | 47 |
| ND<1 U | 0.59 J | 0.41 | 18 | 47 |
| 0.1408 J | 0.59 J | -0.4492 | 18 | 48 |
| 0.0722 J | 0.59 J | -0.5178 | 18 | 49 |
| ND<0.1 U | 0.59 J | -0.49 | 18 | 50 |
| 4.627 | 0.59 J | 4.037 | 19 | 50 |
| 1.45 | 0.59 J | 0.86 | 20 | 50 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 20 | 50 |
| 0.37 J | ND<1.5 U | -1.13 | 20 | 51 |
| ND<1 U | ND<1.5 U | -0.5 | 20 | 52 |
| 0.1408 J | ND<1.5 U | -1.3592 | 20 | 53 |
| 0.0722 J | ND<1.5 U | -1.4278 | 20 | 54 |
| ND<0.1 U | ND<1.5 U | -1.4 | 20 | 55 |
| 4.627 | ND<1.5 U | 3.127 | 21 | 55 |
| 1.45 | ND<1.5 U | -0.05 | 21 | 56 |
| | | | | |
| 0.37 J | ND<1.5 U | -1.13 | 21 | 57 |
| ND<1 U | ND<1.5 U | -0.5 | 21 | 58 |
| 0.1408 J | ND<1.5 U | -1.3592 | 21 | 59 |
| 0.0722 J | ND<1.5 U | -1.4278 | 21 | 60 |

| | | | | |
|---|---|---|---|---|
| ND<0.1 U | ND<1.5 U | -1.4 | 21 | 61 |
| 4.627 | ND<1.5 U | 3.127 | 22 | 61 |
| 1.45 | ND<1.5 U | -0.05 | 22 | 62 |
| | | | | |
| ND<1 U | 0.37 J | 0.63 | 23 | 62 |
| 0.1408 J | 0.37 J | -0.2292 | 23 | 63 |
| 0.0722 J | 0.37 J | -0.2978 | 23 | 64 |
| ND<0.1 U | 0.37 J | -0.27 | 23 | 65 |
| 4.627 | 0.37 J | 4.257 | 24 | 65 |
| 1.45 | 0.37 J | 1.08 | 25 | 65 |
| | | | | |
| 0.1408 J | ND<1 U | -0.8592 | 25 | 66 |
| 0.0722 J | ND<1 U | -0.9278 | 25 | 67 |
| ND<0.1 U | ND<1 U | -0.9 | 25 | 68 |
| 4.627 | ND<1 U | 3.627 | 26 | 68 |
| 1.45 | ND<1 U | 0.45 | 27 | 68 |
| | | | | |
| 0.0722 J | 0.1408 J | -0.0686 | 27 | 69 |
| ND<0.1 U | 0.1408 J | -0.0408 | 27 | 70 |
| 4.627 | 0.1408 J | 4.4862 | 28 | 70 |
| 1.45 | 0.1408 J | 1.3092 | 29 | 70 |
| | | | | |
| ND<0.1 U | 0.0722 J | 0.0278 | 30 | 70 |
| 4.627 | 0.0722 J | 4.5548 | 31 | 70 |
| 1.45 | 0.0722 J | 1.3778 | 32 | 70 |
| | | | | |
| 4.627 | ND<0.1 U | 4.527 | 33 | 70 |
| 1.45 | ND<0.1 U | 1.35 | 34 | 70 |
| | | | | |
| 1.45 | 4.627 | -3.177 | 34 | 71 |

S Statistic = 34 - 71 = -37

| Tied Group | Value | Members |
|---|---|---|
| 1 | 1.5 | 6 |

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 510
B = 18

C = 120
D = 0
E = 30
F = 2
a = 8880
b = 30240
c = 480
Group Variance = 464.125
Z-Score = -1.67103
Comparison Level at 95% confidence level = -1.65463 (downward trend)
**-1.67103 < -1.65463 indicating a downward trend**

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RWM-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| ND<1.5 U | ND<1.5 U | Same Date | 0 | 0 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 0 |
| 0.36 J | ND<1.5 U | -1.14 | 0 | 1 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 1 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 1 |
| ND<1.5 U1c | ND<1.5 U | 0 | 0 | 1 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 1 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 1 |
| 0.36 J | ND<1.5 U | -1.14 | 0 | 2 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 2 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 2 |
| ND<1.5 U1c | ND<1.5 U | 0 | 0 | 2 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 2 |
| | | | | |
| 0.36 J | ND<1.5 U | -1.14 | 0 | 3 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 3 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 3 |
| ND<1.5 U1c | ND<1.5 U | 0 | 0 | 3 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 3 |
| | | | | |
| ND<1.5 U | 0.36 J | 1.14 | 1 | 3 |
| ND<1.5 U | 0.36 J | 1.14 | 2 | 3 |
| ND<1.5 U1c | 0.36 J | 1.14 | 3 | 3 |
| ND<1.5 U | 0.36 J | 1.14 | 4 | 3 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 4 | 3 |
| ND<1.5 U1c | ND<1.5 U | 0 | 4 | 3 |
| ND<1.5 U | ND<1.5 U | 0 | 4 | 3 |
| | | | | |
| ND<1.5 U1c | ND<1.5 U | 0 | 4 | 3 |
| ND<1.5 U | ND<1.5 U | 0 | 4 | 3 |
| | | | | |
| ND<1.5 U | ND<1.5 U1c | 0 | 4 | 3 |

S Statistic = 4 - 3 = 1

| Tied Group | Value | Members |
|---|---|---|
| 1 | 1.5 | 7 |

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |

6/1/2020 1
9/1/2020 1
11/1/2020 1
There are 1 time periods with multiple data

---

A = 798
B = 18
C = 210
D = 0
E = 42
F = 2
a = 1176
b = 3024
c = 112
Group Variance = 20.75
Z-Score = 0
Comparison Level at 95% confidence level = -1.65463 (downward trend)
0 >= -1.65463 indicating no evidence of a downward trend

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RWN-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 13000 | 13000 | Same Date | 0 | 0 |
| 11100 | 13000 | -1900 | 0 | 1 |
| 11200 | 13000 | -1800 | 0 | 2 |
| 9420 MH | 13000 | -3580 | 0 | 3 |
| 6810 | 13000 | -6190 | 0 | 4 |
| 7350 | 13000 | -5650 | 0 | 5 |
| 6260 | 13000 | -6740 | 0 | 6 |
| 4850 | 13000 | -8150 | 0 | 7 |
| 2260 | 13000 | -10740 | 0 | 8 |
| 2517 | 13000 | -10483 | 0 | 9 |
| 2350 | 13000 | -10650 | 0 | 10 |
| | | | | |
| 11100 | 13000 | -1900 | 0 | 11 |
| 11200 | 13000 | -1800 | 0 | 12 |
| 9420 MH | 13000 | -3580 | 0 | 13 |
| 6810 | 13000 | -6190 | 0 | 14 |
| 7350 | 13000 | -5650 | 0 | 15 |
| 6260 | 13000 | -6740 | 0 | 16 |
| 4850 | 13000 | -8150 | 0 | 17 |
| 2260 | 13000 | -10740 | 0 | 18 |
| 2517 | 13000 | -10483 | 0 | 19 |
| 2350 | 13000 | -10650 | 0 | 20 |
| | | | | |
| 11200 | 11100 | 100 | 1 | 20 |
| 9420 MH | 11100 | -1680 | 1 | 21 |
| 6810 | 11100 | -4290 | 1 | 22 |
| 7350 | 11100 | -3750 | 1 | 23 |
| 6260 | 11100 | -4840 | 1 | 24 |
| 4850 | 11100 | -6250 | 1 | 25 |
| 2260 | 11100 | -8840 | 1 | 26 |
| 2517 | 11100 | -8583 | 1 | 27 |
| 2350 | 11100 | -8750 | 1 | 28 |
| | | | | |
| 9420 MH | 11200 | -1780 | 1 | 29 |
| 6810 | 11200 | -4390 | 1 | 30 |
| 7350 | 11200 | -3850 | 1 | 31 |
| 6260 | 11200 | -4940 | 1 | 32 |
| 4850 | 11200 | -6350 | 1 | 33 |
| 2260 | 11200 | -8940 | 1 | 34 |
| 2517 | 11200 | -8683 | 1 | 35 |
| 2350 | 11200 | -8850 | 1 | 36 |
| | | | | |
| 6810 | 9420 MH | -2610 | 1 | 37 |
| 7350 | 9420 MH | -2070 | 1 | 38 |
| 6260 | 9420 MH | -3160 | 1 | 39 |
| 4850 | 9420 MH | -4570 | 1 | 40 |
| 2260 | 9420 MH | -7160 | 1 | 41 |

| | | | | |
|---|---|---|---|---|
| 2517 | 9420 MH | -6903 | 1 | 42 |
| 2350 | 9420 MH | -7070 | 1 | 43 |
| | | | | |
| 7350 | 6810 | 540 | 2 | 43 |
| 6260 | 6810 | -550 | 2 | 44 |
| 4850 | 6810 | -1960 | 2 | 45 |
| 2260 | 6810 | -4550 | 2 | 46 |
| 2517 | 6810 | -4293 | 2 | 47 |
| 2350 | 6810 | -4460 | 2 | 48 |
| | | | | |
| 6260 | 7350 | -1090 | 2 | 49 |
| 4850 | 7350 | -2500 | 2 | 50 |
| 2260 | 7350 | -5090 | 2 | 51 |
| 2517 | 7350 | -4833 | 2 | 52 |
| 2350 | 7350 | -5000 | 2 | 53 |
| | | | | |
| 4850 | 6260 | -1410 | 2 | 54 |
| 2260 | 6260 | -4000 | 2 | 55 |
| 2517 | 6260 | -3743 | 2 | 56 |
| 2350 | 6260 | -3910 | 2 | 57 |
| | | | | |
| 2260 | 4850 | -2590 | 2 | 58 |
| 2517 | 4850 | -2333 | 2 | 59 |
| 2350 | 4850 | -2500 | 2 | 60 |
| | | | | |
| 2517 | 2260 | 257 | 3 | 60 |
| 2350 | 2260 | 90 | 4 | 60 |
| | | | | |
| 2350 | 2517 | -167 | 4 | 61 |

S Statistic = 4 - 61 = -57

| Tied Group | Value | Members |
|---|---|---|
| 1 | 13000 | 2 |

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 3/1/2022 | 1 |
| 3/1/2023 | 1 |
| 3/1/2024 | 1 |

There are 1 time periods with multiple data

A = 18
B = 18
C = 0
D = 0
E = 2
F = 2
a = 3828

b = 11880
c = 264
Group Variance = 210.682
Z-Score = -3.85811
Comparison Level at 95% confidence level = -1.65463 (downward trend)
**-3.85811 < -1.65463 indicating a downward trend**

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RWO-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 10 1c4c | 1.4 J2c | Same Date | 0 | 0 |
| 1.3 J1c | 1.4 J2c | -0.1 | 0 | 1 |
| 7.6 | 1.4 J2c | 6.2 | 1 | 1 |
| 0.65 J | 1.4 J2c | -0.75 | 1 | 2 |
| 0.46 J | 1.4 J2c | -0.94 | 1 | 3 |
| 4.1 1c | 1.4 J2c | 2.7 | 2 | 3 |
| 0.53 J | 1.4 J2c | -0.87 | 2 | 4 |
| 0.85 J | 1.4 J2c | -0.55 | 2 | 5 |
| ND<0.5 U | 1.4 J2c | -0.9 | 2 | 6 |
| ND<1 U | 1.4 J2c | -0.4 | 2 | 7 |
| 0.0752 J | 1.4 J2c | -1.3248 | 2 | 8 |
| ND<0.1 U | 1.4 J2c | -1.3 | 2 | 9 |
| ND<0.1 U | 1.4 J2c | -1.3 | 2 | 10 |
| ND<0.1 U | 1.4 J2c | -1.3 | 2 | 11 |
| ND<5 U | 1.4 J2c | 3.6 | 3 | 11 |
| | | | | |
| 1.3 J1c | 10 1c4c | -8.7 | 3 | 12 |
| 7.6 | 10 1c4c | -2.4 | 3 | 13 |
| 0.65 J | 10 1c4c | -9.35 | 3 | 14 |
| 0.46 J | 10 1c4c | -9.54 | 3 | 15 |
| 4.1 1c | 10 1c4c | -5.9 | 3 | 16 |
| 0.53 J | 10 1c4c | -9.47 | 3 | 17 |
| 0.85 J | 10 1c4c | -9.15 | 3 | 18 |
| ND<0.5 U | 10 1c4c | -9.5 | 3 | 19 |
| ND<1 U | 10 1c4c | -9 | 3 | 20 |
| 0.0752 J | 10 1c4c | -9.9248 | 3 | 21 |
| ND<0.1 U | 10 1c4c | -9.9 | 3 | 22 |
| ND<0.1 U | 10 1c4c | -9.9 | 3 | 23 |
| ND<0.1 U | 10 1c4c | -9.9 | 3 | 24 |
| ND<5 U | 10 1c4c | -5 | 3 | 25 |
| | | | | |
| 7.6 | 1.3 J1c | 6.3 | 4 | 25 |
| 0.65 J | 1.3 J1c | -0.65 | 4 | 26 |
| 0.46 J | 1.3 J1c | -0.84 | 4 | 27 |
| 4.1 1c | 1.3 J1c | 2.8 | 5 | 27 |
| 0.53 J | 1.3 J1c | -0.77 | 5 | 28 |
| 0.85 J | 1.3 J1c | -0.45 | 5 | 29 |
| ND<0.5 U | 1.3 J1c | -0.8 | 5 | 30 |
| ND<1 U | 1.3 J1c | -0.3 | 5 | 31 |
| 0.0752 J | 1.3 J1c | -1.2248 | 5 | 32 |
| ND<0.1 U | 1.3 J1c | -1.2 | 5 | 33 |
| ND<0.1 U | 1.3 J1c | -1.2 | 5 | 34 |
| ND<0.1 U | 1.3 J1c | -1.2 | 5 | 35 |
| ND<5 U | 1.3 J1c | 3.7 | 6 | 35 |
| | | | | |
| 0.65 J | 7.6 | -6.95 | 6 | 36 |
| 0.46 J | 7.6 | -7.14 | 6 | 37 |

| | | | | |
|---|---|---|---|---|
| 4.1 1c | 7.6 | -3.5 | 6 | 38 |
| 0.53 J | 7.6 | -7.07 | 6 | 39 |
| 0.85 J | 7.6 | -6.75 | 6 | 40 |
| ND<0.5 U | 7.6 | -7.1 | 6 | 41 |
| ND<1 U | 7.6 | -6.6 | 6 | 42 |
| 0.0752 J | 7.6 | -7.5248 | 6 | 43 |
| ND<0.1 U | 7.6 | -7.5 | 6 | 44 |
| ND<0.1 U | 7.6 | -7.5 | 6 | 45 |
| ND<0.1 U | 7.6 | -7.5 | 6 | 46 |
| ND<5 U | 7.6 | -2.6 | 6 | 47 |
| | | | | |
| 0.46 J | 0.65 J | -0.19 | 6 | 48 |
| 4.1 1c | 0.65 J | 3.45 | 7 | 48 |
| 0.53 J | 0.65 J | -0.12 | 7 | 49 |
| 0.85 J | 0.65 J | 0.2 | 8 | 49 |
| ND<0.5 U | 0.65 J | -0.15 | 8 | 50 |
| ND<1 U | 0.65 J | 0.35 | 9 | 50 |
| 0.0752 J | 0.65 J | -0.5748 | 9 | 51 |
| ND<0.1 U | 0.65 J | -0.55 | 9 | 52 |
| ND<0.1 U | 0.65 J | -0.55 | 9 | 53 |
| ND<0.1 U | 0.65 J | -0.55 | 9 | 54 |
| ND<5 U | 0.65 J | 4.35 | 10 | 54 |
| | | | | |
| 4.1 1c | 0.46 J | 3.64 | 11 | 54 |
| 0.53 J | 0.46 J | 0.07 | 12 | 54 |
| 0.85 J | 0.46 J | 0.39 | 13 | 54 |
| ND<0.5 U | 0.46 J | 0.04 | 14 | 54 |
| ND<1 U | 0.46 J | 0.54 | 15 | 54 |
| 0.0752 J | 0.46 J | -0.3848 | 15 | 55 |
| ND<0.1 U | 0.46 J | -0.36 | 15 | 56 |
| ND<0.1 U | 0.46 J | -0.36 | 15 | 57 |
| ND<0.1 U | 0.46 J | -0.36 | 15 | 58 |
| ND<5 U | 0.46 J | 4.54 | 16 | 58 |
| | | | | |
| 0.53 J | 4.1 1c | -3.57 | 16 | 59 |
| 0.85 J | 4.1 1c | -3.25 | 16 | 60 |
| ND<0.5 U | 4.1 1c | -3.6 | 16 | 61 |
| ND<1 U | 4.1 1c | -3.1 | 16 | 62 |
| 0.0752 J | 4.1 1c | -4.0248 | 16 | 63 |
| ND<0.1 U | 4.1 1c | -4 | 16 | 64 |
| ND<0.1 U | 4.1 1c | -4 | 16 | 65 |
| ND<0.1 U | 4.1 1c | -4 | 16 | 66 |
| ND<5 U | 4.1 1c | 0.9 | 17 | 66 |
| | | | | |
| 0.85 J | 0.53 J | 0.32 | 18 | 66 |
| ND<0.5 U | 0.53 J | -0.03 | 18 | 67 |
| ND<1 U | 0.53 J | 0.47 | 19 | 67 |
| 0.0752 J | 0.53 J | -0.4548 | 19 | 68 |
| ND<0.1 U | 0.53 J | -0.43 | 19 | 69 |
| ND<0.1 U | 0.53 J | -0.43 | 19 | 70 |
| ND<0.1 U | 0.53 J | -0.43 | 19 | 71 |
| ND<5 U | 0.53 J | 4.47 | 20 | 71 |
| | | | | |
| ND<0.5 U | 0.85 J | -0.35 | 20 | 72 |
| ND<1 U | 0.85 J | 0.15 | 21 | 72 |
| 0.0752 J | 0.85 J | -0.7748 | 21 | 73 |
| ND<0.1 U | 0.85 J | -0.75 | 21 | 74 |

| | | | | |
|---|---|---|---|---|
| ND<0.1 U | 0.85 J | -0.75 | 21 | 75 |
| ND<0.1 U | 0.85 J | -0.75 | 21 | 76 |
| ND<5 U | 0.85 J | 4.15 | 22 | 76 |
| | | | | |
| ND<1 U | ND<0.5 U | 0.5 | 23 | 76 |
| 0.0752 J | ND<0.5 U | -0.4248 | 23 | 77 |
| ND<0.1 U | ND<0.5 U | -0.4 | 23 | 78 |
| ND<0.1 U | ND<0.5 U | -0.4 | 23 | 79 |
| ND<0.1 U | ND<0.5 U | -0.4 | 23 | 80 |
| ND<5 U | ND<0.5 U | 4.5 | 24 | 80 |
| | | | | |
| 0.0752 J | ND<1 U | -0.9248 | 24 | 81 |
| ND<0.1 U | ND<1 U | -0.9 | 24 | 82 |
| ND<0.1 U | ND<1 U | -0.9 | 24 | 83 |
| ND<0.1 U | ND<1 U | -0.9 | 24 | 84 |
| ND<5 U | ND<1 U | 4 | 25 | 84 |
| | | | | |
| ND<0.1 U | 0.0752 J | 0.0248 | 26 | 84 |
| ND<0.1 U | 0.0752 J | 0.0248 | 27 | 84 |
| ND<0.1 U | 0.0752 J | 0.0248 | 28 | 84 |
| ND<5 U | 0.0752 J | 4.9248 | 29 | 84 |
| | | | | |
| ND<0.1 U | ND<0.1 U | 0 | 29 | 84 |
| ND<0.1 U | ND<0.1 U | 0 | 29 | 84 |
| ND<5 U | ND<0.1 U | 4.9 | 30 | 84 |
| | | | | |
| ND<0.1 U | ND<0.1 U | 0 | 30 | 84 |
| ND<5 U | ND<0.1 U | 4.9 | 31 | 84 |
| | | | | |
| ND<5 U | ND<0.1 U | 4.9 | 32 | 84 |

S Statistic = 32 - 84 = -52

| Tied Group | Value | Members |
|---|---|---|
| 1 | 0.1 | 3 |

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 66
B = 18

C = 6
D = 0
E = 6
F = 2
a = 8880
b = 30240
c = 480
Group Variance = 488.692
Z-Score = -2.30703
Comparison Level at 95% confidence level = -1.65463 (downward trend)
**-2.30703 < -1.65463 indicating a downward trend**

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RWQ-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 2.9 J | 2.6 J | Same Date | 0 | 0 |
| 2.6 J1c | 2.6 J | 0 | 0 | 0 |
| 4.4 | 2.6 J | 1.8 | 1 | 0 |
| 3.1 | 2.6 J | 0.5 | 2 | 0 |
| 2.9 J | 2.6 J | 0.3 | 3 | 0 |
| 3.3 1c | 2.6 J | 0.7 | 4 | 0 |
| 3.2 | 2.6 J | 0.6 | 5 | 0 |
| 3.4 | 2.6 J | 0.8 | 6 | 0 |
| 3.1 | 2.6 J | 0.5 | 7 | 0 |
| 3.3 | 2.6 J | 0.7 | 8 | 0 |
| 2.69 | 2.6 J | 0.09 | 9 | 0 |
| 10.47 | 2.6 J | 7.87 | 10 | 0 |
| 2.042 | 2.6 J | -0.558 | 10 | 1 |
| 2.623 | 2.6 J | 0.023 | 11 | 1 |
| 3.007 | 2.6 J | 0.407 | 12 | 1 |
| | | | | |
| 2.6 J1c | 2.9 J | -0.3 | 12 | 2 |
| 4.4 | 2.9 J | 1.5 | 13 | 2 |
| 3.1 | 2.9 J | 0.2 | 14 | 2 |
| 2.9 J | 2.9 J | 0 | 14 | 2 |
| 3.3 1c | 2.9 J | 0.4 | 15 | 2 |
| 3.2 | 2.9 J | 0.3 | 16 | 2 |
| 3.4 | 2.9 J | 0.5 | 17 | 2 |
| 3.1 | 2.9 J | 0.2 | 18 | 2 |
| 3.3 | 2.9 J | 0.4 | 19 | 2 |
| 2.69 | 2.9 J | -0.21 | 19 | 3 |
| 10.47 | 2.9 J | 7.57 | 20 | 3 |
| 2.042 | 2.9 J | -0.858 | 20 | 4 |
| 2.623 | 2.9 J | -0.277 | 20 | 5 |
| 3.007 | 2.9 J | 0.107 | 21 | 5 |
| | | | | |
| 4.4 | 2.6 J1c | 1.8 | 22 | 5 |
| 3.1 | 2.6 J1c | 0.5 | 23 | 5 |
| 2.9 J | 2.6 J1c | 0.3 | 24 | 5 |
| 3.3 1c | 2.6 J1c | 0.7 | 25 | 5 |
| 3.2 | 2.6 J1c | 0.6 | 26 | 5 |
| 3.4 | 2.6 J1c | 0.8 | 27 | 5 |
| 3.1 | 2.6 J1c | 0.5 | 28 | 5 |
| 3.3 | 2.6 J1c | 0.7 | 29 | 5 |
| 2.69 | 2.6 J1c | 0.09 | 30 | 5 |
| 10.47 | 2.6 J1c | 7.87 | 31 | 5 |
| 2.042 | 2.6 J1c | -0.558 | 31 | 6 |
| 2.623 | 2.6 J1c | 0.023 | 32 | 6 |
| 3.007 | 2.6 J1c | 0.407 | 33 | 6 |
| | | | | |
| 3.1 | 4.4 | -1.3 | 33 | 7 |
| 2.9 J | 4.4 | -1.5 | 33 | 8 |

| | | | | |
|---|---|---|---|---|
| 3.3 1c | 4.4 | -1.1 | 33 | 9 |
| 3.2 | 4.4 | -1.2 | 33 | 10 |
| 3.4 | 4.4 | -1 | 33 | 11 |
| 3.1 | 4.4 | -1.3 | 33 | 12 |
| 3.3 | 4.4 | -1.1 | 33 | 13 |
| 2.69 | 4.4 | -1.71 | 33 | 14 |
| 10.47 | 4.4 | 6.07 | 34 | 14 |
| 2.042 | 4.4 | -2.358 | 34 | 15 |
| 2.623 | 4.4 | -1.777 | 34 | 16 |
| 3.007 | 4.4 | -1.393 | 34 | 17 |
| | | | | |
| 2.9 J | 3.1 | -0.2 | 34 | 18 |
| 3.3 1c | 3.1 | 0.2 | 35 | 18 |
| 3.2 | 3.1 | 0.1 | 36 | 18 |
| 3.4 | 3.1 | 0.3 | 37 | 18 |
| 3.1 | 3.1 | 0 | 37 | 18 |
| 3.3 | 3.1 | 0.2 | 38 | 18 |
| 2.69 | 3.1 | -0.41 | 38 | 19 |
| 10.47 | 3.1 | 7.37 | 39 | 19 |
| 2.042 | 3.1 | -1.058 | 39 | 20 |
| 2.623 | 3.1 | -0.477 | 39 | 21 |
| 3.007 | 3.1 | -0.093 | 39 | 22 |
| | | | | |
| 3.3 1c | 2.9 J | 0.4 | 40 | 22 |
| 3.2 | 2.9 J | 0.3 | 41 | 22 |
| 3.4 | 2.9 J | 0.5 | 42 | 22 |
| 3.1 | 2.9 J | 0.2 | 43 | 22 |
| 3.3 | 2.9 J | 0.4 | 44 | 22 |
| 2.69 | 2.9 J | -0.21 | 44 | 23 |
| 10.47 | 2.9 J | 7.57 | 45 | 23 |
| 2.042 | 2.9 J | -0.858 | 45 | 24 |
| 2.623 | 2.9 J | -0.277 | 45 | 25 |
| 3.007 | 2.9 J | 0.107 | 46 | 25 |
| | | | | |
| 3.2 | 3.3 1c | -0.1 | 46 | 26 |
| 3.4 | 3.3 1c | 0.1 | 47 | 26 |
| 3.1 | 3.3 1c | -0.2 | 47 | 27 |
| 3.3 | 3.3 1c | 0 | 47 | 27 |
| 2.69 | 3.3 1c | -0.61 | 47 | 28 |
| 10.47 | 3.3 1c | 7.17 | 48 | 28 |
| 2.042 | 3.3 1c | -1.258 | 48 | 29 |
| 2.623 | 3.3 1c | -0.677 | 48 | 30 |
| 3.007 | 3.3 1c | -0.293 | 48 | 31 |
| | | | | |
| 3.4 | 3.2 | 0.2 | 49 | 31 |
| 3.1 | 3.2 | -0.1 | 49 | 32 |
| 3.3 | 3.2 | 0.1 | 50 | 32 |
| 2.69 | 3.2 | -0.51 | 50 | 33 |
| 10.47 | 3.2 | 7.27 | 51 | 33 |
| 2.042 | 3.2 | -1.158 | 51 | 34 |
| 2.623 | 3.2 | -0.577 | 51 | 35 |
| 3.007 | 3.2 | -0.193 | 51 | 36 |
| | | | | |
| 3.1 | 3.4 | -0.3 | 51 | 37 |
| 3.3 | 3.4 | -0.1 | 51 | 38 |
| 2.69 | 3.4 | -0.71 | 51 | 39 |
| 10.47 | 3.4 | 7.07 | 52 | 39 |

| | | | | |
|---|---|---|---|---|
| 2.042 | 3.4 | -1.358 | 52 | 40 |
| 2.623 | 3.4 | -0.777 | 52 | 41 |
| 3.007 | 3.4 | -0.393 | 52 | 42 |
| | | | | |
| 3.3 | 3.1 | 0.2 | 53 | 42 |
| 2.69 | 3.1 | -0.41 | 53 | 43 |
| 10.47 | 3.1 | 7.37 | 54 | 43 |
| 2.042 | 3.1 | -1.058 | 54 | 44 |
| 2.623 | 3.1 | -0.477 | 54 | 45 |
| 3.007 | 3.1 | -0.093 | 54 | 46 |
| | | | | |
| 2.69 | 3.3 | -0.61 | 54 | 47 |
| 10.47 | 3.3 | 7.17 | 55 | 47 |
| 2.042 | 3.3 | -1.258 | 55 | 48 |
| 2.623 | 3.3 | -0.677 | 55 | 49 |
| 3.007 | 3.3 | -0.293 | 55 | 50 |
| | | | | |
| 10.47 | 2.69 | 7.78 | 56 | 50 |
| 2.042 | 2.69 | -0.648 | 56 | 51 |
| 2.623 | 2.69 | -0.067 | 56 | 52 |
| 3.007 | 2.69 | 0.317 | 57 | 52 |
| | | | | |
| 2.042 | 10.47 | -8.428 | 57 | 53 |
| 2.623 | 10.47 | -7.847 | 57 | 54 |
| 3.007 | 10.47 | -7.463 | 57 | 55 |
| | | | | |
| 2.623 | 2.042 | 0.581 | 58 | 55 |
| 3.007 | 2.042 | 0.965 | 59 | 55 |
| | | | | |
| 3.007 | 2.623 | 0.384 | 60 | 55 |

S Statistic = 60 - 55 = 5

| Tied Group | Value | Members |
|---|---|---|
| 1 | 2.6 | 2 |
| 2 | 2.9 | 2 |
| 3 | 3.1 | 2 |
| 4 | 3.3 | 2 |

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 72
B = 18
C = 0
D = 0
E = 8
F = 2
a = 8880
b = 30240
c = 480
Group Variance = 488.367
Z-Score = 0.181004
Comparison Level at 95% confidence level = -1.65463 (downward trend)
0.181004 >= -1.65463 indicating no evidence of a downward trend

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RWR-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 50 2c | 51.8 1c4c | Same Date | 0 | 0 |
| 41 1c | 51.8 1c4c | -10.8 | 0 | 1 |
| 42.3 | 51.8 1c4c | -9.5 | 0 | 2 |
| 38.8 | 51.8 1c4c | -13 | 0 | 3 |
| 35.5 | 51.8 1c4c | -16.3 | 0 | 4 |
| 34.3 | 51.8 1c4c | -17.5 | 0 | 5 |
| 33.8 | 51.8 1c4c | -18 | 0 | 6 |
| 35.1 | 51.8 1c4c | -16.7 | 0 | 7 |
| 39.3 | 51.8 1c4c | -12.5 | 0 | 8 |
| 28.8 | 51.8 1c4c | -23 | 0 | 9 |
| 23.54 | 51.8 1c4c | -28.26 | 0 | 10 |
| 19.3 | 51.8 1c4c | -32.5 | 0 | 11 |
| 20.34 | 51.8 1c4c | -31.46 | 0 | 12 |
| 15.34 | 51.8 1c4c | -36.46 | 0 | 13 |
| 36.18 | 51.8 1c4c | -15.62 | 0 | 14 |
| | | | | |
| 41 1c | 50 2c | -9 | 0 | 15 |
| 42.3 | 50 2c | -7.7 | 0 | 16 |
| 38.8 | 50 2c | -11.2 | 0 | 17 |
| 35.5 | 50 2c | -14.5 | 0 | 18 |
| 34.3 | 50 2c | -15.7 | 0 | 19 |
| 33.8 | 50 2c | -16.2 | 0 | 20 |
| 35.1 | 50 2c | -14.9 | 0 | 21 |
| 39.3 | 50 2c | -10.7 | 0 | 22 |
| 28.8 | 50 2c | -21.2 | 0 | 23 |
| 23.54 | 50 2c | -26.46 | 0 | 24 |
| 19.3 | 50 2c | -30.7 | 0 | 25 |
| 20.34 | 50 2c | -29.66 | 0 | 26 |
| 15.34 | 50 2c | -34.66 | 0 | 27 |
| 36.18 | 50 2c | -13.82 | 0 | 28 |
| | | | | |
| 42.3 | 41 1c | 1.3 | 1 | 28 |
| 38.8 | 41 1c | -2.2 | 1 | 29 |
| 35.5 | 41 1c | -5.5 | 1 | 30 |
| 34.3 | 41 1c | -6.7 | 1 | 31 |
| 33.8 | 41 1c | -7.2 | 1 | 32 |
| 35.1 | 41 1c | -5.9 | 1 | 33 |
| 39.3 | 41 1c | -1.7 | 1 | 34 |
| 28.8 | 41 1c | -12.2 | 1 | 35 |
| 23.54 | 41 1c | -17.46 | 1 | 36 |
| 19.3 | 41 1c | -21.7 | 1 | 37 |
| 20.34 | 41 1c | -20.66 | 1 | 38 |
| 15.34 | 41 1c | -25.66 | 1 | 39 |
| 36.18 | 41 1c | -4.82 | 1 | 40 |
| | | | | |
| 38.8 | 42.3 | -3.5 | 1 | 41 |
| 35.5 | 42.3 | -6.8 | 1 | 42 |

| | | | | |
|---|---|---|---|---|
| 34.3 | 42.3 | -8 | 1 | 43 |
| 33.8 | 42.3 | -8.5 | 1 | 44 |
| 35.1 | 42.3 | -7.2 | 1 | 45 |
| 39.3 | 42.3 | -3 | 1 | 46 |
| 28.8 | 42.3 | -13.5 | 1 | 47 |
| 23.54 | 42.3 | -18.76 | 1 | 48 |
| 19.3 | 42.3 | -23 | 1 | 49 |
| 20.34 | 42.3 | -21.96 | 1 | 50 |
| 15.34 | 42.3 | -26.96 | 1 | 51 |
| 36.18 | 42.3 | -6.12 | 1 | 52 |
| | | | | |
| 35.5 | 38.8 | -3.3 | 1 | 53 |
| 34.3 | 38.8 | -4.5 | 1 | 54 |
| 33.8 | 38.8 | -5 | 1 | 55 |
| 35.1 | 38.8 | -3.7 | 1 | 56 |
| 39.3 | 38.8 | 0.5 | 2 | 56 |
| 28.8 | 38.8 | -10 | 2 | 57 |
| 23.54 | 38.8 | -15.26 | 2 | 58 |
| 19.3 | 38.8 | -19.5 | 2 | 59 |
| 20.34 | 38.8 | -18.46 | 2 | 60 |
| 15.34 | 38.8 | -23.46 | 2 | 61 |
| 36.18 | 38.8 | -2.62 | 2 | 62 |
| | | | | |
| 34.3 | 35.5 | -1.2 | 2 | 63 |
| 33.8 | 35.5 | -1.7 | 2 | 64 |
| 35.1 | 35.5 | -0.4 | 2 | 65 |
| 39.3 | 35.5 | 3.8 | 3 | 65 |
| 28.8 | 35.5 | -6.7 | 3 | 66 |
| 23.54 | 35.5 | -11.96 | 3 | 67 |
| 19.3 | 35.5 | -16.2 | 3 | 68 |
| 20.34 | 35.5 | -15.16 | 3 | 69 |
| 15.34 | 35.5 | -20.16 | 3 | 70 |
| 36.18 | 35.5 | 0.68 | 4 | 70 |
| | | | | |
| 33.8 | 34.3 | -0.5 | 4 | 71 |
| 35.1 | 34.3 | 0.8 | 5 | 71 |
| 39.3 | 34.3 | 5 | 6 | 71 |
| 28.8 | 34.3 | -5.5 | 6 | 72 |
| 23.54 | 34.3 | -10.76 | 6 | 73 |
| 19.3 | 34.3 | -15 | 6 | 74 |
| 20.34 | 34.3 | -13.96 | 6 | 75 |
| 15.34 | 34.3 | -18.96 | 6 | 76 |
| 36.18 | 34.3 | 1.88 | 7 | 76 |
| | | | | |
| 35.1 | 33.8 | 1.3 | 8 | 76 |
| 39.3 | 33.8 | 5.5 | 9 | 76 |
| 28.8 | 33.8 | -5 | 9 | 77 |
| 23.54 | 33.8 | -10.26 | 9 | 78 |
| 19.3 | 33.8 | -14.5 | 9 | 79 |
| 20.34 | 33.8 | -13.46 | 9 | 80 |
| 15.34 | 33.8 | -18.46 | 9 | 81 |
| 36.18 | 33.8 | 2.38 | 10 | 81 |
| | | | | |
| 39.3 | 35.1 | 4.2 | 11 | 81 |
| 28.8 | 35.1 | -6.3 | 11 | 82 |
| 23.54 | 35.1 | -11.56 | 11 | 83 |
| 19.3 | 35.1 | -15.8 | 11 | 84 |

| | | | | |
|---|---|---|---|---|
| 20.34 | 35.1 | -14.76 | 11 | 85 |
| 15.34 | 35.1 | -19.76 | 11 | 86 |
| 36.18 | 35.1 | 1.08 | 12 | 86 |
| | | | | |
| 28.8 | 39.3 | -10.5 | 12 | 87 |
| 23.54 | 39.3 | -15.76 | 12 | 88 |
| 19.3 | 39.3 | -20 | 12 | 89 |
| 20.34 | 39.3 | -18.96 | 12 | 90 |
| 15.34 | 39.3 | -23.96 | 12 | 91 |
| 36.18 | 39.3 | -3.12 | 12 | 92 |
| | | | | |
| 23.54 | 28.8 | -5.26 | 12 | 93 |
| 19.3 | 28.8 | -9.5 | 12 | 94 |
| 20.34 | 28.8 | -8.46 | 12 | 95 |
| 15.34 | 28.8 | -13.46 | 12 | 96 |
| 36.18 | 28.8 | 7.38 | 13 | 96 |
| | | | | |
| 19.3 | 23.54 | -4.24 | 13 | 97 |
| 20.34 | 23.54 | -3.2 | 13 | 98 |
| 15.34 | 23.54 | -8.2 | 13 | 99 |
| 36.18 | 23.54 | 12.64 | 14 | 99 |
| | | | | |
| 20.34 | 19.3 | 1.04 | 15 | 99 |
| 15.34 | 19.3 | -3.96 | 15 | 100 |
| 36.18 | 19.3 | 16.88 | 16 | 100 |
| | | | | |
| 15.34 | 20.34 | -5 | 16 | 101 |
| 36.18 | 20.34 | 15.84 | 17 | 101 |
| | | | | |
| 36.18 | 15.34 | 20.84 | 18 | 101 |

S Statistic = 18 - 101 = -83

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 0
B = 18
C = 0

D = 0
E = 0
F = 2
a = 8880
b = 30240
c = 480
Group Variance = 492.333
Z-Score = -3.69559
Comparison Level at 95% confidence level = -1.65463 (downward trend)
**-3.69559 < -1.65463 indicating a downward trend**

## Mann-Kendall Trend Analysis
### Parameter: Cadmium
### Location: RWS-MWS
**Original Data (Not Transformed)**
**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| ND<1.5 U | ND<1.5 U | Same Date | 0 | 0 |
| ND<1.5 U1c | ND<1.5 U | 0 | 0 | 0 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 0 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 0 |
| 1.9 J | ND<1.5 U | 0.4 | 1 | 0 |
| 0.42 J | ND<1.5 U | -1.08 | 1 | 1 |
| 0.39 J | ND<1.5 U | -1.11 | 1 | 2 |
| ND<1.5 U | ND<1.5 U | 0 | 1 | 2 |
| ND<5 U | ND<1.5 U | 3.5 | 2 | 2 |
| ND<1 U | ND<1.5 U | -0.5 | 2 | 3 |
| 0.2304 | ND<1.5 U | -1.2696 | 2 | 4 |
| 0.6824 | ND<1.5 U | -0.8176 | 2 | 5 |
| 0.166 J | ND<1.5 U | -1.334 | 2 | 6 |
| 1.028 | ND<1.5 U | -0.472 | 2 | 7 |
| 1.43 | ND<1.5 U | -0.07 | 2 | 8 |
| | | | | |
| ND<1.5 U1c | ND<1.5 U | 0 | 2 | 8 |
| ND<1.5 U | ND<1.5 U | 0 | 2 | 8 |
| ND<1.5 U | ND<1.5 U | 0 | 2 | 8 |
| 1.9 J | ND<1.5 U | 0.4 | 3 | 8 |
| 0.42 J | ND<1.5 U | -1.08 | 3 | 9 |
| 0.39 J | ND<1.5 U | -1.11 | 3 | 10 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 10 |
| ND<5 U | ND<1.5 U | 3.5 | 4 | 10 |
| ND<1 U | ND<1.5 U | -0.5 | 4 | 11 |
| 0.2304 | ND<1.5 U | -1.2696 | 4 | 12 |
| 0.6824 | ND<1.5 U | -0.8176 | 4 | 13 |
| 0.166 J | ND<1.5 U | -1.334 | 4 | 14 |
| 1.028 | ND<1.5 U | -0.472 | 4 | 15 |
| 1.43 | ND<1.5 U | -0.07 | 4 | 16 |
| | | | | |
| ND<1.5 U | ND<1.5 U1c | 0 | 4 | 16 |
| ND<1.5 U | ND<1.5 U1c | 0 | 4 | 16 |
| 1.9 J | ND<1.5 U1c | 0.4 | 5 | 16 |
| 0.42 J | ND<1.5 U1c | -1.08 | 5 | 17 |
| 0.39 J | ND<1.5 U1c | -1.11 | 5 | 18 |
| ND<1.5 U | ND<1.5 U1c | 0 | 5 | 18 |
| ND<5 U | ND<1.5 U1c | 3.5 | 6 | 18 |
| ND<1 U | ND<1.5 U1c | -0.5 | 6 | 19 |
| 0.2304 | ND<1.5 U1c | -1.2696 | 6 | 20 |
| 0.6824 | ND<1.5 U1c | -0.8176 | 6 | 21 |
| 0.166 J | ND<1.5 U1c | -1.334 | 6 | 22 |
| 1.028 | ND<1.5 U1c | -0.472 | 6 | 23 |
| 1.43 | ND<1.5 U1c | -0.07 | 6 | 24 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 6 | 24 |
| 1.9 J | ND<1.5 U | 0.4 | 7 | 24 |

| | | | | |
|---|---|---|---|---|
| 0.42 J | ND<1.5 U | -1.08 | 7 | 25 |
| 0.39 J | ND<1.5 U | -1.11 | 7 | 26 |
| ND<1.5 U | ND<1.5 U | 0 | 7 | 26 |
| ND<5 U | ND<1.5 U | 3.5 | 8 | 26 |
| ND<1 U | ND<1.5 U | -0.5 | 8 | 27 |
| 0.2304 | ND<1.5 U | -1.2696 | 8 | 28 |
| 0.6824 | ND<1.5 U | -0.8176 | 8 | 29 |
| 0.166 J | ND<1.5 U | -1.334 | 8 | 30 |
| 1.028 | ND<1.5 U | -0.472 | 8 | 31 |
| 1.43 | ND<1.5 U | -0.07 | 8 | 32 |
| | | | | |
| 1.9 J | ND<1.5 U | 0.4 | 9 | 32 |
| 0.42 J | ND<1.5 U | -1.08 | 9 | 33 |
| 0.39 J | ND<1.5 U | -1.11 | 9 | 34 |
| ND<1.5 U | ND<1.5 U | 0 | 9 | 34 |
| ND<5 U | ND<1.5 U | 3.5 | 10 | 34 |
| ND<1 U | ND<1.5 U | -0.5 | 10 | 35 |
| 0.2304 | ND<1.5 U | -1.2696 | 10 | 36 |
| 0.6824 | ND<1.5 U | -0.8176 | 10 | 37 |
| 0.166 J | ND<1.5 U | -1.334 | 10 | 38 |
| 1.028 | ND<1.5 U | -0.472 | 10 | 39 |
| 1.43 | ND<1.5 U | -0.07 | 10 | 40 |
| | | | | |
| 0.42 J | 1.9 J | -1.48 | 10 | 41 |
| 0.39 J | 1.9 J | -1.51 | 10 | 42 |
| ND<1.5 U | 1.9 J | -0.4 | 10 | 43 |
| ND<5 U | 1.9 J | 3.1 | 11 | 43 |
| ND<1 U | 1.9 J | -0.9 | 11 | 44 |
| 0.2304 | 1.9 J | -1.6696 | 11 | 45 |
| 0.6824 | 1.9 J | -1.2176 | 11 | 46 |
| 0.166 J | 1.9 J | -1.734 | 11 | 47 |
| 1.028 | 1.9 J | -0.872 | 11 | 48 |
| 1.43 | 1.9 J | -0.47 | 11 | 49 |
| | | | | |
| 0.39 J | 0.42 J | -0.03 | 11 | 50 |
| ND<1.5 U | 0.42 J | 1.08 | 12 | 50 |
| ND<5 U | 0.42 J | 4.58 | 13 | 50 |
| ND<1 U | 0.42 J | 0.58 | 14 | 50 |
| 0.2304 | 0.42 J | -0.1896 | 14 | 51 |
| 0.6824 | 0.42 J | 0.2624 | 15 | 51 |
| 0.166 J | 0.42 J | -0.254 | 15 | 52 |
| 1.028 | 0.42 J | 0.608 | 16 | 52 |
| 1.43 | 0.42 J | 1.01 | 17 | 52 |
| | | | | |
| ND<1.5 U | 0.39 J | 1.11 | 18 | 52 |
| ND<5 U | 0.39 J | 4.61 | 19 | 52 |
| ND<1 U | 0.39 J | 0.61 | 20 | 52 |
| 0.2304 | 0.39 J | -0.1596 | 20 | 53 |
| 0.6824 | 0.39 J | 0.2924 | 21 | 53 |
| 0.166 J | 0.39 J | -0.224 | 21 | 54 |
| 1.028 | 0.39 J | 0.638 | 22 | 54 |
| 1.43 | 0.39 J | 1.04 | 23 | 54 |
| | | | | |
| ND<5 U | ND<1.5 U | 3.5 | 24 | 54 |
| ND<1 U | ND<1.5 U | -0.5 | 24 | 55 |
| 0.2304 | ND<1.5 U | -1.2696 | 24 | 56 |
| 0.6824 | ND<1.5 U | -0.8176 | 24 | 57 |

| | | | | |
|---|---|---|---|---|
| 0.166 J | ND<1.5 U | -1.334 | 24 | 58 |
| 1.028 | ND<1.5 U | -0.472 | 24 | 59 |
| 1.43 | ND<1.5 U | -0.07 | 24 | 60 |
| | | | | |
| ND<1 U | ND<5 U | -4 | 24 | 61 |
| 0.2304 | ND<5 U | -4.7696 | 24 | 62 |
| 0.6824 | ND<5 U | -4.3176 | 24 | 63 |
| 0.166 J | ND<5 U | -4.834 | 24 | 64 |
| 1.028 | ND<5 U | -3.972 | 24 | 65 |
| 1.43 | ND<5 U | -3.57 | 24 | 66 |
| | | | | |
| 0.2304 | ND<1 U | -0.7696 | 24 | 67 |
| 0.6824 | ND<1 U | -0.3176 | 24 | 68 |
| 0.166 J | ND<1 U | -0.834 | 24 | 69 |
| 1.028 | ND<1 U | 0.028 | 25 | 69 |
| 1.43 | ND<1 U | 0.43 | 26 | 69 |
| | | | | |
| 0.6824 | 0.2304 | 0.452 | 27 | 69 |
| 0.166 J | 0.2304 | -0.0644 | 27 | 70 |
| 1.028 | 0.2304 | 0.7976 | 28 | 70 |
| 1.43 | 0.2304 | 1.1996 | 29 | 70 |
| | | | | |
| 0.166 J | 0.6824 | -0.5164 | 29 | 71 |
| 1.028 | 0.6824 | 0.3456 | 30 | 71 |
| 1.43 | 0.6824 | 0.7476 | 31 | 71 |
| | | | | |
| 1.028 | 0.166 J | 0.862 | 32 | 71 |
| 1.43 | 0.166 J | 1.264 | 33 | 71 |
| | | | | |
| 1.43 | 1.028 | 0.402 | 34 | 71 |

S Statistic = 34 - 71 = -37

| Tied Group | Value | Members |
|---|---|---|
| 1 | 1.5 | 6 |

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 510
B = 18

C = 120
D = 0
E = 30
F = 2
a = 8880
b = 30240
c = 480
Group Variance = 464.125
Z-Score = -1.67103
Comparison Level at 95% confidence level = -1.65463 (downward trend)
**-1.67103 < -1.65463 indicating a downward trend**

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RW01-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 5730 | 12200 MH | -6470 | 0 | 1 |
| 7730 | 12200 MH | -4470 | 0 | 2 |
| 25200 | 12200 MH | 13000 | 1 | 2 |
| 7300 | 12200 MH | -4900 | 1 | 3 |
| 35200 | 12200 MH | 23000 | 2 | 3 |
| 52000 | 12200 MH | 39800 | 3 | 3 |
| 24100 | 12200 MH | 11900 | 4 | 3 |
| 37000 | 12200 MH | 24800 | 5 | 3 |
| 16500 MH | 12200 MH | 4300 | 6 | 3 |
| 17200 ML | 12200 MH | 5000 | 7 | 3 |
| 16100 | 12200 MH | 3900 | 8 | 3 |
| 16300 | 12200 MH | 4100 | 9 | 3 |
| 16300 2c | 12200 MH | 4100 | 10 | 3 |
| 10400 | 12200 MH | -1800 | 10 | 4 |
| 9810 | 12200 MH | -2390 | 10 | 5 |
| 6200 ML | 12200 MH | -6000 | 10 | 6 |
| 7050 | 12200 MH | -5150 | 10 | 7 |
| 4140 | 12200 MH | -8060 | 10 | 8 |
| 3620 | 12200 MH | -8580 | 10 | 9 |
| 5560 | 12200 MH | -6640 | 10 | 10 |
| 11300 | 12200 MH | -900 | 10 | 11 |
| 6406 | 12200 MH | -5794 | 10 | 12 |
| 10390 | 12200 MH | -1810 | 10 | 13 |
| | | | | |
| 7730 | 5730 | 2000 | 11 | 13 |
| 25200 | 5730 | 19470 | 12 | 13 |
| 7300 | 5730 | 1570 | 13 | 13 |
| 35200 | 5730 | 29470 | 14 | 13 |
| 52000 | 5730 | 46270 | 15 | 13 |
| 24100 | 5730 | 18370 | 16 | 13 |
| 37000 | 5730 | 31270 | 17 | 13 |
| 16500 MH | 5730 | 10770 | 18 | 13 |
| 17200 ML | 5730 | 11470 | 19 | 13 |
| 16100 | 5730 | 10370 | 20 | 13 |
| 16300 | 5730 | 10570 | 21 | 13 |
| 16300 2c | 5730 | 10570 | 22 | 13 |
| 10400 | 5730 | 4670 | 23 | 13 |
| 9810 | 5730 | 4080 | 24 | 13 |
| 6200 ML | 5730 | 470 | 25 | 13 |
| 7050 | 5730 | 1320 | 26 | 13 |
| 4140 | 5730 | -1590 | 26 | 14 |
| 3620 | 5730 | -2110 | 26 | 15 |
| 5560 | 5730 | -170 | 26 | 16 |
| 11300 | 5730 | 5570 | 27 | 16 |
| 6406 | 5730 | 676 | 28 | 16 |
| 10390 | 5730 | 4660 | 29 | 16 |

| | | | | |
|---|---|---|---|---|
| 25200 | 7730 | 17470 | 30 | 16 |
| 7300 | 7730 | -430 | 30 | 17 |
| 35200 | 7730 | 27470 | 31 | 17 |
| 52000 | 7730 | 44270 | 32 | 17 |
| 24100 | 7730 | 16370 | 33 | 17 |
| 37000 | 7730 | 29270 | 34 | 17 |
| 16500 MH | 7730 | 8770 | 35 | 17 |
| 17200 ML | 7730 | 9470 | 36 | 17 |
| 16100 | 7730 | 8370 | 37 | 17 |
| 16300 | 7730 | 8570 | 38 | 17 |
| 16300 2c | 7730 | 8570 | 39 | 17 |
| 10400 | 7730 | 2670 | 40 | 17 |
| 9810 | 7730 | 2080 | 41 | 17 |
| 6200 ML | 7730 | -1530 | 41 | 18 |
| 7050 | 7730 | -680 | 41 | 19 |
| 4140 | 7730 | -3590 | 41 | 20 |
| 3620 | 7730 | -4110 | 41 | 21 |
| 5560 | 7730 | -2170 | 41 | 22 |
| 11300 | 7730 | 3570 | 42 | 22 |
| 6406 | 7730 | -1324 | 42 | 23 |
| 10390 | 7730 | 2660 | 43 | 23 |
| | | | | |
| 7300 | 25200 | -17900 | 43 | 24 |
| 35200 | 25200 | 10000 | 44 | 24 |
| 52000 | 25200 | 26800 | 45 | 24 |
| 24100 | 25200 | -1100 | 45 | 25 |
| 37000 | 25200 | 11800 | 46 | 25 |
| 16500 MH | 25200 | -8700 | 46 | 26 |
| 17200 ML | 25200 | -8000 | 46 | 27 |
| 16100 | 25200 | -9100 | 46 | 28 |
| 16300 | 25200 | -8900 | 46 | 29 |
| 16300 2c | 25200 | -8900 | 46 | 30 |
| 10400 | 25200 | -14800 | 46 | 31 |
| 9810 | 25200 | -15390 | 46 | 32 |
| 6200 ML | 25200 | -19000 | 46 | 33 |
| 7050 | 25200 | -18150 | 46 | 34 |
| 4140 | 25200 | -21060 | 46 | 35 |
| 3620 | 25200 | -21580 | 46 | 36 |
| 5560 | 25200 | -19640 | 46 | 37 |
| 11300 | 25200 | -13900 | 46 | 38 |
| 6406 | 25200 | -18794 | 46 | 39 |
| 10390 | 25200 | -14810 | 46 | 40 |
| | | | | |
| 35200 | 7300 | 27900 | 47 | 40 |
| 52000 | 7300 | 44700 | 48 | 40 |
| 24100 | 7300 | 16800 | 49 | 40 |
| 37000 | 7300 | 29700 | 50 | 40 |
| 16500 MH | 7300 | 9200 | 51 | 40 |
| 17200 ML | 7300 | 9900 | 52 | 40 |
| 16100 | 7300 | 8800 | 53 | 40 |
| 16300 | 7300 | 9000 | 54 | 40 |
| 16300 2c | 7300 | 9000 | 55 | 40 |
| 10400 | 7300 | 3100 | 56 | 40 |
| 9810 | 7300 | 2510 | 57 | 40 |
| 6200 ML | 7300 | -1100 | 57 | 41 |
| 7050 | 7300 | -250 | 57 | 42 |
| 4140 | 7300 | -3160 | 57 | 43 |

| | | | | |
|---|---|---|---|---|
| 3620 | 7300 | -3680 | 57 | 44 |
| 5560 | 7300 | -1740 | 57 | 45 |
| 11300 | 7300 | 4000 | 58 | 45 |
| 6406 | 7300 | -894 | 58 | 46 |
| 10390 | 7300 | 3090 | 59 | 46 |
| | | | | |
| 52000 | 35200 | 16800 | 60 | 46 |
| 24100 | 35200 | -11100 | 60 | 47 |
| 37000 | 35200 | 1800 | 61 | 47 |
| 16500 MH | 35200 | -18700 | 61 | 48 |
| 17200 ML | 35200 | -18000 | 61 | 49 |
| 16100 | 35200 | -19100 | 61 | 50 |
| 16300 | 35200 | -18900 | 61 | 51 |
| 16300 2c | 35200 | -18900 | 61 | 52 |
| 10400 | 35200 | -24800 | 61 | 53 |
| 9810 | 35200 | -25390 | 61 | 54 |
| 6200 ML | 35200 | -29000 | 61 | 55 |
| 7050 | 35200 | -28150 | 61 | 56 |
| 4140 | 35200 | -31060 | 61 | 57 |
| 3620 | 35200 | -31580 | 61 | 58 |
| 5560 | 35200 | -29640 | 61 | 59 |
| 11300 | 35200 | -23900 | 61 | 60 |
| 6406 | 35200 | -28794 | 61 | 61 |
| 10390 | 35200 | -24810 | 61 | 62 |
| | | | | |
| 24100 | 52000 | -27900 | 61 | 63 |
| 37000 | 52000 | -15000 | 61 | 64 |
| 16500 MH | 52000 | -35500 | 61 | 65 |
| 17200 ML | 52000 | -34800 | 61 | 66 |
| 16100 | 52000 | -35900 | 61 | 67 |
| 16300 | 52000 | -35700 | 61 | 68 |
| 16300 2c | 52000 | -35700 | 61 | 69 |
| 10400 | 52000 | -41600 | 61 | 70 |
| 9810 | 52000 | -42190 | 61 | 71 |
| 6200 ML | 52000 | -45800 | 61 | 72 |
| 7050 | 52000 | -44950 | 61 | 73 |
| 4140 | 52000 | -47860 | 61 | 74 |
| 3620 | 52000 | -48380 | 61 | 75 |
| 5560 | 52000 | -46440 | 61 | 76 |
| 11300 | 52000 | -40700 | 61 | 77 |
| 6406 | 52000 | -45594 | 61 | 78 |
| 10390 | 52000 | -41610 | 61 | 79 |
| | | | | |
| 37000 | 24100 | 12900 | 62 | 79 |
| 16500 MH | 24100 | -7600 | 62 | 80 |
| 17200 ML | 24100 | -6900 | 62 | 81 |
| 16100 | 24100 | -8000 | 62 | 82 |
| 16300 | 24100 | -7800 | 62 | 83 |
| 16300 2c | 24100 | -7800 | 62 | 84 |
| 10400 | 24100 | -13700 | 62 | 85 |
| 9810 | 24100 | -14290 | 62 | 86 |
| 6200 ML | 24100 | -17900 | 62 | 87 |
| 7050 | 24100 | -17050 | 62 | 88 |
| 4140 | 24100 | -19960 | 62 | 89 |
| 3620 | 24100 | -20480 | 62 | 90 |
| 5560 | 24100 | -18540 | 62 | 91 |
| 11300 | 24100 | -12800 | 62 | 92 |

| | | | | |
|---|---|---|---|---|
| 6406 | 24100 | -17694 | 62 | 93 |
| 10390 | 24100 | -13710 | 62 | 94 |
| | | | | |
| 16500 MH | 37000 | -20500 | 62 | 95 |
| 17200 ML | 37000 | -19800 | 62 | 96 |
| 16100 | 37000 | -20900 | 62 | 97 |
| 16300 | 37000 | -20700 | 62 | 98 |
| 16300 2c | 37000 | -20700 | 62 | 99 |
| 10400 | 37000 | -26600 | 62 | 100 |
| 9810 | 37000 | -27190 | 62 | 101 |
| 6200 ML | 37000 | -30800 | 62 | 102 |
| 7050 | 37000 | -29950 | 62 | 103 |
| 4140 | 37000 | -32860 | 62 | 104 |
| 3620 | 37000 | -33380 | 62 | 105 |
| 5560 | 37000 | -31440 | 62 | 106 |
| 11300 | 37000 | -25700 | 62 | 107 |
| 6406 | 37000 | -30594 | 62 | 108 |
| 10390 | 37000 | -26610 | 62 | 109 |
| | | | | |
| 17200 ML | 16500 MH | Same Date | 62 | 109 |
| 16100 | 16500 MH | -400 | 62 | 110 |
| 16300 | 16500 MH | -200 | 62 | 111 |
| 16300 2c | 16500 MH | -200 | 62 | 112 |
| 10400 | 16500 MH | -6100 | 62 | 113 |
| 9810 | 16500 MH | -6690 | 62 | 114 |
| 6200 ML | 16500 MH | -10300 | 62 | 115 |
| 7050 | 16500 MH | -9450 | 62 | 116 |
| 4140 | 16500 MH | -12360 | 62 | 117 |
| 3620 | 16500 MH | -12880 | 62 | 118 |
| 5560 | 16500 MH | -10940 | 62 | 119 |
| 11300 | 16500 MH | -5200 | 62 | 120 |
| 6406 | 16500 MH | -10094 | 62 | 121 |
| 10390 | 16500 MH | -6110 | 62 | 122 |
| | | | | |
| 16100 | 17200 ML | -1100 | 62 | 123 |
| 16300 | 17200 ML | -900 | 62 | 124 |
| 16300 2c | 17200 ML | -900 | 62 | 125 |
| 10400 | 17200 ML | -6800 | 62 | 126 |
| 9810 | 17200 ML | -7390 | 62 | 127 |
| 6200 ML | 17200 ML | -11000 | 62 | 128 |
| 7050 | 17200 ML | -10150 | 62 | 129 |
| 4140 | 17200 ML | -13060 | 62 | 130 |
| 3620 | 17200 ML | -13580 | 62 | 131 |
| 5560 | 17200 ML | -11640 | 62 | 132 |
| 11300 | 17200 ML | -5900 | 62 | 133 |
| 6406 | 17200 ML | -10794 | 62 | 134 |
| 10390 | 17200 ML | -6810 | 62 | 135 |
| | | | | |
| 16300 | 16100 | Same Date | 62 | 135 |
| 16300 2c | 16100 | 200 | 63 | 135 |
| 10400 | 16100 | -5700 | 63 | 136 |
| 9810 | 16100 | -6290 | 63 | 137 |
| 6200 ML | 16100 | -9900 | 63 | 138 |
| 7050 | 16100 | -9050 | 63 | 139 |
| 4140 | 16100 | -11960 | 63 | 140 |
| 3620 | 16100 | -12480 | 63 | 141 |
| 5560 | 16100 | -10540 | 63 | 142 |

| | | | | |
|---|---|---|---|---|
| 11300 | 16100 | -4800 | 63 | 143 |
| 6406 | 16100 | -9694 | 63 | 144 |
| 10390 | 16100 | -5710 | 63 | 145 |
| | | | | |
| 16300 2c | 16300 | 0 | 63 | 145 |
| 10400 | 16300 | -5900 | 63 | 146 |
| 9810 | 16300 | -6490 | 63 | 147 |
| 6200 ML | 16300 | -10100 | 63 | 148 |
| 7050 | 16300 | -9250 | 63 | 149 |
| 4140 | 16300 | -12160 | 63 | 150 |
| 3620 | 16300 | -12680 | 63 | 151 |
| 5560 | 16300 | -10740 | 63 | 152 |
| 11300 | 16300 | -5000 | 63 | 153 |
| 6406 | 16300 | -9894 | 63 | 154 |
| 10390 | 16300 | -5910 | 63 | 155 |
| | | | | |
| 10400 | 16300 2c | -5900 | 63 | 156 |
| 9810 | 16300 2c | -6490 | 63 | 157 |
| 6200 ML | 16300 2c | -10100 | 63 | 158 |
| 7050 | 16300 2c | -9250 | 63 | 159 |
| 4140 | 16300 2c | -12160 | 63 | 160 |
| 3620 | 16300 2c | -12680 | 63 | 161 |
| 5560 | 16300 2c | -10740 | 63 | 162 |
| 11300 | 16300 2c | -5000 | 63 | 163 |
| 6406 | 16300 2c | -9894 | 63 | 164 |
| 10390 | 16300 2c | -5910 | 63 | 165 |
| | | | | |
| 9810 | 10400 | -590 | 63 | 166 |
| 6200 ML | 10400 | -4200 | 63 | 167 |
| 7050 | 10400 | -3350 | 63 | 168 |
| 4140 | 10400 | -6260 | 63 | 169 |
| 3620 | 10400 | -6780 | 63 | 170 |
| 5560 | 10400 | -4840 | 63 | 171 |
| 11300 | 10400 | 900 | 64 | 171 |
| 6406 | 10400 | -3994 | 64 | 172 |
| 10390 | 10400 | -10 | 64 | 173 |
| | | | | |
| 6200 ML | 9810 | -3610 | 64 | 174 |
| 7050 | 9810 | -2760 | 64 | 175 |
| 4140 | 9810 | -5670 | 64 | 176 |
| 3620 | 9810 | -6190 | 64 | 177 |
| 5560 | 9810 | -4250 | 64 | 178 |
| 11300 | 9810 | 1490 | 65 | 178 |
| 6406 | 9810 | -3404 | 65 | 179 |
| 10390 | 9810 | 580 | 66 | 179 |
| | | | | |
| 7050 | 6200 ML | 850 | 67 | 179 |
| 4140 | 6200 ML | -2060 | 67 | 180 |
| 3620 | 6200 ML | -2580 | 67 | 181 |
| 5560 | 6200 ML | -640 | 67 | 182 |
| 11300 | 6200 ML | 5100 | 68 | 182 |
| 6406 | 6200 ML | 206 | 69 | 182 |
| 10390 | 6200 ML | 4190 | 70 | 182 |
| | | | | |
| 4140 | 7050 | -2910 | 70 | 183 |
| 3620 | 7050 | -3430 | 70 | 184 |
| 5560 | 7050 | -1490 | 70 | 185 |

| | | | | |
|---|---|---|---|---|
| 11300 | 7050 | 4250 | 71 | 185 |
| 6406 | 7050 | -644 | 71 | 186 |
| 10390 | 7050 | 3340 | 72 | 186 |
| | | | | |
| 3620 | 4140 | -520 | 72 | 187 |
| 5560 | 4140 | 1420 | 73 | 187 |
| 11300 | 4140 | 7160 | 74 | 187 |
| 6406 | 4140 | 2266 | 75 | 187 |
| 10390 | 4140 | 6250 | 76 | 187 |
| | | | | |
| 5560 | 3620 | 1940 | 77 | 187 |
| 11300 | 3620 | 7680 | 78 | 187 |
| 6406 | 3620 | 2786 | 79 | 187 |
| 10390 | 3620 | 6770 | 80 | 187 |
| | | | | |
| 11300 | 5560 | 5740 | 81 | 187 |
| 6406 | 5560 | 846 | 82 | 187 |
| 10390 | 5560 | 4830 | 83 | 187 |
| | | | | |
| 6406 | 11300 | -4894 | 83 | 188 |
| 10390 | 11300 | -910 | 83 | 189 |
| | | | | |
| 10390 | 6406 | 3984 | 84 | 189 |

S Statistic = 84 - 189 = -105

| Tied Group | Value | Members |
|---|---|---|
| 1 | 16300 | 2 |

| Time Period | Observations |
|---|---|
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |

There are 2 time periods with multiple data

A = 18
B = 36

C = 0
D = 0
E = 2
F = 4
a = 29256
b = 109296
c = 1104
Group Variance = 1622.34
Z-Score = -2.58204
Comparison Level at 95% confidence level = -1.65463 (downward trend)
**-2.58204 < -1.65463 indicating a downward trend**

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RW02-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 3220 | 6290 | -3070 | 0 | 1 |
| 5490 | 6290 | -800 | 0 | 2 |
| 1460 | 6290 | -4830 | 0 | 3 |
| 79.3 | 6290 | -6210.7 | 0 | 4 |
| 2210 | 6290 | -4080 | 0 | 5 |
| 5320 | 6290 | -970 | 0 | 6 |
| 5470 | 6290 | -820 | 0 | 7 |
| 5930 | 6290 | -360 | 0 | 8 |
| 14200 | 6290 | 7910 | 1 | 8 |
| 13100 | 6290 | 6810 | 2 | 8 |
| 22400 | 6290 | 16110 | 3 | 8 |
| 21900 | 6290 | 15610 | 4 | 8 |
| 27400 2c | 6290 | 21110 | 5 | 8 |
| 594 | 6290 | -5696 | 5 | 9 |
| 269 | 6290 | -6021 | 5 | 10 |
| 1940 | 6290 | -4350 | 5 | 11 |
| 1280 | 6290 | -5010 | 5 | 12 |
| 9950 | 6290 | 3660 | 6 | 12 |
| 472 | 6290 | -5818 | 6 | 13 |
| 3.1 JB | 6290 | -6286.9 | 6 | 14 |
| 36300 | 6290 | 30010 | 7 | 14 |
| 7503 | 6290 | 1213 | 8 | 14 |
| 18640 | 6290 | 12350 | 9 | 14 |
| | | | | |
| 5490 | 3220 | 2270 | 10 | 14 |
| 1460 | 3220 | -1760 | 10 | 15 |
| 79.3 | 3220 | -3140.7 | 10 | 16 |
| 2210 | 3220 | -1010 | 10 | 17 |
| 5320 | 3220 | 2100 | 11 | 17 |
| 5470 | 3220 | 2250 | 12 | 17 |
| 5930 | 3220 | 2710 | 13 | 17 |
| 14200 | 3220 | 10980 | 14 | 17 |
| 13100 | 3220 | 9880 | 15 | 17 |
| 22400 | 3220 | 19180 | 16 | 17 |
| 21900 | 3220 | 18680 | 17 | 17 |
| 27400 2c | 3220 | 24180 | 18 | 17 |
| 594 | 3220 | -2626 | 18 | 18 |
| 269 | 3220 | -2951 | 18 | 19 |
| 1940 | 3220 | -1280 | 18 | 20 |
| 1280 | 3220 | -1940 | 18 | 21 |
| 9950 | 3220 | 6730 | 19 | 21 |
| 472 | 3220 | -2748 | 19 | 22 |
| 3.1 JB | 3220 | -3216.9 | 19 | 23 |
| 36300 | 3220 | 33080 | 20 | 23 |
| 7503 | 3220 | 4283 | 21 | 23 |
| 18640 | 3220 | 15420 | 22 | 23 |

| | | | | |
|---|---|---|---|---|
| 1460 | 5490 | -4030 | 22 | 24 |
| 79.3 | 5490 | -5410.7 | 22 | 25 |
| 2210 | 5490 | -3280 | 22 | 26 |
| 5320 | 5490 | -170 | 22 | 27 |
| 5470 | 5490 | -20 | 22 | 28 |
| 5930 | 5490 | 440 | 23 | 28 |
| 14200 | 5490 | 8710 | 24 | 28 |
| 13100 | 5490 | 7610 | 25 | 28 |
| 22400 | 5490 | 16910 | 26 | 28 |
| 21900 | 5490 | 16410 | 27 | 28 |
| 27400 2c | 5490 | 21910 | 28 | 28 |
| 594 | 5490 | -4896 | 28 | 29 |
| 269 | 5490 | -5221 | 28 | 30 |
| 1940 | 5490 | -3550 | 28 | 31 |
| 1280 | 5490 | -4210 | 28 | 32 |
| 9950 | 5490 | 4460 | 29 | 32 |
| 472 | 5490 | -5018 | 29 | 33 |
| 3.1 JB | 5490 | -5486.9 | 29 | 34 |
| 36300 | 5490 | 30810 | 30 | 34 |
| 7503 | 5490 | 2013 | 31 | 34 |
| 18640 | 5490 | 13150 | 32 | 34 |
| | | | | |
| 79.3 | 1460 | -1380.7 | 32 | 35 |
| 2210 | 1460 | 750 | 33 | 35 |
| 5320 | 1460 | 3860 | 34 | 35 |
| 5470 | 1460 | 4010 | 35 | 35 |
| 5930 | 1460 | 4470 | 36 | 35 |
| 14200 | 1460 | 12740 | 37 | 35 |
| 13100 | 1460 | 11640 | 38 | 35 |
| 22400 | 1460 | 20940 | 39 | 35 |
| 21900 | 1460 | 20440 | 40 | 35 |
| 27400 2c | 1460 | 25940 | 41 | 35 |
| 594 | 1460 | -866 | 41 | 36 |
| 269 | 1460 | -1191 | 41 | 37 |
| 1940 | 1460 | 480 | 42 | 37 |
| 1280 | 1460 | -180 | 42 | 38 |
| 9950 | 1460 | 8490 | 43 | 38 |
| 472 | 1460 | -988 | 43 | 39 |
| 3.1 JB | 1460 | -1456.9 | 43 | 40 |
| 36300 | 1460 | 34840 | 44 | 40 |
| 7503 | 1460 | 6043 | 45 | 40 |
| 18640 | 1460 | 17180 | 46 | 40 |
| | | | | |
| 2210 | 79.3 | 2130.7 | 47 | 40 |
| 5320 | 79.3 | 5240.7 | 48 | 40 |
| 5470 | 79.3 | 5390.7 | 49 | 40 |
| 5930 | 79.3 | 5850.7 | 50 | 40 |
| 14200 | 79.3 | 14120.7 | 51 | 40 |
| 13100 | 79.3 | 13020.7 | 52 | 40 |
| 22400 | 79.3 | 22320.7 | 53 | 40 |
| 21900 | 79.3 | 21820.7 | 54 | 40 |
| 27400 2c | 79.3 | 27320.7 | 55 | 40 |
| 594 | 79.3 | 514.7 | 56 | 40 |
| 269 | 79.3 | 189.7 | 57 | 40 |
| 1940 | 79.3 | 1860.7 | 58 | 40 |
| 1280 | 79.3 | 1200.7 | 59 | 40 |
| 9950 | 79.3 | 9870.7 | 60 | 40 |

| | | | | |
|---|---|---|---|---|
| 472 | 79.3 | 392.7 | 61 | 40 |
| 3.1 JB | 79.3 | -76.2 | 61 | 41 |
| 36300 | 79.3 | 36220.7 | 62 | 41 |
| 7503 | 79.3 | 7423.7 | 63 | 41 |
| 18640 | 79.3 | 18560.7 | 64 | 41 |
| | | | | |
| 5320 | 2210 | 3110 | 65 | 41 |
| 5470 | 2210 | 3260 | 66 | 41 |
| 5930 | 2210 | 3720 | 67 | 41 |
| 14200 | 2210 | 11990 | 68 | 41 |
| 13100 | 2210 | 10890 | 69 | 41 |
| 22400 | 2210 | 20190 | 70 | 41 |
| 21900 | 2210 | 19690 | 71 | 41 |
| 27400 2c | 2210 | 25190 | 72 | 41 |
| 594 | 2210 | -1616 | 72 | 42 |
| 269 | 2210 | -1941 | 72 | 43 |
| 1940 | 2210 | -270 | 72 | 44 |
| 1280 | 2210 | -930 | 72 | 45 |
| 9950 | 2210 | 7740 | 73 | 45 |
| 472 | 2210 | -1738 | 73 | 46 |
| 3.1 JB | 2210 | -2206.9 | 73 | 47 |
| 36300 | 2210 | 34090 | 74 | 47 |
| 7503 | 2210 | 5293 | 75 | 47 |
| 18640 | 2210 | 16430 | 76 | 47 |
| | | | | |
| 5470 | 5320 | 150 | 77 | 47 |
| 5930 | 5320 | 610 | 78 | 47 |
| 14200 | 5320 | 8880 | 79 | 47 |
| 13100 | 5320 | 7780 | 80 | 47 |
| 22400 | 5320 | 17080 | 81 | 47 |
| 21900 | 5320 | 16580 | 82 | 47 |
| 27400 2c | 5320 | 22080 | 83 | 47 |
| 594 | 5320 | -4726 | 83 | 48 |
| 269 | 5320 | -5051 | 83 | 49 |
| 1940 | 5320 | -3380 | 83 | 50 |
| 1280 | 5320 | -4040 | 83 | 51 |
| 9950 | 5320 | 4630 | 84 | 51 |
| 472 | 5320 | -4848 | 84 | 52 |
| 3.1 JB | 5320 | -5316.9 | 84 | 53 |
| 36300 | 5320 | 30980 | 85 | 53 |
| 7503 | 5320 | 2183 | 86 | 53 |
| 18640 | 5320 | 13320 | 87 | 53 |
| | | | | |
| 5930 | 5470 | 460 | 88 | 53 |
| 14200 | 5470 | 8730 | 89 | 53 |
| 13100 | 5470 | 7630 | 90 | 53 |
| 22400 | 5470 | 16930 | 91 | 53 |
| 21900 | 5470 | 16430 | 92 | 53 |
| 27400 2c | 5470 | 21930 | 93 | 53 |
| 594 | 5470 | -4876 | 93 | 54 |
| 269 | 5470 | -5201 | 93 | 55 |
| 1940 | 5470 | -3530 | 93 | 56 |
| 1280 | 5470 | -4190 | 93 | 57 |
| 9950 | 5470 | 4480 | 94 | 57 |
| 472 | 5470 | -4998 | 94 | 58 |
| 3.1 JB | 5470 | -5466.9 | 94 | 59 |
| 36300 | 5470 | 30830 | 95 | 59 |

| | | | | |
|---|---|---|---|---|
| 7503 | 5470 | 2033 | 96 | 59 |
| 18640 | 5470 | 13170 | 97 | 59 |
| | | | | |
| 14200 | 5930 | 8270 | 98 | 59 |
| 13100 | 5930 | 7170 | 99 | 59 |
| 22400 | 5930 | 16470 | 100 | 59 |
| 21900 | 5930 | 15970 | 101 | 59 |
| 27400 2c | 5930 | 21470 | 102 | 59 |
| 594 | 5930 | -5336 | 102 | 60 |
| 269 | 5930 | -5661 | 102 | 61 |
| 1940 | 5930 | -3990 | 102 | 62 |
| 1280 | 5930 | -4650 | 102 | 63 |
| 9950 | 5930 | 4020 | 103 | 63 |
| 472 | 5930 | -5458 | 103 | 64 |
| 3.1 JB | 5930 | -5926.9 | 103 | 65 |
| 36300 | 5930 | 30370 | 104 | 65 |
| 7503 | 5930 | 1573 | 105 | 65 |
| 18640 | 5930 | 12710 | 106 | 65 |
| | | | | |
| 13100 | 14200 | Same Date | 106 | 65 |
| 22400 | 14200 | 8200 | 107 | 65 |
| 21900 | 14200 | 7700 | 108 | 65 |
| 27400 2c | 14200 | 13200 | 109 | 65 |
| 594 | 14200 | -13606 | 109 | 66 |
| 269 | 14200 | -13931 | 109 | 67 |
| 1940 | 14200 | -12260 | 109 | 68 |
| 1280 | 14200 | -12920 | 109 | 69 |
| 9950 | 14200 | -4250 | 109 | 70 |
| 472 | 14200 | -13728 | 109 | 71 |
| 3.1 JB | 14200 | -14196.9 | 109 | 72 |
| 36300 | 14200 | 22100 | 110 | 72 |
| 7503 | 14200 | -6697 | 110 | 73 |
| 18640 | 14200 | 4440 | 111 | 73 |
| | | | | |
| 22400 | 13100 | 9300 | 112 | 73 |
| 21900 | 13100 | 8800 | 113 | 73 |
| 27400 2c | 13100 | 14300 | 114 | 73 |
| 594 | 13100 | -12506 | 114 | 74 |
| 269 | 13100 | -12831 | 114 | 75 |
| 1940 | 13100 | -11160 | 114 | 76 |
| 1280 | 13100 | -11820 | 114 | 77 |
| 9950 | 13100 | -3150 | 114 | 78 |
| 472 | 13100 | -12628 | 114 | 79 |
| 3.1 JB | 13100 | -13096.9 | 114 | 80 |
| 36300 | 13100 | 23200 | 115 | 80 |
| 7503 | 13100 | -5597 | 115 | 81 |
| 18640 | 13100 | 5540 | 116 | 81 |
| | | | | |
| 21900 | 22400 | Same Date | 116 | 81 |
| 27400 2c | 22400 | 5000 | 117 | 81 |
| 594 | 22400 | -21806 | 117 | 82 |
| 269 | 22400 | -22131 | 117 | 83 |
| 1940 | 22400 | -20460 | 117 | 84 |
| 1280 | 22400 | -21120 | 117 | 85 |
| 9950 | 22400 | -12450 | 117 | 86 |
| 472 | 22400 | -21928 | 117 | 87 |
| 3.1 JB | 22400 | -22396.9 | 117 | 88 |

| | | | | |
|---|---|---|---|---|
| 36300 | 22400 | 13900 | 118 | 88 |
| 7503 | 22400 | -14897 | 118 | 89 |
| 18640 | 22400 | -3760 | 118 | 90 |
| | | | | |
| 27400 2c | 21900 | 5500 | 119 | 90 |
| 594 | 21900 | -21306 | 119 | 91 |
| 269 | 21900 | -21631 | 119 | 92 |
| 1940 | 21900 | -19960 | 119 | 93 |
| 1280 | 21900 | -20620 | 119 | 94 |
| 9950 | 21900 | -11950 | 119 | 95 |
| 472 | 21900 | -21428 | 119 | 96 |
| 3.1 JB | 21900 | -21896.9 | 119 | 97 |
| 36300 | 21900 | 14400 | 120 | 97 |
| 7503 | 21900 | -14397 | 120 | 98 |
| 18640 | 21900 | -3260 | 120 | 99 |
| | | | | |
| 594 | 27400 2c | -26806 | 120 | 100 |
| 269 | 27400 2c | -27131 | 120 | 101 |
| 1940 | 27400 2c | -25460 | 120 | 102 |
| 1280 | 27400 2c | -26120 | 120 | 103 |
| 9950 | 27400 2c | -17450 | 120 | 104 |
| 472 | 27400 2c | -26928 | 120 | 105 |
| 3.1 JB | 27400 2c | -27396.9 | 120 | 106 |
| 36300 | 27400 2c | 8900 | 121 | 106 |
| 7503 | 27400 2c | -19897 | 121 | 107 |
| 18640 | 27400 2c | -8760 | 121 | 108 |
| | | | | |
| 269 | 594 | -325 | 121 | 109 |
| 1940 | 594 | 1346 | 122 | 109 |
| 1280 | 594 | 686 | 123 | 109 |
| 9950 | 594 | 9356 | 124 | 109 |
| 472 | 594 | -122 | 124 | 110 |
| 3.1 JB | 594 | -590.9 | 124 | 111 |
| 36300 | 594 | 35706 | 125 | 111 |
| 7503 | 594 | 6909 | 126 | 111 |
| 18640 | 594 | 18046 | 127 | 111 |
| | | | | |
| 1940 | 269 | 1671 | 128 | 111 |
| 1280 | 269 | 1011 | 129 | 111 |
| 9950 | 269 | 9681 | 130 | 111 |
| 472 | 269 | 203 | 131 | 111 |
| 3.1 JB | 269 | -265.9 | 131 | 112 |
| 36300 | 269 | 36031 | 132 | 112 |
| 7503 | 269 | 7234 | 133 | 112 |
| 18640 | 269 | 18371 | 134 | 112 |
| | | | | |
| 1280 | 1940 | -660 | 134 | 113 |
| 9950 | 1940 | 8010 | 135 | 113 |
| 472 | 1940 | -1468 | 135 | 114 |
| 3.1 JB | 1940 | -1936.9 | 135 | 115 |
| 36300 | 1940 | 34360 | 136 | 115 |
| 7503 | 1940 | 5563 | 137 | 115 |
| 18640 | 1940 | 16700 | 138 | 115 |
| | | | | |
| 9950 | 1280 | 8670 | 139 | 115 |
| 472 | 1280 | -808 | 139 | 116 |
| 3.1 JB | 1280 | -1276.9 | 139 | 117 |

| | | | | |
|---|---|---|---|---|
| 36300 | 1280 | 35020 | 140 | 117 |
| 7503 | 1280 | 6223 | 141 | 117 |
| 18640 | 1280 | 17360 | 142 | 117 |
| | | | | |
| 472 | 9950 | -9478 | 142 | 118 |
| 3.1 JB | 9950 | -9946.9 | 142 | 119 |
| 36300 | 9950 | 26350 | 143 | 119 |
| 7503 | 9950 | -2447 | 143 | 120 |
| 18640 | 9950 | 8690 | 144 | 120 |
| | | | | |
| 3.1 JB | 472 | -468.9 | 144 | 121 |
| 36300 | 472 | 35828 | 145 | 121 |
| 7503 | 472 | 7031 | 146 | 121 |
| 18640 | 472 | 18168 | 147 | 121 |
| | | | | |
| 36300 | 3.1 JB | 36296.9 | 148 | 121 |
| 7503 | 3.1 JB | 7499.9 | 149 | 121 |
| 18640 | 3.1 JB | 18636.9 | 150 | 121 |
| | | | | |
| 7503 | 36300 | -28797 | 150 | 122 |
| 18640 | 36300 | -17660 | 150 | 123 |
| | | | | |
| 18640 | 7503 | 11137 | 151 | 123 |

S Statistic = 151 - 123 = 28

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |

There are 2 time periods with multiple data

A = 0
B = 36
C = 0

D = 0
E = 0
F = 4
a = 29256
b = 109296
c = 1104
Group Variance = 1623.33
Z-Score = 0.670131
Comparison Level at 95% confidence level = -1.65463 (downward trend)
0.670131 >= -1.65463 indicating no evidence of a downward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RW03R-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 657.9 | 101.9 | 556 | 1 | 0 |
| 82.75 | 101.9 | -19.15 | 1 | 1 |
| 25.78 | 101.9 | -76.12 | 1 | 2 |
| ND<250 U | 101.9 | 148.1 | 2 | 2 |
| | | | | |
| 82.75 | 657.9 | -575.15 | 2 | 3 |
| 25.78 | 657.9 | -632.12 | 2 | 4 |
| ND<250 U | 657.9 | -407.9 | 2 | 5 |
| | | | | |
| 25.78 | 82.75 | -56.97 | 2 | 6 |
| ND<250 U | 82.75 | 167.25 | 3 | 6 |
| | | | | |
| ND<250 U | 25.78 | 224.22 | 4 | 6 |

S Statistic = 4 - 6 = -2

Comparing at 95% confidence level (downward trend)

Probability of obtaining S >= 2 is 0.408

S > 0 or 0.408 > 0.05 indicating no evidence of a downward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RW04-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 179 | 58.2 | 120.8 | 1 | 0 |
| 74.7 | 58.2 | 16.5 | 2 | 0 |
| 163 | 58.2 | 104.8 | 3 | 0 |
| 137 | 58.2 | 78.8 | 4 | 0 |
| 123 | 58.2 | 64.8 | 5 | 0 |
| 279 | 58.2 | 220.8 | 6 | 0 |
| 384 | 58.2 | 325.8 | 7 | 0 |
| 300 | 58.2 | 241.8 | 8 | 0 |
| 7.9 J | 58.2 | -50.3 | 8 | 1 |
| 168 | 58.2 | 109.8 | 9 | 1 |
| 142 1c | 58.2 | 83.8 | 10 | 1 |
| 33.6 2c | 58.2 | -24.6 | 10 | 2 |
| ND<5 U | 58.2 | -53.2 | 10 | 3 |
| 132 | 58.2 | 73.8 | 11 | 3 |
| 313 | 58.2 | 254.8 | 12 | 3 |
| 604 | 58.2 | 545.8 | 13 | 3 |
| 37.8 | 58.2 | -20.4 | 13 | 4 |
| 79.4 1c | 58.2 | 21.2 | 14 | 4 |
| 75.4 | 58.2 | 17.2 | 15 | 4 |
| 54.6 | 58.2 | -3.6 | 15 | 5 |
| | | | | |
| 74.7 | 179 | -104.3 | 15 | 6 |
| 163 | 179 | -16 | 15 | 7 |
| 137 | 179 | -42 | 15 | 8 |
| 123 | 179 | -56 | 15 | 9 |
| 279 | 179 | 100 | 16 | 9 |
| 384 | 179 | 205 | 17 | 9 |
| 300 | 179 | 121 | 18 | 9 |
| 7.9 J | 179 | -171.1 | 18 | 10 |
| 168 | 179 | -11 | 18 | 11 |
| 142 1c | 179 | -37 | 18 | 12 |
| 33.6 2c | 179 | -145.4 | 18 | 13 |
| ND<5 U | 179 | -174 | 18 | 14 |
| 132 | 179 | -47 | 18 | 15 |
| 313 | 179 | 134 | 19 | 15 |
| 604 | 179 | 425 | 20 | 15 |
| 37.8 | 179 | -141.2 | 20 | 16 |
| 79.4 1c | 179 | -99.6 | 20 | 17 |
| 75.4 | 179 | -103.6 | 20 | 18 |
| 54.6 | 179 | -124.4 | 20 | 19 |
| | | | | |
| 163 | 74.7 | 88.3 | 21 | 19 |
| 137 | 74.7 | 62.3 | 22 | 19 |
| 123 | 74.7 | 48.3 | 23 | 19 |
| 279 | 74.7 | 204.3 | 24 | 19 |
| 384 | 74.7 | 309.3 | 25 | 19 |
| 300 | 74.7 | 225.3 | 26 | 19 |

| | | | | |
|---|---|---|---|---|
| 7.9 J | 74.7 | -66.8 | 26 | 20 |
| 168 | 74.7 | 93.3 | 27 | 20 |
| 142 1c | 74.7 | 67.3 | 28 | 20 |
| 33.6 2c | 74.7 | -41.1 | 28 | 21 |
| ND<5 U | 74.7 | -69.7 | 28 | 22 |
| 132 | 74.7 | 57.3 | 29 | 22 |
| 313 | 74.7 | 238.3 | 30 | 22 |
| 604 | 74.7 | 529.3 | 31 | 22 |
| 37.8 | 74.7 | -36.9 | 31 | 23 |
| 79.4 1c | 74.7 | 4.7 | 32 | 23 |
| 75.4 | 74.7 | 0.7 | 33 | 23 |
| 54.6 | 74.7 | -20.1 | 33 | 24 |
| | | | | |
| 137 | 163 | -26 | 33 | 25 |
| 123 | 163 | -40 | 33 | 26 |
| 279 | 163 | 116 | 34 | 26 |
| 384 | 163 | 221 | 35 | 26 |
| 300 | 163 | 137 | 36 | 26 |
| 7.9 J | 163 | -155.1 | 36 | 27 |
| 168 | 163 | 5 | 37 | 27 |
| 142 1c | 163 | -21 | 37 | 28 |
| 33.6 2c | 163 | -129.4 | 37 | 29 |
| ND<5 U | 163 | -158 | 37 | 30 |
| 132 | 163 | -31 | 37 | 31 |
| 313 | 163 | 150 | 38 | 31 |
| 604 | 163 | 441 | 39 | 31 |
| 37.8 | 163 | -125.2 | 39 | 32 |
| 79.4 1c | 163 | -83.6 | 39 | 33 |
| 75.4 | 163 | -87.6 | 39 | 34 |
| 54.6 | 163 | -108.4 | 39 | 35 |
| | | | | |
| 123 | 137 | -14 | 39 | 36 |
| 279 | 137 | 142 | 40 | 36 |
| 384 | 137 | 247 | 41 | 36 |
| 300 | 137 | 163 | 42 | 36 |
| 7.9 J | 137 | -129.1 | 42 | 37 |
| 168 | 137 | 31 | 43 | 37 |
| 142 1c | 137 | 5 | 44 | 37 |
| 33.6 2c | 137 | -103.4 | 44 | 38 |
| ND<5 U | 137 | -132 | 44 | 39 |
| 132 | 137 | -5 | 44 | 40 |
| 313 | 137 | 176 | 45 | 40 |
| 604 | 137 | 467 | 46 | 40 |
| 37.8 | 137 | -99.2 | 46 | 41 |
| 79.4 1c | 137 | -57.6 | 46 | 42 |
| 75.4 | 137 | -61.6 | 46 | 43 |
| 54.6 | 137 | -82.4 | 46 | 44 |
| | | | | |
| 279 | 123 | 156 | 47 | 44 |
| 384 | 123 | 261 | 48 | 44 |
| 300 | 123 | 177 | 49 | 44 |
| 7.9 J | 123 | -115.1 | 49 | 45 |
| 168 | 123 | 45 | 50 | 45 |
| 142 1c | 123 | 19 | 51 | 45 |
| 33.6 2c | 123 | -89.4 | 51 | 46 |
| ND<5 U | 123 | -118 | 51 | 47 |
| 132 | 123 | 9 | 52 | 47 |

| | | | | |
|---|---|---|---|---|
| 313 | 123 | 190 | 53 | 47 |
| 604 | 123 | 481 | 54 | 47 |
| 37.8 | 123 | -85.2 | 54 | 48 |
| 79.4 1c | 123 | -43.6 | 54 | 49 |
| 75.4 | 123 | -47.6 | 54 | 50 |
| 54.6 | 123 | -68.4 | 54 | 51 |
| | | | | |
| 384 | 279 | 105 | 55 | 51 |
| 300 | 279 | 21 | 56 | 51 |
| 7.9 J | 279 | -271.1 | 56 | 52 |
| 168 | 279 | -111 | 56 | 53 |
| 142 1c | 279 | -137 | 56 | 54 |
| 33.6 2c | 279 | -245.4 | 56 | 55 |
| ND<5 U | 279 | -274 | 56 | 56 |
| 132 | 279 | -147 | 56 | 57 |
| 313 | 279 | 34 | 57 | 57 |
| 604 | 279 | 325 | 58 | 57 |
| 37.8 | 279 | -241.2 | 58 | 58 |
| 79.4 1c | 279 | -199.6 | 58 | 59 |
| 75.4 | 279 | -203.6 | 58 | 60 |
| 54.6 | 279 | -224.4 | 58 | 61 |
| | | | | |
| 300 | 384 | -84 | 58 | 62 |
| 7.9 J | 384 | -376.1 | 58 | 63 |
| 168 | 384 | -216 | 58 | 64 |
| 142 1c | 384 | -242 | 58 | 65 |
| 33.6 2c | 384 | -350.4 | 58 | 66 |
| ND<5 U | 384 | -379 | 58 | 67 |
| 132 | 384 | -252 | 58 | 68 |
| 313 | 384 | -71 | 58 | 69 |
| 604 | 384 | 220 | 59 | 69 |
| 37.8 | 384 | -346.2 | 59 | 70 |
| 79.4 1c | 384 | -304.6 | 59 | 71 |
| 75.4 | 384 | -308.6 | 59 | 72 |
| 54.6 | 384 | -329.4 | 59 | 73 |
| | | | | |
| 7.9 J | 300 | -292.1 | 59 | 74 |
| 168 | 300 | -132 | 59 | 75 |
| 142 1c | 300 | -158 | 59 | 76 |
| 33.6 2c | 300 | -266.4 | 59 | 77 |
| ND<5 U | 300 | -295 | 59 | 78 |
| 132 | 300 | -168 | 59 | 79 |
| 313 | 300 | 13 | 60 | 79 |
| 604 | 300 | 304 | 61 | 79 |
| 37.8 | 300 | -262.2 | 61 | 80 |
| 79.4 1c | 300 | -220.6 | 61 | 81 |
| 75.4 | 300 | -224.6 | 61 | 82 |
| 54.6 | 300 | -245.4 | 61 | 83 |
| | | | | |
| 168 | 7.9 J | 160.1 | 62 | 83 |
| 142 1c | 7.9 J | 134.1 | 63 | 83 |
| 33.6 2c | 7.9 J | 25.7 | 64 | 83 |
| ND<5 U | 7.9 J | -2.9 | 64 | 84 |
| 132 | 7.9 J | 124.1 | 65 | 84 |
| 313 | 7.9 J | 305.1 | 66 | 84 |
| 604 | 7.9 J | 596.1 | 67 | 84 |
| 37.8 | 7.9 J | 29.9 | 68 | 84 |

| | | | | |
|---|---|---|---|---|
| 79.4 1c | 7.9 J | 71.5 | 69 | 84 |
| 75.4 | 7.9 J | 67.5 | 70 | 84 |
| 54.6 | 7.9 J | 46.7 | 71 | 84 |
| | | | | |
| 142 1c | 168 | -26 | 71 | 85 |
| 33.6 2c | 168 | -134.4 | 71 | 86 |
| ND<5 U | 168 | -163 | 71 | 87 |
| 132 | 168 | -36 | 71 | 88 |
| 313 | 168 | 145 | 72 | 88 |
| 604 | 168 | 436 | 73 | 88 |
| 37.8 | 168 | -130.2 | 73 | 89 |
| 79.4 1c | 168 | -88.6 | 73 | 90 |
| 75.4 | 168 | -92.6 | 73 | 91 |
| 54.6 | 168 | -113.4 | 73 | 92 |
| | | | | |
| 33.6 2c | 142 1c | Same Date | 73 | 92 |
| ND<5 U | 142 1c | -137 | 73 | 93 |
| 132 | 142 1c | -10 | 73 | 94 |
| 313 | 142 1c | 171 | 74 | 94 |
| 604 | 142 1c | 462 | 75 | 94 |
| 37.8 | 142 1c | -104.2 | 75 | 95 |
| 79.4 1c | 142 1c | -62.6 | 75 | 96 |
| 75.4 | 142 1c | -66.6 | 75 | 97 |
| 54.6 | 142 1c | -87.4 | 75 | 98 |
| | | | | |
| ND<5 U | 33.6 2c | -28.6 | 75 | 99 |
| 132 | 33.6 2c | 98.4 | 76 | 99 |
| 313 | 33.6 2c | 279.4 | 77 | 99 |
| 604 | 33.6 2c | 570.4 | 78 | 99 |
| 37.8 | 33.6 2c | 4.2 | 79 | 99 |
| 79.4 1c | 33.6 2c | 45.8 | 80 | 99 |
| 75.4 | 33.6 2c | 41.8 | 81 | 99 |
| 54.6 | 33.6 2c | 21 | 82 | 99 |
| | | | | |
| 132 | ND<5 U | Same Date | 82 | 99 |
| 313 | ND<5 U | 308 | 83 | 99 |
| 604 | ND<5 U | 599 | 84 | 99 |
| 37.8 | ND<5 U | 32.8 | 85 | 99 |
| 79.4 1c | ND<5 U | 74.4 | 86 | 99 |
| 75.4 | ND<5 U | 70.4 | 87 | 99 |
| 54.6 | ND<5 U | 49.6 | 88 | 99 |
| | | | | |
| 313 | 132 | 181 | 89 | 99 |
| 604 | 132 | 472 | 90 | 99 |
| 37.8 | 132 | -94.2 | 90 | 100 |
| 79.4 1c | 132 | -52.6 | 90 | 101 |
| 75.4 | 132 | -56.6 | 90 | 102 |
| 54.6 | 132 | -77.4 | 90 | 103 |
| | | | | |
| 604 | 313 | 291 | 91 | 103 |
| 37.8 | 313 | -275.2 | 91 | 104 |
| 79.4 1c | 313 | -233.6 | 91 | 105 |
| 75.4 | 313 | -237.6 | 91 | 106 |
| 54.6 | 313 | -258.4 | 91 | 107 |
| | | | | |
| 37.8 | 604 | -566.2 | 91 | 108 |
| 79.4 1c | 604 | -524.6 | 91 | 109 |

| | | | | |
|---|---|---|---|---|
| 75.4 | 604 | -528.6 | 91 | 110 |
| 54.6 | 604 | -549.4 | 91 | 111 |
| | | | | |
| 79.4 1c | 37.8 | 41.6 | 92 | 111 |
| 75.4 | 37.8 | 37.6 | 93 | 111 |
| 54.6 | 37.8 | 16.8 | 94 | 111 |
| | | | | |
| 75.4 | 79.4 1c | -4 | 94 | 112 |
| 54.6 | 79.4 1c | -24.8 | 94 | 113 |
| | | | | |
| 54.6 | 75.4 | -20.8 | 94 | 114 |

S Statistic = 94 - 114 = -20

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 6/1/2017 | 1 |
| 7/1/2017 | 1 |
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |

There are 2 time periods with multiple data

A = 0
B = 36
C = 0
D = 0
E = 0
F = 4
a = 19740
b = 71820
c = 840
Group Variance = 1094.67
Z-Score = -0.574265
Comparison Level at 95% confidence level = -1.65463 (downward trend)
-0.574265 >= -1.65463 indicating no evidence of a downward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RW05-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 184 | 550 | -366 | 0 | 1 |
| 1410 | 550 | 860 | 1 | 1 |
| 503 | 550 | -47 | 1 | 2 |
| 5440 | 550 | 4890 | 2 | 2 |
| 35.7 | 550 | -514.3 | 2 | 3 |
| 75.3 | 550 | -474.7 | 2 | 4 |
| 32.6 | 550 | -517.4 | 2 | 5 |
| 21.7 | 550 | -528.3 | 2 | 6 |
| ND<5 U2c | 550 | -545 | 2 | 7 |
| 48.3 1c | 550 | -501.7 | 2 | 8 |
| ND<5 U | 550 | -545 | 2 | 9 |
| 10 J | 550 | -540 | 2 | 10 |
| 8.3 JB2c | 550 | -541.7 | 2 | 11 |
| 41.6 | 550 | -508.4 | 2 | 12 |
| 5.4 J | 550 | -544.6 | 2 | 13 |
| 8.6 J | 550 | -541.4 | 2 | 14 |
| 5.9 J1c | 550 | -544.1 | 2 | 15 |
| 9.8 J1c | 550 | -540.2 | 2 | 16 |
| 7 JB | 550 | -543 | 2 | 17 |
| 17.8 J | 550 | -532.2 | 2 | 18 |
| 56.7 | 550 | -493.3 | 2 | 19 |
| 14.65 | 550 | -535.35 | 2 | 20 |
| 14.5 | 550 | -535.5 | 2 | 21 |
| | | | | |
| 1410 | 184 | 1226 | 3 | 21 |
| 503 | 184 | 319 | 4 | 21 |
| 5440 | 184 | 5256 | 5 | 21 |
| 35.7 | 184 | -148.3 | 5 | 22 |
| 75.3 | 184 | -108.7 | 5 | 23 |
| 32.6 | 184 | -151.4 | 5 | 24 |
| 21.7 | 184 | -162.3 | 5 | 25 |
| ND<5 U2c | 184 | -179 | 5 | 26 |
| 48.3 1c | 184 | -135.7 | 5 | 27 |
| ND<5 U | 184 | -179 | 5 | 28 |
| 10 J | 184 | -174 | 5 | 29 |
| 8.3 JB2c | 184 | -175.7 | 5 | 30 |
| 41.6 | 184 | -142.4 | 5 | 31 |
| 5.4 J | 184 | -178.6 | 5 | 32 |
| 8.6 J | 184 | -175.4 | 5 | 33 |
| 5.9 J1c | 184 | -178.1 | 5 | 34 |
| 9.8 J1c | 184 | -174.2 | 5 | 35 |
| 7 JB | 184 | -177 | 5 | 36 |
| 17.8 J | 184 | -166.2 | 5 | 37 |
| 56.7 | 184 | -127.3 | 5 | 38 |
| 14.65 | 184 | -169.35 | 5 | 39 |
| 14.5 | 184 | -169.5 | 5 | 40 |

| | | | | |
|---|---|---|---|---|
| 503 | 1410 | -907 | 5 | 41 |
| 5440 | 1410 | 4030 | 6 | 41 |
| 35.7 | 1410 | -1374.3 | 6 | 42 |
| 75.3 | 1410 | -1334.7 | 6 | 43 |
| 32.6 | 1410 | -1377.4 | 6 | 44 |
| 21.7 | 1410 | -1388.3 | 6 | 45 |
| ND<5 U2c | 1410 | -1405 | 6 | 46 |
| 48.3 1c | 1410 | -1361.7 | 6 | 47 |
| ND<5 U | 1410 | -1405 | 6 | 48 |
| 10 J | 1410 | -1400 | 6 | 49 |
| 8.3 JB2c | 1410 | -1401.7 | 6 | 50 |
| 41.6 | 1410 | -1368.4 | 6 | 51 |
| 5.4 J | 1410 | -1404.6 | 6 | 52 |
| 8.6 J | 1410 | -1401.4 | 6 | 53 |
| 5.9 J1c | 1410 | -1404.1 | 6 | 54 |
| 9.8 J1c | 1410 | -1400.2 | 6 | 55 |
| 7 JB | 1410 | -1403 | 6 | 56 |
| 17.8 J | 1410 | -1392.2 | 6 | 57 |
| 56.7 | 1410 | -1353.3 | 6 | 58 |
| 14.65 | 1410 | -1395.35 | 6 | 59 |
| 14.5 | 1410 | -1395.5 | 6 | 60 |
| | | | | |
| 5440 | 503 | 4937 | 7 | 60 |
| 35.7 | 503 | -467.3 | 7 | 61 |
| 75.3 | 503 | -427.7 | 7 | 62 |
| 32.6 | 503 | -470.4 | 7 | 63 |
| 21.7 | 503 | -481.3 | 7 | 64 |
| ND<5 U2c | 503 | -498 | 7 | 65 |
| 48.3 1c | 503 | -454.7 | 7 | 66 |
| ND<5 U | 503 | -498 | 7 | 67 |
| 10 J | 503 | -493 | 7 | 68 |
| 8.3 JB2c | 503 | -494.7 | 7 | 69 |
| 41.6 | 503 | -461.4 | 7 | 70 |
| 5.4 J | 503 | -497.6 | 7 | 71 |
| 8.6 J | 503 | -494.4 | 7 | 72 |
| 5.9 J1c | 503 | -497.1 | 7 | 73 |
| 9.8 J1c | 503 | -493.2 | 7 | 74 |
| 7 JB | 503 | -496 | 7 | 75 |
| 17.8 J | 503 | -485.2 | 7 | 76 |
| 56.7 | 503 | -446.3 | 7 | 77 |
| 14.65 | 503 | -488.35 | 7 | 78 |
| 14.5 | 503 | -488.5 | 7 | 79 |
| | | | | |
| 35.7 | 5440 | -5404.3 | 7 | 80 |
| 75.3 | 5440 | -5364.7 | 7 | 81 |
| 32.6 | 5440 | -5407.4 | 7 | 82 |
| 21.7 | 5440 | -5418.3 | 7 | 83 |
| ND<5 U2c | 5440 | -5435 | 7 | 84 |
| 48.3 1c | 5440 | -5391.7 | 7 | 85 |
| ND<5 U | 5440 | -5435 | 7 | 86 |
| 10 J | 5440 | -5430 | 7 | 87 |
| 8.3 JB2c | 5440 | -5431.7 | 7 | 88 |
| 41.6 | 5440 | -5398.4 | 7 | 89 |
| 5.4 J | 5440 | -5434.6 | 7 | 90 |
| 8.6 J | 5440 | -5431.4 | 7 | 91 |
| 5.9 J1c | 5440 | -5434.1 | 7 | 92 |
| 9.8 J1c | 5440 | -5430.2 | 7 | 93 |

| | | | | |
|---|---|---|---|---|
| 7 JB | 5440 | -5433 | 7 | 94 |
| 17.8 J | 5440 | -5422.2 | 7 | 95 |
| 56.7 | 5440 | -5383.3 | 7 | 96 |
| 14.65 | 5440 | -5425.35 | 7 | 97 |
| 14.5 | 5440 | -5425.5 | 7 | 98 |
| | | | | |
| 75.3 | 35.7 | 39.6 | 8 | 98 |
| 32.6 | 35.7 | -3.1 | 8 | 99 |
| 21.7 | 35.7 | -14 | 8 | 100 |
| ND<5 U2c | 35.7 | -30.7 | 8 | 101 |
| 48.3 1c | 35.7 | 12.6 | 9 | 101 |
| ND<5 U | 35.7 | -30.7 | 9 | 102 |
| 10 J | 35.7 | -25.7 | 9 | 103 |
| 8.3 JB2c | 35.7 | -27.4 | 9 | 104 |
| 41.6 | 35.7 | 5.9 | 10 | 104 |
| 5.4 J | 35.7 | -30.3 | 10 | 105 |
| 8.6 J | 35.7 | -27.1 | 10 | 106 |
| 5.9 J1c | 35.7 | -29.8 | 10 | 107 |
| 9.8 J1c | 35.7 | -25.9 | 10 | 108 |
| 7 JB | 35.7 | -28.7 | 10 | 109 |
| 17.8 J | 35.7 | -17.9 | 10 | 110 |
| 56.7 | 35.7 | 21 | 11 | 110 |
| 14.65 | 35.7 | -21.05 | 11 | 111 |
| 14.5 | 35.7 | -21.2 | 11 | 112 |
| | | | | |
| 32.6 | 75.3 | -42.7 | 11 | 113 |
| 21.7 | 75.3 | -53.6 | 11 | 114 |
| ND<5 U2c | 75.3 | -70.3 | 11 | 115 |
| 48.3 1c | 75.3 | -27 | 11 | 116 |
| ND<5 U | 75.3 | -70.3 | 11 | 117 |
| 10 J | 75.3 | -65.3 | 11 | 118 |
| 8.3 JB2c | 75.3 | -67 | 11 | 119 |
| 41.6 | 75.3 | -33.7 | 11 | 120 |
| 5.4 J | 75.3 | -69.9 | 11 | 121 |
| 8.6 J | 75.3 | -66.7 | 11 | 122 |
| 5.9 J1c | 75.3 | -69.4 | 11 | 123 |
| 9.8 J1c | 75.3 | -65.5 | 11 | 124 |
| 7 JB | 75.3 | -68.3 | 11 | 125 |
| 17.8 J | 75.3 | -57.5 | 11 | 126 |
| 56.7 | 75.3 | -18.6 | 11 | 127 |
| 14.65 | 75.3 | -60.65 | 11 | 128 |
| 14.5 | 75.3 | -60.8 | 11 | 129 |
| | | | | |
| 21.7 | 32.6 | -10.9 | 11 | 130 |
| ND<5 U2c | 32.6 | -27.6 | 11 | 131 |
| 48.3 1c | 32.6 | 15.7 | 12 | 131 |
| ND<5 U | 32.6 | -27.6 | 12 | 132 |
| 10 J | 32.6 | -22.6 | 12 | 133 |
| 8.3 JB2c | 32.6 | -24.3 | 12 | 134 |
| 41.6 | 32.6 | 9 | 13 | 134 |
| 5.4 J | 32.6 | -27.2 | 13 | 135 |
| 8.6 J | 32.6 | -24 | 13 | 136 |
| 5.9 J1c | 32.6 | -26.7 | 13 | 137 |
| 9.8 J1c | 32.6 | -22.8 | 13 | 138 |
| 7 JB | 32.6 | -25.6 | 13 | 139 |
| 17.8 J | 32.6 | -14.8 | 13 | 140 |
| 56.7 | 32.6 | 24.1 | 14 | 140 |

| | | | | |
|---|---|---|---|---|
| 14.65 | 32.6 | -17.95 | 14 | 141 |
| 14.5 | 32.6 | -18.1 | 14 | 142 |
| | | | | |
| ND<5 U2c | 21.7 | -16.7 | 14 | 143 |
| 48.3 1c | 21.7 | 26.6 | 15 | 143 |
| ND<5 U | 21.7 | -16.7 | 15 | 144 |
| 10 J | 21.7 | -11.7 | 15 | 145 |
| 8.3 JB2c | 21.7 | -13.4 | 15 | 146 |
| 41.6 | 21.7 | 19.9 | 16 | 146 |
| 5.4 J | 21.7 | -16.3 | 16 | 147 |
| 8.6 J | 21.7 | -13.1 | 16 | 148 |
| 5.9 J1c | 21.7 | -15.8 | 16 | 149 |
| 9.8 J1c | 21.7 | -11.9 | 16 | 150 |
| 7 JB | 21.7 | -14.7 | 16 | 151 |
| 17.8 J | 21.7 | -3.9 | 16 | 152 |
| 56.7 | 21.7 | 35 | 17 | 152 |
| 14.65 | 21.7 | -7.05 | 17 | 153 |
| 14.5 | 21.7 | -7.2 | 17 | 154 |
| | | | | |
| 48.3 1c | ND<5 U2c | Same Date | 17 | 154 |
| ND<5 U | ND<5 U2c | 0 | 17 | 154 |
| 10 J | ND<5 U2c | 5 | 18 | 154 |
| 8.3 JB2c | ND<5 U2c | 3.3 | 19 | 154 |
| 41.6 | ND<5 U2c | 36.6 | 20 | 154 |
| 5.4 J | ND<5 U2c | 0.4 | 21 | 154 |
| 8.6 J | ND<5 U2c | 3.6 | 22 | 154 |
| 5.9 J1c | ND<5 U2c | 0.9 | 23 | 154 |
| 9.8 J1c | ND<5 U2c | 4.8 | 24 | 154 |
| 7 JB | ND<5 U2c | 2 | 25 | 154 |
| 17.8 J | ND<5 U2c | 12.8 | 26 | 154 |
| 56.7 | ND<5 U2c | 51.7 | 27 | 154 |
| 14.65 | ND<5 U2c | 9.65 | 28 | 154 |
| 14.5 | ND<5 U2c | 9.5 | 29 | 154 |
| | | | | |
| ND<5 U | 48.3 1c | -43.3 | 29 | 155 |
| 10 J | 48.3 1c | -38.3 | 29 | 156 |
| 8.3 JB2c | 48.3 1c | -40 | 29 | 157 |
| 41.6 | 48.3 1c | -6.7 | 29 | 158 |
| 5.4 J | 48.3 1c | -42.9 | 29 | 159 |
| 8.6 J | 48.3 1c | -39.7 | 29 | 160 |
| 5.9 J1c | 48.3 1c | -42.4 | 29 | 161 |
| 9.8 J1c | 48.3 1c | -38.5 | 29 | 162 |
| 7 JB | 48.3 1c | -41.3 | 29 | 163 |
| 17.8 J | 48.3 1c | -30.5 | 29 | 164 |
| 56.7 | 48.3 1c | 8.4 | 30 | 164 |
| 14.65 | 48.3 1c | -33.65 | 30 | 165 |
| 14.5 | 48.3 1c | -33.8 | 30 | 166 |
| | | | | |
| 10 J | ND<5 U | Same Date | 30 | 166 |
| 8.3 JB2c | ND<5 U | 3.3 | 31 | 166 |
| 41.6 | ND<5 U | 36.6 | 32 | 166 |
| 5.4 J | ND<5 U | 0.4 | 33 | 166 |
| 8.6 J | ND<5 U | 3.6 | 34 | 166 |
| 5.9 J1c | ND<5 U | 0.9 | 35 | 166 |
| 9.8 J1c | ND<5 U | 4.8 | 36 | 166 |
| 7 JB | ND<5 U | 2 | 37 | 166 |
| 17.8 J | ND<5 U | 12.8 | 38 | 166 |

| | | | | |
|---|---|---|---|---|
| 56.7 | ND<5 U | 51.7 | 39 | 166 |
| 14.65 | ND<5 U | 9.65 | 40 | 166 |
| 14.5 | ND<5 U | 9.5 | 41 | 166 |
| | | | | |
| 8.3 JB2c | 10 J | -1.7 | 41 | 167 |
| 41.6 | 10 J | 31.6 | 42 | 167 |
| 5.4 J | 10 J | -4.6 | 42 | 168 |
| 8.6 J | 10 J | -1.4 | 42 | 169 |
| 5.9 J1c | 10 J | -4.1 | 42 | 170 |
| 9.8 J1c | 10 J | -0.2 | 42 | 171 |
| 7 JB | 10 J | -3 | 42 | 172 |
| 17.8 J | 10 J | 7.8 | 43 | 172 |
| 56.7 | 10 J | 46.7 | 44 | 172 |
| 14.65 | 10 J | 4.65 | 45 | 172 |
| 14.5 | 10 J | 4.5 | 46 | 172 |
| | | | | |
| 41.6 | 8.3 JB2c | 33.3 | 47 | 172 |
| 5.4 J | 8.3 JB2c | -2.9 | 47 | 173 |
| 8.6 J | 8.3 JB2c | 0.3 | 48 | 173 |
| 5.9 J1c | 8.3 JB2c | -2.4 | 48 | 174 |
| 9.8 J1c | 8.3 JB2c | 1.5 | 49 | 174 |
| 7 JB | 8.3 JB2c | -1.3 | 49 | 175 |
| 17.8 J | 8.3 JB2c | 9.5 | 50 | 175 |
| 56.7 | 8.3 JB2c | 48.4 | 51 | 175 |
| 14.65 | 8.3 JB2c | 6.35 | 52 | 175 |
| 14.5 | 8.3 JB2c | 6.2 | 53 | 175 |
| | | | | |
| 5.4 J | 41.6 | -36.2 | 53 | 176 |
| 8.6 J | 41.6 | -33 | 53 | 177 |
| 5.9 J1c | 41.6 | -35.7 | 53 | 178 |
| 9.8 J1c | 41.6 | -31.8 | 53 | 179 |
| 7 JB | 41.6 | -34.6 | 53 | 180 |
| 17.8 J | 41.6 | -23.8 | 53 | 181 |
| 56.7 | 41.6 | 15.1 | 54 | 181 |
| 14.65 | 41.6 | -26.95 | 54 | 182 |
| 14.5 | 41.6 | -27.1 | 54 | 183 |
| | | | | |
| 8.6 J | 5.4 J | 3.2 | 55 | 183 |
| 5.9 J1c | 5.4 J | 0.5 | 56 | 183 |
| 9.8 J1c | 5.4 J | 4.4 | 57 | 183 |
| 7 JB | 5.4 J | 1.6 | 58 | 183 |
| 17.8 J | 5.4 J | 12.4 | 59 | 183 |
| 56.7 | 5.4 J | 51.3 | 60 | 183 |
| 14.65 | 5.4 J | 9.25 | 61 | 183 |
| 14.5 | 5.4 J | 9.1 | 62 | 183 |
| | | | | |
| 5.9 J1c | 8.6 J | -2.7 | 62 | 184 |
| 9.8 J1c | 8.6 J | 1.2 | 63 | 184 |
| 7 JB | 8.6 J | -1.6 | 63 | 185 |
| 17.8 J | 8.6 J | 9.2 | 64 | 185 |
| 56.7 | 8.6 J | 48.1 | 65 | 185 |
| 14.65 | 8.6 J | 6.05 | 66 | 185 |
| 14.5 | 8.6 J | 5.9 | 67 | 185 |
| | | | | |
| 9.8 J1c | 5.9 J1c | 3.9 | 68 | 185 |
| 7 JB | 5.9 J1c | 1.1 | 69 | 185 |
| 17.8 J | 5.9 J1c | 11.9 | 70 | 185 |

| | | | | |
|---|---|---|---|---|
| 56.7 | 5.9 J1c | 50.8 | 71 | 185 |
| 14.65 | 5.9 J1c | 8.75 | 72 | 185 |
| 14.5 | 5.9 J1c | 8.6 | 73 | 185 |
| | | | | |
| 7 JB | 9.8 J1c | -2.8 | 73 | 186 |
| 17.8 J | 9.8 J1c | 8 | 74 | 186 |
| 56.7 | 9.8 J1c | 46.9 | 75 | 186 |
| 14.65 | 9.8 J1c | 4.85 | 76 | 186 |
| 14.5 | 9.8 J1c | 4.7 | 77 | 186 |
| | | | | |
| 17.8 J | 7 JB | 10.8 | 78 | 186 |
| 56.7 | 7 JB | 49.7 | 79 | 186 |
| 14.65 | 7 JB | 7.65 | 80 | 186 |
| 14.5 | 7 JB | 7.5 | 81 | 186 |
| | | | | |
| 56.7 | 17.8 J | 38.9 | 82 | 186 |
| 14.65 | 17.8 J | -3.15 | 82 | 187 |
| 14.5 | 17.8 J | -3.3 | 82 | 188 |
| | | | | |
| 14.65 | 56.7 | -42.05 | 82 | 189 |
| 14.5 | 56.7 | -42.2 | 82 | 190 |
| | | | | |
| 14.5 | 14.65 | -0.15 | 82 | 191 |

S Statistic = 82 - 191 = -109

| Tied Group | Value | Members |
|---|---|---|
| 1 | 5 | 2 |

| Time Period | Observations |
|---|---|
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |

There are 2 time periods with multiple data

A = 18
B = 36

C = 0
D = 0
E = 2
F = 4
a = 29256
b = 109296
c = 1104
Group Variance = 1622.34
Z-Score = -2.68135
Comparison Level at 95% confidence level = -1.65463 (downward trend)
**-2.68135 < -1.65463 indicating a downward trend**

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RW06R-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 3.7 J | 22 | -18.3 | 0 | 1 |
| ND<5 U2c | 22 | -17 | 0 | 2 |
| ND<5 U1c | 22 | -17 | 0 | 3 |
| 4.1 JB | 22 | -17.9 | 0 | 4 |
| 4.1 J | 22 | -17.9 | 0 | 5 |
| 19.4 | 22 | -2.6 | 0 | 6 |
| ND<5 U | 22 | -17 | 0 | 7 |
| ND<5 U | 22 | -17 | 0 | 8 |
| ND<10 U | 22 | -12 | 0 | 9 |
| ND<5 U | 22 | -17 | 0 | 10 |
| 3.552 J | 22 | -18.448 | 0 | 11 |
| | | | | |
| ND<5 U2c | 3.7 J | 1.3 | 1 | 11 |
| ND<5 U1c | 3.7 J | 1.3 | 2 | 11 |
| 4.1 JB | 3.7 J | 0.4 | 3 | 11 |
| 4.1 J | 3.7 J | 0.4 | 4 | 11 |
| 19.4 | 3.7 J | 15.7 | 5 | 11 |
| ND<5 U | 3.7 J | 1.3 | 6 | 11 |
| ND<5 U | 3.7 J | 1.3 | 7 | 11 |
| ND<10 U | 3.7 J | 6.3 | 8 | 11 |
| ND<5 U | 3.7 J | 1.3 | 9 | 11 |
| 3.552 J | 3.7 J | -0.148 | 9 | 12 |
| | | | | |
| ND<5 U1c | ND<5 U2c | Same Date | 9 | 12 |
| 4.1 JB | ND<5 U2c | -0.9 | 9 | 13 |
| 4.1 J | ND<5 U2c | -0.9 | 9 | 14 |
| 19.4 | ND<5 U2c | 14.4 | 10 | 14 |
| ND<5 U | ND<5 U2c | 0 | 10 | 14 |
| ND<5 U | ND<5 U2c | 0 | 10 | 14 |
| ND<10 U | ND<5 U2c | 5 | 11 | 14 |
| ND<5 U | ND<5 U2c | 0 | 11 | 14 |
| 3.552 J | ND<5 U2c | -1.448 | 11 | 15 |
| | | | | |
| 4.1 JB | ND<5 U1c | -0.9 | 11 | 16 |
| 4.1 J | ND<5 U1c | -0.9 | 11 | 17 |
| 19.4 | ND<5 U1c | 14.4 | 12 | 17 |
| ND<5 U | ND<5 U1c | 0 | 12 | 17 |
| ND<5 U | ND<5 U1c | 0 | 12 | 17 |
| ND<10 U | ND<5 U1c | 5 | 13 | 17 |
| ND<5 U | ND<5 U1c | 0 | 13 | 17 |
| 3.552 J | ND<5 U1c | -1.448 | 13 | 18 |
| | | | | |
| 4.1 J | 4.1 JB | 0 | 13 | 18 |
| 19.4 | 4.1 JB | 15.3 | 14 | 18 |
| ND<5 U | 4.1 JB | 0.9 | 15 | 18 |
| ND<5 U | 4.1 JB | 0.9 | 16 | 18 |
| ND<10 U | 4.1 JB | 5.9 | 17 | 18 |

| | | | | |
|---|---|---|---|---|
| ND<5 U | 4.1 JB | 0.9 | 18 | 18 |
| 3.552 J | 4.1 JB | -0.548 | 18 | 19 |
| | | | | |
| 19.4 | 4.1 J | 15.3 | 19 | 19 |
| ND<5 U | 4.1 J | 0.9 | 20 | 19 |
| ND<5 U | 4.1 J | 0.9 | 21 | 19 |
| ND<10 U | 4.1 J | 5.9 | 22 | 19 |
| ND<5 U | 4.1 J | 0.9 | 23 | 19 |
| 3.552 J | 4.1 J | -0.548 | 23 | 20 |
| | | | | |
| ND<5 U | 19.4 | -14.4 | 23 | 21 |
| ND<5 U | 19.4 | -14.4 | 23 | 22 |
| ND<10 U | 19.4 | -9.4 | 23 | 23 |
| ND<5 U | 19.4 | -14.4 | 23 | 24 |
| 3.552 J | 19.4 | -15.848 | 23 | 25 |
| | | | | |
| ND<5 U | ND<5 U | 0 | 23 | 25 |
| ND<10 U | ND<5 U | 5 | 24 | 25 |
| ND<5 U | ND<5 U | 0 | 24 | 25 |
| 3.552 J | ND<5 U | -1.448 | 24 | 26 |
| | | | | |
| ND<10 U | ND<5 U | 5 | 25 | 26 |
| ND<5 U | ND<5 U | 0 | 25 | 26 |
| 3.552 J | ND<5 U | -1.448 | 25 | 27 |
| | | | | |
| ND<5 U | ND<10 U | -5 | 25 | 28 |
| 3.552 J | ND<10 U | -6.448 | 25 | 29 |
| | | | | |
| 3.552 J | ND<5 U | -1.448 | 25 | 30 |

S Statistic = 25 - 30 = -5

| Tied Group | Value | Members |
|---|---|---|
| 1 | 5 | 5 |
| 2 | 4.1 | 2 |

| Time Period | Observations |
|---|---|
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 9/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 3/1/2022 | 1 |
| 3/1/2023 | 1 |
| 3/1/2024 | 1 |

There are 1 time periods with multiple data

A = 318
B = 18
C = 60
D = 0
E = 22
F = 2

a = 3828
b = 11880
c = 264
Group Variance = 194.167
Z-Score = -0.28706
Comparison Level at 95% confidence level = -1.65463 (downward trend)
-0.28706 >= -1.65463 indicating no evidence of a downward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RW07-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 74.8 | 81.6 | -6.8 | 0 | 1 |
| 86.4 | 81.6 | 4.8 | 1 | 1 |
| 102 | 81.6 | 20.4 | 2 | 1 |
| 107 | 81.6 | 25.4 | 3 | 1 |
| 114 | 81.6 | 32.4 | 4 | 1 |
| 127 | 81.6 | 45.4 | 5 | 1 |
| 165 | 81.6 | 83.4 | 6 | 1 |
| 144 | 81.6 | 62.4 | 7 | 1 |
| 227 | 81.6 | 145.4 | 8 | 1 |
| 216 | 81.6 | 134.4 | 9 | 1 |
| 276 | 81.6 | 194.4 | 10 | 1 |
| 204 | 81.6 | 122.4 | 11 | 1 |
| 248 | 81.6 | 166.4 | 12 | 1 |
| 223 | 81.6 | 141.4 | 13 | 1 |
| 199 | 81.6 | 117.4 | 14 | 1 |
| 142 | 81.6 | 60.4 | 15 | 1 |
| 137 | 81.6 | 55.4 | 16 | 1 |
| 151 | 81.6 | 69.4 | 17 | 1 |
| 148 | 81.6 | 66.4 | 18 | 1 |
| 168 | 81.6 | 86.4 | 19 | 1 |
| 124 | 81.6 | 42.4 | 20 | 1 |
| 220 | 81.6 | 138.4 | 21 | 1 |
| 298 | 81.6 | 216.4 | 22 | 1 |
| 406 | 81.6 | 324.4 | 23 | 1 |
| 96.09 | 81.6 | 14.49 | 24 | 1 |
| 149.2 | 81.6 | 67.6 | 25 | 1 |
| | | | | |
| 86.4 | 74.8 | 11.6 | 26 | 1 |
| 102 | 74.8 | 27.2 | 27 | 1 |
| 107 | 74.8 | 32.2 | 28 | 1 |
| 114 | 74.8 | 39.2 | 29 | 1 |
| 127 | 74.8 | 52.2 | 30 | 1 |
| 165 | 74.8 | 90.2 | 31 | 1 |
| 144 | 74.8 | 69.2 | 32 | 1 |
| 227 | 74.8 | 152.2 | 33 | 1 |
| 216 | 74.8 | 141.2 | 34 | 1 |
| 276 | 74.8 | 201.2 | 35 | 1 |
| 204 | 74.8 | 129.2 | 36 | 1 |
| 248 | 74.8 | 173.2 | 37 | 1 |
| 223 | 74.8 | 148.2 | 38 | 1 |
| 199 | 74.8 | 124.2 | 39 | 1 |
| 142 | 74.8 | 67.2 | 40 | 1 |
| 137 | 74.8 | 62.2 | 41 | 1 |
| 151 | 74.8 | 76.2 | 42 | 1 |
| 148 | 74.8 | 73.2 | 43 | 1 |
| 168 | 74.8 | 93.2 | 44 | 1 |
| 124 | 74.8 | 49.2 | 45 | 1 |

| | | | | |
|---|---|---|---|---|
| 220 | 74.8 | 145.2 | 46 | 1 |
| 298 | 74.8 | 223.2 | 47 | 1 |
| 406 | 74.8 | 331.2 | 48 | 1 |
| 96.09 | 74.8 | 21.29 | 49 | 1 |
| 149.2 | 74.8 | 74.4 | 50 | 1 |
| | | | | |
| 102 | 86.4 | 15.6 | 51 | 1 |
| 107 | 86.4 | 20.6 | 52 | 1 |
| 114 | 86.4 | 27.6 | 53 | 1 |
| 127 | 86.4 | 40.6 | 54 | 1 |
| 165 | 86.4 | 78.6 | 55 | 1 |
| 144 | 86.4 | 57.6 | 56 | 1 |
| 227 | 86.4 | 140.6 | 57 | 1 |
| 216 | 86.4 | 129.6 | 58 | 1 |
| 276 | 86.4 | 189.6 | 59 | 1 |
| 204 | 86.4 | 117.6 | 60 | 1 |
| 248 | 86.4 | 161.6 | 61 | 1 |
| 223 | 86.4 | 136.6 | 62 | 1 |
| 199 | 86.4 | 112.6 | 63 | 1 |
| 142 | 86.4 | 55.6 | 64 | 1 |
| 137 | 86.4 | 50.6 | 65 | 1 |
| 151 | 86.4 | 64.6 | 66 | 1 |
| 148 | 86.4 | 61.6 | 67 | 1 |
| 168 | 86.4 | 81.6 | 68 | 1 |
| 124 | 86.4 | 37.6 | 69 | 1 |
| 220 | 86.4 | 133.6 | 70 | 1 |
| 298 | 86.4 | 211.6 | 71 | 1 |
| 406 | 86.4 | 319.6 | 72 | 1 |
| 96.09 | 86.4 | 9.69 | 73 | 1 |
| 149.2 | 86.4 | 62.8 | 74 | 1 |
| | | | | |
| 107 | 102 | 5 | 75 | 1 |
| 114 | 102 | 12 | 76 | 1 |
| 127 | 102 | 25 | 77 | 1 |
| 165 | 102 | 63 | 78 | 1 |
| 144 | 102 | 42 | 79 | 1 |
| 227 | 102 | 125 | 80 | 1 |
| 216 | 102 | 114 | 81 | 1 |
| 276 | 102 | 174 | 82 | 1 |
| 204 | 102 | 102 | 83 | 1 |
| 248 | 102 | 146 | 84 | 1 |
| 223 | 102 | 121 | 85 | 1 |
| 199 | 102 | 97 | 86 | 1 |
| 142 | 102 | 40 | 87 | 1 |
| 137 | 102 | 35 | 88 | 1 |
| 151 | 102 | 49 | 89 | 1 |
| 148 | 102 | 46 | 90 | 1 |
| 168 | 102 | 66 | 91 | 1 |
| 124 | 102 | 22 | 92 | 1 |
| 220 | 102 | 118 | 93 | 1 |
| 298 | 102 | 196 | 94 | 1 |
| 406 | 102 | 304 | 95 | 1 |
| 96.09 | 102 | -5.91 | 95 | 2 |
| 149.2 | 102 | 47.2 | 96 | 2 |
| | | | | |
| 114 | 107 | 7 | 97 | 2 |
| 127 | 107 | 20 | 98 | 2 |

| | | | | |
|---|---|---|---|---|
| 165 | 107 | 58 | 99 | 2 |
| 144 | 107 | 37 | 100 | 2 |
| 227 | 107 | 120 | 101 | 2 |
| 216 | 107 | 109 | 102 | 2 |
| 276 | 107 | 169 | 103 | 2 |
| 204 | 107 | 97 | 104 | 2 |
| 248 | 107 | 141 | 105 | 2 |
| 223 | 107 | 116 | 106 | 2 |
| 199 | 107 | 92 | 107 | 2 |
| 142 | 107 | 35 | 108 | 2 |
| 137 | 107 | 30 | 109 | 2 |
| 151 | 107 | 44 | 110 | 2 |
| 148 | 107 | 41 | 111 | 2 |
| 168 | 107 | 61 | 112 | 2 |
| 124 | 107 | 17 | 113 | 2 |
| 220 | 107 | 113 | 114 | 2 |
| 298 | 107 | 191 | 115 | 2 |
| 406 | 107 | 299 | 116 | 2 |
| 96.09 | 107 | -10.91 | 116 | 3 |
| 149.2 | 107 | 42.2 | 117 | 3 |
| | | | | |
| 127 | 114 | 13 | 118 | 3 |
| 165 | 114 | 51 | 119 | 3 |
| 144 | 114 | 30 | 120 | 3 |
| 227 | 114 | 113 | 121 | 3 |
| 216 | 114 | 102 | 122 | 3 |
| 276 | 114 | 162 | 123 | 3 |
| 204 | 114 | 90 | 124 | 3 |
| 248 | 114 | 134 | 125 | 3 |
| 223 | 114 | 109 | 126 | 3 |
| 199 | 114 | 85 | 127 | 3 |
| 142 | 114 | 28 | 128 | 3 |
| 137 | 114 | 23 | 129 | 3 |
| 151 | 114 | 37 | 130 | 3 |
| 148 | 114 | 34 | 131 | 3 |
| 168 | 114 | 54 | 132 | 3 |
| 124 | 114 | 10 | 133 | 3 |
| 220 | 114 | 106 | 134 | 3 |
| 298 | 114 | 184 | 135 | 3 |
| 406 | 114 | 292 | 136 | 3 |
| 96.09 | 114 | -17.91 | 136 | 4 |
| 149.2 | 114 | 35.2 | 137 | 4 |
| | | | | |
| 165 | 127 | 38 | 138 | 4 |
| 144 | 127 | 17 | 139 | 4 |
| 227 | 127 | 100 | 140 | 4 |
| 216 | 127 | 89 | 141 | 4 |
| 276 | 127 | 149 | 142 | 4 |
| 204 | 127 | 77 | 143 | 4 |
| 248 | 127 | 121 | 144 | 4 |
| 223 | 127 | 96 | 145 | 4 |
| 199 | 127 | 72 | 146 | 4 |
| 142 | 127 | 15 | 147 | 4 |
| 137 | 127 | 10 | 148 | 4 |
| 151 | 127 | 24 | 149 | 4 |
| 148 | 127 | 21 | 150 | 4 |
| 168 | 127 | 41 | 151 | 4 |

| | | | | |
|---|---|---|---|---|
| 124 | 127 | -3 | 151 | 5 |
| 220 | 127 | 93 | 152 | 5 |
| 298 | 127 | 171 | 153 | 5 |
| 406 | 127 | 279 | 154 | 5 |
| 96.09 | 127 | -30.91 | 154 | 6 |
| 149.2 | 127 | 22.2 | 155 | 6 |
| | | | | |
| 144 | 165 | -21 | 155 | 7 |
| 227 | 165 | 62 | 156 | 7 |
| 216 | 165 | 51 | 157 | 7 |
| 276 | 165 | 111 | 158 | 7 |
| 204 | 165 | 39 | 159 | 7 |
| 248 | 165 | 83 | 160 | 7 |
| 223 | 165 | 58 | 161 | 7 |
| 199 | 165 | 34 | 162 | 7 |
| 142 | 165 | -23 | 162 | 8 |
| 137 | 165 | -28 | 162 | 9 |
| 151 | 165 | -14 | 162 | 10 |
| 148 | 165 | -17 | 162 | 11 |
| 168 | 165 | 3 | 163 | 11 |
| 124 | 165 | -41 | 163 | 12 |
| 220 | 165 | 55 | 164 | 12 |
| 298 | 165 | 133 | 165 | 12 |
| 406 | 165 | 241 | 166 | 12 |
| 96.09 | 165 | -68.91 | 166 | 13 |
| 149.2 | 165 | -15.8 | 166 | 14 |
| | | | | |
| 227 | 144 | 83 | 167 | 14 |
| 216 | 144 | 72 | 168 | 14 |
| 276 | 144 | 132 | 169 | 14 |
| 204 | 144 | 60 | 170 | 14 |
| 248 | 144 | 104 | 171 | 14 |
| 223 | 144 | 79 | 172 | 14 |
| 199 | 144 | 55 | 173 | 14 |
| 142 | 144 | -2 | 173 | 15 |
| 137 | 144 | -7 | 173 | 16 |
| 151 | 144 | 7 | 174 | 16 |
| 148 | 144 | 4 | 175 | 16 |
| 168 | 144 | 24 | 176 | 16 |
| 124 | 144 | -20 | 176 | 17 |
| 220 | 144 | 76 | 177 | 17 |
| 298 | 144 | 154 | 178 | 17 |
| 406 | 144 | 262 | 179 | 17 |
| 96.09 | 144 | -47.91 | 179 | 18 |
| 149.2 | 144 | 5.2 | 180 | 18 |
| | | | | |
| 216 | 227 | -11 | 180 | 19 |
| 276 | 227 | 49 | 181 | 19 |
| 204 | 227 | -23 | 181 | 20 |
| 248 | 227 | 21 | 182 | 20 |
| 223 | 227 | -4 | 182 | 21 |
| 199 | 227 | -28 | 182 | 22 |
| 142 | 227 | -85 | 182 | 23 |
| 137 | 227 | -90 | 182 | 24 |
| 151 | 227 | -76 | 182 | 25 |
| 148 | 227 | -79 | 182 | 26 |
| 168 | 227 | -59 | 182 | 27 |

| | | | | |
|---|---|---|---|---|
| 124 | 227 | -103 | 182 | 28 |
| 220 | 227 | -7 | 182 | 29 |
| 298 | 227 | 71 | 183 | 29 |
| 406 | 227 | 179 | 184 | 29 |
| 96.09 | 227 | -130.91 | 184 | 30 |
| 149.2 | 227 | -77.8 | 184 | 31 |
| | | | | |
| 276 | 216 | 60 | 185 | 31 |
| 204 | 216 | -12 | 185 | 32 |
| 248 | 216 | 32 | 186 | 32 |
| 223 | 216 | 7 | 187 | 32 |
| 199 | 216 | -17 | 187 | 33 |
| 142 | 216 | -74 | 187 | 34 |
| 137 | 216 | -79 | 187 | 35 |
| 151 | 216 | -65 | 187 | 36 |
| 148 | 216 | -68 | 187 | 37 |
| 168 | 216 | -48 | 187 | 38 |
| 124 | 216 | -92 | 187 | 39 |
| 220 | 216 | 4 | 188 | 39 |
| 298 | 216 | 82 | 189 | 39 |
| 406 | 216 | 190 | 190 | 39 |
| 96.09 | 216 | -119.91 | 190 | 40 |
| 149.2 | 216 | -66.8 | 190 | 41 |
| | | | | |
| 204 | 276 | -72 | 190 | 42 |
| 248 | 276 | -28 | 190 | 43 |
| 223 | 276 | -53 | 190 | 44 |
| 199 | 276 | -77 | 190 | 45 |
| 142 | 276 | -134 | 190 | 46 |
| 137 | 276 | -139 | 190 | 47 |
| 151 | 276 | -125 | 190 | 48 |
| 148 | 276 | -128 | 190 | 49 |
| 168 | 276 | -108 | 190 | 50 |
| 124 | 276 | -152 | 190 | 51 |
| 220 | 276 | -56 | 190 | 52 |
| 298 | 276 | 22 | 191 | 52 |
| 406 | 276 | 130 | 192 | 52 |
| 96.09 | 276 | -179.91 | 192 | 53 |
| 149.2 | 276 | -126.8 | 192 | 54 |
| | | | | |
| 248 | 204 | 44 | 193 | 54 |
| 223 | 204 | 19 | 194 | 54 |
| 199 | 204 | -5 | 194 | 55 |
| 142 | 204 | -62 | 194 | 56 |
| 137 | 204 | -67 | 194 | 57 |
| 151 | 204 | -53 | 194 | 58 |
| 148 | 204 | -56 | 194 | 59 |
| 168 | 204 | -36 | 194 | 60 |
| 124 | 204 | -80 | 194 | 61 |
| 220 | 204 | 16 | 195 | 61 |
| 298 | 204 | 94 | 196 | 61 |
| 406 | 204 | 202 | 197 | 61 |
| 96.09 | 204 | -107.91 | 197 | 62 |
| 149.2 | 204 | -54.8 | 197 | 63 |
| | | | | |
| 223 | 248 | -25 | 197 | 64 |
| 199 | 248 | -49 | 197 | 65 |

| | | | | |
|---|---|---|---|---|
| 142 | 248 | -106 | 197 | 66 |
| 137 | 248 | -111 | 197 | 67 |
| 151 | 248 | -97 | 197 | 68 |
| 148 | 248 | -100 | 197 | 69 |
| 168 | 248 | -80 | 197 | 70 |
| 124 | 248 | -124 | 197 | 71 |
| 220 | 248 | -28 | 197 | 72 |
| 298 | 248 | 50 | 198 | 72 |
| 406 | 248 | 158 | 199 | 72 |
| 96.09 | 248 | -151.91 | 199 | 73 |
| 149.2 | 248 | -98.8 | 199 | 74 |
| | | | | |
| 199 | 223 | -24 | 199 | 75 |
| 142 | 223 | -81 | 199 | 76 |
| 137 | 223 | -86 | 199 | 77 |
| 151 | 223 | -72 | 199 | 78 |
| 148 | 223 | -75 | 199 | 79 |
| 168 | 223 | -55 | 199 | 80 |
| 124 | 223 | -99 | 199 | 81 |
| 220 | 223 | -3 | 199 | 82 |
| 298 | 223 | 75 | 200 | 82 |
| 406 | 223 | 183 | 201 | 82 |
| 96.09 | 223 | -126.91 | 201 | 83 |
| 149.2 | 223 | -73.8 | 201 | 84 |
| | | | | |
| 142 | 199 | Same Date | 201 | 84 |
| 137 | 199 | -62 | 201 | 85 |
| 151 | 199 | -48 | 201 | 86 |
| 148 | 199 | -51 | 201 | 87 |
| 168 | 199 | -31 | 201 | 88 |
| 124 | 199 | -75 | 201 | 89 |
| 220 | 199 | 21 | 202 | 89 |
| 298 | 199 | 99 | 203 | 89 |
| 406 | 199 | 207 | 204 | 89 |
| 96.09 | 199 | -102.91 | 204 | 90 |
| 149.2 | 199 | -49.8 | 204 | 91 |
| | | | | |
| 137 | 142 | -5 | 204 | 92 |
| 151 | 142 | 9 | 205 | 92 |
| 148 | 142 | 6 | 206 | 92 |
| 168 | 142 | 26 | 207 | 92 |
| 124 | 142 | -18 | 207 | 93 |
| 220 | 142 | 78 | 208 | 93 |
| 298 | 142 | 156 | 209 | 93 |
| 406 | 142 | 264 | 210 | 93 |
| 96.09 | 142 | -45.91 | 210 | 94 |
| 149.2 | 142 | 7.2 | 211 | 94 |
| | | | | |
| 151 | 137 | Same Date | 211 | 94 |
| 148 | 137 | 11 | 212 | 94 |
| 168 | 137 | 31 | 213 | 94 |
| 124 | 137 | -13 | 213 | 95 |
| 220 | 137 | 83 | 214 | 95 |
| 298 | 137 | 161 | 215 | 95 |
| 406 | 137 | 269 | 216 | 95 |
| 96.09 | 137 | -40.91 | 216 | 96 |
| 149.2 | 137 | 12.2 | 217 | 96 |

| | | | | |
|---|---|---|---|---|
| 148 | 151 | -3 | 217 | 97 |
| 168 | 151 | 17 | 218 | 97 |
| 124 | 151 | -27 | 218 | 98 |
| 220 | 151 | 69 | 219 | 98 |
| 298 | 151 | 147 | 220 | 98 |
| 406 | 151 | 255 | 221 | 98 |
| 96.09 | 151 | -54.91 | 221 | 99 |
| 149.2 | 151 | -1.8 | 221 | 100 |
| | | | | |
| 168 | 148 | 20 | 222 | 100 |
| 124 | 148 | -24 | 222 | 101 |
| 220 | 148 | 72 | 223 | 101 |
| 298 | 148 | 150 | 224 | 101 |
| 406 | 148 | 258 | 225 | 101 |
| 96.09 | 148 | -51.91 | 225 | 102 |
| 149.2 | 148 | 1.2 | 226 | 102 |
| | | | | |
| 124 | 168 | -44 | 226 | 103 |
| 220 | 168 | 52 | 227 | 103 |
| 298 | 168 | 130 | 228 | 103 |
| 406 | 168 | 238 | 229 | 103 |
| 96.09 | 168 | -71.91 | 229 | 104 |
| 149.2 | 168 | -18.8 | 229 | 105 |
| | | | | |
| 220 | 124 | 96 | 230 | 105 |
| 298 | 124 | 174 | 231 | 105 |
| 406 | 124 | 282 | 232 | 105 |
| 96.09 | 124 | -27.91 | 232 | 106 |
| 149.2 | 124 | 25.2 | 233 | 106 |
| | | | | |
| 298 | 220 | 78 | 234 | 106 |
| 406 | 220 | 186 | 235 | 106 |
| 96.09 | 220 | -123.91 | 235 | 107 |
| 149.2 | 220 | -70.8 | 235 | 108 |
| | | | | |
| 406 | 298 | 108 | 236 | 108 |
| 96.09 | 298 | -201.91 | 236 | 109 |
| 149.2 | 298 | -148.8 | 236 | 110 |
| | | | | |
| 96.09 | 406 | -309.91 | 236 | 111 |
| 149.2 | 406 | -256.8 | 236 | 112 |
| | | | | |
| 149.2 | 96.09 | 53.11 | 237 | 112 |

S Statistic = 237 - 112 = 125

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 2/1/2017 | 1 |
| 3/1/2017 | 1 |
| 4/1/2017 | 1 |
| 5/1/2017 | 1 |
| 6/1/2017 | 1 |
| 7/1/2017 | 1 |

| | |
|---|---|
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 11/1/2021 | 1 |
| 3/1/2022 | 1 |
| 3/1/2023 | 1 |
| 3/1/2024 | 1 |

There are 2 time periods with multiple data

---

A = 0
B = 36
C = 0
D = 0
E = 0
F = 4
a = 41418
b = 157950
c = 1404
Group Variance = 2299
Z-Score = 2.58614
Comparison Level at 95% confidence level = -1.65463 (downward trend)
2.58614 >= -1.65463 indicating no evidence of a downward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RW08-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 8710 | 1080 | 7630 | 1 | 0 |
| 9520 MH | 1080 | 8440 | 2 | 0 |
| 2680 | 1080 | 1600 | 3 | 0 |
| 1870 | 1080 | 790 | 4 | 0 |
| 968 | 1080 | -112 | 4 | 1 |
| 3190 | 1080 | 2110 | 5 | 1 |
| 4460 | 1080 | 3380 | 6 | 1 |
| 1950 | 1080 | 870 | 7 | 1 |
| 1600 | 1080 | 520 | 8 | 1 |
| 1770 | 1080 | 690 | 9 | 1 |
| 2600 | 1080 | 1520 | 10 | 1 |
| 13200 | 1080 | 12120 | 11 | 1 |
| 6640 | 1080 | 5560 | 12 | 1 |
| 13300 | 1080 | 12220 | 13 | 1 |
| 14600 2c | 1080 | 13520 | 14 | 1 |
| 14300 1c | 1080 | 13220 | 15 | 1 |
| 11300 | 1080 | 10220 | 16 | 1 |
| 12500 | 1080 | 11420 | 17 | 1 |
| 1350 | 1080 | 270 | 18 | 1 |
| 1250 | 1080 | 170 | 19 | 1 |
| 10300 | 1080 | 9220 | 20 | 1 |
| 12000 | 1080 | 10920 | 21 | 1 |
| 2330 | 1080 | 1250 | 22 | 1 |
| 1600 | 1080 | 520 | 23 | 1 |
| | | | | |
| 9520 MH | 8710 | 810 | 24 | 1 |
| 2680 | 8710 | -6030 | 24 | 2 |
| 1870 | 8710 | -6840 | 24 | 3 |
| 968 | 8710 | -7742 | 24 | 4 |
| 3190 | 8710 | -5520 | 24 | 5 |
| 4460 | 8710 | -4250 | 24 | 6 |
| 1950 | 8710 | -6760 | 24 | 7 |
| 1600 | 8710 | -7110 | 24 | 8 |
| 1770 | 8710 | -6940 | 24 | 9 |
| 2600 | 8710 | -6110 | 24 | 10 |
| 13200 | 8710 | 4490 | 25 | 10 |
| 6640 | 8710 | -2070 | 25 | 11 |
| 13300 | 8710 | 4590 | 26 | 11 |
| 14600 2c | 8710 | 5890 | 27 | 11 |
| 14300 1c | 8710 | 5590 | 28 | 11 |
| 11300 | 8710 | 2590 | 29 | 11 |
| 12500 | 8710 | 3790 | 30 | 11 |
| 1350 | 8710 | -7360 | 30 | 12 |
| 1250 | 8710 | -7460 | 30 | 13 |
| 10300 | 8710 | 1590 | 31 | 13 |
| 12000 | 8710 | 3290 | 32 | 13 |
| 2330 | 8710 | -6380 | 32 | 14 |

| | | | | |
|---|---|---|---|---|
| 1600 | 8710 | -7110 | 32 | 15 |
| | | | | |
| 2680 | 9520 MH | -6840 | 32 | 16 |
| 1870 | 9520 MH | -7650 | 32 | 17 |
| 968 | 9520 MH | -8552 | 32 | 18 |
| 3190 | 9520 MH | -6330 | 32 | 19 |
| 4460 | 9520 MH | -5060 | 32 | 20 |
| 1950 | 9520 MH | -7570 | 32 | 21 |
| 1600 | 9520 MH | -7920 | 32 | 22 |
| 1770 | 9520 MH | -7750 | 32 | 23 |
| 2600 | 9520 MH | -6920 | 32 | 24 |
| 13200 | 9520 MH | 3680 | 33 | 24 |
| 6640 | 9520 MH | -2880 | 33 | 25 |
| 13300 | 9520 MH | 3780 | 34 | 25 |
| 14600 2c | 9520 MH | 5080 | 35 | 25 |
| 14300 1c | 9520 MH | 4780 | 36 | 25 |
| 11300 | 9520 MH | 1780 | 37 | 25 |
| 12500 | 9520 MH | 2980 | 38 | 25 |
| 1350 | 9520 MH | -8170 | 38 | 26 |
| 1250 | 9520 MH | -8270 | 38 | 27 |
| 10300 | 9520 MH | 780 | 39 | 27 |
| 12000 | 9520 MH | 2480 | 40 | 27 |
| 2330 | 9520 MH | -7190 | 40 | 28 |
| 1600 | 9520 MH | -7920 | 40 | 29 |
| | | | | |
| 1870 | 2680 | -810 | 40 | 30 |
| 968 | 2680 | -1712 | 40 | 31 |
| 3190 | 2680 | 510 | 41 | 31 |
| 4460 | 2680 | 1780 | 42 | 31 |
| 1950 | 2680 | -730 | 42 | 32 |
| 1600 | 2680 | -1080 | 42 | 33 |
| 1770 | 2680 | -910 | 42 | 34 |
| 2600 | 2680 | -80 | 42 | 35 |
| 13200 | 2680 | 10520 | 43 | 35 |
| 6640 | 2680 | 3960 | 44 | 35 |
| 13300 | 2680 | 10620 | 45 | 35 |
| 14600 2c | 2680 | 11920 | 46 | 35 |
| 14300 1c | 2680 | 11620 | 47 | 35 |
| 11300 | 2680 | 8620 | 48 | 35 |
| 12500 | 2680 | 9820 | 49 | 35 |
| 1350 | 2680 | -1330 | 49 | 36 |
| 1250 | 2680 | -1430 | 49 | 37 |
| 10300 | 2680 | 7620 | 50 | 37 |
| 12000 | 2680 | 9320 | 51 | 37 |
| 2330 | 2680 | -350 | 51 | 38 |
| 1600 | 2680 | -1080 | 51 | 39 |
| | | | | |
| 968 | 1870 | -902 | 51 | 40 |
| 3190 | 1870 | 1320 | 52 | 40 |
| 4460 | 1870 | 2590 | 53 | 40 |
| 1950 | 1870 | 80 | 54 | 40 |
| 1600 | 1870 | -270 | 54 | 41 |
| 1770 | 1870 | -100 | 54 | 42 |
| 2600 | 1870 | 730 | 55 | 42 |
| 13200 | 1870 | 11330 | 56 | 42 |
| 6640 | 1870 | 4770 | 57 | 42 |
| 13300 | 1870 | 11430 | 58 | 42 |

| | | | | |
|---|---|---|---|---|
| 14600 2c | 1870 | 12730 | 59 | 42 |
| 14300 1c | 1870 | 12430 | 60 | 42 |
| 11300 | 1870 | 9430 | 61 | 42 |
| 12500 | 1870 | 10630 | 62 | 42 |
| 1350 | 1870 | -520 | 62 | 43 |
| 1250 | 1870 | -620 | 62 | 44 |
| 10300 | 1870 | 8430 | 63 | 44 |
| 12000 | 1870 | 10130 | 64 | 44 |
| 2330 | 1870 | 460 | 65 | 44 |
| 1600 | 1870 | -270 | 65 | 45 |
| | | | | |
| 3190 | 968 | 2222 | 66 | 45 |
| 4460 | 968 | 3492 | 67 | 45 |
| 1950 | 968 | 982 | 68 | 45 |
| 1600 | 968 | 632 | 69 | 45 |
| 1770 | 968 | 802 | 70 | 45 |
| 2600 | 968 | 1632 | 71 | 45 |
| 13200 | 968 | 12232 | 72 | 45 |
| 6640 | 968 | 5672 | 73 | 45 |
| 13300 | 968 | 12332 | 74 | 45 |
| 14600 2c | 968 | 13632 | 75 | 45 |
| 14300 1c | 968 | 13332 | 76 | 45 |
| 11300 | 968 | 10332 | 77 | 45 |
| 12500 | 968 | 11532 | 78 | 45 |
| 1350 | 968 | 382 | 79 | 45 |
| 1250 | 968 | 282 | 80 | 45 |
| 10300 | 968 | 9332 | 81 | 45 |
| 12000 | 968 | 11032 | 82 | 45 |
| 2330 | 968 | 1362 | 83 | 45 |
| 1600 | 968 | 632 | 84 | 45 |
| | | | | |
| 4460 | 3190 | 1270 | 85 | 45 |
| 1950 | 3190 | -1240 | 85 | 46 |
| 1600 | 3190 | -1590 | 85 | 47 |
| 1770 | 3190 | -1420 | 85 | 48 |
| 2600 | 3190 | -590 | 85 | 49 |
| 13200 | 3190 | 10010 | 86 | 49 |
| 6640 | 3190 | 3450 | 87 | 49 |
| 13300 | 3190 | 10110 | 88 | 49 |
| 14600 2c | 3190 | 11410 | 89 | 49 |
| 14300 1c | 3190 | 11110 | 90 | 49 |
| 11300 | 3190 | 8110 | 91 | 49 |
| 12500 | 3190 | 9310 | 92 | 49 |
| 1350 | 3190 | -1840 | 92 | 50 |
| 1250 | 3190 | -1940 | 92 | 51 |
| 10300 | 3190 | 7110 | 93 | 51 |
| 12000 | 3190 | 8810 | 94 | 51 |
| 2330 | 3190 | -860 | 94 | 52 |
| 1600 | 3190 | -1590 | 94 | 53 |
| | | | | |
| 1950 | 4460 | -2510 | 94 | 54 |
| 1600 | 4460 | -2860 | 94 | 55 |
| 1770 | 4460 | -2690 | 94 | 56 |
| 2600 | 4460 | -1860 | 94 | 57 |
| 13200 | 4460 | 8740 | 95 | 57 |
| 6640 | 4460 | 2180 | 96 | 57 |
| 13300 | 4460 | 8840 | 97 | 57 |

| | | | | |
|---|---|---|---|---|
| 14600 2c | 4460 | 10140 | 98 | 57 |
| 14300 1c | 4460 | 9840 | 99 | 57 |
| 11300 | 4460 | 6840 | 100 | 57 |
| 12500 | 4460 | 8040 | 101 | 57 |
| 1350 | 4460 | -3110 | 101 | 58 |
| 1250 | 4460 | -3210 | 101 | 59 |
| 10300 | 4460 | 5840 | 102 | 59 |
| 12000 | 4460 | 7540 | 103 | 59 |
| 2330 | 4460 | -2130 | 103 | 60 |
| 1600 | 4460 | -2860 | 103 | 61 |
| | | | | |
| 1600 | 1950 | -350 | 103 | 62 |
| 1770 | 1950 | -180 | 103 | 63 |
| 2600 | 1950 | 650 | 104 | 63 |
| 13200 | 1950 | 11250 | 105 | 63 |
| 6640 | 1950 | 4690 | 106 | 63 |
| 13300 | 1950 | 11350 | 107 | 63 |
| 14600 2c | 1950 | 12650 | 108 | 63 |
| 14300 1c | 1950 | 12350 | 109 | 63 |
| 11300 | 1950 | 9350 | 110 | 63 |
| 12500 | 1950 | 10550 | 111 | 63 |
| 1350 | 1950 | -600 | 111 | 64 |
| 1250 | 1950 | -700 | 111 | 65 |
| 10300 | 1950 | 8350 | 112 | 65 |
| 12000 | 1950 | 10050 | 113 | 65 |
| 2330 | 1950 | 380 | 114 | 65 |
| 1600 | 1950 | -350 | 114 | 66 |
| | | | | |
| 1770 | 1600 | 170 | 115 | 66 |
| 2600 | 1600 | 1000 | 116 | 66 |
| 13200 | 1600 | 11600 | 117 | 66 |
| 6640 | 1600 | 5040 | 118 | 66 |
| 13300 | 1600 | 11700 | 119 | 66 |
| 14600 2c | 1600 | 13000 | 120 | 66 |
| 14300 1c | 1600 | 12700 | 121 | 66 |
| 11300 | 1600 | 9700 | 122 | 66 |
| 12500 | 1600 | 10900 | 123 | 66 |
| 1350 | 1600 | -250 | 123 | 67 |
| 1250 | 1600 | -350 | 123 | 68 |
| 10300 | 1600 | 8700 | 124 | 68 |
| 12000 | 1600 | 10400 | 125 | 68 |
| 2330 | 1600 | 730 | 126 | 68 |
| 1600 | 1600 | 0 | 126 | 68 |
| | | | | |
| 2600 | 1770 | 830 | 127 | 68 |
| 13200 | 1770 | 11430 | 128 | 68 |
| 6640 | 1770 | 4870 | 129 | 68 |
| 13300 | 1770 | 11530 | 130 | 68 |
| 14600 2c | 1770 | 12830 | 131 | 68 |
| 14300 1c | 1770 | 12530 | 132 | 68 |
| 11300 | 1770 | 9530 | 133 | 68 |
| 12500 | 1770 | 10730 | 134 | 68 |
| 1350 | 1770 | -420 | 134 | 69 |
| 1250 | 1770 | -520 | 134 | 70 |
| 10300 | 1770 | 8530 | 135 | 70 |
| 12000 | 1770 | 10230 | 136 | 70 |
| 2330 | 1770 | 560 | 137 | 70 |

| | | | | |
|---|---|---|---|---|
| 1600 | 1770 | -170 | 137 | 71 |
| | | | | |
| 13200 | 2600 | 10600 | 138 | 71 |
| 6640 | 2600 | 4040 | 139 | 71 |
| 13300 | 2600 | 10700 | 140 | 71 |
| 14600 2c | 2600 | 12000 | 141 | 71 |
| 14300 1c | 2600 | 11700 | 142 | 71 |
| 11300 | 2600 | 8700 | 143 | 71 |
| 12500 | 2600 | 9900 | 144 | 71 |
| 1350 | 2600 | -1250 | 144 | 72 |
| 1250 | 2600 | -1350 | 144 | 73 |
| 10300 | 2600 | 7700 | 145 | 73 |
| 12000 | 2600 | 9400 | 146 | 73 |
| 2330 | 2600 | -270 | 146 | 74 |
| 1600 | 2600 | -1000 | 146 | 75 |
| | | | | |
| 6640 | 13200 | -6560 | 146 | 76 |
| 13300 | 13200 | 100 | 147 | 76 |
| 14600 2c | 13200 | 1400 | 148 | 76 |
| 14300 1c | 13200 | 1100 | 149 | 76 |
| 11300 | 13200 | -1900 | 149 | 77 |
| 12500 | 13200 | -700 | 149 | 78 |
| 1350 | 13200 | -11850 | 149 | 79 |
| 1250 | 13200 | -11950 | 149 | 80 |
| 10300 | 13200 | -2900 | 149 | 81 |
| 12000 | 13200 | -1200 | 149 | 82 |
| 2330 | 13200 | -10870 | 149 | 83 |
| 1600 | 13200 | -11600 | 149 | 84 |
| | | | | |
| 13300 | 6640 | 6660 | 150 | 84 |
| 14600 2c | 6640 | 7960 | 151 | 84 |
| 14300 1c | 6640 | 7660 | 152 | 84 |
| 11300 | 6640 | 4660 | 153 | 84 |
| 12500 | 6640 | 5860 | 154 | 84 |
| 1350 | 6640 | -5290 | 154 | 85 |
| 1250 | 6640 | -5390 | 154 | 86 |
| 10300 | 6640 | 3660 | 155 | 86 |
| 12000 | 6640 | 5360 | 156 | 86 |
| 2330 | 6640 | -4310 | 156 | 87 |
| 1600 | 6640 | -5040 | 156 | 88 |
| | | | | |
| 14600 2c | 13300 | 1300 | 157 | 88 |
| 14300 1c | 13300 | 1000 | 158 | 88 |
| 11300 | 13300 | -2000 | 158 | 89 |
| 12500 | 13300 | -800 | 158 | 90 |
| 1350 | 13300 | -11950 | 158 | 91 |
| 1250 | 13300 | -12050 | 158 | 92 |
| 10300 | 13300 | -3000 | 158 | 93 |
| 12000 | 13300 | -1300 | 158 | 94 |
| 2330 | 13300 | -10970 | 158 | 95 |
| 1600 | 13300 | -11700 | 158 | 96 |
| | | | | |
| 14300 1c | 14600 2c | Same Date | 158 | 96 |
| 11300 | 14600 2c | -3300 | 158 | 97 |
| 12500 | 14600 2c | -2100 | 158 | 98 |
| 1350 | 14600 2c | -13250 | 158 | 99 |
| 1250 | 14600 2c | -13350 | 158 | 100 |

| | | | | |
|---|---|---|---|---|
| 10300 | 14600 2c | -4300 | 158 | 101 |
| 12000 | 14600 2c | -2600 | 158 | 102 |
| 2330 | 14600 2c | -12270 | 158 | 103 |
| 1600 | 14600 2c | -13000 | 158 | 104 |
| | | | | |
| 11300 | 14300 1c | -3000 | 158 | 105 |
| 12500 | 14300 1c | -1800 | 158 | 106 |
| 1350 | 14300 1c | -12950 | 158 | 107 |
| 1250 | 14300 1c | -13050 | 158 | 108 |
| 10300 | 14300 1c | -4000 | 158 | 109 |
| 12000 | 14300 1c | -2300 | 158 | 110 |
| 2330 | 14300 1c | -11970 | 158 | 111 |
| 1600 | 14300 1c | -12700 | 158 | 112 |
| | | | | |
| 12500 | 11300 | Same Date | 158 | 112 |
| 1350 | 11300 | -9950 | 158 | 113 |
| 1250 | 11300 | -10050 | 158 | 114 |
| 10300 | 11300 | -1000 | 158 | 115 |
| 12000 | 11300 | 700 | 159 | 115 |
| 2330 | 11300 | -8970 | 159 | 116 |
| 1600 | 11300 | -9700 | 159 | 117 |
| | | | | |
| 1350 | 12500 | -11150 | 159 | 118 |
| 1250 | 12500 | -11250 | 159 | 119 |
| 10300 | 12500 | -2200 | 159 | 120 |
| 12000 | 12500 | -500 | 159 | 121 |
| 2330 | 12500 | -10170 | 159 | 122 |
| 1600 | 12500 | -10900 | 159 | 123 |
| | | | | |
| 1250 | 1350 | -100 | 159 | 124 |
| 10300 | 1350 | 8950 | 160 | 124 |
| 12000 | 1350 | 10650 | 161 | 124 |
| 2330 | 1350 | 980 | 162 | 124 |
| 1600 | 1350 | 250 | 163 | 124 |
| | | | | |
| 10300 | 1250 | 9050 | 164 | 124 |
| 12000 | 1250 | 10750 | 165 | 124 |
| 2330 | 1250 | 1080 | 166 | 124 |
| 1600 | 1250 | 350 | 167 | 124 |
| | | | | |
| 12000 | 10300 | 1700 | 168 | 124 |
| 2330 | 10300 | -7970 | 168 | 125 |
| 1600 | 10300 | -8700 | 168 | 126 |
| | | | | |
| 2330 | 12000 | -9670 | 168 | 127 |
| 1600 | 12000 | -10400 | 168 | 128 |
| | | | | |
| 1600 | 2330 | -730 | 168 | 129 |

S Statistic = 168 - 129 = 39

| Tied Group | Value | Members |
|---|---|---|
| 1 | 1600 | 2 |

| Time Period | Observations |
|---|---|
| 2/1/2017 | 1 |

| | |
|---|---|
| 3/1/2017 | 1 |
| 4/1/2017 | 1 |
| 5/1/2017 | 1 |
| 6/1/2017 | 1 |
| 7/1/2017 | 1 |
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |

There are 2 time periods with multiple data

---

A = 18
B = 36
C = 0
D = 0
E = 2
F = 4
a = 33000
b = 124200
c = 1200
Group Variance = 1830.34
Z-Score = 0.888214
Comparison Level at 95% confidence level = -1.65463 (downward trend)
0.888214 >= -1.65463 indicating no evidence of a downward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RW09-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 12400 | 14500 | -2100 | 0 | 1 |
| 12900 | 14500 | -1600 | 0 | 2 |
| 11900 | 14500 | -2600 | 0 | 3 |
| 13000 | 14500 | -1500 | 0 | 4 |
| 11500 | 14500 | -3000 | 0 | 5 |
| 9700 | 14500 | -4800 | 0 | 6 |
| 8750 | 14500 | -5750 | 0 | 7 |
| 8310 ML | 14500 | -6190 | 0 | 8 |
| 9290 | 14500 | -5210 | 0 | 9 |
| 8550 | 14500 | -5950 | 0 | 10 |
| 9310 | 14500 | -5190 | 0 | 11 |
| 8980 | 14500 | -5520 | 0 | 12 |
| 10700 | 14500 | -3800 | 0 | 13 |
| 10800 | 14500 | -3700 | 0 | 14 |
| 11800 1c | 14500 | -2700 | 0 | 15 |
| 11300 MH2c | 14500 | -3200 | 0 | 16 |
| 14100 | 14500 | -400 | 0 | 17 |
| 15300 | 14500 | 800 | 1 | 17 |
| 19600 M61c | 14500 | 5100 | 2 | 17 |
| 20600 | 14500 | 6100 | 3 | 17 |
| 20700 | 14500 | 6200 | 4 | 17 |
| 26700 | 14500 | 12200 | 5 | 17 |
| 39900 | 14500 | 25400 | 6 | 17 |
| 45200 | 14500 | 30700 | 7 | 17 |
| | | | | |
| 12900 | 12400 | 500 | 8 | 17 |
| 11900 | 12400 | -500 | 8 | 18 |
| 13000 | 12400 | 600 | 9 | 18 |
| 11500 | 12400 | -900 | 9 | 19 |
| 9700 | 12400 | -2700 | 9 | 20 |
| 8750 | 12400 | -3650 | 9 | 21 |
| 8310 ML | 12400 | -4090 | 9 | 22 |
| 9290 | 12400 | -3110 | 9 | 23 |
| 8550 | 12400 | -3850 | 9 | 24 |
| 9310 | 12400 | -3090 | 9 | 25 |
| 8980 | 12400 | -3420 | 9 | 26 |
| 10700 | 12400 | -1700 | 9 | 27 |
| 10800 | 12400 | -1600 | 9 | 28 |
| 11800 1c | 12400 | -600 | 9 | 29 |
| 11300 MH2c | 12400 | -1100 | 9 | 30 |
| 14100 | 12400 | 1700 | 10 | 30 |
| 15300 | 12400 | 2900 | 11 | 30 |
| 19600 M61c | 12400 | 7200 | 12 | 30 |
| 20600 | 12400 | 8200 | 13 | 30 |
| 20700 | 12400 | 8300 | 14 | 30 |
| 26700 | 12400 | 14300 | 15 | 30 |
| 39900 | 12400 | 27500 | 16 | 30 |

| | | | | |
|---|---|---|---|---|
| 45200 | 12400 | 32800 | 17 | 30 |
| | | | | |
| 11900 | 12900 | -1000 | 17 | 31 |
| 13000 | 12900 | 100 | 18 | 31 |
| 11500 | 12900 | -1400 | 18 | 32 |
| 9700 | 12900 | -3200 | 18 | 33 |
| 8750 | 12900 | -4150 | 18 | 34 |
| 8310 ML | 12900 | -4590 | 18 | 35 |
| 9290 | 12900 | -3610 | 18 | 36 |
| 8550 | 12900 | -4350 | 18 | 37 |
| 9310 | 12900 | -3590 | 18 | 38 |
| 8980 | 12900 | -3920 | 18 | 39 |
| 10700 | 12900 | -2200 | 18 | 40 |
| 10800 | 12900 | -2100 | 18 | 41 |
| 11800 1c | 12900 | -1100 | 18 | 42 |
| 11300 MH2c | 12900 | -1600 | 18 | 43 |
| 14100 | 12900 | 1200 | 19 | 43 |
| 15300 | 12900 | 2400 | 20 | 43 |
| 19600 M61c | 12900 | 6700 | 21 | 43 |
| 20600 | 12900 | 7700 | 22 | 43 |
| 20700 | 12900 | 7800 | 23 | 43 |
| 26700 | 12900 | 13800 | 24 | 43 |
| 39900 | 12900 | 27000 | 25 | 43 |
| 45200 | 12900 | 32300 | 26 | 43 |
| | | | | |
| 13000 | 11900 | 1100 | 27 | 43 |
| 11500 | 11900 | -400 | 27 | 44 |
| 9700 | 11900 | -2200 | 27 | 45 |
| 8750 | 11900 | -3150 | 27 | 46 |
| 8310 ML | 11900 | -3590 | 27 | 47 |
| 9290 | 11900 | -2610 | 27 | 48 |
| 8550 | 11900 | -3350 | 27 | 49 |
| 9310 | 11900 | -2590 | 27 | 50 |
| 8980 | 11900 | -2920 | 27 | 51 |
| 10700 | 11900 | -1200 | 27 | 52 |
| 10800 | 11900 | -1100 | 27 | 53 |
| 11800 1c | 11900 | -100 | 27 | 54 |
| 11300 MH2c | 11900 | -600 | 27 | 55 |
| 14100 | 11900 | 2200 | 28 | 55 |
| 15300 | 11900 | 3400 | 29 | 55 |
| 19600 M61c | 11900 | 7700 | 30 | 55 |
| 20600 | 11900 | 8700 | 31 | 55 |
| 20700 | 11900 | 8800 | 32 | 55 |
| 26700 | 11900 | 14800 | 33 | 55 |
| 39900 | 11900 | 28000 | 34 | 55 |
| 45200 | 11900 | 33300 | 35 | 55 |
| | | | | |
| 11500 | 13000 | -1500 | 35 | 56 |
| 9700 | 13000 | -3300 | 35 | 57 |
| 8750 | 13000 | -4250 | 35 | 58 |
| 8310 ML | 13000 | -4690 | 35 | 59 |
| 9290 | 13000 | -3710 | 35 | 60 |
| 8550 | 13000 | -4450 | 35 | 61 |
| 9310 | 13000 | -3690 | 35 | 62 |
| 8980 | 13000 | -4020 | 35 | 63 |
| 10700 | 13000 | -2300 | 35 | 64 |
| 10800 | 13000 | -2200 | 35 | 65 |

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|---|---|---|---|---|
| 11800 1c | 13000 | -1200 | 35 | 66 |
| 11300 MH2c | 13000 | -1700 | 35 | 67 |
| 14100 | 13000 | 1100 | 36 | 67 |
| 15300 | 13000 | 2300 | 37 | 67 |
| 19600 M61c | 13000 | 6600 | 38 | 67 |
| 20600 | 13000 | 7600 | 39 | 67 |
| 20700 | 13000 | 7700 | 40 | 67 |
| 26700 | 13000 | 13700 | 41 | 67 |
| 39900 | 13000 | 26900 | 42 | 67 |
| 45200 | 13000 | 32200 | 43 | 67 |
| | | | | |
| 9700 | 11500 | -1800 | 43 | 68 |
| 8750 | 11500 | -2750 | 43 | 69 |
| 8310 ML | 11500 | -3190 | 43 | 70 |
| 9290 | 11500 | -2210 | 43 | 71 |
| 8550 | 11500 | -2950 | 43 | 72 |
| 9310 | 11500 | -2190 | 43 | 73 |
| 8980 | 11500 | -2520 | 43 | 74 |
| 10700 | 11500 | -800 | 43 | 75 |
| 10800 | 11500 | -700 | 43 | 76 |
| 11800 1c | 11500 | 300 | 44 | 76 |
| 11300 MH2c | 11500 | -200 | 44 | 77 |
| 14100 | 11500 | 2600 | 45 | 77 |
| 15300 | 11500 | 3800 | 46 | 77 |
| 19600 M61c | 11500 | 8100 | 47 | 77 |
| 20600 | 11500 | 9100 | 48 | 77 |
| 20700 | 11500 | 9200 | 49 | 77 |
| 26700 | 11500 | 15200 | 50 | 77 |
| 39900 | 11500 | 28400 | 51 | 77 |
| 45200 | 11500 | 33700 | 52 | 77 |
| | | | | |
| 8750 | 9700 | -950 | 52 | 78 |
| 8310 ML | 9700 | -1390 | 52 | 79 |
| 9290 | 9700 | -410 | 52 | 80 |
| 8550 | 9700 | -1150 | 52 | 81 |
| 9310 | 9700 | -390 | 52 | 82 |
| 8980 | 9700 | -720 | 52 | 83 |
| 10700 | 9700 | 1000 | 53 | 83 |
| 10800 | 9700 | 1100 | 54 | 83 |
| 11800 1c | 9700 | 2100 | 55 | 83 |
| 11300 MH2c | 9700 | 1600 | 56 | 83 |
| 14100 | 9700 | 4400 | 57 | 83 |
| 15300 | 9700 | 5600 | 58 | 83 |
| 19600 M61c | 9700 | 9900 | 59 | 83 |
| 20600 | 9700 | 10900 | 60 | 83 |
| 20700 | 9700 | 11000 | 61 | 83 |
| 26700 | 9700 | 17000 | 62 | 83 |
| 39900 | 9700 | 30200 | 63 | 83 |
| 45200 | 9700 | 35500 | 64 | 83 |
| | | | | |
| 8310 ML | 8750 | -440 | 64 | 84 |
| 9290 | 8750 | 540 | 65 | 84 |
| 8550 | 8750 | -200 | 65 | 85 |
| 9310 | 8750 | 560 | 66 | 85 |
| 8980 | 8750 | 230 | 67 | 85 |
| 10700 | 8750 | 1950 | 68 | 85 |
| 10800 | 8750 | 2050 | 69 | 85 |

| | | | | |
|---|---|---|---|---|
| 11800 1c | 8750 | 3050 | 70 | 85 |
| 11300 MH2c | 8750 | 2550 | 71 | 85 |
| 14100 | 8750 | 5350 | 72 | 85 |
| 15300 | 8750 | 6550 | 73 | 85 |
| 19600 M61c | 8750 | 10850 | 74 | 85 |
| 20600 | 8750 | 11850 | 75 | 85 |
| 20700 | 8750 | 11950 | 76 | 85 |
| 26700 | 8750 | 17950 | 77 | 85 |
| 39900 | 8750 | 31150 | 78 | 85 |
| 45200 | 8750 | 36450 | 79 | 85 |
| | | | | |
| 9290 | 8310 ML | 980 | 80 | 85 |
| 8550 | 8310 ML | 240 | 81 | 85 |
| 9310 | 8310 ML | 1000 | 82 | 85 |
| 8980 | 8310 ML | 670 | 83 | 85 |
| 10700 | 8310 ML | 2390 | 84 | 85 |
| 10800 | 8310 ML | 2490 | 85 | 85 |
| 11800 1c | 8310 ML | 3490 | 86 | 85 |
| 11300 MH2c | 8310 ML | 2990 | 87 | 85 |
| 14100 | 8310 ML | 5790 | 88 | 85 |
| 15300 | 8310 ML | 6990 | 89 | 85 |
| 19600 M61c | 8310 ML | 11290 | 90 | 85 |
| 20600 | 8310 ML | 12290 | 91 | 85 |
| 20700 | 8310 ML | 12390 | 92 | 85 |
| 26700 | 8310 ML | 18390 | 93 | 85 |
| 39900 | 8310 ML | 31590 | 94 | 85 |
| 45200 | 8310 ML | 36890 | 95 | 85 |
| | | | | |
| 8550 | 9290 | -740 | 95 | 86 |
| 9310 | 9290 | 20 | 96 | 86 |
| 8980 | 9290 | -310 | 96 | 87 |
| 10700 | 9290 | 1410 | 97 | 87 |
| 10800 | 9290 | 1510 | 98 | 87 |
| 11800 1c | 9290 | 2510 | 99 | 87 |
| 11300 MH2c | 9290 | 2010 | 100 | 87 |
| 14100 | 9290 | 4810 | 101 | 87 |
| 15300 | 9290 | 6010 | 102 | 87 |
| 19600 M61c | 9290 | 10310 | 103 | 87 |
| 20600 | 9290 | 11310 | 104 | 87 |
| 20700 | 9290 | 11410 | 105 | 87 |
| 26700 | 9290 | 17410 | 106 | 87 |
| 39900 | 9290 | 30610 | 107 | 87 |
| 45200 | 9290 | 35910 | 108 | 87 |
| | | | | |
| 9310 | 8550 | 760 | 109 | 87 |
| 8980 | 8550 | 430 | 110 | 87 |
| 10700 | 8550 | 2150 | 111 | 87 |
| 10800 | 8550 | 2250 | 112 | 87 |
| 11800 1c | 8550 | 3250 | 113 | 87 |
| 11300 MH2c | 8550 | 2750 | 114 | 87 |
| 14100 | 8550 | 5550 | 115 | 87 |
| 15300 | 8550 | 6750 | 116 | 87 |
| 19600 M61c | 8550 | 11050 | 117 | 87 |
| 20600 | 8550 | 12050 | 118 | 87 |
| 20700 | 8550 | 12150 | 119 | 87 |
| 26700 | 8550 | 18150 | 120 | 87 |
| 39900 | 8550 | 31350 | 121 | 87 |

| | | | | |
|---|---|---|---|---|
| 45200 | 8550 | 36650 | 122 | 87 |
| | | | | |
| 8980 | 9310 | -330 | 122 | 88 |
| 10700 | 9310 | 1390 | 123 | 88 |
| 10800 | 9310 | 1490 | 124 | 88 |
| 11800 1c | 9310 | 2490 | 125 | 88 |
| 11300 MH2c | 9310 | 1990 | 126 | 88 |
| 14100 | 9310 | 4790 | 127 | 88 |
| 15300 | 9310 | 5990 | 128 | 88 |
| 19600 M61c | 9310 | 10290 | 129 | 88 |
| 20600 | 9310 | 11290 | 130 | 88 |
| 20700 | 9310 | 11390 | 131 | 88 |
| 26700 | 9310 | 17390 | 132 | 88 |
| 39900 | 9310 | 30590 | 133 | 88 |
| 45200 | 9310 | 35890 | 134 | 88 |
| | | | | |
| 10700 | 8980 | 1720 | 135 | 88 |
| 10800 | 8980 | 1820 | 136 | 88 |
| 11800 1c | 8980 | 2820 | 137 | 88 |
| 11300 MH2c | 8980 | 2320 | 138 | 88 |
| 14100 | 8980 | 5120 | 139 | 88 |
| 15300 | 8980 | 6320 | 140 | 88 |
| 19600 M61c | 8980 | 10620 | 141 | 88 |
| 20600 | 8980 | 11620 | 142 | 88 |
| 20700 | 8980 | 11720 | 143 | 88 |
| 26700 | 8980 | 17720 | 144 | 88 |
| 39900 | 8980 | 30920 | 145 | 88 |
| 45200 | 8980 | 36220 | 146 | 88 |
| | | | | |
| 10800 | 10700 | 100 | 147 | 88 |
| 11800 1c | 10700 | 1100 | 148 | 88 |
| 11300 MH2c | 10700 | 600 | 149 | 88 |
| 14100 | 10700 | 3400 | 150 | 88 |
| 15300 | 10700 | 4600 | 151 | 88 |
| 19600 M61c | 10700 | 8900 | 152 | 88 |
| 20600 | 10700 | 9900 | 153 | 88 |
| 20700 | 10700 | 10000 | 154 | 88 |
| 26700 | 10700 | 16000 | 155 | 88 |
| 39900 | 10700 | 29200 | 156 | 88 |
| 45200 | 10700 | 34500 | 157 | 88 |
| | | | | |
| 11800 1c | 10800 | 1000 | 158 | 88 |
| 11300 MH2c | 10800 | 500 | 159 | 88 |
| 14100 | 10800 | 3300 | 160 | 88 |
| 15300 | 10800 | 4500 | 161 | 88 |
| 19600 M61c | 10800 | 8800 | 162 | 88 |
| 20600 | 10800 | 9800 | 163 | 88 |
| 20700 | 10800 | 9900 | 164 | 88 |
| 26700 | 10800 | 15900 | 165 | 88 |
| 39900 | 10800 | 29100 | 166 | 88 |
| 45200 | 10800 | 34400 | 167 | 88 |
| | | | | |
| 11300 MH2c | 11800 1c | Same Date | 167 | 88 |
| 14100 | 11800 1c | 2300 | 168 | 88 |
| 15300 | 11800 1c | 3500 | 169 | 88 |
| 19600 M61c | 11800 1c | 7800 | 170 | 88 |
| 20600 | 11800 1c | 8800 | 171 | 88 |

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|---|---|---|---|---|
| 20700 | 11800 1c | 8900 | 172 | 88 |
| 26700 | 11800 1c | 14900 | 173 | 88 |
| 39900 | 11800 1c | 28100 | 174 | 88 |
| 45200 | 11800 1c | 33400 | 175 | 88 |
| | | | | |
| 14100 | 11300 MH2c | 2800 | 176 | 88 |
| 15300 | 11300 MH2c | 4000 | 177 | 88 |
| 19600 M61c | 11300 MH2c | 8300 | 178 | 88 |
| 20600 | 11300 MH2c | 9300 | 179 | 88 |
| 20700 | 11300 MH2c | 9400 | 180 | 88 |
| 26700 | 11300 MH2c | 15400 | 181 | 88 |
| 39900 | 11300 MH2c | 28600 | 182 | 88 |
| 45200 | 11300 MH2c | 33900 | 183 | 88 |
| | | | | |
| 15300 | 14100 | Same Date | 183 | 88 |
| 19600 M61c | 14100 | 5500 | 184 | 88 |
| 20600 | 14100 | 6500 | 185 | 88 |
| 20700 | 14100 | 6600 | 186 | 88 |
| 26700 | 14100 | 12600 | 187 | 88 |
| 39900 | 14100 | 25800 | 188 | 88 |
| 45200 | 14100 | 31100 | 189 | 88 |
| | | | | |
| 19600 M61c | 15300 | 4300 | 190 | 88 |
| 20600 | 15300 | 5300 | 191 | 88 |
| 20700 | 15300 | 5400 | 192 | 88 |
| 26700 | 15300 | 11400 | 193 | 88 |
| 39900 | 15300 | 24600 | 194 | 88 |
| 45200 | 15300 | 29900 | 195 | 88 |
| | | | | |
| 20600 | 19600 M61c | 1000 | 196 | 88 |
| 20700 | 19600 M61c | 1100 | 197 | 88 |
| 26700 | 19600 M61c | 7100 | 198 | 88 |
| 39900 | 19600 M61c | 20300 | 199 | 88 |
| 45200 | 19600 M61c | 25600 | 200 | 88 |
| | | | | |
| 20700 | 20600 | 100 | 201 | 88 |
| 26700 | 20600 | 6100 | 202 | 88 |
| 39900 | 20600 | 19300 | 203 | 88 |
| 45200 | 20600 | 24600 | 204 | 88 |
| | | | | |
| 26700 | 20700 | 6000 | 205 | 88 |
| 39900 | 20700 | 19200 | 206 | 88 |
| 45200 | 20700 | 24500 | 207 | 88 |
| | | | | |
| 39900 | 26700 | 13200 | 208 | 88 |
| 45200 | 26700 | 18500 | 209 | 88 |
| | | | | |
| 45200 | 39900 | 5300 | 210 | 88 |

S Statistic = 210 - 88 = 122

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 2/1/2017 | 1 |
| 3/1/2017 | 1 |

| | |
|---|---|
| 4/1/2017 | 1 |
| 5/1/2017 | 1 |
| 6/1/2017 | 1 |
| 7/1/2017 | 1 |
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |

There are 2 time periods with multiple data

---

A = 0
B = 36
C = 0
D = 0
E = 0
F = 4
a = 33000
b = 124200
c = 1200
Group Variance = 1831.33
Z-Score = 2.82749
Comparison Level at 95% confidence level = -1.65463 (downward trend)
2.82749 >= -1.65463 indicating no evidence of a downward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RW11-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 10500 | 8790 | 1710 | 1 | 0 |
| 13100 | 8790 | 4310 | 2 | 0 |
| 12500 | 8790 | 3710 | 3 | 0 |
| 13500 | 8790 | 4710 | 4 | 0 |
| 10900 | 8790 | 2110 | 5 | 0 |
| 10800 | 8790 | 2010 | 6 | 0 |
| 10600 | 8790 | 1810 | 7 | 0 |
| 9270 | 8790 | 480 | 8 | 0 |
| 18300 | 8790 | 9510 | 9 | 0 |
| 24000 | 8790 | 15210 | 10 | 0 |
| 27700 | 8790 | 18910 | 11 | 0 |
| 37100 | 8790 | 28310 | 12 | 0 |
| 109000 | 8790 | 100210 | 13 | 0 |
| 29500 | 8790 | 20710 | 14 | 0 |
| 13500 MHML2c | 8790 | 4710 | 15 | 0 |
| 16600 ML1c | 8790 | 7810 | 16 | 0 |
| 38600 | 8790 | 29810 | 17 | 0 |
| 38900 | 8790 | 30110 | 18 | 0 |
| 44000 M6 | 8790 | 35210 | 19 | 0 |
| 37500 | 8790 | 28710 | 20 | 0 |
| 28900 | 8790 | 20110 | 21 | 0 |
| 37200 ML | 8790 | 28410 | 22 | 0 |
| 46600 | 8790 | 37810 | 23 | 0 |
| 55200 | 8790 | 46410 | 24 | 0 |
| 61000 BML1c | 8790 | 52210 | 25 | 0 |
| 13500 | 8790 | 4710 | 26 | 0 |
| 58030 | 8790 | 49240 | 27 | 0 |
| 254.3 | 8790 | -8535.7 | 27 | 1 |
| | | | | |
| 13100 | 10500 | 2600 | 28 | 1 |
| 12500 | 10500 | 2000 | 29 | 1 |
| 13500 | 10500 | 3000 | 30 | 1 |
| 10900 | 10500 | 400 | 31 | 1 |
| 10800 | 10500 | 300 | 32 | 1 |
| 10600 | 10500 | 100 | 33 | 1 |
| 9270 | 10500 | -1230 | 33 | 2 |
| 18300 | 10500 | 7800 | 34 | 2 |
| 24000 | 10500 | 13500 | 35 | 2 |
| 27700 | 10500 | 17200 | 36 | 2 |
| 37100 | 10500 | 26600 | 37 | 2 |
| 109000 | 10500 | 98500 | 38 | 2 |
| 29500 | 10500 | 19000 | 39 | 2 |
| 13500 MHML2c | 10500 | 3000 | 40 | 2 |
| 16600 ML1c | 10500 | 6100 | 41 | 2 |
| 38600 | 10500 | 28100 | 42 | 2 |
| 38900 | 10500 | 28400 | 43 | 2 |
| 44000 M6 | 10500 | 33500 | 44 | 2 |

| | | | | |
|---|---|---|---|---|
| 37500 | 10500 | 27000 | 45 | 2 |
| 28900 | 10500 | 18400 | 46 | 2 |
| 37200 ML | 10500 | 26700 | 47 | 2 |
| 46600 | 10500 | 36100 | 48 | 2 |
| 55200 | 10500 | 44700 | 49 | 2 |
| 61000 BML1c | 10500 | 50500 | 50 | 2 |
| 13500 | 10500 | 3000 | 51 | 2 |
| 58030 | 10500 | 47530 | 52 | 2 |
| 254.3 | 10500 | -10245.7 | 52 | 3 |
| | | | | |
| 12500 | 13100 | -600 | 52 | 4 |
| 13500 | 13100 | 400 | 53 | 4 |
| 10900 | 13100 | -2200 | 53 | 5 |
| 10800 | 13100 | -2300 | 53 | 6 |
| 10600 | 13100 | -2500 | 53 | 7 |
| 9270 | 13100 | -3830 | 53 | 8 |
| 18300 | 13100 | 5200 | 54 | 8 |
| 24000 | 13100 | 10900 | 55 | 8 |
| 27700 | 13100 | 14600 | 56 | 8 |
| 37100 | 13100 | 24000 | 57 | 8 |
| 109000 | 13100 | 95900 | 58 | 8 |
| 29500 | 13100 | 16400 | 59 | 8 |
| 13500 MHML2c3 | 13100 | 400 | 60 | 8 |
| 16600 ML1c | 13100 | 3500 | 61 | 8 |
| 38600 | 13100 | 25500 | 62 | 8 |
| 38900 | 13100 | 25800 | 63 | 8 |
| 44000 M6 | 13100 | 30900 | 64 | 8 |
| 37500 | 13100 | 24400 | 65 | 8 |
| 28900 | 13100 | 15800 | 66 | 8 |
| 37200 ML | 13100 | 24100 | 67 | 8 |
| 46600 | 13100 | 33500 | 68 | 8 |
| 55200 | 13100 | 42100 | 69 | 8 |
| 61000 BML1c | 13100 | 47900 | 70 | 8 |
| 13500 | 13100 | 400 | 71 | 8 |
| 58030 | 13100 | 44930 | 72 | 8 |
| 254.3 | 13100 | -12845.7 | 72 | 9 |
| | | | | |
| 13500 | 12500 | 1000 | 73 | 9 |
| 10900 | 12500 | -1600 | 73 | 10 |
| 10800 | 12500 | -1700 | 73 | 11 |
| 10600 | 12500 | -1900 | 73 | 12 |
| 9270 | 12500 | -3230 | 73 | 13 |
| 18300 | 12500 | 5800 | 74 | 13 |
| 24000 | 12500 | 11500 | 75 | 13 |
| 27700 | 12500 | 15200 | 76 | 13 |
| 37100 | 12500 | 24600 | 77 | 13 |
| 109000 | 12500 | 96500 | 78 | 13 |
| 29500 | 12500 | 17000 | 79 | 13 |
| 13500 MHML2c3 | 12500 | 1000 | 80 | 13 |
| 16600 ML1c | 12500 | 4100 | 81 | 13 |
| 38600 | 12500 | 26100 | 82 | 13 |
| 38900 | 12500 | 26400 | 83 | 13 |
| 44000 M6 | 12500 | 31500 | 84 | 13 |
| 37500 | 12500 | 25000 | 85 | 13 |
| 28900 | 12500 | 16400 | 86 | 13 |
| 37200 ML | 12500 | 24700 | 87 | 13 |
| 46600 | 12500 | 34100 | 88 | 13 |

| | | | | |
|---|---|---|---|---|
| 55200 | 12500 | 42700 | 89 | 13 |
| 61000 BML1c | 12500 | 48500 | 90 | 13 |
| 13500 | 12500 | 1000 | 91 | 13 |
| 58030 | 12500 | 45530 | 92 | 13 |
| 254.3 | 12500 | -12245.7 | 92 | 14 |
| | | | | |
| 10900 | 13500 | -2600 | 92 | 15 |
| 10800 | 13500 | -2700 | 92 | 16 |
| 10600 | 13500 | -2900 | 92 | 17 |
| 9270 | 13500 | -4230 | 92 | 18 |
| 18300 | 13500 | 4800 | 93 | 18 |
| 24000 | 13500 | 10500 | 94 | 18 |
| 27700 | 13500 | 14200 | 95 | 18 |
| 37100 | 13500 | 23600 | 96 | 18 |
| 109000 | 13500 | 95500 | 97 | 18 |
| 29500 | 13500 | 16000 | 98 | 18 |
| 13500 MHML2c3 | 13500 | 0 | 98 | 18 |
| 16600 ML1c | 13500 | 3100 | 99 | 18 |
| 38600 | 13500 | 25100 | 100 | 18 |
| 38900 | 13500 | 25400 | 101 | 18 |
| 44000 M6 | 13500 | 30500 | 102 | 18 |
| 37500 | 13500 | 24000 | 103 | 18 |
| 28900 | 13500 | 15400 | 104 | 18 |
| 37200 ML | 13500 | 23700 | 105 | 18 |
| 46600 | 13500 | 33100 | 106 | 18 |
| 55200 | 13500 | 41700 | 107 | 18 |
| 61000 BML1c | 13500 | 47500 | 108 | 18 |
| 13500 | 13500 | 0 | 108 | 18 |
| 58030 | 13500 | 44530 | 109 | 18 |
| 254.3 | 13500 | -13245.7 | 109 | 19 |
| | | | | |
| 10800 | 10900 | -100 | 109 | 20 |
| 10600 | 10900 | -300 | 109 | 21 |
| 9270 | 10900 | -1630 | 109 | 22 |
| 18300 | 10900 | 7400 | 110 | 22 |
| 24000 | 10900 | 13100 | 111 | 22 |
| 27700 | 10900 | 16800 | 112 | 22 |
| 37100 | 10900 | 26200 | 113 | 22 |
| 109000 | 10900 | 98100 | 114 | 22 |
| 29500 | 10900 | 18600 | 115 | 22 |
| 13500 MHML2c3 | 10900 | 2600 | 116 | 22 |
| 16600 ML1c | 10900 | 5700 | 117 | 22 |
| 38600 | 10900 | 27700 | 118 | 22 |
| 38900 | 10900 | 28000 | 119 | 22 |
| 44000 M6 | 10900 | 33100 | 120 | 22 |
| 37500 | 10900 | 26600 | 121 | 22 |
| 28900 | 10900 | 18000 | 122 | 22 |
| 37200 ML | 10900 | 26300 | 123 | 22 |
| 46600 | 10900 | 35700 | 124 | 22 |
| 55200 | 10900 | 44300 | 125 | 22 |
| 61000 BML1c | 10900 | 50100 | 126 | 22 |
| 13500 | 10900 | 2600 | 127 | 22 |
| 58030 | 10900 | 47130 | 128 | 22 |
| 254.3 | 10900 | -10645.7 | 128 | 23 |
| | | | | |
| 10600 | 10800 | -200 | 128 | 24 |
| 9270 | 10800 | -1530 | 128 | 25 |

| | | | | |
|---|---|---|---|---|
| 18300 | 10800 | 7500 | 129 | 25 |
| 24000 | 10800 | 13200 | 130 | 25 |
| 27700 | 10800 | 16900 | 131 | 25 |
| 37100 | 10800 | 26300 | 132 | 25 |
| 109000 | 10800 | 98200 | 133 | 25 |
| 29500 | 10800 | 18700 | 134 | 25 |
| 13500 MHML2c3 | 10800 | 2700 | 135 | 25 |
| 16600 ML1c | 10800 | 5800 | 136 | 25 |
| 38600 | 10800 | 27800 | 137 | 25 |
| 38900 | 10800 | 28100 | 138 | 25 |
| 44000 M6 | 10800 | 33200 | 139 | 25 |
| 37500 | 10800 | 26700 | 140 | 25 |
| 28900 | 10800 | 18100 | 141 | 25 |
| 37200 ML | 10800 | 26400 | 142 | 25 |
| 46600 | 10800 | 35800 | 143 | 25 |
| 55200 | 10800 | 44400 | 144 | 25 |
| 61000 BML1c | 10800 | 50200 | 145 | 25 |
| 13500 | 10800 | 2700 | 146 | 25 |
| 58030 | 10800 | 47230 | 147 | 25 |
| 254.3 | 10800 | -10545.7 | 147 | 26 |
| | | | | |
| 9270 | 10600 | -1330 | 147 | 27 |
| 18300 | 10600 | 7700 | 148 | 27 |
| 24000 | 10600 | 13400 | 149 | 27 |
| 27700 | 10600 | 17100 | 150 | 27 |
| 37100 | 10600 | 26500 | 151 | 27 |
| 109000 | 10600 | 98400 | 152 | 27 |
| 29500 | 10600 | 18900 | 153 | 27 |
| 13500 MHML2c3 | 10600 | 2900 | 154 | 27 |
| 16600 ML1c | 10600 | 6000 | 155 | 27 |
| 38600 | 10600 | 28000 | 156 | 27 |
| 38900 | 10600 | 28300 | 157 | 27 |
| 44000 M6 | 10600 | 33400 | 158 | 27 |
| 37500 | 10600 | 26900 | 159 | 27 |
| 28900 | 10600 | 18300 | 160 | 27 |
| 37200 ML | 10600 | 26600 | 161 | 27 |
| 46600 | 10600 | 36000 | 162 | 27 |
| 55200 | 10600 | 44600 | 163 | 27 |
| 61000 BML1c | 10600 | 50400 | 164 | 27 |
| 13500 | 10600 | 2900 | 165 | 27 |
| 58030 | 10600 | 47430 | 166 | 27 |
| 254.3 | 10600 | -10345.7 | 166 | 28 |
| | | | | |
| 18300 | 9270 | 9030 | 167 | 28 |
| 24000 | 9270 | 14730 | 168 | 28 |
| 27700 | 9270 | 18430 | 169 | 28 |
| 37100 | 9270 | 27830 | 170 | 28 |
| 109000 | 9270 | 99730 | 171 | 28 |
| 29500 | 9270 | 20230 | 172 | 28 |
| 13500 MHML2c3 | 9270 | 4230 | 173 | 28 |
| 16600 ML1c | 9270 | 7330 | 174 | 28 |
| 38600 | 9270 | 29330 | 175 | 28 |
| 38900 | 9270 | 29630 | 176 | 28 |
| 44000 M6 | 9270 | 34730 | 177 | 28 |
| 37500 | 9270 | 28230 | 178 | 28 |
| 28900 | 9270 | 19630 | 179 | 28 |
| 37200 ML | 9270 | 27930 | 180 | 28 |

| | | | | |
|---|---|---|---|---|
| 46600 | 9270 | 37330 | 181 | 28 |
| 55200 | 9270 | 45930 | 182 | 28 |
| 61000 BML1c | 9270 | 51730 | 183 | 28 |
| 13500 | 9270 | 4230 | 184 | 28 |
| 58030 | 9270 | 48760 | 185 | 28 |
| 254.3 | 9270 | -9015.7 | 185 | 29 |
| | | | | |
| 24000 | 18300 | 5700 | 186 | 29 |
| 27700 | 18300 | 9400 | 187 | 29 |
| 37100 | 18300 | 18800 | 188 | 29 |
| 109000 | 18300 | 90700 | 189 | 29 |
| 29500 | 18300 | 11200 | 190 | 29 |
| 13500 MHML2c3 | 18300 | -4800 | 190 | 30 |
| 16600 ML1c | 18300 | -1700 | 190 | 31 |
| 38600 | 18300 | 20300 | 191 | 31 |
| 38900 | 18300 | 20600 | 192 | 31 |
| 44000 M6 | 18300 | 25700 | 193 | 31 |
| 37500 | 18300 | 19200 | 194 | 31 |
| 28900 | 18300 | 10600 | 195 | 31 |
| 37200 ML | 18300 | 18900 | 196 | 31 |
| 46600 | 18300 | 28300 | 197 | 31 |
| 55200 | 18300 | 36900 | 198 | 31 |
| 61000 BML1c | 18300 | 42700 | 199 | 31 |
| 13500 | 18300 | -4800 | 199 | 32 |
| 58030 | 18300 | 39730 | 200 | 32 |
| 254.3 | 18300 | -18045.7 | 200 | 33 |
| | | | | |
| 27700 | 24000 | 3700 | 201 | 33 |
| 37100 | 24000 | 13100 | 202 | 33 |
| 109000 | 24000 | 85000 | 203 | 33 |
| 29500 | 24000 | 5500 | 204 | 33 |
| 13500 MHML2c3 | 24000 | -10500 | 204 | 34 |
| 16600 ML1c | 24000 | -7400 | 204 | 35 |
| 38600 | 24000 | 14600 | 205 | 35 |
| 38900 | 24000 | 14900 | 206 | 35 |
| 44000 M6 | 24000 | 20000 | 207 | 35 |
| 37500 | 24000 | 13500 | 208 | 35 |
| 28900 | 24000 | 4900 | 209 | 35 |
| 37200 ML | 24000 | 13200 | 210 | 35 |
| 46600 | 24000 | 22600 | 211 | 35 |
| 55200 | 24000 | 31200 | 212 | 35 |
| 61000 BML1c | 24000 | 37000 | 213 | 35 |
| 13500 | 24000 | -10500 | 213 | 36 |
| 58030 | 24000 | 34030 | 214 | 36 |
| 254.3 | 24000 | -23745.7 | 214 | 37 |
| | | | | |
| 37100 | 27700 | 9400 | 215 | 37 |
| 109000 | 27700 | 81300 | 216 | 37 |
| 29500 | 27700 | 1800 | 217 | 37 |
| 13500 MHML2c3 | 27700 | -14200 | 217 | 38 |
| 16600 ML1c | 27700 | -11100 | 217 | 39 |
| 38600 | 27700 | 10900 | 218 | 39 |
| 38900 | 27700 | 11200 | 219 | 39 |
| 44000 M6 | 27700 | 16300 | 220 | 39 |
| 37500 | 27700 | 9800 | 221 | 39 |
| 28900 | 27700 | 1200 | 222 | 39 |
| 37200 ML | 27700 | 9500 | 223 | 39 |

| | | | | |
|---|---|---|---|---|
| 46600 | 27700 | 18900 | 224 | 39 |
| 55200 | 27700 | 27500 | 225 | 39 |
| 61000 BML1c | 27700 | 33300 | 226 | 39 |
| 13500 | 27700 | -14200 | 226 | 40 |
| 58030 | 27700 | 30330 | 227 | 40 |
| 254.3 | 27700 | -27445.7 | 227 | 41 |
| | | | | |
| 109000 | 37100 | 71900 | 228 | 41 |
| 29500 | 37100 | -7600 | 228 | 42 |
| 13500 MHML2c3 | 37100 | -23600 | 228 | 43 |
| 16600 ML1c | 37100 | -20500 | 228 | 44 |
| 38600 | 37100 | 1500 | 229 | 44 |
| 38900 | 37100 | 1800 | 230 | 44 |
| 44000 M6 | 37100 | 6900 | 231 | 44 |
| 37500 | 37100 | 400 | 232 | 44 |
| 28900 | 37100 | -8200 | 232 | 45 |
| 37200 ML | 37100 | 100 | 233 | 45 |
| 46600 | 37100 | 9500 | 234 | 45 |
| 55200 | 37100 | 18100 | 235 | 45 |
| 61000 BML1c | 37100 | 23900 | 236 | 45 |
| 13500 | 37100 | -23600 | 236 | 46 |
| 58030 | 37100 | 20930 | 237 | 46 |
| 254.3 | 37100 | -36845.7 | 237 | 47 |
| | | | | |
| 29500 | 109000 | -79500 | 237 | 48 |
| 13500 MHML2c3 | 109000 | -95500 | 237 | 49 |
| 16600 ML1c | 109000 | -92400 | 237 | 50 |
| 38600 | 109000 | -70400 | 237 | 51 |
| 38900 | 109000 | -70100 | 237 | 52 |
| 44000 M6 | 109000 | -65000 | 237 | 53 |
| 37500 | 109000 | -71500 | 237 | 54 |
| 28900 | 109000 | -80100 | 237 | 55 |
| 37200 ML | 109000 | -71800 | 237 | 56 |
| 46600 | 109000 | -62400 | 237 | 57 |
| 55200 | 109000 | -53800 | 237 | 58 |
| 61000 BML1c | 109000 | -48000 | 237 | 59 |
| 13500 | 109000 | -95500 | 237 | 60 |
| 58030 | 109000 | -50970 | 237 | 61 |
| 254.3 | 109000 | -108746 | 237 | 62 |
| | | | | |
| 13500 MHML2c3 | 29500 | -16000 | 237 | 63 |
| 16600 ML1c | 29500 | -12900 | 237 | 64 |
| 38600 | 29500 | 9100 | 238 | 64 |
| 38900 | 29500 | 9400 | 239 | 64 |
| 44000 M6 | 29500 | 14500 | 240 | 64 |
| 37500 | 29500 | 8000 | 241 | 64 |
| 28900 | 29500 | -600 | 241 | 65 |
| 37200 ML | 29500 | 7700 | 242 | 65 |
| 46600 | 29500 | 17100 | 243 | 65 |
| 55200 | 29500 | 25700 | 244 | 65 |
| 61000 BML1c | 29500 | 31500 | 245 | 65 |
| 13500 | 29500 | -16000 | 245 | 66 |
| 58030 | 29500 | 28530 | 246 | 66 |
| 254.3 | 29500 | -29245.7 | 246 | 67 |
| | | | | |
| 16600 ML1c | 13500 MHML2c3 | Same Date | 246 | 67 |
| 38600 | 13500 MHML2c3 | 25100 | 247 | 67 |

| | | | | |
|---|---|---|---|---|
| 38900 | 13500 MHML2c3 | 25400 | 248 | 67 |
| 44000 M6 | 13500 MHML2c3 | 30500 | 249 | 67 |
| 37500 | 13500 MHML2c3 | 24000 | 250 | 67 |
| 28900 | 13500 MHML2c3 | 15400 | 251 | 67 |
| 37200 ML | 13500 MHML2c3 | 23700 | 252 | 67 |
| 46600 | 13500 MHML2c3 | 33100 | 253 | 67 |
| 55200 | 13500 MHML2c3 | 41700 | 254 | 67 |
| 61000 BML1c | 13500 MHML2c3 | 47500 | 255 | 67 |
| 13500 | 13500 MHML2c3 | 0 | 255 | 67 |
| 58030 | 13500 MHML2c3 | 44530 | 256 | 67 |
| 254.3 | 13500 MHML2c3 | -13245.7 | 256 | 68 |

| | | | | |
|---|---|---|---|---|
| 38600 | 16600 ML1c | 22000 | 257 | 68 |
| 38900 | 16600 ML1c | 22300 | 258 | 68 |
| 44000 M6 | 16600 ML1c | 27400 | 259 | 68 |
| 37500 | 16600 ML1c | 20900 | 260 | 68 |
| 28900 | 16600 ML1c | 12300 | 261 | 68 |
| 37200 ML | 16600 ML1c | 20600 | 262 | 68 |
| 46600 | 16600 ML1c | 30000 | 263 | 68 |
| 55200 | 16600 ML1c | 38600 | 264 | 68 |
| 61000 BML1c | 16600 ML1c | 44400 | 265 | 68 |
| 13500 | 16600 ML1c | -3100 | 265 | 69 |
| 58030 | 16600 ML1c | 41430 | 266 | 69 |
| 254.3 | 16600 ML1c | -16345.7 | 266 | 70 |

| | | | | |
|---|---|---|---|---|
| 38900 | 38600 | Same Date | 266 | 70 |
| 44000 M6 | 38600 | 5400 | 267 | 70 |
| 37500 | 38600 | -1100 | 267 | 71 |
| 28900 | 38600 | -9700 | 267 | 72 |
| 37200 ML | 38600 | -1400 | 267 | 73 |
| 46600 | 38600 | 8000 | 268 | 73 |
| 55200 | 38600 | 16600 | 269 | 73 |
| 61000 BML1c | 38600 | 22400 | 270 | 73 |
| 13500 | 38600 | -25100 | 270 | 74 |
| 58030 | 38600 | 19430 | 271 | 74 |
| 254.3 | 38600 | -38345.7 | 271 | 75 |

| | | | | |
|---|---|---|---|---|
| 44000 M6 | 38900 | 5100 | 272 | 75 |
| 37500 | 38900 | -1400 | 272 | 76 |
| 28900 | 38900 | -10000 | 272 | 77 |
| 37200 ML | 38900 | -1700 | 272 | 78 |
| 46600 | 38900 | 7700 | 273 | 78 |
| 55200 | 38900 | 16300 | 274 | 78 |
| 61000 BML1c | 38900 | 22100 | 275 | 78 |
| 13500 | 38900 | -25400 | 275 | 79 |
| 58030 | 38900 | 19130 | 276 | 79 |
| 254.3 | 38900 | -38645.7 | 276 | 80 |

| | | | | |
|---|---|---|---|---|
| 37500 | 44000 M6 | -6500 | 276 | 81 |
| 28900 | 44000 M6 | -15100 | 276 | 82 |
| 37200 ML | 44000 M6 | -6800 | 276 | 83 |
| 46600 | 44000 M6 | 2600 | 277 | 83 |
| 55200 | 44000 M6 | 11200 | 278 | 83 |
| 61000 BML1c | 44000 M6 | 17000 | 279 | 83 |
| 13500 | 44000 M6 | -30500 | 279 | 84 |
| 58030 | 44000 M6 | 14030 | 280 | 84 |
| 254.3 | 44000 M6 | -43745.7 | 280 | 85 |

| | | | | |
|---|---|---|---|---|
| 28900 | 37500 | -8600 | 280 | 86 |
| 37200 ML | 37500 | -300 | 280 | 87 |
| 46600 | 37500 | 9100 | 281 | 87 |
| 55200 | 37500 | 17700 | 282 | 87 |
| 61000 BML1c | 37500 | 23500 | 283 | 87 |
| 13500 | 37500 | -24000 | 283 | 88 |
| 58030 | 37500 | 20530 | 284 | 88 |
| 254.3 | 37500 | -37245.7 | 284 | 89 |
| | | | | |
| 37200 ML | 28900 | 8300 | 285 | 89 |
| 46600 | 28900 | 17700 | 286 | 89 |
| 55200 | 28900 | 26300 | 287 | 89 |
| 61000 BML1c | 28900 | 32100 | 288 | 89 |
| 13500 | 28900 | -15400 | 288 | 90 |
| 58030 | 28900 | 29130 | 289 | 90 |
| 254.3 | 28900 | -28645.7 | 289 | 91 |
| | | | | |
| 46600 | 37200 ML | 9400 | 290 | 91 |
| 55200 | 37200 ML | 18000 | 291 | 91 |
| 61000 BML1c | 37200 ML | 23800 | 292 | 91 |
| 13500 | 37200 ML | -23700 | 292 | 92 |
| 58030 | 37200 ML | 20830 | 293 | 92 |
| 254.3 | 37200 ML | -36945.7 | 293 | 93 |
| | | | | |
| 55200 | 46600 | 8600 | 294 | 93 |
| 61000 BML1c | 46600 | 14400 | 295 | 93 |
| 13500 | 46600 | -33100 | 295 | 94 |
| 58030 | 46600 | 11430 | 296 | 94 |
| 254.3 | 46600 | -46345.7 | 296 | 95 |
| | | | | |
| 61000 BML1c | 55200 | 5800 | 297 | 95 |
| 13500 | 55200 | -41700 | 297 | 96 |
| 58030 | 55200 | 2830 | 298 | 96 |
| 254.3 | 55200 | -54945.7 | 298 | 97 |
| | | | | |
| 13500 | 61000 BML1c | -47500 | 298 | 98 |
| 58030 | 61000 BML1c | -2970 | 298 | 99 |
| 254.3 | 61000 BML1c | -60745.7 | 298 | 100 |
| | | | | |
| 58030 | 13500 | 44530 | 299 | 100 |
| 254.3 | 13500 | -13245.7 | 299 | 101 |
| | | | | |
| 254.3 | 58030 | -57775.7 | 299 | 102 |

S Statistic = 299 - 102 = 197

| Tied Group | Value | Members |
|---|---|---|
| 1 | 13500 | 3 |

| Time Period | Observations |
|---|---|
| 2/1/2017 | 1 |
| 3/1/2017 | 1 |
| 4/1/2017 | 1 |
| 5/1/2017 | 1 |
| 6/1/2017 | 1 |

| | |
|---|---|
| 7/1/2017 | 1 |
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 3/1/2022 | 1 |
| 3/1/2023 | 1 |
| 3/1/2024 | 1 |

There are 2 time periods with multiple data

---

A = 66
B = 36
C = 6
D = 0
E = 6
F = 4
a = 51156
b = 197316
c = 1624
Group Variance = 2836.35
Z-Score = 3.68024
Comparison Level at 95% confidence level = -1.65463 (downward trend)
3.68024 >= -1.65463 indicating no evidence of a downward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RW12-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 9090 | 11400 | -2310 | 0 | 1 |
| 5090 | 11400 | -6310 | 0 | 2 |
| 3980 | 11400 | -7420 | 0 | 3 |
| 3790 | 11400 | -7610 | 0 | 4 |
| 235000 ML | 11400 | 223600 | 1 | 4 |
| 2980 | 11400 | -8420 | 1 | 5 |
| 10100 | 11400 | -1300 | 1 | 6 |
| 10600 | 11400 | -800 | 1 | 7 |
| 2900 | 11400 | -8500 | 1 | 8 |
| 1140 | 11400 | -10260 | 1 | 9 |
| 5360 | 11400 | -6040 | 1 | 10 |
| 4640 | 11400 | -6760 | 1 | 11 |
| 1550 | 11400 | -9850 | 1 | 12 |
| 5870 | 11400 | -5530 | 1 | 13 |
| 5390 | 11400 | -6010 | 1 | 14 |
| 763 | 11400 | -10637 | 1 | 15 |
| 4660 | 11400 | -6740 | 1 | 16 |
| 4960 | 11400 | -6440 | 1 | 17 |
| 12400 R1M1 | 11400 | 1000 | 2 | 17 |
| 21800 | 11400 | 10400 | 3 | 17 |
| 20890 | 11400 | 9490 | 4 | 17 |
| 19360 | 11400 | 7960 | 5 | 17 |
| 6243 | 11400 | -5157 | 5 | 18 |
| 5627 | 11400 | -5773 | 5 | 19 |
| | | | | |
| 5090 | 9090 | -4000 | 5 | 20 |
| 3980 | 9090 | -5110 | 5 | 21 |
| 3790 | 9090 | -5300 | 5 | 22 |
| 235000 ML | 9090 | 225910 | 6 | 22 |
| 2980 | 9090 | -6110 | 6 | 23 |
| 10100 | 9090 | 1010 | 7 | 23 |
| 10600 | 9090 | 1510 | 8 | 23 |
| 2900 | 9090 | -6190 | 8 | 24 |
| 1140 | 9090 | -7950 | 8 | 25 |
| 5360 | 9090 | -3730 | 8 | 26 |
| 4640 | 9090 | -4450 | 8 | 27 |
| 1550 | 9090 | -7540 | 8 | 28 |
| 5870 | 9090 | -3220 | 8 | 29 |
| 5390 | 9090 | -3700 | 8 | 30 |
| 763 | 9090 | -8327 | 8 | 31 |
| 4660 | 9090 | -4430 | 8 | 32 |
| 4960 | 9090 | -4130 | 8 | 33 |
| 12400 R1M1 | 9090 | 3310 | 9 | 33 |
| 21800 | 9090 | 12710 | 10 | 33 |
| 20890 | 9090 | 11800 | 11 | 33 |
| 19360 | 9090 | 10270 | 12 | 33 |
| 6243 | 9090 | -2847 | 12 | 34 |

| | | | | |
|---|---|---|---|---|
| 5627 | 9090 | -3463 | 12 | 35 |
| | | | | |
| 3980 | 5090 | -1110 | 12 | 36 |
| 3790 | 5090 | -1300 | 12 | 37 |
| 235000 ML | 5090 | 229910 | 13 | 37 |
| 2980 | 5090 | -2110 | 13 | 38 |
| 10100 | 5090 | 5010 | 14 | 38 |
| 10600 | 5090 | 5510 | 15 | 38 |
| 2900 | 5090 | -2190 | 15 | 39 |
| 1140 | 5090 | -3950 | 15 | 40 |
| 5360 | 5090 | 270 | 16 | 40 |
| 4640 | 5090 | -450 | 16 | 41 |
| 1550 | 5090 | -3540 | 16 | 42 |
| 5870 | 5090 | 780 | 17 | 42 |
| 5390 | 5090 | 300 | 18 | 42 |
| 763 | 5090 | -4327 | 18 | 43 |
| 4660 | 5090 | -430 | 18 | 44 |
| 4960 | 5090 | -130 | 18 | 45 |
| 12400 R1M1 | 5090 | 7310 | 19 | 45 |
| 21800 | 5090 | 16710 | 20 | 45 |
| 20890 | 5090 | 15800 | 21 | 45 |
| 19360 | 5090 | 14270 | 22 | 45 |
| 6243 | 5090 | 1153 | 23 | 45 |
| 5627 | 5090 | 537 | 24 | 45 |
| | | | | |
| 3790 | 3980 | -190 | 24 | 46 |
| 235000 ML | 3980 | 231020 | 25 | 46 |
| 2980 | 3980 | -1000 | 25 | 47 |
| 10100 | 3980 | 6120 | 26 | 47 |
| 10600 | 3980 | 6620 | 27 | 47 |
| 2900 | 3980 | -1080 | 27 | 48 |
| 1140 | 3980 | -2840 | 27 | 49 |
| 5360 | 3980 | 1380 | 28 | 49 |
| 4640 | 3980 | 660 | 29 | 49 |
| 1550 | 3980 | -2430 | 29 | 50 |
| 5870 | 3980 | 1890 | 30 | 50 |
| 5390 | 3980 | 1410 | 31 | 50 |
| 763 | 3980 | -3217 | 31 | 51 |
| 4660 | 3980 | 680 | 32 | 51 |
| 4960 | 3980 | 980 | 33 | 51 |
| 12400 R1M1 | 3980 | 8420 | 34 | 51 |
| 21800 | 3980 | 17820 | 35 | 51 |
| 20890 | 3980 | 16910 | 36 | 51 |
| 19360 | 3980 | 15380 | 37 | 51 |
| 6243 | 3980 | 2263 | 38 | 51 |
| 5627 | 3980 | 1647 | 39 | 51 |
| | | | | |
| 235000 ML | 3790 | 231210 | 40 | 51 |
| 2980 | 3790 | -810 | 40 | 52 |
| 10100 | 3790 | 6310 | 41 | 52 |
| 10600 | 3790 | 6810 | 42 | 52 |
| 2900 | 3790 | -890 | 42 | 53 |
| 1140 | 3790 | -2650 | 42 | 54 |
| 5360 | 3790 | 1570 | 43 | 54 |
| 4640 | 3790 | 850 | 44 | 54 |
| 1550 | 3790 | -2240 | 44 | 55 |
| 5870 | 3790 | 2080 | 45 | 55 |

| | | | | |
|---|---|---|---|---|
| 5390 | 3790 | 1600 | 46 | 55 |
| 763 | 3790 | -3027 | 46 | 56 |
| 4660 | 3790 | 870 | 47 | 56 |
| 4960 | 3790 | 1170 | 48 | 56 |
| 12400 R1M1 | 3790 | 8610 | 49 | 56 |
| 21800 | 3790 | 18010 | 50 | 56 |
| 20890 | 3790 | 17100 | 51 | 56 |
| 19360 | 3790 | 15570 | 52 | 56 |
| 6243 | 3790 | 2453 | 53 | 56 |
| 5627 | 3790 | 1837 | 54 | 56 |
| | | | | |
| 2980 | 235000 ML | -232020 | 54 | 57 |
| 10100 | 235000 ML | -224900 | 54 | 58 |
| 10600 | 235000 ML | -224400 | 54 | 59 |
| 2900 | 235000 ML | -232100 | 54 | 60 |
| 1140 | 235000 ML | -233860 | 54 | 61 |
| 5360 | 235000 ML | -229640 | 54 | 62 |
| 4640 | 235000 ML | -230360 | 54 | 63 |
| 1550 | 235000 ML | -233450 | 54 | 64 |
| 5870 | 235000 ML | -229130 | 54 | 65 |
| 5390 | 235000 ML | -229610 | 54 | 66 |
| 763 | 235000 ML | -234237 | 54 | 67 |
| 4660 | 235000 ML | -230340 | 54 | 68 |
| 4960 | 235000 ML | -230040 | 54 | 69 |
| 12400 R1M1 | 235000 ML | -222600 | 54 | 70 |
| 21800 | 235000 ML | -213200 | 54 | 71 |
| 20890 | 235000 ML | -214110 | 54 | 72 |
| 19360 | 235000 ML | -215640 | 54 | 73 |
| 6243 | 235000 ML | -228757 | 54 | 74 |
| 5627 | 235000 ML | -229373 | 54 | 75 |
| | | | | |
| 10100 | 2980 | 7120 | 55 | 75 |
| 10600 | 2980 | 7620 | 56 | 75 |
| 2900 | 2980 | -80 | 56 | 76 |
| 1140 | 2980 | -1840 | 56 | 77 |
| 5360 | 2980 | 2380 | 57 | 77 |
| 4640 | 2980 | 1660 | 58 | 77 |
| 1550 | 2980 | -1430 | 58 | 78 |
| 5870 | 2980 | 2890 | 59 | 78 |
| 5390 | 2980 | 2410 | 60 | 78 |
| 763 | 2980 | -2217 | 60 | 79 |
| 4660 | 2980 | 1680 | 61 | 79 |
| 4960 | 2980 | 1980 | 62 | 79 |
| 12400 R1M1 | 2980 | 9420 | 63 | 79 |
| 21800 | 2980 | 18820 | 64 | 79 |
| 20890 | 2980 | 17910 | 65 | 79 |
| 19360 | 2980 | 16380 | 66 | 79 |
| 6243 | 2980 | 3263 | 67 | 79 |
| 5627 | 2980 | 2647 | 68 | 79 |
| | | | | |
| 10600 | 10100 | 500 | 69 | 79 |
| 2900 | 10100 | -7200 | 69 | 80 |
| 1140 | 10100 | -8960 | 69 | 81 |
| 5360 | 10100 | -4740 | 69 | 82 |
| 4640 | 10100 | -5460 | 69 | 83 |
| 1550 | 10100 | -8550 | 69 | 84 |
| 5870 | 10100 | -4230 | 69 | 85 |

| | | | | |
|---|---|---|---|---|
| 5390 | 10100 | -4710 | 69 | 86 |
| 763 | 10100 | -9337 | 69 | 87 |
| 4660 | 10100 | -5440 | 69 | 88 |
| 4960 | 10100 | -5140 | 69 | 89 |
| 12400 R1M1 | 10100 | 2300 | 70 | 89 |
| 21800 | 10100 | 11700 | 71 | 89 |
| 20890 | 10100 | 10790 | 72 | 89 |
| 19360 | 10100 | 9260 | 73 | 89 |
| 6243 | 10100 | -3857 | 73 | 90 |
| 5627 | 10100 | -4473 | 73 | 91 |
| | | | | |
| 2900 | 10600 | -7700 | 73 | 92 |
| 1140 | 10600 | -9460 | 73 | 93 |
| 5360 | 10600 | -5240 | 73 | 94 |
| 4640 | 10600 | -5960 | 73 | 95 |
| 1550 | 10600 | -9050 | 73 | 96 |
| 5870 | 10600 | -4730 | 73 | 97 |
| 5390 | 10600 | -5210 | 73 | 98 |
| 763 | 10600 | -9837 | 73 | 99 |
| 4660 | 10600 | -5940 | 73 | 100 |
| 4960 | 10600 | -5640 | 73 | 101 |
| 12400 R1M1 | 10600 | 1800 | 74 | 101 |
| 21800 | 10600 | 11200 | 75 | 101 |
| 20890 | 10600 | 10290 | 76 | 101 |
| 19360 | 10600 | 8760 | 77 | 101 |
| 6243 | 10600 | -4357 | 77 | 102 |
| 5627 | 10600 | -4973 | 77 | 103 |
| | | | | |
| 1140 | 2900 | -1760 | 77 | 104 |
| 5360 | 2900 | 2460 | 78 | 104 |
| 4640 | 2900 | 1740 | 79 | 104 |
| 1550 | 2900 | -1350 | 79 | 105 |
| 5870 | 2900 | 2970 | 80 | 105 |
| 5390 | 2900 | 2490 | 81 | 105 |
| 763 | 2900 | -2137 | 81 | 106 |
| 4660 | 2900 | 1760 | 82 | 106 |
| 4960 | 2900 | 2060 | 83 | 106 |
| 12400 R1M1 | 2900 | 9500 | 84 | 106 |
| 21800 | 2900 | 18900 | 85 | 106 |
| 20890 | 2900 | 17990 | 86 | 106 |
| 19360 | 2900 | 16460 | 87 | 106 |
| 6243 | 2900 | 3343 | 88 | 106 |
| 5627 | 2900 | 2727 | 89 | 106 |
| | | | | |
| 5360 | 1140 | 4220 | 90 | 106 |
| 4640 | 1140 | 3500 | 91 | 106 |
| 1550 | 1140 | 410 | 92 | 106 |
| 5870 | 1140 | 4730 | 93 | 106 |
| 5390 | 1140 | 4250 | 94 | 106 |
| 763 | 1140 | -377 | 94 | 107 |
| 4660 | 1140 | 3520 | 95 | 107 |
| 4960 | 1140 | 3820 | 96 | 107 |
| 12400 R1M1 | 1140 | 11260 | 97 | 107 |
| 21800 | 1140 | 20660 | 98 | 107 |
| 20890 | 1140 | 19750 | 99 | 107 |
| 19360 | 1140 | 18220 | 100 | 107 |
| 6243 | 1140 | 5103 | 101 | 107 |

| | | | | |
|---|---|---|---|---|
| 5627 | 1140 | 4487 | 102 | 107 |
| | | | | |
| 4640 | 5360 | Same Date | 102 | 107 |
| 1550 | 5360 | -3810 | 102 | 108 |
| 5870 | 5360 | 510 | 103 | 108 |
| 5390 | 5360 | 30 | 104 | 108 |
| 763 | 5360 | -4597 | 104 | 109 |
| 4660 | 5360 | -700 | 104 | 110 |
| 4960 | 5360 | -400 | 104 | 111 |
| 12400 R1M1 | 5360 | 7040 | 105 | 111 |
| 21800 | 5360 | 16440 | 106 | 111 |
| 20890 | 5360 | 15530 | 107 | 111 |
| 19360 | 5360 | 14000 | 108 | 111 |
| 6243 | 5360 | 883 | 109 | 111 |
| 5627 | 5360 | 267 | 110 | 111 |
| | | | | |
| 1550 | 4640 | -3090 | 110 | 112 |
| 5870 | 4640 | 1230 | 111 | 112 |
| 5390 | 4640 | 750 | 112 | 112 |
| 763 | 4640 | -3877 | 112 | 113 |
| 4660 | 4640 | 20 | 113 | 113 |
| 4960 | 4640 | 320 | 114 | 113 |
| 12400 R1M1 | 4640 | 7760 | 115 | 113 |
| 21800 | 4640 | 17160 | 116 | 113 |
| 20890 | 4640 | 16250 | 117 | 113 |
| 19360 | 4640 | 14720 | 118 | 113 |
| 6243 | 4640 | 1603 | 119 | 113 |
| 5627 | 4640 | 987 | 120 | 113 |
| | | | | |
| 5870 | 1550 | Same Date | 120 | 113 |
| 5390 | 1550 | 3840 | 121 | 113 |
| 763 | 1550 | -787 | 121 | 114 |
| 4660 | 1550 | 3110 | 122 | 114 |
| 4960 | 1550 | 3410 | 123 | 114 |
| 12400 R1M1 | 1550 | 10850 | 124 | 114 |
| 21800 | 1550 | 20250 | 125 | 114 |
| 20890 | 1550 | 19340 | 126 | 114 |
| 19360 | 1550 | 17810 | 127 | 114 |
| 6243 | 1550 | 4693 | 128 | 114 |
| 5627 | 1550 | 4077 | 129 | 114 |
| | | | | |
| 5390 | 5870 | -480 | 129 | 115 |
| 763 | 5870 | -5107 | 129 | 116 |
| 4660 | 5870 | -1210 | 129 | 117 |
| 4960 | 5870 | -910 | 129 | 118 |
| 12400 R1M1 | 5870 | 6530 | 130 | 118 |
| 21800 | 5870 | 15930 | 131 | 118 |
| 20890 | 5870 | 15020 | 132 | 118 |
| 19360 | 5870 | 13490 | 133 | 118 |
| 6243 | 5870 | 373 | 134 | 118 |
| 5627 | 5870 | -243 | 134 | 119 |
| | | | | |
| 763 | 5390 | -4627 | 134 | 120 |
| 4660 | 5390 | -730 | 134 | 121 |
| 4960 | 5390 | -430 | 134 | 122 |
| 12400 R1M1 | 5390 | 7010 | 135 | 122 |
| 21800 | 5390 | 16410 | 136 | 122 |

| | | | | |
|---|---|---|---|---|
| 20890 | 5390 | 15500 | 137 | 122 |
| 19360 | 5390 | 13970 | 138 | 122 |
| 6243 | 5390 | 853 | 139 | 122 |
| 5627 | 5390 | 237 | 140 | 122 |
| | | | | |
| 4660 | 763 | 3897 | 141 | 122 |
| 4960 | 763 | 4197 | 142 | 122 |
| 12400 R1M1 | 763 | 11637 | 143 | 122 |
| 21800 | 763 | 21037 | 144 | 122 |
| 20890 | 763 | 20127 | 145 | 122 |
| 19360 | 763 | 18597 | 146 | 122 |
| 6243 | 763 | 5480 | 147 | 122 |
| 5627 | 763 | 4864 | 148 | 122 |
| | | | | |
| 4960 | 4660 | 300 | 149 | 122 |
| 12400 R1M1 | 4660 | 7740 | 150 | 122 |
| 21800 | 4660 | 17140 | 151 | 122 |
| 20890 | 4660 | 16230 | 152 | 122 |
| 19360 | 4660 | 14700 | 153 | 122 |
| 6243 | 4660 | 1583 | 154 | 122 |
| 5627 | 4660 | 967 | 155 | 122 |
| | | | | |
| 12400 R1M1 | 4960 | 7440 | 156 | 122 |
| 21800 | 4960 | 16840 | 157 | 122 |
| 20890 | 4960 | 15930 | 158 | 122 |
| 19360 | 4960 | 14400 | 159 | 122 |
| 6243 | 4960 | 1283 | 160 | 122 |
| 5627 | 4960 | 667 | 161 | 122 |
| | | | | |
| 21800 | 12400 R1M1 | 9400 | 162 | 122 |
| 20890 | 12400 R1M1 | 8490 | 163 | 122 |
| 19360 | 12400 R1M1 | 6960 | 164 | 122 |
| 6243 | 12400 R1M1 | -6157 | 164 | 123 |
| 5627 | 12400 R1M1 | -6773 | 164 | 124 |
| | | | | |
| 20890 | 21800 | -910 | 164 | 125 |
| 19360 | 21800 | -2440 | 164 | 126 |
| 6243 | 21800 | -15557 | 164 | 127 |
| 5627 | 21800 | -16173 | 164 | 128 |
| | | | | |
| 19360 | 20890 | -1530 | 164 | 129 |
| 6243 | 20890 | -14647 | 164 | 130 |
| 5627 | 20890 | -15263 | 164 | 131 |
| | | | | |
| 6243 | 19360 | -13117 | 164 | 132 |
| 5627 | 19360 | -13733 | 164 | 133 |
| | | | | |
| 5627 | 6243 | -616 | 164 | 134 |

S Statistic = 164 - 134 = 30

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 6/1/2017 | 1 |
| 7/1/2017 | 1 |

| | |
|---|---|
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 6/1/2020 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 2 time periods with multiple data

---

A = 0
B = 36
C = 0
D = 0
E = 0
F = 4
a = 33000
b = 124200
c = 1200
Group Variance = 1831.33
Z-Score = 0.677664
Comparison Level at 95% confidence level = -1.65463 (downward trend)
0.677664 >= -1.65463 indicating no evidence of a downward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RW14-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 42000 | 12200 MH | 29800 | 1 | 0 |
| 43500 | 12200 MH | 31300 | 2 | 0 |
| 28900 | 12200 MH | 16700 | 3 | 0 |
| 28100 | 12200 MH | 15900 | 4 | 0 |
| 49200 | 12200 MH | 37000 | 5 | 0 |
| 61800 | 12200 MH | 49600 | 6 | 0 |
| 62100 | 12200 MH | 49900 | 7 | 0 |
| 64100 | 12200 MH | 51900 | 8 | 0 |
| 80100 | 12200 MH | 67900 | 9 | 0 |
| 65700 | 12200 MH | 53500 | 10 | 0 |
| 65500 | 12200 MH | 53300 | 11 | 0 |
| 69600 | 12200 MH | 57400 | 12 | 0 |
| 73600 | 12200 MH | 61400 | 13 | 0 |
| 70500 | 12200 MH | 58300 | 14 | 0 |
| 77500 | 12200 MH | 65300 | 15 | 0 |
| 70800 | 12200 MH | 58600 | 16 | 0 |
| 71900 | 12200 MH | 59700 | 17 | 0 |
| 56600 1c | 12200 MH | 44400 | 18 | 0 |
| 50200 1c | 12200 MH | 38000 | 19 | 0 |
| | | | | |
| 43500 | 42000 | 1500 | 20 | 0 |
| 28900 | 42000 | -13100 | 20 | 1 |
| 28100 | 42000 | -13900 | 20 | 2 |
| 49200 | 42000 | 7200 | 21 | 2 |
| 61800 | 42000 | 19800 | 22 | 2 |
| 62100 | 42000 | 20100 | 23 | 2 |
| 64100 | 42000 | 22100 | 24 | 2 |
| 80100 | 42000 | 38100 | 25 | 2 |
| 65700 | 42000 | 23700 | 26 | 2 |
| 65500 | 42000 | 23500 | 27 | 2 |
| 69600 | 42000 | 27600 | 28 | 2 |
| 73600 | 42000 | 31600 | 29 | 2 |
| 70500 | 42000 | 28500 | 30 | 2 |
| 77500 | 42000 | 35500 | 31 | 2 |
| 70800 | 42000 | 28800 | 32 | 2 |
| 71900 | 42000 | 29900 | 33 | 2 |
| 56600 1c | 42000 | 14600 | 34 | 2 |
| 50200 1c | 42000 | 8200 | 35 | 2 |
| | | | | |
| 28900 | 43500 | -14600 | 35 | 3 |
| 28100 | 43500 | -15400 | 35 | 4 |
| 49200 | 43500 | 5700 | 36 | 4 |
| 61800 | 43500 | 18300 | 37 | 4 |
| 62100 | 43500 | 18600 | 38 | 4 |
| 64100 | 43500 | 20600 | 39 | 4 |
| 80100 | 43500 | 36600 | 40 | 4 |
| 65700 | 43500 | 22200 | 41 | 4 |

| | | | | |
|---|---|---|---|---|
| 65500 | 43500 | 22000 | 42 | 4 |
| 69600 | 43500 | 26100 | 43 | 4 |
| 73600 | 43500 | 30100 | 44 | 4 |
| 70500 | 43500 | 27000 | 45 | 4 |
| 77500 | 43500 | 34000 | 46 | 4 |
| 70800 | 43500 | 27300 | 47 | 4 |
| 71900 | 43500 | 28400 | 48 | 4 |
| 56600 1c | 43500 | 13100 | 49 | 4 |
| 50200 1c | 43500 | 6700 | 50 | 4 |
| | | | | |
| 28100 | 28900 | -800 | 50 | 5 |
| 49200 | 28900 | 20300 | 51 | 5 |
| 61800 | 28900 | 32900 | 52 | 5 |
| 62100 | 28900 | 33200 | 53 | 5 |
| 64100 | 28900 | 35200 | 54 | 5 |
| 80100 | 28900 | 51200 | 55 | 5 |
| 65700 | 28900 | 36800 | 56 | 5 |
| 65500 | 28900 | 36600 | 57 | 5 |
| 69600 | 28900 | 40700 | 58 | 5 |
| 73600 | 28900 | 44700 | 59 | 5 |
| 70500 | 28900 | 41600 | 60 | 5 |
| 77500 | 28900 | 48600 | 61 | 5 |
| 70800 | 28900 | 41900 | 62 | 5 |
| 71900 | 28900 | 43000 | 63 | 5 |
| 56600 1c | 28900 | 27700 | 64 | 5 |
| 50200 1c | 28900 | 21300 | 65 | 5 |
| | | | | |
| 49200 | 28100 | 21100 | 66 | 5 |
| 61800 | 28100 | 33700 | 67 | 5 |
| 62100 | 28100 | 34000 | 68 | 5 |
| 64100 | 28100 | 36000 | 69 | 5 |
| 80100 | 28100 | 52000 | 70 | 5 |
| 65700 | 28100 | 37600 | 71 | 5 |
| 65500 | 28100 | 37400 | 72 | 5 |
| 69600 | 28100 | 41500 | 73 | 5 |
| 73600 | 28100 | 45500 | 74 | 5 |
| 70500 | 28100 | 42400 | 75 | 5 |
| 77500 | 28100 | 49400 | 76 | 5 |
| 70800 | 28100 | 42700 | 77 | 5 |
| 71900 | 28100 | 43800 | 78 | 5 |
| 56600 1c | 28100 | 28500 | 79 | 5 |
| 50200 1c | 28100 | 22100 | 80 | 5 |
| | | | | |
| 61800 | 49200 | 12600 | 81 | 5 |
| 62100 | 49200 | 12900 | 82 | 5 |
| 64100 | 49200 | 14900 | 83 | 5 |
| 80100 | 49200 | 30900 | 84 | 5 |
| 65700 | 49200 | 16500 | 85 | 5 |
| 65500 | 49200 | 16300 | 86 | 5 |
| 69600 | 49200 | 20400 | 87 | 5 |
| 73600 | 49200 | 24400 | 88 | 5 |
| 70500 | 49200 | 21300 | 89 | 5 |
| 77500 | 49200 | 28300 | 90 | 5 |
| 70800 | 49200 | 21600 | 91 | 5 |
| 71900 | 49200 | 22700 | 92 | 5 |
| 56600 1c | 49200 | 7400 | 93 | 5 |
| 50200 1c | 49200 | 1000 | 94 | 5 |

| | | | | |
|---|---|---|---|---|
| 62100 | 61800 | 300 | 95 | 5 |
| 64100 | 61800 | 2300 | 96 | 5 |
| 80100 | 61800 | 18300 | 97 | 5 |
| 65700 | 61800 | 3900 | 98 | 5 |
| 65500 | 61800 | 3700 | 99 | 5 |
| 69600 | 61800 | 7800 | 100 | 5 |
| 73600 | 61800 | 11800 | 101 | 5 |
| 70500 | 61800 | 8700 | 102 | 5 |
| 77500 | 61800 | 15700 | 103 | 5 |
| 70800 | 61800 | 9000 | 104 | 5 |
| 71900 | 61800 | 10100 | 105 | 5 |
| 56600 1c | 61800 | -5200 | 105 | 6 |
| 50200 1c | 61800 | -11600 | 105 | 7 |
| | | | | |
| 64100 | 62100 | 2000 | 106 | 7 |
| 80100 | 62100 | 18000 | 107 | 7 |
| 65700 | 62100 | 3600 | 108 | 7 |
| 65500 | 62100 | 3400 | 109 | 7 |
| 69600 | 62100 | 7500 | 110 | 7 |
| 73600 | 62100 | 11500 | 111 | 7 |
| 70500 | 62100 | 8400 | 112 | 7 |
| 77500 | 62100 | 15400 | 113 | 7 |
| 70800 | 62100 | 8700 | 114 | 7 |
| 71900 | 62100 | 9800 | 115 | 7 |
| 56600 1c | 62100 | -5500 | 115 | 8 |
| 50200 1c | 62100 | -11900 | 115 | 9 |
| | | | | |
| 80100 | 64100 | 16000 | 116 | 9 |
| 65700 | 64100 | 1600 | 117 | 9 |
| 65500 | 64100 | 1400 | 118 | 9 |
| 69600 | 64100 | 5500 | 119 | 9 |
| 73600 | 64100 | 9500 | 120 | 9 |
| 70500 | 64100 | 6400 | 121 | 9 |
| 77500 | 64100 | 13400 | 122 | 9 |
| 70800 | 64100 | 6700 | 123 | 9 |
| 71900 | 64100 | 7800 | 124 | 9 |
| 56600 1c | 64100 | -7500 | 124 | 10 |
| 50200 1c | 64100 | -13900 | 124 | 11 |
| | | | | |
| 65700 | 80100 | -14400 | 124 | 12 |
| 65500 | 80100 | -14600 | 124 | 13 |
| 69600 | 80100 | -10500 | 124 | 14 |
| 73600 | 80100 | -6500 | 124 | 15 |
| 70500 | 80100 | -9600 | 124 | 16 |
| 77500 | 80100 | -2600 | 124 | 17 |
| 70800 | 80100 | -9300 | 124 | 18 |
| 71900 | 80100 | -8200 | 124 | 19 |
| 56600 1c | 80100 | -23500 | 124 | 20 |
| 50200 1c | 80100 | -29900 | 124 | 21 |
| | | | | |
| 65500 | 65700 | Same Date | 124 | 21 |
| 69600 | 65700 | 3900 | 125 | 21 |
| 73600 | 65700 | 7900 | 126 | 21 |
| 70500 | 65700 | 4800 | 127 | 21 |
| 77500 | 65700 | 11800 | 128 | 21 |
| 70800 | 65700 | 5100 | 129 | 21 |

| | | | | |
|---|---|---|---|---|
| 71900 | 65700 | 6200 | 130 | 21 |
| 56600 1c | 65700 | -9100 | 130 | 22 |
| 50200 1c | 65700 | -15500 | 130 | 23 |
| | | | | |
| 69600 | 65500 | 4100 | 131 | 23 |
| 73600 | 65500 | 8100 | 132 | 23 |
| 70500 | 65500 | 5000 | 133 | 23 |
| 77500 | 65500 | 12000 | 134 | 23 |
| 70800 | 65500 | 5300 | 135 | 23 |
| 71900 | 65500 | 6400 | 136 | 23 |
| 56600 1c | 65500 | -8900 | 136 | 24 |
| 50200 1c | 65500 | -15300 | 136 | 25 |
| | | | | |
| 73600 | 69600 | Same Date | 136 | 25 |
| 70500 | 69600 | 900 | 137 | 25 |
| 77500 | 69600 | 7900 | 138 | 25 |
| 70800 | 69600 | 1200 | 139 | 25 |
| 71900 | 69600 | 2300 | 140 | 25 |
| 56600 1c | 69600 | -13000 | 140 | 26 |
| 50200 1c | 69600 | -19400 | 140 | 27 |
| | | | | |
| 70500 | 73600 | -3100 | 140 | 28 |
| 77500 | 73600 | 3900 | 141 | 28 |
| 70800 | 73600 | -2800 | 141 | 29 |
| 71900 | 73600 | -1700 | 141 | 30 |
| 56600 1c | 73600 | -17000 | 141 | 31 |
| 50200 1c | 73600 | -23400 | 141 | 32 |
| | | | | |
| 77500 | 70500 | 7000 | 142 | 32 |
| 70800 | 70500 | 300 | 143 | 32 |
| 71900 | 70500 | 1400 | 144 | 32 |
| 56600 1c | 70500 | -13900 | 144 | 33 |
| 50200 1c | 70500 | -20300 | 144 | 34 |
| | | | | |
| 70800 | 77500 | -6700 | 144 | 35 |
| 71900 | 77500 | -5600 | 144 | 36 |
| 56600 1c | 77500 | -20900 | 144 | 37 |
| 50200 1c | 77500 | -27300 | 144 | 38 |
| | | | | |
| 71900 | 70800 | 1100 | 145 | 38 |
| 56600 1c | 70800 | -14200 | 145 | 39 |
| 50200 1c | 70800 | -20600 | 145 | 40 |
| | | | | |
| 56600 1c | 71900 | -15300 | 145 | 41 |
| 50200 1c | 71900 | -21700 | 145 | 42 |
| | | | | |
| 50200 1c | 56600 1c | -6400 | 145 | 43 |

S Statistic = 145 - 43 = 102

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 6/1/2017 | 1 |
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |

| | |
|---|---|
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |

There are 2 time periods with multiple data

---

A = 0
B = 36
C = 0
D = 0
E = 0
F = 4
a = 17100
b = 61560
c = 760
Group Variance = 948
Z-Score = 3.28033
Comparison Level at 95% confidence level = -1.65463 (downward trend)
3.28033 >= -1.65463 indicating no evidence of a downward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RW15-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 1080 | 276 | 804 | 1 | 0 |
| 900 | 276 | 624 | 2 | 0 |
| 8800 | 276 | 8524 | 3 | 0 |
| 7630 | 276 | 7354 | 4 | 0 |
| 5150 | 276 | 4874 | 5 | 0 |
| 5940 | 276 | 5664 | 6 | 0 |
| 1320 | 276 | 1044 | 7 | 0 |
| 2950 | 276 | 2674 | 8 | 0 |
| 499 | 276 | 223 | 9 | 0 |
| 1060 | 276 | 784 | 10 | 0 |
| 766 | 276 | 490 | 11 | 0 |
| 684 | 276 | 408 | 12 | 0 |
| 134 | 276 | -142 | 12 | 1 |
| 378 | 276 | 102 | 13 | 1 |
| 105 | 276 | -171 | 13 | 2 |
| 2.7 J | 276 | -273.3 | 13 | 3 |
| 9.4 J1c | 276 | -266.6 | 13 | 4 |
| 3.3 J1c | 276 | -272.7 | 13 | 5 |
| | | | | |
| 900 | 1080 | -180 | 13 | 6 |
| 8800 | 1080 | 7720 | 14 | 6 |
| 7630 | 1080 | 6550 | 15 | 6 |
| 5150 | 1080 | 4070 | 16 | 6 |
| 5940 | 1080 | 4860 | 17 | 6 |
| 1320 | 1080 | 240 | 18 | 6 |
| 2950 | 1080 | 1870 | 19 | 6 |
| 499 | 1080 | -581 | 19 | 7 |
| 1060 | 1080 | -20 | 19 | 8 |
| 766 | 1080 | -314 | 19 | 9 |
| 684 | 1080 | -396 | 19 | 10 |
| 134 | 1080 | -946 | 19 | 11 |
| 378 | 1080 | -702 | 19 | 12 |
| 105 | 1080 | -975 | 19 | 13 |
| 2.7 J | 1080 | -1077.3 | 19 | 14 |
| 9.4 J1c | 1080 | -1070.6 | 19 | 15 |
| 3.3 J1c | 1080 | -1076.7 | 19 | 16 |
| | | | | |
| 8800 | 900 | 7900 | 20 | 16 |
| 7630 | 900 | 6730 | 21 | 16 |
| 5150 | 900 | 4250 | 22 | 16 |
| 5940 | 900 | 5040 | 23 | 16 |
| 1320 | 900 | 420 | 24 | 16 |
| 2950 | 900 | 2050 | 25 | 16 |
| 499 | 900 | -401 | 25 | 17 |
| 1060 | 900 | 160 | 26 | 17 |
| 766 | 900 | -134 | 26 | 18 |
| 684 | 900 | -216 | 26 | 19 |

| | | | | |
|---|---|---|---|---|
| 134 | 900 | -766 | 26 | 20 |
| 378 | 900 | -522 | 26 | 21 |
| 105 | 900 | -795 | 26 | 22 |
| 2.7 J | 900 | -897.3 | 26 | 23 |
| 9.4 J1c | 900 | -890.6 | 26 | 24 |
| 3.3 J1c | 900 | -896.7 | 26 | 25 |
| | | | | |
| 7630 | 8800 | -1170 | 26 | 26 |
| 5150 | 8800 | -3650 | 26 | 27 |
| 5940 | 8800 | -2860 | 26 | 28 |
| 1320 | 8800 | -7480 | 26 | 29 |
| 2950 | 8800 | -5850 | 26 | 30 |
| 499 | 8800 | -8301 | 26 | 31 |
| 1060 | 8800 | -7740 | 26 | 32 |
| 766 | 8800 | -8034 | 26 | 33 |
| 684 | 8800 | -8116 | 26 | 34 |
| 134 | 8800 | -8666 | 26 | 35 |
| 378 | 8800 | -8422 | 26 | 36 |
| 105 | 8800 | -8695 | 26 | 37 |
| 2.7 J | 8800 | -8797.3 | 26 | 38 |
| 9.4 J1c | 8800 | -8790.6 | 26 | 39 |
| 3.3 J1c | 8800 | -8796.7 | 26 | 40 |
| | | | | |
| 5150 | 7630 | -2480 | 26 | 41 |
| 5940 | 7630 | -1690 | 26 | 42 |
| 1320 | 7630 | -6310 | 26 | 43 |
| 2950 | 7630 | -4680 | 26 | 44 |
| 499 | 7630 | -7131 | 26 | 45 |
| 1060 | 7630 | -6570 | 26 | 46 |
| 766 | 7630 | -6864 | 26 | 47 |
| 684 | 7630 | -6946 | 26 | 48 |
| 134 | 7630 | -7496 | 26 | 49 |
| 378 | 7630 | -7252 | 26 | 50 |
| 105 | 7630 | -7525 | 26 | 51 |
| 2.7 J | 7630 | -7627.3 | 26 | 52 |
| 9.4 J1c | 7630 | -7620.6 | 26 | 53 |
| 3.3 J1c | 7630 | -7626.7 | 26 | 54 |
| | | | | |
| 5940 | 5150 | 790 | 27 | 54 |
| 1320 | 5150 | -3830 | 27 | 55 |
| 2950 | 5150 | -2200 | 27 | 56 |
| 499 | 5150 | -4651 | 27 | 57 |
| 1060 | 5150 | -4090 | 27 | 58 |
| 766 | 5150 | -4384 | 27 | 59 |
| 684 | 5150 | -4466 | 27 | 60 |
| 134 | 5150 | -5016 | 27 | 61 |
| 378 | 5150 | -4772 | 27 | 62 |
| 105 | 5150 | -5045 | 27 | 63 |
| 2.7 J | 5150 | -5147.3 | 27 | 64 |
| 9.4 J1c | 5150 | -5140.6 | 27 | 65 |
| 3.3 J1c | 5150 | -5146.7 | 27 | 66 |
| | | | | |
| 1320 | 5940 | -4620 | 27 | 67 |
| 2950 | 5940 | -2990 | 27 | 68 |
| 499 | 5940 | -5441 | 27 | 69 |
| 1060 | 5940 | -4880 | 27 | 70 |
| 766 | 5940 | -5174 | 27 | 71 |

| | | | | |
|---|---|---|---|---|
| 684 | 5940 | -5256 | 27 | 72 |
| 134 | 5940 | -5806 | 27 | 73 |
| 378 | 5940 | -5562 | 27 | 74 |
| 105 | 5940 | -5835 | 27 | 75 |
| 2.7 J | 5940 | -5937.3 | 27 | 76 |
| 9.4 J1c | 5940 | -5930.6 | 27 | 77 |
| 3.3 J1c | 5940 | -5936.7 | 27 | 78 |
| | | | | |
| 2950 | 1320 | 1630 | 28 | 78 |
| 499 | 1320 | -821 | 28 | 79 |
| 1060 | 1320 | -260 | 28 | 80 |
| 766 | 1320 | -554 | 28 | 81 |
| 684 | 1320 | -636 | 28 | 82 |
| 134 | 1320 | -1186 | 28 | 83 |
| 378 | 1320 | -942 | 28 | 84 |
| 105 | 1320 | -1215 | 28 | 85 |
| 2.7 J | 1320 | -1317.3 | 28 | 86 |
| 9.4 J1c | 1320 | -1310.6 | 28 | 87 |
| 3.3 J1c | 1320 | -1316.7 | 28 | 88 |
| | | | | |
| 499 | 2950 | -2451 | 28 | 89 |
| 1060 | 2950 | -1890 | 28 | 90 |
| 766 | 2950 | -2184 | 28 | 91 |
| 684 | 2950 | -2266 | 28 | 92 |
| 134 | 2950 | -2816 | 28 | 93 |
| 378 | 2950 | -2572 | 28 | 94 |
| 105 | 2950 | -2845 | 28 | 95 |
| 2.7 J | 2950 | -2947.3 | 28 | 96 |
| 9.4 J1c | 2950 | -2940.6 | 28 | 97 |
| 3.3 J1c | 2950 | -2946.7 | 28 | 98 |
| | | | | |
| 1060 | 499 | Same Date | 28 | 98 |
| 766 | 499 | 267 | 29 | 98 |
| 684 | 499 | 185 | 30 | 98 |
| 134 | 499 | -365 | 30 | 99 |
| 378 | 499 | -121 | 30 | 100 |
| 105 | 499 | -394 | 30 | 101 |
| 2.7 J | 499 | -496.3 | 30 | 102 |
| 9.4 J1c | 499 | -489.6 | 30 | 103 |
| 3.3 J1c | 499 | -495.7 | 30 | 104 |
| | | | | |
| 766 | 1060 | -294 | 30 | 105 |
| 684 | 1060 | -376 | 30 | 106 |
| 134 | 1060 | -926 | 30 | 107 |
| 378 | 1060 | -682 | 30 | 108 |
| 105 | 1060 | -955 | 30 | 109 |
| 2.7 J | 1060 | -1057.3 | 30 | 110 |
| 9.4 J1c | 1060 | -1050.6 | 30 | 111 |
| 3.3 J1c | 1060 | -1056.7 | 30 | 112 |
| | | | | |
| 684 | 766 | Same Date | 30 | 112 |
| 134 | 766 | -632 | 30 | 113 |
| 378 | 766 | -388 | 30 | 114 |
| 105 | 766 | -661 | 30 | 115 |
| 2.7 J | 766 | -763.3 | 30 | 116 |
| 9.4 J1c | 766 | -756.6 | 30 | 117 |
| 3.3 J1c | 766 | -762.7 | 30 | 118 |

| | | | | |
|---|---|---|---|---|
| 134 | 684 | -550 | 30 | 119 |
| 378 | 684 | -306 | 30 | 120 |
| 105 | 684 | -579 | 30 | 121 |
| 2.7 J | 684 | -681.3 | 30 | 122 |
| 9.4 J1c | 684 | -674.6 | 30 | 123 |
| 3.3 J1c | 684 | -680.7 | 30 | 124 |
| | | | | |
| 378 | 134 | 244 | 31 | 124 |
| 105 | 134 | -29 | 31 | 125 |
| 2.7 J | 134 | -131.3 | 31 | 126 |
| 9.4 J1c | 134 | -124.6 | 31 | 127 |
| 3.3 J1c | 134 | -130.7 | 31 | 128 |
| | | | | |
| 105 | 378 | -273 | 31 | 129 |
| 2.7 J | 378 | -375.3 | 31 | 130 |
| 9.4 J1c | 378 | -368.6 | 31 | 131 |
| 3.3 J1c | 378 | -374.7 | 31 | 132 |
| | | | | |
| 2.7 J | 105 | -102.3 | 31 | 133 |
| 9.4 J1c | 105 | -95.6 | 31 | 134 |
| 3.3 J1c | 105 | -101.7 | 31 | 135 |
| | | | | |
| 9.4 J1c | 2.7 J | 6.7 | 32 | 135 |
| 3.3 J1c | 2.7 J | 0.6 | 33 | 135 |
| | | | | |
| 3.3 J1c | 9.4 J1c | -6.1 | 33 | 136 |

S Statistic = 33 - 136 = -103

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |

There are 2 time periods with multiple data

A = 0
B = 36
C = 0
D = 0

E = 0
F = 4
a = 14706
b = 52326
c = 684
Group Variance = 815
Z-Score = -3.5729
Comparison Level at 95% confidence level = -1.65463 (downward trend)
**-3.5729 < -1.65463 indicating a downward trend**

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RW16-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 4320 | 3370 | 950 | 1 | 0 |
| 3350 | 3370 | -20 | 1 | 1 |
| 15800 | 3370 | 12430 | 2 | 1 |
| 25.6 | 3370 | -3344.4 | 2 | 2 |
| 26.2 | 3370 | -3343.8 | 2 | 3 |
| 48.6 | 3370 | -3321.4 | 2 | 4 |
| 27.7 | 3370 | -3342.3 | 2 | 5 |
| 31.2 | 3370 | -3338.8 | 2 | 6 |
| 25 | 3370 | -3345 | 2 | 7 |
| 35.9 | 3370 | -3334.1 | 2 | 8 |
| 30 | 3370 | -3340 | 2 | 9 |
| 7 J | 3370 | -3363 | 2 | 10 |
| 24 | 3370 | -3346 | 2 | 11 |
| 106 | 3370 | -3264 | 2 | 12 |
| 5.5 J | 3370 | -3364.5 | 2 | 13 |
| ND<5 U | 3370 | -3365 | 2 | 14 |
| 22.7 | 3370 | -3347.3 | 2 | 15 |
| ND<5 U | 3370 | -3365 | 2 | 16 |
| ND<5 U | 3370 | -3365 | 2 | 17 |
| 22.3 | 3370 | -3347.7 | 2 | 18 |
| 3.7 J1c | 3370 | -3366.3 | 2 | 19 |
| 3 J | 3370 | -3367 | 2 | 20 |
| ND<10 U | 3370 | -3360 | 2 | 21 |
| 10.39 | 3370 | -3359.61 | 2 | 22 |
| ND<5 U | 3370 | -3365 | 2 | 23 |
| | | | | |
| 3350 | 4320 | -970 | 2 | 24 |
| 15800 | 4320 | 11480 | 3 | 24 |
| 25.6 | 4320 | -4294.4 | 3 | 25 |
| 26.2 | 4320 | -4293.8 | 3 | 26 |
| 48.6 | 4320 | -4271.4 | 3 | 27 |
| 27.7 | 4320 | -4292.3 | 3 | 28 |
| 31.2 | 4320 | -4288.8 | 3 | 29 |
| 25 | 4320 | -4295 | 3 | 30 |
| 35.9 | 4320 | -4284.1 | 3 | 31 |
| 30 | 4320 | -4290 | 3 | 32 |
| 7 J | 4320 | -4313 | 3 | 33 |
| 24 | 4320 | -4296 | 3 | 34 |
| 106 | 4320 | -4214 | 3 | 35 |
| 5.5 J | 4320 | -4314.5 | 3 | 36 |
| ND<5 U | 4320 | -4315 | 3 | 37 |
| 22.7 | 4320 | -4297.3 | 3 | 38 |
| ND<5 U | 4320 | -4315 | 3 | 39 |
| ND<5 U | 4320 | -4315 | 3 | 40 |
| 22.3 | 4320 | -4297.7 | 3 | 41 |
| 3.7 J1c | 4320 | -4316.3 | 3 | 42 |
| 3 J | 4320 | -4317 | 3 | 43 |

| | | | | |
|---|---|---|---|---|
| ND<10 U | 4320 | -4310 | 3 | 44 |
| 10.39 | 4320 | -4309.61 | 3 | 45 |
| ND<5 U | 4320 | -4315 | 3 | 46 |
| | | | | |
| 15800 | 3350 | 12450 | 4 | 46 |
| 25.6 | 3350 | -3324.4 | 4 | 47 |
| 26.2 | 3350 | -3323.8 | 4 | 48 |
| 48.6 | 3350 | -3301.4 | 4 | 49 |
| 27.7 | 3350 | -3322.3 | 4 | 50 |
| 31.2 | 3350 | -3318.8 | 4 | 51 |
| 25 | 3350 | -3325 | 4 | 52 |
| 35.9 | 3350 | -3314.1 | 4 | 53 |
| 30 | 3350 | -3320 | 4 | 54 |
| 7 J | 3350 | -3343 | 4 | 55 |
| 24 | 3350 | -3326 | 4 | 56 |
| 106 | 3350 | -3244 | 4 | 57 |
| 5.5 J | 3350 | -3344.5 | 4 | 58 |
| ND<5 U | 3350 | -3345 | 4 | 59 |
| 22.7 | 3350 | -3327.3 | 4 | 60 |
| ND<5 U | 3350 | -3345 | 4 | 61 |
| ND<5 U | 3350 | -3345 | 4 | 62 |
| 22.3 | 3350 | -3327.7 | 4 | 63 |
| 3.7 J1c | 3350 | -3346.3 | 4 | 64 |
| 3 J | 3350 | -3347 | 4 | 65 |
| ND<10 U | 3350 | -3340 | 4 | 66 |
| 10.39 | 3350 | -3339.61 | 4 | 67 |
| ND<5 U | 3350 | -3345 | 4 | 68 |
| | | | | |
| 25.6 | 15800 | -15774.4 | 4 | 69 |
| 26.2 | 15800 | -15773.8 | 4 | 70 |
| 48.6 | 15800 | -15751.4 | 4 | 71 |
| 27.7 | 15800 | -15772.3 | 4 | 72 |
| 31.2 | 15800 | -15768.8 | 4 | 73 |
| 25 | 15800 | -15775 | 4 | 74 |
| 35.9 | 15800 | -15764.1 | 4 | 75 |
| 30 | 15800 | -15770 | 4 | 76 |
| 7 J | 15800 | -15793 | 4 | 77 |
| 24 | 15800 | -15776 | 4 | 78 |
| 106 | 15800 | -15694 | 4 | 79 |
| 5.5 J | 15800 | -15794.5 | 4 | 80 |
| ND<5 U | 15800 | -15795 | 4 | 81 |
| 22.7 | 15800 | -15777.3 | 4 | 82 |
| ND<5 U | 15800 | -15795 | 4 | 83 |
| ND<5 U | 15800 | -15795 | 4 | 84 |
| 22.3 | 15800 | -15777.7 | 4 | 85 |
| 3.7 J1c | 15800 | -15796.3 | 4 | 86 |
| 3 J | 15800 | -15797 | 4 | 87 |
| ND<10 U | 15800 | -15790 | 4 | 88 |
| 10.39 | 15800 | -15789.6 | 4 | 89 |
| ND<5 U | 15800 | -15795 | 4 | 90 |
| | | | | |
| 26.2 | 25.6 | 0.6 | 5 | 90 |
| 48.6 | 25.6 | 23 | 6 | 90 |
| 27.7 | 25.6 | 2.1 | 7 | 90 |
| 31.2 | 25.6 | 5.6 | 8 | 90 |
| 25 | 25.6 | -0.6 | 8 | 91 |
| 35.9 | 25.6 | 10.3 | 9 | 91 |

| | | | | |
|---|---|---|---|---|
| 30 | 25.6 | 4.4 | 10 | 91 |
| 7 J | 25.6 | -18.6 | 10 | 92 |
| 24 | 25.6 | -1.6 | 10 | 93 |
| 106 | 25.6 | 80.4 | 11 | 93 |
| 5.5 J | 25.6 | -20.1 | 11 | 94 |
| ND<5 U | 25.6 | -20.6 | 11 | 95 |
| 22.7 | 25.6 | -2.9 | 11 | 96 |
| ND<5 U | 25.6 | -20.6 | 11 | 97 |
| ND<5 U | 25.6 | -20.6 | 11 | 98 |
| 22.3 | 25.6 | -3.3 | 11 | 99 |
| 3.7 J1c | 25.6 | -21.9 | 11 | 100 |
| 3 J | 25.6 | -22.6 | 11 | 101 |
| ND<10 U | 25.6 | -15.6 | 11 | 102 |
| 10.39 | 25.6 | -15.21 | 11 | 103 |
| ND<5 U | 25.6 | -20.6 | 11 | 104 |
| | | | | |
| 48.6 | 26.2 | 22.4 | 12 | 104 |
| 27.7 | 26.2 | 1.5 | 13 | 104 |
| 31.2 | 26.2 | 5 | 14 | 104 |
| 25 | 26.2 | -1.2 | 14 | 105 |
| 35.9 | 26.2 | 9.7 | 15 | 105 |
| 30 | 26.2 | 3.8 | 16 | 105 |
| 7 J | 26.2 | -19.2 | 16 | 106 |
| 24 | 26.2 | -2.2 | 16 | 107 |
| 106 | 26.2 | 79.8 | 17 | 107 |
| 5.5 J | 26.2 | -20.7 | 17 | 108 |
| ND<5 U | 26.2 | -21.2 | 17 | 109 |
| 22.7 | 26.2 | -3.5 | 17 | 110 |
| ND<5 U | 26.2 | -21.2 | 17 | 111 |
| ND<5 U | 26.2 | -21.2 | 17 | 112 |
| 22.3 | 26.2 | -3.9 | 17 | 113 |
| 3.7 J1c | 26.2 | -22.5 | 17 | 114 |
| 3 J | 26.2 | -23.2 | 17 | 115 |
| ND<10 U | 26.2 | -16.2 | 17 | 116 |
| 10.39 | 26.2 | -15.81 | 17 | 117 |
| ND<5 U | 26.2 | -21.2 | 17 | 118 |
| | | | | |
| 27.7 | 48.6 | -20.9 | 17 | 119 |
| 31.2 | 48.6 | -17.4 | 17 | 120 |
| 25 | 48.6 | -23.6 | 17 | 121 |
| 35.9 | 48.6 | -12.7 | 17 | 122 |
| 30 | 48.6 | -18.6 | 17 | 123 |
| 7 J | 48.6 | -41.6 | 17 | 124 |
| 24 | 48.6 | -24.6 | 17 | 125 |
| 106 | 48.6 | 57.4 | 18 | 125 |
| 5.5 J | 48.6 | -43.1 | 18 | 126 |
| ND<5 U | 48.6 | -43.6 | 18 | 127 |
| 22.7 | 48.6 | -25.9 | 18 | 128 |
| ND<5 U | 48.6 | -43.6 | 18 | 129 |
| ND<5 U | 48.6 | -43.6 | 18 | 130 |
| 22.3 | 48.6 | -26.3 | 18 | 131 |
| 3.7 J1c | 48.6 | -44.9 | 18 | 132 |
| 3 J | 48.6 | -45.6 | 18 | 133 |
| ND<10 U | 48.6 | -38.6 | 18 | 134 |
| 10.39 | 48.6 | -38.21 | 18 | 135 |
| ND<5 U | 48.6 | -43.6 | 18 | 136 |

| | | | | |
|---|---|---|---|---|
| 31.2 | 27.7 | 3.5 | 19 | 136 |
| 25 | 27.7 | -2.7 | 19 | 137 |
| 35.9 | 27.7 | 8.2 | 20 | 137 |
| 30 | 27.7 | 2.3 | 21 | 137 |
| 7 J | 27.7 | -20.7 | 21 | 138 |
| 24 | 27.7 | -3.7 | 21 | 139 |
| 106 | 27.7 | 78.3 | 22 | 139 |
| 5.5 J | 27.7 | -22.2 | 22 | 140 |
| ND<5 U | 27.7 | -22.7 | 22 | 141 |
| 22.7 | 27.7 | -5 | 22 | 142 |
| ND<5 U | 27.7 | -22.7 | 22 | 143 |
| ND<5 U | 27.7 | -22.7 | 22 | 144 |
| 22.3 | 27.7 | -5.4 | 22 | 145 |
| 3.7 J1c | 27.7 | -24 | 22 | 146 |
| 3 J | 27.7 | -24.7 | 22 | 147 |
| ND<10 U | 27.7 | -17.7 | 22 | 148 |
| 10.39 | 27.7 | -17.31 | 22 | 149 |
| ND<5 U | 27.7 | -22.7 | 22 | 150 |
| | | | | |
| 25 | 31.2 | -6.2 | 22 | 151 |
| 35.9 | 31.2 | 4.7 | 23 | 151 |
| 30 | 31.2 | -1.2 | 23 | 152 |
| 7 J | 31.2 | -24.2 | 23 | 153 |
| 24 | 31.2 | -7.2 | 23 | 154 |
| 106 | 31.2 | 74.8 | 24 | 154 |
| 5.5 J | 31.2 | -25.7 | 24 | 155 |
| ND<5 U | 31.2 | -26.2 | 24 | 156 |
| 22.7 | 31.2 | -8.5 | 24 | 157 |
| ND<5 U | 31.2 | -26.2 | 24 | 158 |
| ND<5 U | 31.2 | -26.2 | 24 | 159 |
| 22.3 | 31.2 | -8.9 | 24 | 160 |
| 3.7 J1c | 31.2 | -27.5 | 24 | 161 |
| 3 J | 31.2 | -28.2 | 24 | 162 |
| ND<10 U | 31.2 | -21.2 | 24 | 163 |
| 10.39 | 31.2 | -20.81 | 24 | 164 |
| ND<5 U | 31.2 | -26.2 | 24 | 165 |
| | | | | |
| 35.9 | 25 | 10.9 | 25 | 165 |
| 30 | 25 | 5 | 26 | 165 |
| 7 J | 25 | -18 | 26 | 166 |
| 24 | 25 | -1 | 26 | 167 |
| 106 | 25 | 81 | 27 | 167 |
| 5.5 J | 25 | -19.5 | 27 | 168 |
| ND<5 U | 25 | -20 | 27 | 169 |
| 22.7 | 25 | -2.3 | 27 | 170 |
| ND<5 U | 25 | -20 | 27 | 171 |
| ND<5 U | 25 | -20 | 27 | 172 |
| 22.3 | 25 | -2.7 | 27 | 173 |
| 3.7 J1c | 25 | -21.3 | 27 | 174 |
| 3 J | 25 | -22 | 27 | 175 |
| ND<10 U | 25 | -15 | 27 | 176 |
| 10.39 | 25 | -14.61 | 27 | 177 |
| ND<5 U | 25 | -20 | 27 | 178 |
| | | | | |
| 30 | 35.9 | -5.9 | 27 | 179 |
| 7 J | 35.9 | -28.9 | 27 | 180 |
| 24 | 35.9 | -11.9 | 27 | 181 |

| | | | | |
|---|---|---|---|---|
| 106 | 35.9 | 70.1 | 28 | 181 |
| 5.5 J | 35.9 | -30.4 | 28 | 182 |
| ND<5 U | 35.9 | -30.9 | 28 | 183 |
| 22.7 | 35.9 | -13.2 | 28 | 184 |
| ND<5 U | 35.9 | -30.9 | 28 | 185 |
| ND<5 U | 35.9 | -30.9 | 28 | 186 |
| 22.3 | 35.9 | -13.6 | 28 | 187 |
| 3.7 J1c | 35.9 | -32.2 | 28 | 188 |
| 3 J | 35.9 | -32.9 | 28 | 189 |
| ND<10 U | 35.9 | -25.9 | 28 | 190 |
| 10.39 | 35.9 | -25.51 | 28 | 191 |
| ND<5 U | 35.9 | -30.9 | 28 | 192 |
| | | | | |
| 7 J | 30 | -23 | 28 | 193 |
| 24 | 30 | -6 | 28 | 194 |
| 106 | 30 | 76 | 29 | 194 |
| 5.5 J | 30 | -24.5 | 29 | 195 |
| ND<5 U | 30 | -25 | 29 | 196 |
| 22.7 | 30 | -7.3 | 29 | 197 |
| ND<5 U | 30 | -25 | 29 | 198 |
| ND<5 U | 30 | -25 | 29 | 199 |
| 22.3 | 30 | -7.7 | 29 | 200 |
| 3.7 J1c | 30 | -26.3 | 29 | 201 |
| 3 J | 30 | -27 | 29 | 202 |
| ND<10 U | 30 | -20 | 29 | 203 |
| 10.39 | 30 | -19.61 | 29 | 204 |
| ND<5 U | 30 | -25 | 29 | 205 |
| | | | | |
| 24 | 7 J | Same Date | 29 | 205 |
| 106 | 7 J | 99 | 30 | 205 |
| 5.5 J | 7 J | -1.5 | 30 | 206 |
| ND<5 U | 7 J | -2 | 30 | 207 |
| 22.7 | 7 J | 15.7 | 31 | 207 |
| ND<5 U | 7 J | -2 | 31 | 208 |
| ND<5 U | 7 J | -2 | 31 | 209 |
| 22.3 | 7 J | 15.3 | 32 | 209 |
| 3.7 J1c | 7 J | -3.3 | 32 | 210 |
| 3 J | 7 J | -4 | 32 | 211 |
| ND<10 U | 7 J | 3 | 33 | 211 |
| 10.39 | 7 J | 3.39 | 34 | 211 |
| ND<5 U | 7 J | -2 | 34 | 212 |
| | | | | |
| 106 | 24 | 82 | 35 | 212 |
| 5.5 J | 24 | -18.5 | 35 | 213 |
| ND<5 U | 24 | -19 | 35 | 214 |
| 22.7 | 24 | -1.3 | 35 | 215 |
| ND<5 U | 24 | -19 | 35 | 216 |
| ND<5 U | 24 | -19 | 35 | 217 |
| 22.3 | 24 | -1.7 | 35 | 218 |
| 3.7 J1c | 24 | -20.3 | 35 | 219 |
| 3 J | 24 | -21 | 35 | 220 |
| ND<10 U | 24 | -14 | 35 | 221 |
| 10.39 | 24 | -13.61 | 35 | 222 |
| ND<5 U | 24 | -19 | 35 | 223 |
| | | | | |
| 5.5 J | 106 | Same Date | 35 | 223 |
| ND<5 U | 106 | -101 | 35 | 224 |

| | | | | |
|---|---|---|---|---|
| 22.7 | 106 | -83.3 | 35 | 225 |
| ND<5 U | 106 | -101 | 35 | 226 |
| ND<5 U | 106 | -101 | 35 | 227 |
| 22.3 | 106 | -83.7 | 35 | 228 |
| 3.7 J1c | 106 | -102.3 | 35 | 229 |
| 3 J | 106 | -103 | 35 | 230 |
| ND<10 U | 106 | -96 | 35 | 231 |
| 10.39 | 106 | -95.61 | 35 | 232 |
| ND<5 U | 106 | -101 | 35 | 233 |
| | | | | |
| ND<5 U | 5.5 J | -0.5 | 35 | 234 |
| 22.7 | 5.5 J | 17.2 | 36 | 234 |
| ND<5 U | 5.5 J | -0.5 | 36 | 235 |
| ND<5 U | 5.5 J | -0.5 | 36 | 236 |
| 22.3 | 5.5 J | 16.8 | 37 | 236 |
| 3.7 J1c | 5.5 J | -1.8 | 37 | 237 |
| 3 J | 5.5 J | -2.5 | 37 | 238 |
| ND<10 U | 5.5 J | 4.5 | 38 | 238 |
| 10.39 | 5.5 J | 4.89 | 39 | 238 |
| ND<5 U | 5.5 J | -0.5 | 39 | 239 |
| | | | | |
| 22.7 | ND<5 U | 17.7 | 40 | 239 |
| ND<5 U | ND<5 U | 0 | 40 | 239 |
| ND<5 U | ND<5 U | 0 | 40 | 239 |
| 22.3 | ND<5 U | 17.3 | 41 | 239 |
| 3.7 J1c | ND<5 U | -1.3 | 41 | 240 |
| 3 J | ND<5 U | -2 | 41 | 241 |
| ND<10 U | ND<5 U | 5 | 42 | 241 |
| 10.39 | ND<5 U | 5.39 | 43 | 241 |
| ND<5 U | ND<5 U | 0 | 43 | 241 |
| | | | | |
| ND<5 U | 22.7 | -17.7 | 43 | 242 |
| ND<5 U | 22.7 | -17.7 | 43 | 243 |
| 22.3 | 22.7 | -0.4 | 43 | 244 |
| 3.7 J1c | 22.7 | -19 | 43 | 245 |
| 3 J | 22.7 | -19.7 | 43 | 246 |
| ND<10 U | 22.7 | -12.7 | 43 | 247 |
| 10.39 | 22.7 | -12.31 | 43 | 248 |
| ND<5 U | 22.7 | -17.7 | 43 | 249 |
| | | | | |
| ND<5 U | ND<5 U | 0 | 43 | 249 |
| 22.3 | ND<5 U | 17.3 | 44 | 249 |
| 3.7 J1c | ND<5 U | -1.3 | 44 | 250 |
| 3 J | ND<5 U | -2 | 44 | 251 |
| ND<10 U | ND<5 U | 5 | 45 | 251 |
| 10.39 | ND<5 U | 5.39 | 46 | 251 |
| ND<5 U | ND<5 U | 0 | 46 | 251 |
| | | | | |
| 22.3 | ND<5 U | 17.3 | 47 | 251 |
| 3.7 J1c | ND<5 U | -1.3 | 47 | 252 |
| 3 J | ND<5 U | -2 | 47 | 253 |
| ND<10 U | ND<5 U | 5 | 48 | 253 |
| 10.39 | ND<5 U | 5.39 | 49 | 253 |
| ND<5 U | ND<5 U | 0 | 49 | 253 |
| | | | | |
| 3.7 J1c | 22.3 | -18.6 | 49 | 254 |
| 3 J | 22.3 | -19.3 | 49 | 255 |

| | | | | |
|---|---|---|---|---|
| ND<10 U | 22.3 | -12.3 | 49 | 256 |
| 10.39 | 22.3 | -11.91 | 49 | 257 |
| ND<5 U | 22.3 | -17.3 | 49 | 258 |
| | | | | |
| 3 J | 3.7 J1c | -0.7 | 49 | 259 |
| ND<10 U | 3.7 J1c | 6.3 | 50 | 259 |
| 10.39 | 3.7 J1c | 6.69 | 51 | 259 |
| ND<5 U | 3.7 J1c | 1.3 | 52 | 259 |
| | | | | |
| ND<10 U | 3 J | 7 | 53 | 259 |
| 10.39 | 3 J | 7.39 | 54 | 259 |
| ND<5 U | 3 J | 2 | 55 | 259 |
| | | | | |
| 10.39 | ND<10 U | 0.39 | 56 | 259 |
| ND<5 U | ND<10 U | -5 | 56 | 260 |
| | | | | |
| ND<5 U | 10.39 | -5.39 | 56 | 261 |

S Statistic = 56 - 261 = -205

| Tied Group | Value | Members |
|---|---|---|
| 1 | 5 | 4 |

| Time Period | Observations |
|---|---|
| 2/1/2017 | 1 |
| 3/1/2017 | 1 |
| 4/1/2017 | 1 |
| 5/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 3/1/2022 | 1 |
| 3/1/2023 | 1 |
| 3/1/2024 | 1 |

There are 2 time periods with multiple data

A = 156
B = 36
C = 24
D = 0
E = 12
F = 4

a = 37050
b = 140400
c = 1300
Group Variance = 2047.7
Z-Score = -4.50813
Comparison Level at 95% confidence level = -1.65463 (downward trend)
**-4.50813 < -1.65463 indicating a downward trend**

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RW18-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 13300 | 25500 | -12200 | 0 | 1 |
| 964 | 25500 | -24536 | 0 | 2 |
| 6160 | 25500 | -19340 | 0 | 3 |
| 14500 | 25500 | -11000 | 0 | 4 |
| 10700 | 25500 | -14800 | 0 | 5 |
| 23400 | 25500 | -2100 | 0 | 6 |
| 11600 | 25500 | -13900 | 0 | 7 |
| 25900 | 25500 | 400 | 1 | 7 |
| 439 | 25500 | -25061 | 1 | 8 |
| 44.9 | 25500 | -25455.1 | 1 | 9 |
| 88.7 | 25500 | -25411.3 | 1 | 10 |
| 30 | 25500 | -25470 | 1 | 11 |
| 16.9 | 25500 | -25483.1 | 1 | 12 |
| 25.6 | 25500 | -25474.4 | 1 | 13 |
| 4.3 JB | 25500 | -25495.7 | 1 | 14 |
| 15.2 D6 | 25500 | -25484.8 | 1 | 15 |
| 4.2 J | 25500 | -25495.8 | 1 | 16 |
| 4.2 J | 25500 | -25495.8 | 1 | 17 |
| 22.7 1c | 25500 | -25477.3 | 1 | 18 |
| 3.3 J1c | 25500 | -25496.7 | 1 | 19 |
| 20.1 | 25500 | -25479.9 | 1 | 20 |
| ND<100 U | 25500 | -25400 | 1 | 21 |
| 12.57 | 25500 | -25487.4 | 1 | 22 |
| 19.99 | 25500 | -25480 | 1 | 23 |
| | | | | |
| 964 | 13300 | -12336 | 1 | 24 |
| 6160 | 13300 | -7140 | 1 | 25 |
| 14500 | 13300 | 1200 | 2 | 25 |
| 10700 | 13300 | -2600 | 2 | 26 |
| 23400 | 13300 | 10100 | 3 | 26 |
| 11600 | 13300 | -1700 | 3 | 27 |
| 25900 | 13300 | 12600 | 4 | 27 |
| 439 | 13300 | -12861 | 4 | 28 |
| 44.9 | 13300 | -13255.1 | 4 | 29 |
| 88.7 | 13300 | -13211.3 | 4 | 30 |
| 30 | 13300 | -13270 | 4 | 31 |
| 16.9 | 13300 | -13283.1 | 4 | 32 |
| 25.6 | 13300 | -13274.4 | 4 | 33 |
| 4.3 JB | 13300 | -13295.7 | 4 | 34 |
| 15.2 D6 | 13300 | -13284.8 | 4 | 35 |
| 4.2 J | 13300 | -13295.8 | 4 | 36 |
| 4.2 J | 13300 | -13295.8 | 4 | 37 |
| 22.7 1c | 13300 | -13277.3 | 4 | 38 |
| 3.3 J1c | 13300 | -13296.7 | 4 | 39 |
| 20.1 | 13300 | -13279.9 | 4 | 40 |
| ND<100 U | 13300 | -13200 | 4 | 41 |
| 12.57 | 13300 | -13287.4 | 4 | 42 |

| | | | | |
|---|---|---|---|---|
| 19.99 | 13300 | -13280 | 4 | 43 |
| | | | | |
| 6160 | 964 | 5196 | 5 | 43 |
| 14500 | 964 | 13536 | 6 | 43 |
| 10700 | 964 | 9736 | 7 | 43 |
| 23400 | 964 | 22436 | 8 | 43 |
| 11600 | 964 | 10636 | 9 | 43 |
| 25900 | 964 | 24936 | 10 | 43 |
| 439 | 964 | -525 | 10 | 44 |
| 44.9 | 964 | -919.1 | 10 | 45 |
| 88.7 | 964 | -875.3 | 10 | 46 |
| 30 | 964 | -934 | 10 | 47 |
| 16.9 | 964 | -947.1 | 10 | 48 |
| 25.6 | 964 | -938.4 | 10 | 49 |
| 4.3 JB | 964 | -959.7 | 10 | 50 |
| 15.2 D6 | 964 | -948.8 | 10 | 51 |
| 4.2 J | 964 | -959.8 | 10 | 52 |
| 4.2 J | 964 | -959.8 | 10 | 53 |
| 22.7 1c | 964 | -941.3 | 10 | 54 |
| 3.3 J1c | 964 | -960.7 | 10 | 55 |
| 20.1 | 964 | -943.9 | 10 | 56 |
| ND<100 U | 964 | -864 | 10 | 57 |
| 12.57 | 964 | -951.43 | 10 | 58 |
| 19.99 | 964 | -944.01 | 10 | 59 |
| | | | | |
| 14500 | 6160 | 8340 | 11 | 59 |
| 10700 | 6160 | 4540 | 12 | 59 |
| 23400 | 6160 | 17240 | 13 | 59 |
| 11600 | 6160 | 5440 | 14 | 59 |
| 25900 | 6160 | 19740 | 15 | 59 |
| 439 | 6160 | -5721 | 15 | 60 |
| 44.9 | 6160 | -6115.1 | 15 | 61 |
| 88.7 | 6160 | -6071.3 | 15 | 62 |
| 30 | 6160 | -6130 | 15 | 63 |
| 16.9 | 6160 | -6143.1 | 15 | 64 |
| 25.6 | 6160 | -6134.4 | 15 | 65 |
| 4.3 JB | 6160 | -6155.7 | 15 | 66 |
| 15.2 D6 | 6160 | -6144.8 | 15 | 67 |
| 4.2 J | 6160 | -6155.8 | 15 | 68 |
| 4.2 J | 6160 | -6155.8 | 15 | 69 |
| 22.7 1c | 6160 | -6137.3 | 15 | 70 |
| 3.3 J1c | 6160 | -6156.7 | 15 | 71 |
| 20.1 | 6160 | -6139.9 | 15 | 72 |
| ND<100 U | 6160 | -6060 | 15 | 73 |
| 12.57 | 6160 | -6147.43 | 15 | 74 |
| 19.99 | 6160 | -6140.01 | 15 | 75 |
| | | | | |
| 10700 | 14500 | -3800 | 15 | 76 |
| 23400 | 14500 | 8900 | 16 | 76 |
| 11600 | 14500 | -2900 | 16 | 77 |
| 25900 | 14500 | 11400 | 17 | 77 |
| 439 | 14500 | -14061 | 17 | 78 |
| 44.9 | 14500 | -14455.1 | 17 | 79 |
| 88.7 | 14500 | -14411.3 | 17 | 80 |
| 30 | 14500 | -14470 | 17 | 81 |
| 16.9 | 14500 | -14483.1 | 17 | 82 |
| 25.6 | 14500 | -14474.4 | 17 | 83 |

| | | | | |
|---|---|---|---|---|
| 4.3 JB | 14500 | -14495.7 | 17 | 84 |
| 15.2 D6 | 14500 | -14484.8 | 17 | 85 |
| 4.2 J | 14500 | -14495.8 | 17 | 86 |
| 4.2 J | 14500 | -14495.8 | 17 | 87 |
| 22.7 1c | 14500 | -14477.3 | 17 | 88 |
| 3.3 J1c | 14500 | -14496.7 | 17 | 89 |
| 20.1 | 14500 | -14479.9 | 17 | 90 |
| ND<100 U | 14500 | -14400 | 17 | 91 |
| 12.57 | 14500 | -14487.4 | 17 | 92 |
| 19.99 | 14500 | -14480 | 17 | 93 |
| | | | | |
| 23400 | 10700 | 12700 | 18 | 93 |
| 11600 | 10700 | 900 | 19 | 93 |
| 25900 | 10700 | 15200 | 20 | 93 |
| 439 | 10700 | -10261 | 20 | 94 |
| 44.9 | 10700 | -10655.1 | 20 | 95 |
| 88.7 | 10700 | -10611.3 | 20 | 96 |
| 30 | 10700 | -10670 | 20 | 97 |
| 16.9 | 10700 | -10683.1 | 20 | 98 |
| 25.6 | 10700 | -10674.4 | 20 | 99 |
| 4.3 JB | 10700 | -10695.7 | 20 | 100 |
| 15.2 D6 | 10700 | -10684.8 | 20 | 101 |
| 4.2 J | 10700 | -10695.8 | 20 | 102 |
| 4.2 J | 10700 | -10695.8 | 20 | 103 |
| 22.7 1c | 10700 | -10677.3 | 20 | 104 |
| 3.3 J1c | 10700 | -10696.7 | 20 | 105 |
| 20.1 | 10700 | -10679.9 | 20 | 106 |
| ND<100 U | 10700 | -10600 | 20 | 107 |
| 12.57 | 10700 | -10687.4 | 20 | 108 |
| 19.99 | 10700 | -10680 | 20 | 109 |
| | | | | |
| 11600 | 23400 | -11800 | 20 | 110 |
| 25900 | 23400 | 2500 | 21 | 110 |
| 439 | 23400 | -22961 | 21 | 111 |
| 44.9 | 23400 | -23355.1 | 21 | 112 |
| 88.7 | 23400 | -23311.3 | 21 | 113 |
| 30 | 23400 | -23370 | 21 | 114 |
| 16.9 | 23400 | -23383.1 | 21 | 115 |
| 25.6 | 23400 | -23374.4 | 21 | 116 |
| 4.3 JB | 23400 | -23395.7 | 21 | 117 |
| 15.2 D6 | 23400 | -23384.8 | 21 | 118 |
| 4.2 J | 23400 | -23395.8 | 21 | 119 |
| 4.2 J | 23400 | -23395.8 | 21 | 120 |
| 22.7 1c | 23400 | -23377.3 | 21 | 121 |
| 3.3 J1c | 23400 | -23396.7 | 21 | 122 |
| 20.1 | 23400 | -23379.9 | 21 | 123 |
| ND<100 U | 23400 | -23300 | 21 | 124 |
| 12.57 | 23400 | -23387.4 | 21 | 125 |
| 19.99 | 23400 | -23380 | 21 | 126 |
| | | | | |
| 25900 | 11600 | 14300 | 22 | 126 |
| 439 | 11600 | -11161 | 22 | 127 |
| 44.9 | 11600 | -11555.1 | 22 | 128 |
| 88.7 | 11600 | -11511.3 | 22 | 129 |
| 30 | 11600 | -11570 | 22 | 130 |
| 16.9 | 11600 | -11583.1 | 22 | 131 |
| 25.6 | 11600 | -11574.4 | 22 | 132 |

| | | | | |
|---|---|---|---|---|
| 4.3 JB | 11600 | -11595.7 | 22 | 133 |
| 15.2 D6 | 11600 | -11584.8 | 22 | 134 |
| 4.2 J | 11600 | -11595.8 | 22 | 135 |
| 4.2 J | 11600 | -11595.8 | 22 | 136 |
| 22.7 1c | 11600 | -11577.3 | 22 | 137 |
| 3.3 J1c | 11600 | -11596.7 | 22 | 138 |
| 20.1 | 11600 | -11579.9 | 22 | 139 |
| ND<100 U | 11600 | -11500 | 22 | 140 |
| 12.57 | 11600 | -11587.4 | 22 | 141 |
| 19.99 | 11600 | -11580 | 22 | 142 |
| | | | | |
| 439 | 25900 | -25461 | 22 | 143 |
| 44.9 | 25900 | -25855.1 | 22 | 144 |
| 88.7 | 25900 | -25811.3 | 22 | 145 |
| 30 | 25900 | -25870 | 22 | 146 |
| 16.9 | 25900 | -25883.1 | 22 | 147 |
| 25.6 | 25900 | -25874.4 | 22 | 148 |
| 4.3 JB | 25900 | -25895.7 | 22 | 149 |
| 15.2 D6 | 25900 | -25884.8 | 22 | 150 |
| 4.2 J | 25900 | -25895.8 | 22 | 151 |
| 4.2 J | 25900 | -25895.8 | 22 | 152 |
| 22.7 1c | 25900 | -25877.3 | 22 | 153 |
| 3.3 J1c | 25900 | -25896.7 | 22 | 154 |
| 20.1 | 25900 | -25879.9 | 22 | 155 |
| ND<100 U | 25900 | -25800 | 22 | 156 |
| 12.57 | 25900 | -25887.4 | 22 | 157 |
| 19.99 | 25900 | -25880 | 22 | 158 |
| | | | | |
| 44.9 | 439 | -394.1 | 22 | 159 |
| 88.7 | 439 | -350.3 | 22 | 160 |
| 30 | 439 | -409 | 22 | 161 |
| 16.9 | 439 | -422.1 | 22 | 162 |
| 25.6 | 439 | -413.4 | 22 | 163 |
| 4.3 JB | 439 | -434.7 | 22 | 164 |
| 15.2 D6 | 439 | -423.8 | 22 | 165 |
| 4.2 J | 439 | -434.8 | 22 | 166 |
| 4.2 J | 439 | -434.8 | 22 | 167 |
| 22.7 1c | 439 | -416.3 | 22 | 168 |
| 3.3 J1c | 439 | -435.7 | 22 | 169 |
| 20.1 | 439 | -418.9 | 22 | 170 |
| ND<100 U | 439 | -339 | 22 | 171 |
| 12.57 | 439 | -426.43 | 22 | 172 |
| 19.99 | 439 | -419.01 | 22 | 173 |
| | | | | |
| 88.7 | 44.9 | 43.8 | 23 | 173 |
| 30 | 44.9 | -14.9 | 23 | 174 |
| 16.9 | 44.9 | -28 | 23 | 175 |
| 25.6 | 44.9 | -19.3 | 23 | 176 |
| 4.3 JB | 44.9 | -40.6 | 23 | 177 |
| 15.2 D6 | 44.9 | -29.7 | 23 | 178 |
| 4.2 J | 44.9 | -40.7 | 23 | 179 |
| 4.2 J | 44.9 | -40.7 | 23 | 180 |
| 22.7 1c | 44.9 | -22.2 | 23 | 181 |
| 3.3 J1c | 44.9 | -41.6 | 23 | 182 |
| 20.1 | 44.9 | -24.8 | 23 | 183 |
| ND<100 U | 44.9 | 55.1 | 24 | 183 |
| 12.57 | 44.9 | -32.33 | 24 | 184 |

| | | | | |
|---|---|---|---|---|
| 19.99 | 44.9 | -24.91 | 24 | 185 |
| | | | | |
| 30 | 88.7 | Same Date | 24 | 185 |
| 16.9 | 88.7 | -71.8 | 24 | 186 |
| 25.6 | 88.7 | -63.1 | 24 | 187 |
| 4.3 JB | 88.7 | -84.4 | 24 | 188 |
| 15.2 D6 | 88.7 | -73.5 | 24 | 189 |
| 4.2 J | 88.7 | -84.5 | 24 | 190 |
| 4.2 J | 88.7 | -84.5 | 24 | 191 |
| 22.7 1c | 88.7 | -66 | 24 | 192 |
| 3.3 J1c | 88.7 | -85.4 | 24 | 193 |
| 20.1 | 88.7 | -68.6 | 24 | 194 |
| ND<100 U | 88.7 | 11.3 | 25 | 194 |
| 12.57 | 88.7 | -76.13 | 25 | 195 |
| 19.99 | 88.7 | -68.71 | 25 | 196 |
| | | | | |
| 16.9 | 30 | -13.1 | 25 | 197 |
| 25.6 | 30 | -4.4 | 25 | 198 |
| 4.3 JB | 30 | -25.7 | 25 | 199 |
| 15.2 D6 | 30 | -14.8 | 25 | 200 |
| 4.2 J | 30 | -25.8 | 25 | 201 |
| 4.2 J | 30 | -25.8 | 25 | 202 |
| 22.7 1c | 30 | -7.3 | 25 | 203 |
| 3.3 J1c | 30 | -26.7 | 25 | 204 |
| 20.1 | 30 | -9.9 | 25 | 205 |
| ND<100 U | 30 | 70 | 26 | 205 |
| 12.57 | 30 | -17.43 | 26 | 206 |
| 19.99 | 30 | -10.01 | 26 | 207 |
| | | | | |
| 25.6 | 16.9 | Same Date | 26 | 207 |
| 4.3 JB | 16.9 | -12.6 | 26 | 208 |
| 15.2 D6 | 16.9 | -1.7 | 26 | 209 |
| 4.2 J | 16.9 | -12.7 | 26 | 210 |
| 4.2 J | 16.9 | -12.7 | 26 | 211 |
| 22.7 1c | 16.9 | 5.8 | 27 | 211 |
| 3.3 J1c | 16.9 | -13.6 | 27 | 212 |
| 20.1 | 16.9 | 3.2 | 28 | 212 |
| ND<100 U | 16.9 | 83.1 | 29 | 212 |
| 12.57 | 16.9 | -4.33 | 29 | 213 |
| 19.99 | 16.9 | 3.09 | 30 | 213 |
| | | | | |
| 4.3 JB | 25.6 | -21.3 | 30 | 214 |
| 15.2 D6 | 25.6 | -10.4 | 30 | 215 |
| 4.2 J | 25.6 | -21.4 | 30 | 216 |
| 4.2 J | 25.6 | -21.4 | 30 | 217 |
| 22.7 1c | 25.6 | -2.9 | 30 | 218 |
| 3.3 J1c | 25.6 | -22.3 | 30 | 219 |
| 20.1 | 25.6 | -5.5 | 30 | 220 |
| ND<100 U | 25.6 | 74.4 | 31 | 220 |
| 12.57 | 25.6 | -13.03 | 31 | 221 |
| 19.99 | 25.6 | -5.61 | 31 | 222 |
| | | | | |
| 15.2 D6 | 4.3 JB | 10.9 | 32 | 222 |
| 4.2 J | 4.3 JB | -0.1 | 32 | 223 |
| 4.2 J | 4.3 JB | -0.1 | 32 | 224 |
| 22.7 1c | 4.3 JB | 18.4 | 33 | 224 |
| 3.3 J1c | 4.3 JB | -1 | 33 | 225 |

| | | | | |
|---|---|---|---|---|
| 20.1 | 4.3 JB | 15.8 | 34 | 225 |
| ND<100 U | 4.3 JB | 95.7 | 35 | 225 |
| 12.57 | 4.3 JB | 8.27 | 36 | 225 |
| 19.99 | 4.3 JB | 15.69 | 37 | 225 |
| | | | | |
| 4.2 J | 15.2 D6 | -11 | 37 | 226 |
| 4.2 J | 15.2 D6 | -11 | 37 | 227 |
| 22.7 1c | 15.2 D6 | 7.5 | 38 | 227 |
| 3.3 J1c | 15.2 D6 | -11.9 | 38 | 228 |
| 20.1 | 15.2 D6 | 4.9 | 39 | 228 |
| ND<100 U | 15.2 D6 | 84.8 | 40 | 228 |
| 12.57 | 15.2 D6 | -2.63 | 40 | 229 |
| 19.99 | 15.2 D6 | 4.79 | 41 | 229 |
| | | | | |
| 4.2 J | 4.2 J | 0 | 41 | 229 |
| 22.7 1c | 4.2 J | 18.5 | 42 | 229 |
| 3.3 J1c | 4.2 J | -0.9 | 42 | 230 |
| 20.1 | 4.2 J | 15.9 | 43 | 230 |
| ND<100 U | 4.2 J | 95.8 | 44 | 230 |
| 12.57 | 4.2 J | 8.37 | 45 | 230 |
| 19.99 | 4.2 J | 15.79 | 46 | 230 |
| | | | | |
| 22.7 1c | 4.2 J | 18.5 | 47 | 230 |
| 3.3 J1c | 4.2 J | -0.9 | 47 | 231 |
| 20.1 | 4.2 J | 15.9 | 48 | 231 |
| ND<100 U | 4.2 J | 95.8 | 49 | 231 |
| 12.57 | 4.2 J | 8.37 | 50 | 231 |
| 19.99 | 4.2 J | 15.79 | 51 | 231 |
| | | | | |
| 3.3 J1c | 22.7 1c | -19.4 | 51 | 232 |
| 20.1 | 22.7 1c | -2.6 | 51 | 233 |
| ND<100 U | 22.7 1c | 77.3 | 52 | 233 |
| 12.57 | 22.7 1c | -10.13 | 52 | 234 |
| 19.99 | 22.7 1c | -2.71 | 52 | 235 |
| | | | | |
| 20.1 | 3.3 J1c | 16.8 | 53 | 235 |
| ND<100 U | 3.3 J1c | 96.7 | 54 | 235 |
| 12.57 | 3.3 J1c | 9.27 | 55 | 235 |
| 19.99 | 3.3 J1c | 16.69 | 56 | 235 |
| | | | | |
| ND<100 U | 20.1 | 79.9 | 57 | 235 |
| 12.57 | 20.1 | -7.53 | 57 | 236 |
| 19.99 | 20.1 | -0.11 | 57 | 237 |
| | | | | |
| 12.57 | ND<100 U | -87.43 | 57 | 238 |
| 19.99 | ND<100 U | -80.01 | 57 | 239 |
| | | | | |
| 19.99 | 12.57 | 7.42 | 58 | 239 |

S Statistic = 58 - 239 = -181

| Tied Group | Value | Members |
|---|---|---|
| 1 | 4.2 | 2 |

| Time Period | Observations |
|---|---|
| 6/1/2017 | 1 |

| | |
|---|---|
| 7/1/2017 | 1 |
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 3/1/2022 | 1 |
| 3/1/2023 | 1 |
| 3/1/2024 | 1 |

There are 2 time periods with multiple data

---

A = 18
B = 36
C = 0
D = 0
E = 2
F = 4
a = 33000
b = 124200
c = 1200
Group Variance = 1830.34
Z-Score = -4.20733
Comparison Level at 95% confidence level = -1.65463 (downward trend)
**-4.20733 < -1.65463 indicating a downward trend**

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RW19-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 7100 | 10100 | -3000 | 0 | 1 |
| 6260 | 10100 | -3840 | 0 | 2 |
| 4860 | 10100 | -5240 | 0 | 3 |
| 3720 | 10100 | -6380 | 0 | 4 |
| 3700 | 10100 | -6400 | 0 | 5 |
| 3360 | 10100 | -6740 | 0 | 6 |
| 2990 | 10100 | -7110 | 0 | 7 |
| 18700 ML | 10100 | 8600 | 1 | 7 |
| 2730 | 10100 | -7370 | 1 | 8 |
| 3380 | 10100 | -6720 | 1 | 9 |
| 10200 | 10100 | 100 | 2 | 9 |
| 7060 | 10100 | -3040 | 2 | 10 |
| 10100 | 10100 | 0 | 2 | 10 |
| 10500 | 10100 | 400 | 3 | 10 |
| 5210 | 10100 | -4890 | 3 | 11 |
| 4680 | 10100 | -5420 | 3 | 12 |
| 3180 | 10100 | -6920 | 3 | 13 |
| 3150 | 10100 | -6950 | 3 | 14 |
| 2260 | 10100 | -7840 | 3 | 15 |
| 2640 | 10100 | -7460 | 3 | 16 |
| 5300 | 10100 | -4800 | 3 | 17 |
| 2710 | 10100 | -7390 | 3 | 18 |
| 22600 | 10100 | 12500 | 4 | 18 |
| 6190 | 10100 | -3910 | 4 | 19 |
| | | | | |
| 6260 | 7100 | -840 | 4 | 20 |
| 4860 | 7100 | -2240 | 4 | 21 |
| 3720 | 7100 | -3380 | 4 | 22 |
| 3700 | 7100 | -3400 | 4 | 23 |
| 3360 | 7100 | -3740 | 4 | 24 |
| 2990 | 7100 | -4110 | 4 | 25 |
| 18700 ML | 7100 | 11600 | 5 | 25 |
| 2730 | 7100 | -4370 | 5 | 26 |
| 3380 | 7100 | -3720 | 5 | 27 |
| 10200 | 7100 | 3100 | 6 | 27 |
| 7060 | 7100 | -40 | 6 | 28 |
| 10100 | 7100 | 3000 | 7 | 28 |
| 10500 | 7100 | 3400 | 8 | 28 |
| 5210 | 7100 | -1890 | 8 | 29 |
| 4680 | 7100 | -2420 | 8 | 30 |
| 3180 | 7100 | -3920 | 8 | 31 |
| 3150 | 7100 | -3950 | 8 | 32 |
| 2260 | 7100 | -4840 | 8 | 33 |
| 2640 | 7100 | -4460 | 8 | 34 |
| 5300 | 7100 | -1800 | 8 | 35 |
| 2710 | 7100 | -4390 | 8 | 36 |
| 22600 | 7100 | 15500 | 9 | 36 |

| | | | | |
|---|---|---|---|---|
| 6190 | 7100 | -910 | 9 | 37 |
| | | | | |
| 4860 | 6260 | -1400 | 9 | 38 |
| 3720 | 6260 | -2540 | 9 | 39 |
| 3700 | 6260 | -2560 | 9 | 40 |
| 3360 | 6260 | -2900 | 9 | 41 |
| 2990 | 6260 | -3270 | 9 | 42 |
| 18700 ML | 6260 | 12440 | 10 | 42 |
| 2730 | 6260 | -3530 | 10 | 43 |
| 3380 | 6260 | -2880 | 10 | 44 |
| 10200 | 6260 | 3940 | 11 | 44 |
| 7060 | 6260 | 800 | 12 | 44 |
| 10100 | 6260 | 3840 | 13 | 44 |
| 10500 | 6260 | 4240 | 14 | 44 |
| 5210 | 6260 | -1050 | 14 | 45 |
| 4680 | 6260 | -1580 | 14 | 46 |
| 3180 | 6260 | -3080 | 14 | 47 |
| 3150 | 6260 | -3110 | 14 | 48 |
| 2260 | 6260 | -4000 | 14 | 49 |
| 2640 | 6260 | -3620 | 14 | 50 |
| 5300 | 6260 | -960 | 14 | 51 |
| 2710 | 6260 | -3550 | 14 | 52 |
| 22600 | 6260 | 16340 | 15 | 52 |
| 6190 | 6260 | -70 | 15 | 53 |
| | | | | |
| 3720 | 4860 | -1140 | 15 | 54 |
| 3700 | 4860 | -1160 | 15 | 55 |
| 3360 | 4860 | -1500 | 15 | 56 |
| 2990 | 4860 | -1870 | 15 | 57 |
| 18700 ML | 4860 | 13840 | 16 | 57 |
| 2730 | 4860 | -2130 | 16 | 58 |
| 3380 | 4860 | -1480 | 16 | 59 |
| 10200 | 4860 | 5340 | 17 | 59 |
| 7060 | 4860 | 2200 | 18 | 59 |
| 10100 | 4860 | 5240 | 19 | 59 |
| 10500 | 4860 | 5640 | 20 | 59 |
| 5210 | 4860 | 350 | 21 | 59 |
| 4680 | 4860 | -180 | 21 | 60 |
| 3180 | 4860 | -1680 | 21 | 61 |
| 3150 | 4860 | -1710 | 21 | 62 |
| 2260 | 4860 | -2600 | 21 | 63 |
| 2640 | 4860 | -2220 | 21 | 64 |
| 5300 | 4860 | 440 | 22 | 64 |
| 2710 | 4860 | -2150 | 22 | 65 |
| 22600 | 4860 | 17740 | 23 | 65 |
| 6190 | 4860 | 1330 | 24 | 65 |
| | | | | |
| 3700 | 3720 | -20 | 24 | 66 |
| 3360 | 3720 | -360 | 24 | 67 |
| 2990 | 3720 | -730 | 24 | 68 |
| 18700 ML | 3720 | 14980 | 25 | 68 |
| 2730 | 3720 | -990 | 25 | 69 |
| 3380 | 3720 | -340 | 25 | 70 |
| 10200 | 3720 | 6480 | 26 | 70 |
| 7060 | 3720 | 3340 | 27 | 70 |
| 10100 | 3720 | 6380 | 28 | 70 |
| 10500 | 3720 | 6780 | 29 | 70 |

| | | | | |
|---|---|---|---|---|
| 5210 | 3720 | 1490 | 30 | 70 |
| 4680 | 3720 | 960 | 31 | 70 |
| 3180 | 3720 | -540 | 31 | 71 |
| 3150 | 3720 | -570 | 31 | 72 |
| 2260 | 3720 | -1460 | 31 | 73 |
| 2640 | 3720 | -1080 | 31 | 74 |
| 5300 | 3720 | 1580 | 32 | 74 |
| 2710 | 3720 | -1010 | 32 | 75 |
| 22600 | 3720 | 18880 | 33 | 75 |
| 6190 | 3720 | 2470 | 34 | 75 |
| | | | | |
| 3360 | 3700 | -340 | 34 | 76 |
| 2990 | 3700 | -710 | 34 | 77 |
| 18700 ML | 3700 | 15000 | 35 | 77 |
| 2730 | 3700 | -970 | 35 | 78 |
| 3380 | 3700 | -320 | 35 | 79 |
| 10200 | 3700 | 6500 | 36 | 79 |
| 7060 | 3700 | 3360 | 37 | 79 |
| 10100 | 3700 | 6400 | 38 | 79 |
| 10500 | 3700 | 6800 | 39 | 79 |
| 5210 | 3700 | 1510 | 40 | 79 |
| 4680 | 3700 | 980 | 41 | 79 |
| 3180 | 3700 | -520 | 41 | 80 |
| 3150 | 3700 | -550 | 41 | 81 |
| 2260 | 3700 | -1440 | 41 | 82 |
| 2640 | 3700 | -1060 | 41 | 83 |
| 5300 | 3700 | 1600 | 42 | 83 |
| 2710 | 3700 | -990 | 42 | 84 |
| 22600 | 3700 | 18900 | 43 | 84 |
| 6190 | 3700 | 2490 | 44 | 84 |
| | | | | |
| 2990 | 3360 | -370 | 44 | 85 |
| 18700 ML | 3360 | 15340 | 45 | 85 |
| 2730 | 3360 | -630 | 45 | 86 |
| 3380 | 3360 | 20 | 46 | 86 |
| 10200 | 3360 | 6840 | 47 | 86 |
| 7060 | 3360 | 3700 | 48 | 86 |
| 10100 | 3360 | 6740 | 49 | 86 |
| 10500 | 3360 | 7140 | 50 | 86 |
| 5210 | 3360 | 1850 | 51 | 86 |
| 4680 | 3360 | 1320 | 52 | 86 |
| 3180 | 3360 | -180 | 52 | 87 |
| 3150 | 3360 | -210 | 52 | 88 |
| 2260 | 3360 | -1100 | 52 | 89 |
| 2640 | 3360 | -720 | 52 | 90 |
| 5300 | 3360 | 1940 | 53 | 90 |
| 2710 | 3360 | -650 | 53 | 91 |
| 22600 | 3360 | 19240 | 54 | 91 |
| 6190 | 3360 | 2830 | 55 | 91 |
| | | | | |
| 18700 ML | 2990 | 15710 | 56 | 91 |
| 2730 | 2990 | -260 | 56 | 92 |
| 3380 | 2990 | 390 | 57 | 92 |
| 10200 | 2990 | 7210 | 58 | 92 |
| 7060 | 2990 | 4070 | 59 | 92 |
| 10100 | 2990 | 7110 | 60 | 92 |
| 10500 | 2990 | 7510 | 61 | 92 |

| | | | | |
|---|---|---|---|---|
| 5210 | 2990 | 2220 | 62 | 92 |
| 4680 | 2990 | 1690 | 63 | 92 |
| 3180 | 2990 | 190 | 64 | 92 |
| 3150 | 2990 | 160 | 65 | 92 |
| 2260 | 2990 | -730 | 65 | 93 |
| 2640 | 2990 | -350 | 65 | 94 |
| 5300 | 2990 | 2310 | 66 | 94 |
| 2710 | 2990 | -280 | 66 | 95 |
| 22600 | 2990 | 19610 | 67 | 95 |
| 6190 | 2990 | 3200 | 68 | 95 |
| | | | | |
| 2730 | 18700 ML | -15970 | 68 | 96 |
| 3380 | 18700 ML | -15320 | 68 | 97 |
| 10200 | 18700 ML | -8500 | 68 | 98 |
| 7060 | 18700 ML | -11640 | 68 | 99 |
| 10100 | 18700 ML | -8600 | 68 | 100 |
| 10500 | 18700 ML | -8200 | 68 | 101 |
| 5210 | 18700 ML | -13490 | 68 | 102 |
| 4680 | 18700 ML | -14020 | 68 | 103 |
| 3180 | 18700 ML | -15520 | 68 | 104 |
| 3150 | 18700 ML | -15550 | 68 | 105 |
| 2260 | 18700 ML | -16440 | 68 | 106 |
| 2640 | 18700 ML | -16060 | 68 | 107 |
| 5300 | 18700 ML | -13400 | 68 | 108 |
| 2710 | 18700 ML | -15990 | 68 | 109 |
| 22600 | 18700 ML | 3900 | 69 | 109 |
| 6190 | 18700 ML | -12510 | 69 | 110 |
| | | | | |
| 3380 | 2730 | 650 | 70 | 110 |
| 10200 | 2730 | 7470 | 71 | 110 |
| 7060 | 2730 | 4330 | 72 | 110 |
| 10100 | 2730 | 7370 | 73 | 110 |
| 10500 | 2730 | 7770 | 74 | 110 |
| 5210 | 2730 | 2480 | 75 | 110 |
| 4680 | 2730 | 1950 | 76 | 110 |
| 3180 | 2730 | 450 | 77 | 110 |
| 3150 | 2730 | 420 | 78 | 110 |
| 2260 | 2730 | -470 | 78 | 111 |
| 2640 | 2730 | -90 | 78 | 112 |
| 5300 | 2730 | 2570 | 79 | 112 |
| 2710 | 2730 | -20 | 79 | 113 |
| 22600 | 2730 | 19870 | 80 | 113 |
| 6190 | 2730 | 3460 | 81 | 113 |
| | | | | |
| 10200 | 3380 | 6820 | 82 | 113 |
| 7060 | 3380 | 3680 | 83 | 113 |
| 10100 | 3380 | 6720 | 84 | 113 |
| 10500 | 3380 | 7120 | 85 | 113 |
| 5210 | 3380 | 1830 | 86 | 113 |
| 4680 | 3380 | 1300 | 87 | 113 |
| 3180 | 3380 | -200 | 87 | 114 |
| 3150 | 3380 | -230 | 87 | 115 |
| 2260 | 3380 | -1120 | 87 | 116 |
| 2640 | 3380 | -740 | 87 | 117 |
| 5300 | 3380 | 1920 | 88 | 117 |
| 2710 | 3380 | -670 | 88 | 118 |
| 22600 | 3380 | 19220 | 89 | 118 |

| | | | | |
|---|---|---|---|---|
| 6190 | 3380 | 2810 | 90 | 118 |
| | | | | |
| 7060 | 10200 | -3140 | 90 | 119 |
| 10100 | 10200 | -100 | 90 | 120 |
| 10500 | 10200 | 300 | 91 | 120 |
| 5210 | 10200 | -4990 | 91 | 121 |
| 4680 | 10200 | -5520 | 91 | 122 |
| 3180 | 10200 | -7020 | 91 | 123 |
| 3150 | 10200 | -7050 | 91 | 124 |
| 2260 | 10200 | -7940 | 91 | 125 |
| 2640 | 10200 | -7560 | 91 | 126 |
| 5300 | 10200 | -4900 | 91 | 127 |
| 2710 | 10200 | -7490 | 91 | 128 |
| 22600 | 10200 | 12400 | 92 | 128 |
| 6190 | 10200 | -4010 | 92 | 129 |
| | | | | |
| 10100 | 7060 | 3040 | 93 | 129 |
| 10500 | 7060 | 3440 | 94 | 129 |
| 5210 | 7060 | -1850 | 94 | 130 |
| 4680 | 7060 | -2380 | 94 | 131 |
| 3180 | 7060 | -3880 | 94 | 132 |
| 3150 | 7060 | -3910 | 94 | 133 |
| 2260 | 7060 | -4800 | 94 | 134 |
| 2640 | 7060 | -4420 | 94 | 135 |
| 5300 | 7060 | -1760 | 94 | 136 |
| 2710 | 7060 | -4350 | 94 | 137 |
| 22600 | 7060 | 15540 | 95 | 137 |
| 6190 | 7060 | -870 | 95 | 138 |
| | | | | |
| 10500 | 10100 | 400 | 96 | 138 |
| 5210 | 10100 | -4890 | 96 | 139 |
| 4680 | 10100 | -5420 | 96 | 140 |
| 3180 | 10100 | -6920 | 96 | 141 |
| 3150 | 10100 | -6950 | 96 | 142 |
| 2260 | 10100 | -7840 | 96 | 143 |
| 2640 | 10100 | -7460 | 96 | 144 |
| 5300 | 10100 | -4800 | 96 | 145 |
| 2710 | 10100 | -7390 | 96 | 146 |
| 22600 | 10100 | 12500 | 97 | 146 |
| 6190 | 10100 | -3910 | 97 | 147 |
| | | | | |
| 5210 | 10500 | -5290 | 97 | 148 |
| 4680 | 10500 | -5820 | 97 | 149 |
| 3180 | 10500 | -7320 | 97 | 150 |
| 3150 | 10500 | -7350 | 97 | 151 |
| 2260 | 10500 | -8240 | 97 | 152 |
| 2640 | 10500 | -7860 | 97 | 153 |
| 5300 | 10500 | -5200 | 97 | 154 |
| 2710 | 10500 | -7790 | 97 | 155 |
| 22600 | 10500 | 12100 | 98 | 155 |
| 6190 | 10500 | -4310 | 98 | 156 |
| | | | | |
| 4680 | 5210 | Same Date | 98 | 156 |
| 3180 | 5210 | -2030 | 98 | 157 |
| 3150 | 5210 | -2060 | 98 | 158 |
| 2260 | 5210 | -2950 | 98 | 159 |
| 2640 | 5210 | -2570 | 98 | 160 |

| | | | | |
|---|---|---|---|---|
| 5300 | 5210 | 90 | 99 | 160 |
| 2710 | 5210 | -2500 | 99 | 161 |
| 22600 | 5210 | 17390 | 100 | 161 |
| 6190 | 5210 | 980 | 101 | 161 |
| | | | | |
| 3180 | 4680 | -1500 | 101 | 162 |
| 3150 | 4680 | -1530 | 101 | 163 |
| 2260 | 4680 | -2420 | 101 | 164 |
| 2640 | 4680 | -2040 | 101 | 165 |
| 5300 | 4680 | 620 | 102 | 165 |
| 2710 | 4680 | -1970 | 102 | 166 |
| 22600 | 4680 | 17920 | 103 | 166 |
| 6190 | 4680 | 1510 | 104 | 166 |
| | | | | |
| 3150 | 3180 | Same Date | 104 | 166 |
| 2260 | 3180 | -920 | 104 | 167 |
| 2640 | 3180 | -540 | 104 | 168 |
| 5300 | 3180 | 2120 | 105 | 168 |
| 2710 | 3180 | -470 | 105 | 169 |
| 22600 | 3180 | 19420 | 106 | 169 |
| 6190 | 3180 | 3010 | 107 | 169 |
| | | | | |
| 2260 | 3150 | -890 | 107 | 170 |
| 2640 | 3150 | -510 | 107 | 171 |
| 5300 | 3150 | 2150 | 108 | 171 |
| 2710 | 3150 | -440 | 108 | 172 |
| 22600 | 3150 | 19450 | 109 | 172 |
| 6190 | 3150 | 3040 | 110 | 172 |
| | | | | |
| 2640 | 2260 | 380 | 111 | 172 |
| 5300 | 2260 | 3040 | 112 | 172 |
| 2710 | 2260 | 450 | 113 | 172 |
| 22600 | 2260 | 20340 | 114 | 172 |
| 6190 | 2260 | 3930 | 115 | 172 |
| | | | | |
| 5300 | 2640 | 2660 | 116 | 172 |
| 2710 | 2640 | 70 | 117 | 172 |
| 22600 | 2640 | 19960 | 118 | 172 |
| 6190 | 2640 | 3550 | 119 | 172 |
| | | | | |
| 2710 | 5300 | -2590 | 119 | 173 |
| 22600 | 5300 | 17300 | 120 | 173 |
| 6190 | 5300 | 890 | 121 | 173 |
| | | | | |
| 22600 | 2710 | 19890 | 122 | 173 |
| 6190 | 2710 | 3480 | 123 | 173 |
| | | | | |
| 6190 | 22600 | -16410 | 123 | 174 |

S Statistic = 123 - 174 = -51

| Tied Group | Value | Members |
|---|---|---|
| 1 | 10100 | 2 |

| Time Period | Observations |
|---|---|
| 2/1/2017 | 1 |

| | |
|---|---|
| 3/1/2017 | 1 |
| 4/1/2017 | 1 |
| 5/1/2017 | 1 |
| 6/1/2017 | 1 |
| 7/1/2017 | 1 |
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |

There are 2 time periods with multiple data

---

A = 18
B = 36
C = 0
D = 0
E = 2
F = 4
a = 33000
b = 124200
c = 1200
Group Variance = 1830.34
Z-Score = -1.1687
Comparison Level at 95% confidence level = -1.65463 (downward trend)
-1.1687 >= -1.65463 indicating no evidence of a downward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RW21-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 282000 M61c2c | 282000 M61c2c | Same Date | 0 | 0 |
| 279000 M61c2c | 282000 M61c2c | Same Date | 0 | 0 |
| 279000 M61c2c | 282000 M61c2c | Same Date | 0 | 0 |
| 330000 1c | 282000 M61c2c | 48000 | 1 | 0 |
| 368000 | 282000 M61c2c | 86000 | 2 | 0 |
| 301000 | 282000 M61c2c | 19000 | 3 | 0 |
| 268000 M63c | 282000 M61c2c | -14000 | 3 | 1 |
| 298000 3c | 282000 M61c2c | 16000 | 4 | 1 |
| 145000 ML | 282000 M61c2c | -137000 | 4 | 2 |
| 325000 | 282000 M61c2c | 43000 | 5 | 2 |
| 279000 M61c2c | 282000 M61c2c | Same Date | 5 | 2 |
| 279000 M61c2c | 282000 M61c2c | Same Date | 5 | 2 |
| 330000 1c | 282000 M61c2c | 48000 | 6 | 2 |
| 368000 | 282000 M61c2c | 86000 | 7 | 2 |
| 301000 | 282000 M61c2c | 19000 | 8 | 2 |
| 268000 M63c | 282000 M61c2c | -14000 | 8 | 3 |
| 298000 3c | 282000 M61c2c | 16000 | 9 | 3 |
| 145000 ML | 282000 M61c2c | -137000 | 9 | 4 |
| 325000 | 282000 M61c2c | 43000 | 10 | 4 |
| 279000 M61c2c | 279000 M61c2c | Same Date | 10 | 4 |
| 330000 1c | 279000 M61c2c | 51000 | 11 | 4 |
| 368000 | 279000 M61c2c | 89000 | 12 | 4 |
| 301000 | 279000 M61c2c | 22000 | 13 | 4 |
| 268000 M63c | 279000 M61c2c | -11000 | 13 | 5 |
| 298000 3c | 279000 M61c2c | 19000 | 14 | 5 |
| 145000 ML | 279000 M61c2c | -134000 | 14 | 6 |
| 325000 | 279000 M61c2c | 46000 | 15 | 6 |
| 330000 1c | 279000 M61c2c | 51000 | 16 | 6 |
| 368000 | 279000 M61c2c | 89000 | 17 | 6 |
| 301000 | 279000 M61c2c | 22000 | 18 | 6 |
| 268000 M63c | 279000 M61c2c | -11000 | 18 | 7 |
| 298000 3c | 279000 M61c2c | 19000 | 19 | 7 |
| 145000 ML | 279000 M61c2c | -134000 | 19 | 8 |
| 325000 | 279000 M61c2c | 46000 | 20 | 8 |
| 368000 | 330000 1c | 38000 | 21 | 8 |
| 301000 | 330000 1c | -29000 | 21 | 9 |
| 268000 M63c | 330000 1c | -62000 | 21 | 10 |
| 298000 3c | 330000 1c | -32000 | 21 | 11 |
| 145000 ML | 330000 1c | -185000 | 21 | 12 |
| 325000 | 330000 1c | -5000 | 21 | 13 |
| 301000 | 368000 | -67000 | 21 | 14 |
| 268000 M63c | 368000 | -100000 | 21 | 15 |

| | | | | |
|---|---|---|---|---|
| 298000 3c | 368000 | -70000 | 21 | 16 |
| 145000 ML | 368000 | -223000 | 21 | 17 |
| 325000 | 368000 | -43000 | 21 | 18 |
| | | | | |
| 268000 M63c | 301000 | -33000 | 21 | 19 |
| 298000 3c | 301000 | -3000 | 21 | 20 |
| 145000 ML | 301000 | -156000 | 21 | 21 |
| 325000 | 301000 | 24000 | 22 | 21 |
| | | | | |
| 298000 3c | 268000 M63c | 30000 | 23 | 21 |
| 145000 ML | 268000 M63c | -123000 | 23 | 22 |
| 325000 | 268000 M63c | 57000 | 24 | 22 |
| | | | | |
| 145000 ML | 298000 3c | -153000 | 24 | 23 |
| 325000 | 298000 3c | 27000 | 25 | 23 |
| | | | | |
| 325000 | 145000 ML | Same Date | 25 | 23 |

S Statistic = 25 - 23 = 2

| Tied Group | Value | Members |
|---|---|---|
| 1 | 282000 | 2 |
| 2 | 279000 | 2 |

| Time Period | Observations |
|---|---|
| 6/1/2019 | 4 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 2 |

There are 2 time periods with multiple data

A = 36
B = 174
C = 0
D = 24
E = 4
F = 14
a = 2970
b = 8910
c = 220
Group Variance = 153.588
Z-Score = 0.0806903
Comparison Level at 95% confidence level = -1.65463 (downward trend)
0.0806903 >= -1.65463 indicating no evidence of a downward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RW22R-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 65300 1c2c | 58100 | Same Date | 0 | 0 |
| 176000 | 58100 | Same Date | 0 | 0 |
| 176000 | 58100 | Same Date | 0 | 0 |
| 178000 | 58100 | Same Date | 0 | 0 |
| 178000 | 58100 | Same Date | 0 | 0 |
| 176000 | 58100 | Same Date | 0 | 0 |
| 176000 | 58100 | Same Date | 0 | 0 |
| 178000 | 58100 | Same Date | 0 | 0 |
| 178000 | 58100 | Same Date | 0 | 0 |
| 188000 | 58100 | 129900 | 1 | 0 |
| 112000 M6 | 58100 | 53900 | 2 | 0 |
| 213000 | 58100 | 154900 | 3 | 0 |
| 217000 | 58100 | 158900 | 4 | 0 |
| 253000 ML | 58100 | 194900 | 5 | 0 |
| 169000 MH | 58100 | 110900 | 6 | 0 |
| 137000 | 58100 | 78900 | 7 | 0 |
| 113000 | 58100 | 54900 | 8 | 0 |
| 197000 | 58100 | 138900 | 9 | 0 |
| 197000 | 58100 | 138900 | 10 | 0 |
| 138800 | 58100 | 80700 | 11 | 0 |
| 154200 | 58100 | 96100 | 12 | 0 |
| 88690 | 58100 | 30590 | 13 | 0 |
| 196900 | 58100 | 138800 | 14 | 0 |
| | | | | |
| 176000 | 65300 1c2c | Same Date | 14 | 0 |
| 176000 | 65300 1c2c | Same Date | 14 | 0 |
| 178000 | 65300 1c2c | Same Date | 14 | 0 |
| 178000 | 65300 1c2c | Same Date | 14 | 0 |
| 176000 | 65300 1c2c | Same Date | 14 | 0 |
| 176000 | 65300 1c2c | Same Date | 14 | 0 |
| 178000 | 65300 1c2c | Same Date | 14 | 0 |
| 178000 | 65300 1c2c | Same Date | 14 | 0 |
| 188000 | 65300 1c2c | 122700 | 15 | 0 |
| 112000 M6 | 65300 1c2c | 46700 | 16 | 0 |
| 213000 | 65300 1c2c | 147700 | 17 | 0 |
| 217000 | 65300 1c2c | 151700 | 18 | 0 |
| 253000 ML | 65300 1c2c | 187700 | 19 | 0 |
| 169000 MH | 65300 1c2c | 103700 | 20 | 0 |
| 137000 | 65300 1c2c | 71700 | 21 | 0 |
| 113000 | 65300 1c2c | 47700 | 22 | 0 |
| 197000 | 65300 1c2c | 131700 | 23 | 0 |
| 197000 | 65300 1c2c | 131700 | 24 | 0 |
| 138800 | 65300 1c2c | 73500 | 25 | 0 |
| 154200 | 65300 1c2c | 88900 | 26 | 0 |
| 88690 | 65300 1c2c | 23390 | 27 | 0 |
| 196900 | 65300 1c2c | 131600 | 28 | 0 |

| | | | | |
|---|---|---|---|---|
| 176000 | 176000 | Same Date | 28 | 0 |
| 178000 | 176000 | Same Date | 28 | 0 |
| 178000 | 176000 | Same Date | 28 | 0 |
| 176000 | 176000 | Same Date | 28 | 0 |
| 176000 | 176000 | Same Date | 28 | 0 |
| 178000 | 176000 | Same Date | 28 | 0 |
| 178000 | 176000 | Same Date | 28 | 0 |
| 188000 | 176000 | 12000 | 29 | 0 |
| 112000 M6 | 176000 | -64000 | 29 | 1 |
| 213000 | 176000 | 37000 | 30 | 1 |
| 217000 | 176000 | 41000 | 31 | 1 |
| 253000 ML | 176000 | 77000 | 32 | 1 |
| 169000 MH | 176000 | -7000 | 32 | 2 |
| 137000 | 176000 | -39000 | 32 | 3 |
| 113000 | 176000 | -63000 | 32 | 4 |
| 197000 | 176000 | 21000 | 33 | 4 |
| 197000 | 176000 | 21000 | 34 | 4 |
| 138800 | 176000 | -37200 | 34 | 5 |
| 154200 | 176000 | -21800 | 34 | 6 |
| 88690 | 176000 | -87310 | 34 | 7 |
| 196900 | 176000 | 20900 | 35 | 7 |
| | | | | |
| 178000 | 176000 | Same Date | 35 | 7 |
| 178000 | 176000 | Same Date | 35 | 7 |
| 176000 | 176000 | Same Date | 35 | 7 |
| 176000 | 176000 | Same Date | 35 | 7 |
| 178000 | 176000 | Same Date | 35 | 7 |
| 178000 | 176000 | Same Date | 35 | 7 |
| 188000 | 176000 | 12000 | 36 | 7 |
| 112000 M6 | 176000 | -64000 | 36 | 8 |
| 213000 | 176000 | 37000 | 37 | 8 |
| 217000 | 176000 | 41000 | 38 | 8 |
| 253000 ML | 176000 | 77000 | 39 | 8 |
| 169000 MH | 176000 | -7000 | 39 | 9 |
| 137000 | 176000 | -39000 | 39 | 10 |
| 113000 | 176000 | -63000 | 39 | 11 |
| 197000 | 176000 | 21000 | 40 | 11 |
| 197000 | 176000 | 21000 | 41 | 11 |
| 138800 | 176000 | -37200 | 41 | 12 |
| 154200 | 176000 | -21800 | 41 | 13 |
| 88690 | 176000 | -87310 | 41 | 14 |
| 196900 | 176000 | 20900 | 42 | 14 |
| | | | | |
| 178000 | 178000 | Same Date | 42 | 14 |
| 176000 | 178000 | Same Date | 42 | 14 |
| 176000 | 178000 | Same Date | 42 | 14 |
| 178000 | 178000 | Same Date | 42 | 14 |
| 178000 | 178000 | Same Date | 42 | 14 |
| 188000 | 178000 | 10000 | 43 | 14 |
| 112000 M6 | 178000 | -66000 | 43 | 15 |
| 213000 | 178000 | 35000 | 44 | 15 |
| 217000 | 178000 | 39000 | 45 | 15 |
| 253000 ML | 178000 | 75000 | 46 | 15 |
| 169000 MH | 178000 | -9000 | 46 | 16 |
| 137000 | 178000 | -41000 | 46 | 17 |
| 113000 | 178000 | -65000 | 46 | 18 |
| 197000 | 178000 | 19000 | 47 | 18 |

| | | | | |
|---|---|---|---|---|
| 197000 | 178000 | 19000 | 48 | 18 |
| 138800 | 178000 | -39200 | 48 | 19 |
| 154200 | 178000 | -23800 | 48 | 20 |
| 88690 | 178000 | -89310 | 48 | 21 |
| 196900 | 178000 | 18900 | 49 | 21 |
| | | | | |
| 176000 | 178000 | Same Date | 49 | 21 |
| 176000 | 178000 | Same Date | 49 | 21 |
| 178000 | 178000 | Same Date | 49 | 21 |
| 178000 | 178000 | Same Date | 49 | 21 |
| 188000 | 178000 | 10000 | 50 | 21 |
| 112000 M6 | 178000 | -66000 | 50 | 22 |
| 213000 | 178000 | 35000 | 51 | 22 |
| 217000 | 178000 | 39000 | 52 | 22 |
| 253000 ML | 178000 | 75000 | 53 | 22 |
| 169000 MH | 178000 | -9000 | 53 | 23 |
| 137000 | 178000 | -41000 | 53 | 24 |
| 113000 | 178000 | -65000 | 53 | 25 |
| 197000 | 178000 | 19000 | 54 | 25 |
| 197000 | 178000 | 19000 | 55 | 25 |
| 138800 | 178000 | -39200 | 55 | 26 |
| 154200 | 178000 | -23800 | 55 | 27 |
| 88690 | 178000 | -89310 | 55 | 28 |
| 196900 | 178000 | 18900 | 56 | 28 |
| | | | | |
| 176000 | 176000 | Same Date | 56 | 28 |
| 178000 | 176000 | Same Date | 56 | 28 |
| 178000 | 176000 | Same Date | 56 | 28 |
| 188000 | 176000 | 12000 | 57 | 28 |
| 112000 M6 | 176000 | -64000 | 57 | 29 |
| 213000 | 176000 | 37000 | 58 | 29 |
| 217000 | 176000 | 41000 | 59 | 29 |
| 253000 ML | 176000 | 77000 | 60 | 29 |
| 169000 MH | 176000 | -7000 | 60 | 30 |
| 137000 | 176000 | -39000 | 60 | 31 |
| 113000 | 176000 | -63000 | 60 | 32 |
| 197000 | 176000 | 21000 | 61 | 32 |
| 197000 | 176000 | 21000 | 62 | 32 |
| 138800 | 176000 | -37200 | 62 | 33 |
| 154200 | 176000 | -21800 | 62 | 34 |
| 88690 | 176000 | -87310 | 62 | 35 |
| 196900 | 176000 | 20900 | 63 | 35 |
| | | | | |
| 178000 | 176000 | Same Date | 63 | 35 |
| 178000 | 176000 | Same Date | 63 | 35 |
| 188000 | 176000 | 12000 | 64 | 35 |
| 112000 M6 | 176000 | -64000 | 64 | 36 |
| 213000 | 176000 | 37000 | 65 | 36 |
| 217000 | 176000 | 41000 | 66 | 36 |
| 253000 ML | 176000 | 77000 | 67 | 36 |
| 169000 MH | 176000 | -7000 | 67 | 37 |
| 137000 | 176000 | -39000 | 67 | 38 |
| 113000 | 176000 | -63000 | 67 | 39 |
| 197000 | 176000 | 21000 | 68 | 39 |
| 197000 | 176000 | 21000 | 69 | 39 |
| 138800 | 176000 | -37200 | 69 | 40 |
| 154200 | 176000 | -21800 | 69 | 41 |

| | | | | |
|---|---|---|---|---|
| 88690 | 176000 | -87310 | 69 | 42 |
| 196900 | 176000 | 20900 | 70 | 42 |
| | | | | |
| 178000 | 178000 | Same Date | 70 | 42 |
| 188000 | 178000 | 10000 | 71 | 42 |
| 112000 M6 | 178000 | -66000 | 71 | 43 |
| 213000 | 178000 | 35000 | 72 | 43 |
| 217000 | 178000 | 39000 | 73 | 43 |
| 253000 ML | 178000 | 75000 | 74 | 43 |
| 169000 MH | 178000 | -9000 | 74 | 44 |
| 137000 | 178000 | -41000 | 74 | 45 |
| 113000 | 178000 | -65000 | 74 | 46 |
| 197000 | 178000 | 19000 | 75 | 46 |
| 197000 | 178000 | 19000 | 76 | 46 |
| 138800 | 178000 | -39200 | 76 | 47 |
| 154200 | 178000 | -23800 | 76 | 48 |
| 88690 | 178000 | -89310 | 76 | 49 |
| 196900 | 178000 | 18900 | 77 | 49 |
| | | | | |
| 188000 | 178000 | 10000 | 78 | 49 |
| 112000 M6 | 178000 | -66000 | 78 | 50 |
| 213000 | 178000 | 35000 | 79 | 50 |
| 217000 | 178000 | 39000 | 80 | 50 |
| 253000 ML | 178000 | 75000 | 81 | 50 |
| 169000 MH | 178000 | -9000 | 81 | 51 |
| 137000 | 178000 | -41000 | 81 | 52 |
| 113000 | 178000 | -65000 | 81 | 53 |
| 197000 | 178000 | 19000 | 82 | 53 |
| 197000 | 178000 | 19000 | 83 | 53 |
| 138800 | 178000 | -39200 | 83 | 54 |
| 154200 | 178000 | -23800 | 83 | 55 |
| 88690 | 178000 | -89310 | 83 | 56 |
| 196900 | 178000 | 18900 | 84 | 56 |
| | | | | |
| 112000 M6 | 188000 | -76000 | 84 | 57 |
| 213000 | 188000 | 25000 | 85 | 57 |
| 217000 | 188000 | 29000 | 86 | 57 |
| 253000 ML | 188000 | 65000 | 87 | 57 |
| 169000 MH | 188000 | -19000 | 87 | 58 |
| 137000 | 188000 | -51000 | 87 | 59 |
| 113000 | 188000 | -75000 | 87 | 60 |
| 197000 | 188000 | 9000 | 88 | 60 |
| 197000 | 188000 | 9000 | 89 | 60 |
| 138800 | 188000 | -49200 | 89 | 61 |
| 154200 | 188000 | -33800 | 89 | 62 |
| 88690 | 188000 | -99310 | 89 | 63 |
| 196900 | 188000 | 8900 | 90 | 63 |
| | | | | |
| 213000 | 112000 M6 | 101000 | 91 | 63 |
| 217000 | 112000 M6 | 105000 | 92 | 63 |
| 253000 ML | 112000 M6 | 141000 | 93 | 63 |
| 169000 MH | 112000 M6 | 57000 | 94 | 63 |
| 137000 | 112000 M6 | 25000 | 95 | 63 |
| 113000 | 112000 M6 | 1000 | 96 | 63 |
| 197000 | 112000 M6 | 85000 | 97 | 63 |
| 197000 | 112000 M6 | 85000 | 98 | 63 |
| 138800 | 112000 M6 | 26800 | 99 | 63 |

| | | | | |
|---|---|---|---|---|
| 154200 | 112000 M6 | 42200 | 100 | 63 |
| 88690 | 112000 M6 | -23310 | 100 | 64 |
| 196900 | 112000 M6 | 84900 | 101 | 64 |
| | | | | |
| 217000 | 213000 | 4000 | 102 | 64 |
| 253000 ML | 213000 | 40000 | 103 | 64 |
| 169000 MH | 213000 | -44000 | 103 | 65 |
| 137000 | 213000 | -76000 | 103 | 66 |
| 113000 | 213000 | -100000 | 103 | 67 |
| 197000 | 213000 | -16000 | 103 | 68 |
| 197000 | 213000 | -16000 | 103 | 69 |
| 138800 | 213000 | -74200 | 103 | 70 |
| 154200 | 213000 | -58800 | 103 | 71 |
| 88690 | 213000 | -124310 | 103 | 72 |
| 196900 | 213000 | -16100 | 103 | 73 |
| | | | | |
| 253000 ML | 217000 | 36000 | 104 | 73 |
| 169000 MH | 217000 | -48000 | 104 | 74 |
| 137000 | 217000 | -80000 | 104 | 75 |
| 113000 | 217000 | -104000 | 104 | 76 |
| 197000 | 217000 | -20000 | 104 | 77 |
| 197000 | 217000 | -20000 | 104 | 78 |
| 138800 | 217000 | -78200 | 104 | 79 |
| 154200 | 217000 | -62800 | 104 | 80 |
| 88690 | 217000 | -128310 | 104 | 81 |
| 196900 | 217000 | -20100 | 104 | 82 |
| | | | | |
| 169000 MH | 253000 ML | -84000 | 104 | 83 |
| 137000 | 253000 ML | -116000 | 104 | 84 |
| 113000 | 253000 ML | -140000 | 104 | 85 |
| 197000 | 253000 ML | -56000 | 104 | 86 |
| 197000 | 253000 ML | -56000 | 104 | 87 |
| 138800 | 253000 ML | -114200 | 104 | 88 |
| 154200 | 253000 ML | -98800 | 104 | 89 |
| 88690 | 253000 ML | -164310 | 104 | 90 |
| 196900 | 253000 ML | -56100 | 104 | 91 |
| | | | | |
| 137000 | 169000 MH | -32000 | 104 | 92 |
| 113000 | 169000 MH | -56000 | 104 | 93 |
| 197000 | 169000 MH | 28000 | 105 | 93 |
| 197000 | 169000 MH | 28000 | 106 | 93 |
| 138800 | 169000 MH | -30200 | 106 | 94 |
| 154200 | 169000 MH | -14800 | 106 | 95 |
| 88690 | 169000 MH | -80310 | 106 | 96 |
| 196900 | 169000 MH | 27900 | 107 | 96 |
| | | | | |
| 113000 | 137000 | -24000 | 107 | 97 |
| 197000 | 137000 | 60000 | 108 | 97 |
| 197000 | 137000 | 60000 | 109 | 97 |
| 138800 | 137000 | 1800 | 110 | 97 |
| 154200 | 137000 | 17200 | 111 | 97 |
| 88690 | 137000 | -48310 | 111 | 98 |
| 196900 | 137000 | 59900 | 112 | 98 |
| | | | | |
| 197000 | 113000 | 84000 | 113 | 98 |
| 197000 | 113000 | 84000 | 114 | 98 |
| 138800 | 113000 | 25800 | 115 | 98 |

| | | | | |
|---|---|---|---|---|
| 154200 | 113000 | 41200 | 116 | 98 |
| 88690 | 113000 | -24310 | 116 | 99 |
| 196900 | 113000 | 83900 | 117 | 99 |
| | | | | |
| 197000 | 197000 | Same Date | 117 | 99 |
| 138800 | 197000 | -58200 | 117 | 100 |
| 154200 | 197000 | -42800 | 117 | 101 |
| 88690 | 197000 | -108310 | 117 | 102 |
| 196900 | 197000 | -100 | 117 | 103 |
| | | | | |
| 138800 | 197000 | -58200 | 117 | 104 |
| 154200 | 197000 | -42800 | 117 | 105 |
| 88690 | 197000 | -108310 | 117 | 106 |
| 196900 | 197000 | -100 | 117 | 107 |
| | | | | |
| 154200 | 138800 | 15400 | 118 | 107 |
| 88690 | 138800 | -50110 | 118 | 108 |
| 196900 | 138800 | 58100 | 119 | 108 |
| | | | | |
| 88690 | 154200 | -65510 | 119 | 109 |
| 196900 | 154200 | 42700 | 120 | 109 |
| | | | | |
| 196900 | 88690 | 108210 | 121 | 109 |

S Statistic = 121 - 109 = 12

| Tied Group | Value | Members |
|---|---|---|
| 1 | 176000 | 4 |
| 2 | 178000 | 4 |
| 3 | 197000 | 2 |

| Time Period | Observations |
|---|---|
| 5/1/2019 | 10 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 2 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 2 time periods with multiple data

A = 330
B = 2268
C = 48
D = 720
E = 26
F = 92
a = 29256
b = 109296

c = 1104
Group Variance = 1483.48
Z-Score = 0.285596
Comparison Level at 95% confidence level = -1.65463 (downward trend)
0.285596 >= -1.65463 indicating no evidence of a downward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RW23-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 22.4 | 12.7 | Same Date | 0 | 0 |
| 20.6 | 12.7 | 7.9 | 1 | 0 |
| 38.6 | 12.7 | 25.9 | 2 | 0 |
| 5 J | 12.7 | -7.7 | 2 | 1 |
| 2.7 J | 12.7 | -10 | 2 | 2 |
| 6.4 J2c | 12.7 | -6.3 | 2 | 3 |
| 5.9 J | 12.7 | -6.8 | 2 | 4 |
| 2.8 J | 12.7 | -9.9 | 2 | 5 |
| 6.5 J | 12.7 | -6.2 | 2 | 6 |
| ND<10 U | 12.7 | -2.7 | 2 | 7 |
| ND<5 U | 12.7 | -7.7 | 2 | 8 |
| 3.472 J | 12.7 | -9.228 | 2 | 9 |
| 4.053 J | 12.7 | -8.647 | 2 | 10 |
| 5.737 J | 12.7 | -6.963 | 2 | 11 |
| 538.7 | 12.7 | 526 | 3 | 11 |
| | | | | |
| 20.6 | 22.4 | -1.8 | 3 | 12 |
| 38.6 | 22.4 | 16.2 | 4 | 12 |
| 5 J | 22.4 | -17.4 | 4 | 13 |
| 2.7 J | 22.4 | -19.7 | 4 | 14 |
| 6.4 J2c | 22.4 | -16 | 4 | 15 |
| 5.9 J | 22.4 | -16.5 | 4 | 16 |
| 2.8 J | 22.4 | -19.6 | 4 | 17 |
| 6.5 J | 22.4 | -15.9 | 4 | 18 |
| ND<10 U | 22.4 | -12.4 | 4 | 19 |
| ND<5 U | 22.4 | -17.4 | 4 | 20 |
| 3.472 J | 22.4 | -18.928 | 4 | 21 |
| 4.053 J | 22.4 | -18.347 | 4 | 22 |
| 5.737 J | 22.4 | -16.663 | 4 | 23 |
| 538.7 | 22.4 | 516.3 | 5 | 23 |
| | | | | |
| 38.6 | 20.6 | 18 | 6 | 23 |
| 5 J | 20.6 | -15.6 | 6 | 24 |
| 2.7 J | 20.6 | -17.9 | 6 | 25 |
| 6.4 J2c | 20.6 | -14.2 | 6 | 26 |
| 5.9 J | 20.6 | -14.7 | 6 | 27 |
| 2.8 J | 20.6 | -17.8 | 6 | 28 |
| 6.5 J | 20.6 | -14.1 | 6 | 29 |
| ND<10 U | 20.6 | -10.6 | 6 | 30 |
| ND<5 U | 20.6 | -15.6 | 6 | 31 |
| 3.472 J | 20.6 | -17.128 | 6 | 32 |
| 4.053 J | 20.6 | -16.547 | 6 | 33 |
| 5.737 J | 20.6 | -14.863 | 6 | 34 |
| 538.7 | 20.6 | 518.1 | 7 | 34 |
| | | | | |
| 5 J | 38.6 | -33.6 | 7 | 35 |
| 2.7 J | 38.6 | -35.9 | 7 | 36 |

| | | | | |
|---|---|---|---|---|
| 6.4 J2c | 38.6 | -32.2 | 7 | 37 |
| 5.9 J | 38.6 | -32.7 | 7 | 38 |
| 2.8 J | 38.6 | -35.8 | 7 | 39 |
| 6.5 J | 38.6 | -32.1 | 7 | 40 |
| ND<10 U | 38.6 | -28.6 | 7 | 41 |
| ND<5 U | 38.6 | -33.6 | 7 | 42 |
| 3.472 J | 38.6 | -35.128 | 7 | 43 |
| 4.053 J | 38.6 | -34.547 | 7 | 44 |
| 5.737 J | 38.6 | -32.863 | 7 | 45 |
| 538.7 | 38.6 | 500.1 | 8 | 45 |
| | | | | |
| 2.7 J | 5 J | -2.3 | 8 | 46 |
| 6.4 J2c | 5 J | 1.4 | 9 | 46 |
| 5.9 J | 5 J | 0.9 | 10 | 46 |
| 2.8 J | 5 J | -2.2 | 10 | 47 |
| 6.5 J | 5 J | 1.5 | 11 | 47 |
| ND<10 U | 5 J | 5 | 12 | 47 |
| ND<5 U | 5 J | 0 | 12 | 47 |
| 3.472 J | 5 J | -1.528 | 12 | 48 |
| 4.053 J | 5 J | -0.947 | 12 | 49 |
| 5.737 J | 5 J | 0.737 | 13 | 49 |
| 538.7 | 5 J | 533.7 | 14 | 49 |
| | | | | |
| 6.4 J2c | 2.7 J | 3.7 | 15 | 49 |
| 5.9 J | 2.7 J | 3.2 | 16 | 49 |
| 2.8 J | 2.7 J | 0.1 | 17 | 49 |
| 6.5 J | 2.7 J | 3.8 | 18 | 49 |
| ND<10 U | 2.7 J | 7.3 | 19 | 49 |
| ND<5 U | 2.7 J | 2.3 | 20 | 49 |
| 3.472 J | 2.7 J | 0.772 | 21 | 49 |
| 4.053 J | 2.7 J | 1.353 | 22 | 49 |
| 5.737 J | 2.7 J | 3.037 | 23 | 49 |
| 538.7 | 2.7 J | 536 | 24 | 49 |
| | | | | |
| 5.9 J | 6.4 J2c | -0.5 | 24 | 50 |
| 2.8 J | 6.4 J2c | -3.6 | 24 | 51 |
| 6.5 J | 6.4 J2c | 0.1 | 25 | 51 |
| ND<10 U | 6.4 J2c | 3.6 | 26 | 51 |
| ND<5 U | 6.4 J2c | -1.4 | 26 | 52 |
| 3.472 J | 6.4 J2c | -2.928 | 26 | 53 |
| 4.053 J | 6.4 J2c | -2.347 | 26 | 54 |
| 5.737 J | 6.4 J2c | -0.663 | 26 | 55 |
| 538.7 | 6.4 J2c | 532.3 | 27 | 55 |
| | | | | |
| 2.8 J | 5.9 J | -3.1 | 27 | 56 |
| 6.5 J | 5.9 J | 0.6 | 28 | 56 |
| ND<10 U | 5.9 J | 4.1 | 29 | 56 |
| ND<5 U | 5.9 J | -0.9 | 29 | 57 |
| 3.472 J | 5.9 J | -2.428 | 29 | 58 |
| 4.053 J | 5.9 J | -1.847 | 29 | 59 |
| 5.737 J | 5.9 J | -0.163 | 29 | 60 |
| 538.7 | 5.9 J | 532.8 | 30 | 60 |
| | | | | |
| 6.5 J | 2.8 J | 3.7 | 31 | 60 |
| ND<10 U | 2.8 J | 7.2 | 32 | 60 |
| ND<5 U | 2.8 J | 2.2 | 33 | 60 |
| 3.472 J | 2.8 J | 0.672 | 34 | 60 |

| | | | | |
|---|---|---|---|---|
| 4.053 J | 2.8 J | 1.253 | 35 | 60 |
| 5.737 J | 2.8 J | 2.937 | 36 | 60 |
| 538.7 | 2.8 J | 535.9 | 37 | 60 |
| | | | | |
| ND<10 U | 6.5 J | 3.5 | 38 | 60 |
| ND<5 U | 6.5 J | -1.5 | 38 | 61 |
| 3.472 J | 6.5 J | -3.028 | 38 | 62 |
| 4.053 J | 6.5 J | -2.447 | 38 | 63 |
| 5.737 J | 6.5 J | -0.763 | 38 | 64 |
| 538.7 | 6.5 J | 532.2 | 39 | 64 |
| | | | | |
| ND<5 U | ND<10 U | -5 | 39 | 65 |
| 3.472 J | ND<10 U | -6.528 | 39 | 66 |
| 4.053 J | ND<10 U | -5.947 | 39 | 67 |
| 5.737 J | ND<10 U | -4.263 | 39 | 68 |
| 538.7 | ND<10 U | 528.7 | 40 | 68 |
| | | | | |
| 3.472 J | ND<5 U | -1.528 | 40 | 69 |
| 4.053 J | ND<5 U | -0.947 | 40 | 70 |
| 5.737 J | ND<5 U | 0.737 | 41 | 70 |
| 538.7 | ND<5 U | 533.7 | 42 | 70 |
| | | | | |
| 4.053 J | 3.472 J | 0.581 | 43 | 70 |
| 5.737 J | 3.472 J | 2.265 | 44 | 70 |
| 538.7 | 3.472 J | 535.228 | 45 | 70 |
| | | | | |
| 5.737 J | 4.053 J | 1.684 | 46 | 70 |
| 538.7 | 4.053 J | 534.647 | 47 | 70 |
| | | | | |
| 538.7 | 5.737 J | 532.963 | 48 | 70 |

S Statistic = 48 - 70 = -22

| Tied Group | Value | Members |
|---|---|---|
| 1 | 5 | 2 |

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 18
B = 18

C = 0
D = 0
E = 2
F = 2
a = 8880
b = 30240
c = 480
Group Variance = 491.342
Z-Score = -0.947387
Comparison Level at 95% confidence level = -1.65463 (downward trend)
-0.947387 >= -1.65463 indicating no evidence of a downward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RW24-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 5 J | 94 | Same Date | 0 | 0 |
| 8.2 J | 94 | -85.8 | 0 | 1 |
| 6.7 J | 94 | -87.3 | 0 | 2 |
| 3.5 J | 94 | -90.5 | 0 | 3 |
| 3.4 J | 94 | -90.6 | 0 | 4 |
| 16.4 | 94 | -77.6 | 0 | 5 |
| ND<5 U1c | 94 | -89 | 0 | 6 |
| | | | | |
| 8.2 J | 5 J | 3.2 | 1 | 6 |
| 6.7 J | 5 J | 1.7 | 2 | 6 |
| 3.5 J | 5 J | -1.5 | 2 | 7 |
| 3.4 J | 5 J | -1.6 | 2 | 8 |
| 16.4 | 5 J | 11.4 | 3 | 8 |
| ND<5 U1c | 5 J | 0 | 3 | 8 |
| | | | | |
| 6.7 J | 8.2 J | -1.5 | 3 | 9 |
| 3.5 J | 8.2 J | -4.7 | 3 | 10 |
| 3.4 J | 8.2 J | -4.8 | 3 | 11 |
| 16.4 | 8.2 J | 8.2 | 4 | 11 |
| ND<5 U1c | 8.2 J | -3.2 | 4 | 12 |
| | | | | |
| 3.5 J | 6.7 J | -3.2 | 4 | 13 |
| 3.4 J | 6.7 J | -3.3 | 4 | 14 |
| 16.4 | 6.7 J | 9.7 | 5 | 14 |
| ND<5 U1c | 6.7 J | -1.7 | 5 | 15 |
| | | | | |
| 3.4 J | 3.5 J | -0.1 | 5 | 16 |
| 16.4 | 3.5 J | 12.9 | 6 | 16 |
| ND<5 U1c | 3.5 J | 1.5 | 7 | 16 |
| | | | | |
| 16.4 | 3.4 J | 13 | 8 | 16 |
| ND<5 U1c | 3.4 J | 1.6 | 9 | 16 |
| | | | | |
| ND<5 U1c | 16.4 | -11.4 | 9 | 17 |

S Statistic = 9 - 17 = -8

| Tied Group | Value | Members |
|---|---|---|
| 1 | 5 | 2 |

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |

| | |
|---|---|
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |

There are 1 time periods with multiple data

---

A = 18
B = 18
C = 0
D = 0
E = 2
F = 2
a = 1176
b = 3024
c = 112
Group Variance = 63.369
Z-Score = -0.879345
Comparison Level at 95% confidence level = -1.65463 (downward trend)
-0.879345 >= -1.65463 indicating no evidence of a downward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RW25-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 70800 M6 | 70500 | Same Date | 0 | 0 |
| 437000 | 70500 | 366500 | 1 | 0 |
| 11900 | 70500 | -58600 | 1 | 1 |
| 2570 | 70500 | -67930 | 1 | 2 |
| 5720 | 70500 | -64780 | 1 | 3 |
| 2780 | 70500 | -67720 | 1 | 4 |
| 9930 1c | 70500 | -60570 | 1 | 5 |
| | | | | |
| 437000 | 70800 M6 | 366200 | 2 | 5 |
| 11900 | 70800 M6 | -58900 | 2 | 6 |
| 2570 | 70800 M6 | -68230 | 2 | 7 |
| 5720 | 70800 M6 | -65080 | 2 | 8 |
| 2780 | 70800 M6 | -68020 | 2 | 9 |
| 9930 1c | 70800 M6 | -60870 | 2 | 10 |
| | | | | |
| 11900 | 437000 | -425100 | 2 | 11 |
| 2570 | 437000 | -434430 | 2 | 12 |
| 5720 | 437000 | -431280 | 2 | 13 |
| 2780 | 437000 | -434220 | 2 | 14 |
| 9930 1c | 437000 | -427070 | 2 | 15 |
| | | | | |
| 2570 | 11900 | -9330 | 2 | 16 |
| 5720 | 11900 | -6180 | 2 | 17 |
| 2780 | 11900 | -9120 | 2 | 18 |
| 9930 1c | 11900 | -1970 | 2 | 19 |
| | | | | |
| 5720 | 2570 | 3150 | 3 | 19 |
| 2780 | 2570 | 210 | 4 | 19 |
| 9930 1c | 2570 | 7360 | 5 | 19 |
| | | | | |
| 2780 | 5720 | -2940 | 5 | 20 |
| 9930 1c | 5720 | 4210 | 6 | 20 |
| | | | | |
| 9930 1c | 2780 | 7150 | 7 | 20 |

S Statistic = 7 - 20 = -13

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |

9/1/2020 1
11/1/2020 1
There are 1 time periods with multiple data

---

A = 0
B = 18
C = 0
D = 0
E = 0
F = 2
a = 1176
b = 3024
c = 112
Group Variance = 64.3333
Z-Score = -1.49611
Comparison Level at 95% confidence level = -1.65463 (downward trend)
-1.49611 >= -1.65463 indicating no evidence of a downward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RWA-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 17.6 | 516 | Same Date | 0 | 0 |
| 17.6 | 516 | Same Date | 0 | 0 |
| 32.6 | 516 | Same Date | 0 | 0 |
| 32.6 | 516 | Same Date | 0 | 0 |
| 750 1c2c | 516 | Same Date | 0 | 0 |
| 32.6 | 516 | Same Date | 0 | 0 |
| 32.6 | 516 | Same Date | 0 | 0 |
| 17.6 | 516 | Same Date | 0 | 0 |
| 17.6 | 516 | Same Date | 0 | 0 |
| 1720 | 516 | 1204 | 1 | 0 |
| 49.7 | 516 | -466.3 | 1 | 1 |
| 9.7 J | 516 | -506.3 | 1 | 2 |
| 21.5 | 516 | -494.5 | 1 | 3 |
| 182 | 516 | -334 | 1 | 4 |
| 52.1 1c | 516 | -463.9 | 1 | 5 |
| 6.1 J | 516 | -509.9 | 1 | 6 |
| 7.6 J | 516 | -508.4 | 1 | 7 |
| 46.8 | 516 | -469.2 | 1 | 8 |
| 627.7 | 516 | 111.7 | 2 | 8 |
| 284.4 | 516 | -231.6 | 2 | 9 |
| 319 | 516 | -197 | 2 | 10 |
| 152.4 | 516 | -363.6 | 2 | 11 |
| 183.9 | 516 | -332.1 | 2 | 12 |
| | | | | |
| 17.6 | 17.6 | Same Date | 2 | 12 |
| 32.6 | 17.6 | Same Date | 2 | 12 |
| 32.6 | 17.6 | Same Date | 2 | 12 |
| 750 1c2c | 17.6 | Same Date | 2 | 12 |
| 32.6 | 17.6 | Same Date | 2 | 12 |
| 32.6 | 17.6 | Same Date | 2 | 12 |
| 17.6 | 17.6 | Same Date | 2 | 12 |
| 17.6 | 17.6 | Same Date | 2 | 12 |
| 1720 | 17.6 | 1702.4 | 3 | 12 |
| 49.7 | 17.6 | 32.1 | 4 | 12 |
| 9.7 J | 17.6 | -7.9 | 4 | 13 |
| 21.5 | 17.6 | 3.9 | 5 | 13 |
| 182 | 17.6 | 164.4 | 6 | 13 |
| 52.1 1c | 17.6 | 34.5 | 7 | 13 |
| 6.1 J | 17.6 | -11.5 | 7 | 14 |
| 7.6 J | 17.6 | -10 | 7 | 15 |
| 46.8 | 17.6 | 29.2 | 8 | 15 |
| 627.7 | 17.6 | 610.1 | 9 | 15 |
| 284.4 | 17.6 | 266.8 | 10 | 15 |
| 319 | 17.6 | 301.4 | 11 | 15 |
| 152.4 | 17.6 | 134.8 | 12 | 15 |
| 183.9 | 17.6 | 166.3 | 13 | 15 |

| | | | | |
|---|---|---|---|---|
| 32.6 | 17.6 | Same Date | 13 | 15 |
| 32.6 | 17.6 | Same Date | 13 | 15 |
| 750 1c2c | 17.6 | Same Date | 13 | 15 |
| 32.6 | 17.6 | Same Date | 13 | 15 |
| 32.6 | 17.6 | Same Date | 13 | 15 |
| 17.6 | 17.6 | Same Date | 13 | 15 |
| 17.6 | 17.6 | Same Date | 13 | 15 |
| 1720 | 17.6 | 1702.4 | 14 | 15 |
| 49.7 | 17.6 | 32.1 | 15 | 15 |
| 9.7 J | 17.6 | -7.9 | 15 | 16 |
| 21.5 | 17.6 | 3.9 | 16 | 16 |
| 182 | 17.6 | 164.4 | 17 | 16 |
| 52.1 1c | 17.6 | 34.5 | 18 | 16 |
| 6.1 J | 17.6 | -11.5 | 18 | 17 |
| 7.6 J | 17.6 | -10 | 18 | 18 |
| 46.8 | 17.6 | 29.2 | 19 | 18 |
| 627.7 | 17.6 | 610.1 | 20 | 18 |
| 284.4 | 17.6 | 266.8 | 21 | 18 |
| 319 | 17.6 | 301.4 | 22 | 18 |
| 152.4 | 17.6 | 134.8 | 23 | 18 |
| 183.9 | 17.6 | 166.3 | 24 | 18 |
| | | | | |
| 32.6 | 32.6 | Same Date | 24 | 18 |
| 750 1c2c | 32.6 | Same Date | 24 | 18 |
| 32.6 | 32.6 | Same Date | 24 | 18 |
| 32.6 | 32.6 | Same Date | 24 | 18 |
| 17.6 | 32.6 | Same Date | 24 | 18 |
| 17.6 | 32.6 | Same Date | 24 | 18 |
| 1720 | 32.6 | 1687.4 | 25 | 18 |
| 49.7 | 32.6 | 17.1 | 26 | 18 |
| 9.7 J | 32.6 | -22.9 | 26 | 19 |
| 21.5 | 32.6 | -11.1 | 26 | 20 |
| 182 | 32.6 | 149.4 | 27 | 20 |
| 52.1 1c | 32.6 | 19.5 | 28 | 20 |
| 6.1 J | 32.6 | -26.5 | 28 | 21 |
| 7.6 J | 32.6 | -25 | 28 | 22 |
| 46.8 | 32.6 | 14.2 | 29 | 22 |
| 627.7 | 32.6 | 595.1 | 30 | 22 |
| 284.4 | 32.6 | 251.8 | 31 | 22 |
| 319 | 32.6 | 286.4 | 32 | 22 |
| 152.4 | 32.6 | 119.8 | 33 | 22 |
| 183.9 | 32.6 | 151.3 | 34 | 22 |
| | | | | |
| 750 1c2c | 32.6 | Same Date | 34 | 22 |
| 32.6 | 32.6 | Same Date | 34 | 22 |
| 32.6 | 32.6 | Same Date | 34 | 22 |
| 17.6 | 32.6 | Same Date | 34 | 22 |
| 17.6 | 32.6 | Same Date | 34 | 22 |
| 1720 | 32.6 | 1687.4 | 35 | 22 |
| 49.7 | 32.6 | 17.1 | 36 | 22 |
| 9.7 J | 32.6 | -22.9 | 36 | 23 |
| 21.5 | 32.6 | -11.1 | 36 | 24 |
| 182 | 32.6 | 149.4 | 37 | 24 |
| 52.1 1c | 32.6 | 19.5 | 38 | 24 |
| 6.1 J | 32.6 | -26.5 | 38 | 25 |
| 7.6 J | 32.6 | -25 | 38 | 26 |
| 46.8 | 32.6 | 14.2 | 39 | 26 |

| | | | | |
|---|---|---|---|---|
| 627.7 | 32.6 | 595.1 | 40 | 26 |
| 284.4 | 32.6 | 251.8 | 41 | 26 |
| 319 | 32.6 | 286.4 | 42 | 26 |
| 152.4 | 32.6 | 119.8 | 43 | 26 |
| 183.9 | 32.6 | 151.3 | 44 | 26 |
| | | | | |
| 32.6 | 750 1c2c | Same Date | 44 | 26 |
| 32.6 | 750 1c2c | Same Date | 44 | 26 |
| 17.6 | 750 1c2c | Same Date | 44 | 26 |
| 17.6 | 750 1c2c | Same Date | 44 | 26 |
| 1720 | 750 1c2c | 970 | 45 | 26 |
| 49.7 | 750 1c2c | -700.3 | 45 | 27 |
| 9.7 J | 750 1c2c | -740.3 | 45 | 28 |
| 21.5 | 750 1c2c | -728.5 | 45 | 29 |
| 182 | 750 1c2c | -568 | 45 | 30 |
| 52.1 1c | 750 1c2c | -697.9 | 45 | 31 |
| 6.1 J | 750 1c2c | -743.9 | 45 | 32 |
| 7.6 J | 750 1c2c | -742.4 | 45 | 33 |
| 46.8 | 750 1c2c | -703.2 | 45 | 34 |
| 627.7 | 750 1c2c | -122.3 | 45 | 35 |
| 284.4 | 750 1c2c | -465.6 | 45 | 36 |
| 319 | 750 1c2c | -431 | 45 | 37 |
| 152.4 | 750 1c2c | -597.6 | 45 | 38 |
| 183.9 | 750 1c2c | -566.1 | 45 | 39 |
| | | | | |
| 32.6 | 32.6 | Same Date | 45 | 39 |
| 17.6 | 32.6 | Same Date | 45 | 39 |
| 17.6 | 32.6 | Same Date | 45 | 39 |
| 1720 | 32.6 | 1687.4 | 46 | 39 |
| 49.7 | 32.6 | 17.1 | 47 | 39 |
| 9.7 J | 32.6 | -22.9 | 47 | 40 |
| 21.5 | 32.6 | -11.1 | 47 | 41 |
| 182 | 32.6 | 149.4 | 48 | 41 |
| 52.1 1c | 32.6 | 19.5 | 49 | 41 |
| 6.1 J | 32.6 | -26.5 | 49 | 42 |
| 7.6 J | 32.6 | -25 | 49 | 43 |
| 46.8 | 32.6 | 14.2 | 50 | 43 |
| 627.7 | 32.6 | 595.1 | 51 | 43 |
| 284.4 | 32.6 | 251.8 | 52 | 43 |
| 319 | 32.6 | 286.4 | 53 | 43 |
| 152.4 | 32.6 | 119.8 | 54 | 43 |
| 183.9 | 32.6 | 151.3 | 55 | 43 |
| | | | | |
| 17.6 | 32.6 | Same Date | 55 | 43 |
| 17.6 | 32.6 | Same Date | 55 | 43 |
| 1720 | 32.6 | 1687.4 | 56 | 43 |
| 49.7 | 32.6 | 17.1 | 57 | 43 |
| 9.7 J | 32.6 | -22.9 | 57 | 44 |
| 21.5 | 32.6 | -11.1 | 57 | 45 |
| 182 | 32.6 | 149.4 | 58 | 45 |
| 52.1 1c | 32.6 | 19.5 | 59 | 45 |
| 6.1 J | 32.6 | -26.5 | 59 | 46 |
| 7.6 J | 32.6 | -25 | 59 | 47 |
| 46.8 | 32.6 | 14.2 | 60 | 47 |
| 627.7 | 32.6 | 595.1 | 61 | 47 |
| 284.4 | 32.6 | 251.8 | 62 | 47 |
| 319 | 32.6 | 286.4 | 63 | 47 |

| | | | | |
|---|---|---|---|---|
| 152.4 | 32.6 | 119.8 | 64 | 47 |
| 183.9 | 32.6 | 151.3 | 65 | 47 |
| | | | | |
| 17.6 | 17.6 | Same Date | 65 | 47 |
| 1720 | 17.6 | 1702.4 | 66 | 47 |
| 49.7 | 17.6 | 32.1 | 67 | 47 |
| 9.7 J | 17.6 | -7.9 | 67 | 48 |
| 21.5 | 17.6 | 3.9 | 68 | 48 |
| 182 | 17.6 | 164.4 | 69 | 48 |
| 52.1 1c | 17.6 | 34.5 | 70 | 48 |
| 6.1 J | 17.6 | -11.5 | 70 | 49 |
| 7.6 J | 17.6 | -10 | 70 | 50 |
| 46.8 | 17.6 | 29.2 | 71 | 50 |
| 627.7 | 17.6 | 610.1 | 72 | 50 |
| 284.4 | 17.6 | 266.8 | 73 | 50 |
| 319 | 17.6 | 301.4 | 74 | 50 |
| 152.4 | 17.6 | 134.8 | 75 | 50 |
| 183.9 | 17.6 | 166.3 | 76 | 50 |
| | | | | |
| 1720 | 17.6 | 1702.4 | 77 | 50 |
| 49.7 | 17.6 | 32.1 | 78 | 50 |
| 9.7 J | 17.6 | -7.9 | 78 | 51 |
| 21.5 | 17.6 | 3.9 | 79 | 51 |
| 182 | 17.6 | 164.4 | 80 | 51 |
| 52.1 1c | 17.6 | 34.5 | 81 | 51 |
| 6.1 J | 17.6 | -11.5 | 81 | 52 |
| 7.6 J | 17.6 | -10 | 81 | 53 |
| 46.8 | 17.6 | 29.2 | 82 | 53 |
| 627.7 | 17.6 | 610.1 | 83 | 53 |
| 284.4 | 17.6 | 266.8 | 84 | 53 |
| 319 | 17.6 | 301.4 | 85 | 53 |
| 152.4 | 17.6 | 134.8 | 86 | 53 |
| 183.9 | 17.6 | 166.3 | 87 | 53 |
| | | | | |
| 49.7 | 1720 | -1670.3 | 87 | 54 |
| 9.7 J | 1720 | -1710.3 | 87 | 55 |
| 21.5 | 1720 | -1698.5 | 87 | 56 |
| 182 | 1720 | -1538 | 87 | 57 |
| 52.1 1c | 1720 | -1667.9 | 87 | 58 |
| 6.1 J | 1720 | -1713.9 | 87 | 59 |
| 7.6 J | 1720 | -1712.4 | 87 | 60 |
| 46.8 | 1720 | -1673.2 | 87 | 61 |
| 627.7 | 1720 | -1092.3 | 87 | 62 |
| 284.4 | 1720 | -1435.6 | 87 | 63 |
| 319 | 1720 | -1401 | 87 | 64 |
| 152.4 | 1720 | -1567.6 | 87 | 65 |
| 183.9 | 1720 | -1536.1 | 87 | 66 |
| | | | | |
| 9.7 J | 49.7 | -40 | 87 | 67 |
| 21.5 | 49.7 | -28.2 | 87 | 68 |
| 182 | 49.7 | 132.3 | 88 | 68 |
| 52.1 1c | 49.7 | 2.4 | 89 | 68 |
| 6.1 J | 49.7 | -43.6 | 89 | 69 |
| 7.6 J | 49.7 | -42.1 | 89 | 70 |
| 46.8 | 49.7 | -2.9 | 89 | 71 |
| 627.7 | 49.7 | 578 | 90 | 71 |
| 284.4 | 49.7 | 234.7 | 91 | 71 |

| | | | | |
|---|---|---|---|---|
| 319 | 49.7 | 269.3 | 92 | 71 |
| 152.4 | 49.7 | 102.7 | 93 | 71 |
| 183.9 | 49.7 | 134.2 | 94 | 71 |
| | | | | |
| 21.5 | 9.7 J | 11.8 | 95 | 71 |
| 182 | 9.7 J | 172.3 | 96 | 71 |
| 52.1 1c | 9.7 J | 42.4 | 97 | 71 |
| 6.1 J | 9.7 J | -3.6 | 97 | 72 |
| 7.6 J | 9.7 J | -2.1 | 97 | 73 |
| 46.8 | 9.7 J | 37.1 | 98 | 73 |
| 627.7 | 9.7 J | 618 | 99 | 73 |
| 284.4 | 9.7 J | 274.7 | 100 | 73 |
| 319 | 9.7 J | 309.3 | 101 | 73 |
| 152.4 | 9.7 J | 142.7 | 102 | 73 |
| 183.9 | 9.7 J | 174.2 | 103 | 73 |
| | | | | |
| 182 | 21.5 | 160.5 | 104 | 73 |
| 52.1 1c | 21.5 | 30.6 | 105 | 73 |
| 6.1 J | 21.5 | -15.4 | 105 | 74 |
| 7.6 J | 21.5 | -13.9 | 105 | 75 |
| 46.8 | 21.5 | 25.3 | 106 | 75 |
| 627.7 | 21.5 | 606.2 | 107 | 75 |
| 284.4 | 21.5 | 262.9 | 108 | 75 |
| 319 | 21.5 | 297.5 | 109 | 75 |
| 152.4 | 21.5 | 130.9 | 110 | 75 |
| 183.9 | 21.5 | 162.4 | 111 | 75 |
| | | | | |
| 52.1 1c | 182 | -129.9 | 111 | 76 |
| 6.1 J | 182 | -175.9 | 111 | 77 |
| 7.6 J | 182 | -174.4 | 111 | 78 |
| 46.8 | 182 | -135.2 | 111 | 79 |
| 627.7 | 182 | 445.7 | 112 | 79 |
| 284.4 | 182 | 102.4 | 113 | 79 |
| 319 | 182 | 137 | 114 | 79 |
| 152.4 | 182 | -29.6 | 114 | 80 |
| 183.9 | 182 | 1.9 | 115 | 80 |
| | | | | |
| 6.1 J | 52.1 1c | -46 | 115 | 81 |
| 7.6 J | 52.1 1c | -44.5 | 115 | 82 |
| 46.8 | 52.1 1c | -5.3 | 115 | 83 |
| 627.7 | 52.1 1c | 575.6 | 116 | 83 |
| 284.4 | 52.1 1c | 232.3 | 117 | 83 |
| 319 | 52.1 1c | 266.9 | 118 | 83 |
| 152.4 | 52.1 1c | 100.3 | 119 | 83 |
| 183.9 | 52.1 1c | 131.8 | 120 | 83 |
| | | | | |
| 7.6 J | 6.1 J | 1.5 | 121 | 83 |
| 46.8 | 6.1 J | 40.7 | 122 | 83 |
| 627.7 | 6.1 J | 621.6 | 123 | 83 |
| 284.4 | 6.1 J | 278.3 | 124 | 83 |
| 319 | 6.1 J | 312.9 | 125 | 83 |
| 152.4 | 6.1 J | 146.3 | 126 | 83 |
| 183.9 | 6.1 J | 177.8 | 127 | 83 |
| | | | | |
| 46.8 | 7.6 J | 39.2 | 128 | 83 |
| 627.7 | 7.6 J | 620.1 | 129 | 83 |
| 284.4 | 7.6 J | 276.8 | 130 | 83 |

| | | | | |
|---|---|---|---|---|
| 319 | 7.6 J | 311.4 | 131 | 83 |
| 152.4 | 7.6 J | 144.8 | 132 | 83 |
| 183.9 | 7.6 J | 176.3 | 133 | 83 |
| | | | | |
| 627.7 | 46.8 | 580.9 | 134 | 83 |
| 284.4 | 46.8 | 237.6 | 135 | 83 |
| 319 | 46.8 | 272.2 | 136 | 83 |
| 152.4 | 46.8 | 105.6 | 137 | 83 |
| 183.9 | 46.8 | 137.1 | 138 | 83 |
| | | | | |
| 284.4 | 627.7 | -343.3 | 138 | 84 |
| 319 | 627.7 | -308.7 | 138 | 85 |
| 152.4 | 627.7 | -475.3 | 138 | 86 |
| 183.9 | 627.7 | -443.8 | 138 | 87 |
| | | | | |
| 319 | 284.4 | 34.6 | 139 | 87 |
| 152.4 | 284.4 | -132 | 139 | 88 |
| 183.9 | 284.4 | -100.5 | 139 | 89 |
| | | | | |
| 152.4 | 319 | -166.6 | 139 | 90 |
| 183.9 | 319 | -135.1 | 139 | 91 |
| | | | | |
| 183.9 | 152.4 | 31.5 | 140 | 91 |

S Statistic = 140 - 91 = 49

| Tied Group | Value | Members |
|---|---|---|
| 1 | 17.6 | 4 |
| 2 | 32.6 | 4 |

| Time Period | Observations |
|---|---|
| 5/1/2019 | 10 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 312
B = 2250
C = 48
D = 720
E = 24
F = 90
a = 29256
b = 109296

c = 1104
Group Variance = 1485.27
Z-Score = 1.24548
Comparison Level at 95% confidence level = -1.65463 (downward trend)
1.24548 >= -1.65463 indicating no evidence of a downward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RWB-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 254 | 254 | Same Date | 0 | 0 |
| 5.4 J | 254 | Same Date | 0 | 0 |
| 5.4 J | 254 | Same Date | 0 | 0 |
| 5.4 J | 254 | Same Date | 0 | 0 |
| 5.4 J | 254 | Same Date | 0 | 0 |
| 64.9 1c2c | 254 | Same Date | 0 | 0 |
| 7.4 J | 254 | Same Date | 0 | 0 |
| 254 | 254 | Same Date | 0 | 0 |
| 254 | 254 | Same Date | 0 | 0 |
| 5.5 J | 254 | -248.5 | 0 | 1 |
| 38.7 | 254 | -215.3 | 0 | 2 |
| 6.1 J | 254 | -247.9 | 0 | 3 |
| ND<5 U | 254 | -249 | 0 | 4 |
| 5.8 J1c | 254 | -248.2 | 0 | 5 |
| 11.9 1c | 254 | -242.1 | 0 | 6 |
| ND<5 U | 254 | -249 | 0 | 7 |
| 12.4 J | 254 | -241.6 | 0 | 8 |
| ND<10 U | 254 | -244 | 0 | 9 |
| 5.072 J | 254 | -248.928 | 0 | 10 |
| ND<5 U | 254 | -249 | 0 | 11 |
| 3.551 J | 254 | -250.449 | 0 | 12 |
| 17.04 | 254 | -236.96 | 0 | 13 |
| ND<5 U | 254 | -249 | 0 | 14 |
| | | | | |
| 5.4 J | 254 | Same Date | 0 | 14 |
| 5.4 J | 254 | Same Date | 0 | 14 |
| 5.4 J | 254 | Same Date | 0 | 14 |
| 5.4 J | 254 | Same Date | 0 | 14 |
| 64.9 1c2c | 254 | Same Date | 0 | 14 |
| 7.4 J | 254 | Same Date | 0 | 14 |
| 254 | 254 | Same Date | 0 | 14 |
| 254 | 254 | Same Date | 0 | 14 |
| 5.5 J | 254 | -248.5 | 0 | 15 |
| 38.7 | 254 | -215.3 | 0 | 16 |
| 6.1 J | 254 | -247.9 | 0 | 17 |
| ND<5 U | 254 | -249 | 0 | 18 |
| 5.8 J1c | 254 | -248.2 | 0 | 19 |
| 11.9 1c | 254 | -242.1 | 0 | 20 |
| ND<5 U | 254 | -249 | 0 | 21 |
| 12.4 J | 254 | -241.6 | 0 | 22 |
| ND<10 U | 254 | -244 | 0 | 23 |
| 5.072 J | 254 | -248.928 | 0 | 24 |
| ND<5 U | 254 | -249 | 0 | 25 |
| 3.551 J | 254 | -250.449 | 0 | 26 |
| 17.04 | 254 | -236.96 | 0 | 27 |
| ND<5 U | 254 | -249 | 0 | 28 |

| | | | | |
|---|---|---|---|---|
| 5.4 J | 5.4 J | Same Date | 0 | 28 |
| 5.4 J | 5.4 J | Same Date | 0 | 28 |
| 5.4 J | 5.4 J | Same Date | 0 | 28 |
| 64.9 1c2c | 5.4 J | Same Date | 0 | 28 |
| 7.4 J | 5.4 J | Same Date | 0 | 28 |
| 254 | 5.4 J | Same Date | 0 | 28 |
| 254 | 5.4 J | Same Date | 0 | 28 |
| 5.5 J | 5.4 J | 0.1 | 1 | 28 |
| 38.7 | 5.4 J | 33.3 | 2 | 28 |
| 6.1 J | 5.4 J | 0.7 | 3 | 28 |
| ND<5 U | 5.4 J | -0.4 | 3 | 29 |
| 5.8 J1c | 5.4 J | 0.4 | 4 | 29 |
| 11.9 1c | 5.4 J | 6.5 | 5 | 29 |
| ND<5 U | 5.4 J | -0.4 | 5 | 30 |
| 12.4 J | 5.4 J | 7 | 6 | 30 |
| ND<10 U | 5.4 J | 4.6 | 7 | 30 |
| 5.072 J | 5.4 J | -0.328 | 7 | 31 |
| ND<5 U | 5.4 J | -0.4 | 7 | 32 |
| 3.551 J | 5.4 J | -1.849 | 7 | 33 |
| 17.04 | 5.4 J | 11.64 | 8 | 33 |
| ND<5 U | 5.4 J | -0.4 | 8 | 34 |
| | | | | |
| 5.4 J | 5.4 J | Same Date | 8 | 34 |
| 5.4 J | 5.4 J | Same Date | 8 | 34 |
| 64.9 1c2c | 5.4 J | Same Date | 8 | 34 |
| 7.4 J | 5.4 J | Same Date | 8 | 34 |
| 254 | 5.4 J | Same Date | 8 | 34 |
| 254 | 5.4 J | Same Date | 8 | 34 |
| 5.5 J | 5.4 J | 0.1 | 9 | 34 |
| 38.7 | 5.4 J | 33.3 | 10 | 34 |
| 6.1 J | 5.4 J | 0.7 | 11 | 34 |
| ND<5 U | 5.4 J | -0.4 | 11 | 35 |
| 5.8 J1c | 5.4 J | 0.4 | 12 | 35 |
| 11.9 1c | 5.4 J | 6.5 | 13 | 35 |
| ND<5 U | 5.4 J | -0.4 | 13 | 36 |
| 12.4 J | 5.4 J | 7 | 14 | 36 |
| ND<10 U | 5.4 J | 4.6 | 15 | 36 |
| 5.072 J | 5.4 J | -0.328 | 15 | 37 |
| ND<5 U | 5.4 J | -0.4 | 15 | 38 |
| 3.551 J | 5.4 J | -1.849 | 15 | 39 |
| 17.04 | 5.4 J | 11.64 | 16 | 39 |
| ND<5 U | 5.4 J | -0.4 | 16 | 40 |
| | | | | |
| 5.4 J | 5.4 J | Same Date | 16 | 40 |
| 64.9 1c2c | 5.4 J | Same Date | 16 | 40 |
| 7.4 J | 5.4 J | Same Date | 16 | 40 |
| 254 | 5.4 J | Same Date | 16 | 40 |
| 254 | 5.4 J | Same Date | 16 | 40 |
| 5.5 J | 5.4 J | 0.1 | 17 | 40 |
| 38.7 | 5.4 J | 33.3 | 18 | 40 |
| 6.1 J | 5.4 J | 0.7 | 19 | 40 |
| ND<5 U | 5.4 J | -0.4 | 19 | 41 |
| 5.8 J1c | 5.4 J | 0.4 | 20 | 41 |
| 11.9 1c | 5.4 J | 6.5 | 21 | 41 |
| ND<5 U | 5.4 J | -0.4 | 21 | 42 |
| 12.4 J | 5.4 J | 7 | 22 | 42 |
| ND<10 U | 5.4 J | 4.6 | 23 | 42 |

| | | | | |
|---|---|---|---|---|
| 5.072 J | 5.4 J | -0.328 | 23 | 43 |
| ND<5 U | 5.4 J | -0.4 | 23 | 44 |
| 3.551 J | 5.4 J | -1.849 | 23 | 45 |
| 17.04 | 5.4 J | 11.64 | 24 | 45 |
| ND<5 U | 5.4 J | -0.4 | 24 | 46 |
| | | | | |
| 64.9 1c2c | 5.4 J | Same Date | 24 | 46 |
| 7.4 J | 5.4 J | Same Date | 24 | 46 |
| 254 | 5.4 J | Same Date | 24 | 46 |
| 254 | 5.4 J | Same Date | 24 | 46 |
| 5.5 J | 5.4 J | 0.1 | 25 | 46 |
| 38.7 | 5.4 J | 33.3 | 26 | 46 |
| 6.1 J | 5.4 J | 0.7 | 27 | 46 |
| ND<5 U | 5.4 J | -0.4 | 27 | 47 |
| 5.8 J1c | 5.4 J | 0.4 | 28 | 47 |
| 11.9 1c | 5.4 J | 6.5 | 29 | 47 |
| ND<5 U | 5.4 J | -0.4 | 29 | 48 |
| 12.4 J | 5.4 J | 7 | 30 | 48 |
| ND<10 U | 5.4 J | 4.6 | 31 | 48 |
| 5.072 J | 5.4 J | -0.328 | 31 | 49 |
| ND<5 U | 5.4 J | -0.4 | 31 | 50 |
| 3.551 J | 5.4 J | -1.849 | 31 | 51 |
| 17.04 | 5.4 J | 11.64 | 32 | 51 |
| ND<5 U | 5.4 J | -0.4 | 32 | 52 |
| | | | | |
| 7.4 J | 64.9 1c2c | Same Date | 32 | 52 |
| 254 | 64.9 1c2c | Same Date | 32 | 52 |
| 254 | 64.9 1c2c | Same Date | 32 | 52 |
| 5.5 J | 64.9 1c2c | -59.4 | 32 | 53 |
| 38.7 | 64.9 1c2c | -26.2 | 32 | 54 |
| 6.1 J | 64.9 1c2c | -58.8 | 32 | 55 |
| ND<5 U | 64.9 1c2c | -59.9 | 32 | 56 |
| 5.8 J1c | 64.9 1c2c | -59.1 | 32 | 57 |
| 11.9 1c | 64.9 1c2c | -53 | 32 | 58 |
| ND<5 U | 64.9 1c2c | -59.9 | 32 | 59 |
| 12.4 J | 64.9 1c2c | -52.5 | 32 | 60 |
| ND<10 U | 64.9 1c2c | -54.9 | 32 | 61 |
| 5.072 J | 64.9 1c2c | -59.828 | 32 | 62 |
| ND<5 U | 64.9 1c2c | -59.9 | 32 | 63 |
| 3.551 J | 64.9 1c2c | -61.349 | 32 | 64 |
| 17.04 | 64.9 1c2c | -47.86 | 32 | 65 |
| ND<5 U | 64.9 1c2c | -59.9 | 32 | 66 |
| | | | | |
| 254 | 7.4 J | Same Date | 32 | 66 |
| 254 | 7.4 J | Same Date | 32 | 66 |
| 5.5 J | 7.4 J | -1.9 | 32 | 67 |
| 38.7 | 7.4 J | 31.3 | 33 | 67 |
| 6.1 J | 7.4 J | -1.3 | 33 | 68 |
| ND<5 U | 7.4 J | -2.4 | 33 | 69 |
| 5.8 J1c | 7.4 J | -1.6 | 33 | 70 |
| 11.9 1c | 7.4 J | 4.5 | 34 | 70 |
| ND<5 U | 7.4 J | -2.4 | 34 | 71 |
| 12.4 J | 7.4 J | 5 | 35 | 71 |
| ND<10 U | 7.4 J | 2.6 | 36 | 71 |
| 5.072 J | 7.4 J | -2.328 | 36 | 72 |
| ND<5 U | 7.4 J | -2.4 | 36 | 73 |
| 3.551 J | 7.4 J | -3.849 | 36 | 74 |

| | | | | |
|---|---|---|---|---|
| 17.04 | 7.4 J | 9.64 | 37 | 74 |
| ND<5 U | 7.4 J | -2.4 | 37 | 75 |
| | | | | |
| 254 | 254 | Same Date | 37 | 75 |
| 5.5 J | 254 | -248.5 | 37 | 76 |
| 38.7 | 254 | -215.3 | 37 | 77 |
| 6.1 J | 254 | -247.9 | 37 | 78 |
| ND<5 U | 254 | -249 | 37 | 79 |
| 5.8 J1c | 254 | -248.2 | 37 | 80 |
| 11.9 1c | 254 | -242.1 | 37 | 81 |
| ND<5 U | 254 | -249 | 37 | 82 |
| 12.4 J | 254 | -241.6 | 37 | 83 |
| ND<10 U | 254 | -244 | 37 | 84 |
| 5.072 J | 254 | -248.928 | 37 | 85 |
| ND<5 U | 254 | -249 | 37 | 86 |
| 3.551 J | 254 | -250.449 | 37 | 87 |
| 17.04 | 254 | -236.96 | 37 | 88 |
| ND<5 U | 254 | -249 | 37 | 89 |
| | | | | |
| 5.5 J | 254 | -248.5 | 37 | 90 |
| 38.7 | 254 | -215.3 | 37 | 91 |
| 6.1 J | 254 | -247.9 | 37 | 92 |
| ND<5 U | 254 | -249 | 37 | 93 |
| 5.8 J1c | 254 | -248.2 | 37 | 94 |
| 11.9 1c | 254 | -242.1 | 37 | 95 |
| ND<5 U | 254 | -249 | 37 | 96 |
| 12.4 J | 254 | -241.6 | 37 | 97 |
| ND<10 U | 254 | -244 | 37 | 98 |
| 5.072 J | 254 | -248.928 | 37 | 99 |
| ND<5 U | 254 | -249 | 37 | 100 |
| 3.551 J | 254 | -250.449 | 37 | 101 |
| 17.04 | 254 | -236.96 | 37 | 102 |
| ND<5 U | 254 | -249 | 37 | 103 |
| | | | | |
| 38.7 | 5.5 J | 33.2 | 38 | 103 |
| 6.1 J | 5.5 J | 0.6 | 39 | 103 |
| ND<5 U | 5.5 J | -0.5 | 39 | 104 |
| 5.8 J1c | 5.5 J | 0.3 | 40 | 104 |
| 11.9 1c | 5.5 J | 6.4 | 41 | 104 |
| ND<5 U | 5.5 J | -0.5 | 41 | 105 |
| 12.4 J | 5.5 J | 6.9 | 42 | 105 |
| ND<10 U | 5.5 J | 4.5 | 43 | 105 |
| 5.072 J | 5.5 J | -0.428 | 43 | 106 |
| ND<5 U | 5.5 J | -0.5 | 43 | 107 |
| 3.551 J | 5.5 J | -1.949 | 43 | 108 |
| 17.04 | 5.5 J | 11.54 | 44 | 108 |
| ND<5 U | 5.5 J | -0.5 | 44 | 109 |
| | | | | |
| 6.1 J | 38.7 | -32.6 | 44 | 110 |
| ND<5 U | 38.7 | -33.7 | 44 | 111 |
| 5.8 J1c | 38.7 | -32.9 | 44 | 112 |
| 11.9 1c | 38.7 | -26.8 | 44 | 113 |
| ND<5 U | 38.7 | -33.7 | 44 | 114 |
| 12.4 J | 38.7 | -26.3 | 44 | 115 |
| ND<10 U | 38.7 | -28.7 | 44 | 116 |
| 5.072 J | 38.7 | -33.628 | 44 | 117 |
| ND<5 U | 38.7 | -33.7 | 44 | 118 |

| | | | | |
|---|---|---|---|---|
| 3.551 J | 38.7 | -35.149 | 44 | 119 |
| 17.04 | 38.7 | -21.66 | 44 | 120 |
| ND<5 U | 38.7 | -33.7 | 44 | 121 |
| | | | | |
| ND<5 U | 6.1 J | -1.1 | 44 | 122 |
| 5.8 J1c | 6.1 J | -0.3 | 44 | 123 |
| 11.9 1c | 6.1 J | 5.8 | 45 | 123 |
| ND<5 U | 6.1 J | -1.1 | 45 | 124 |
| 12.4 J | 6.1 J | 6.3 | 46 | 124 |
| ND<10 U | 6.1 J | 3.9 | 47 | 124 |
| 5.072 J | 6.1 J | -1.028 | 47 | 125 |
| ND<5 U | 6.1 J | -1.1 | 47 | 126 |
| 3.551 J | 6.1 J | -2.549 | 47 | 127 |
| 17.04 | 6.1 J | 10.94 | 48 | 127 |
| ND<5 U | 6.1 J | -1.1 | 48 | 128 |
| | | | | |
| 5.8 J1c | ND<5 U | 0.8 | 49 | 128 |
| 11.9 1c | ND<5 U | 6.9 | 50 | 128 |
| ND<5 U | ND<5 U | 0 | 50 | 128 |
| 12.4 J | ND<5 U | 7.4 | 51 | 128 |
| ND<10 U | ND<5 U | 5 | 52 | 128 |
| 5.072 J | ND<5 U | 0.072 | 53 | 128 |
| ND<5 U | ND<5 U | 0 | 53 | 128 |
| 3.551 J | ND<5 U | -1.449 | 53 | 129 |
| 17.04 | ND<5 U | 12.04 | 54 | 129 |
| ND<5 U | ND<5 U | 0 | 54 | 129 |
| | | | | |
| 11.9 1c | 5.8 J1c | 6.1 | 55 | 129 |
| ND<5 U | 5.8 J1c | -0.8 | 55 | 130 |
| 12.4 J | 5.8 J1c | 6.6 | 56 | 130 |
| ND<10 U | 5.8 J1c | 4.2 | 57 | 130 |
| 5.072 J | 5.8 J1c | -0.728 | 57 | 131 |
| ND<5 U | 5.8 J1c | -0.8 | 57 | 132 |
| 3.551 J | 5.8 J1c | -2.249 | 57 | 133 |
| 17.04 | 5.8 J1c | 11.24 | 58 | 133 |
| ND<5 U | 5.8 J1c | -0.8 | 58 | 134 |
| | | | | |
| ND<5 U | 11.9 1c | -6.9 | 58 | 135 |
| 12.4 J | 11.9 1c | 0.5 | 59 | 135 |
| ND<10 U | 11.9 1c | -1.9 | 59 | 136 |
| 5.072 J | 11.9 1c | -6.828 | 59 | 137 |
| ND<5 U | 11.9 1c | -6.9 | 59 | 138 |
| 3.551 J | 11.9 1c | -8.349 | 59 | 139 |
| 17.04 | 11.9 1c | 5.14 | 60 | 139 |
| ND<5 U | 11.9 1c | -6.9 | 60 | 140 |
| | | | | |
| 12.4 J | ND<5 U | 7.4 | 61 | 140 |
| ND<10 U | ND<5 U | 5 | 62 | 140 |
| 5.072 J | ND<5 U | 0.072 | 63 | 140 |
| ND<5 U | ND<5 U | 0 | 63 | 140 |
| 3.551 J | ND<5 U | -1.449 | 63 | 141 |
| 17.04 | ND<5 U | 12.04 | 64 | 141 |
| ND<5 U | ND<5 U | 0 | 64 | 141 |
| | | | | |
| ND<10 U | 12.4 J | -2.4 | 64 | 142 |
| 5.072 J | 12.4 J | -7.328 | 64 | 143 |
| ND<5 U | 12.4 J | -7.4 | 64 | 144 |

| | | | | |
|---|---|---|---|---|
| 3.551 J | 12.4 J | -8.849 | 64 | 145 |
| 17.04 | 12.4 J | 4.64 | 65 | 145 |
| ND<5 U | 12.4 J | -7.4 | 65 | 146 |
| | | | | |
| 5.072 J | ND<10 U | -4.928 | 65 | 147 |
| ND<5 U | ND<10 U | -5 | 65 | 148 |
| 3.551 J | ND<10 U | -6.449 | 65 | 149 |
| 17.04 | ND<10 U | 7.04 | 66 | 149 |
| ND<5 U | ND<10 U | -5 | 66 | 150 |
| | | | | |
| ND<5 U | 5.072 J | -0.072 | 66 | 151 |
| 3.551 J | 5.072 J | -1.521 | 66 | 152 |
| 17.04 | 5.072 J | 11.968 | 67 | 152 |
| ND<5 U | 5.072 J | -0.072 | 67 | 153 |
| | | | | |
| 3.551 J | ND<5 U | -1.449 | 67 | 154 |
| 17.04 | ND<5 U | 12.04 | 68 | 154 |
| ND<5 U | ND<5 U | 0 | 68 | 154 |
| | | | | |
| 17.04 | 3.551 J | 13.489 | 69 | 154 |
| ND<5 U | 3.551 J | 1.449 | 70 | 154 |
| | | | | |
| ND<5 U | 17.04 | -12.04 | 70 | 155 |

S Statistic = 70 - 155 = -85

| Tied Group | Value | Members |
|---|---|---|
| 1 | 254 | 4 |
| 2 | 5.4 | 4 |
| 3 | 5 | 4 |

| Time Period | Observations |
|---|---|
| 5/1/2019 | 10 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 468
B = 2250
C = 72
D = 720
E = 36
F = 90
a = 29256

b = 109296
c = 1104
Group Variance = 1477.74
Z-Score = -2.18514
Comparison Level at 95% confidence level = -1.65463 (downward trend)
**-2.18514 < -1.65463 indicating a downward trend**

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RWD-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 4.8 J1c3c | 4.7 J2c | Same Date | 0 | 0 |
| 9.1 J | 4.7 J2c | 4.4 | 1 | 0 |
| 5.4 J | 4.7 J2c | 0.7 | 2 | 0 |
| 3.6 J | 4.7 J2c | -1.1 | 2 | 1 |
| ND<5 U | 4.7 J2c | 0.3 | 3 | 1 |
| 4.2 J1c | 4.7 J2c | -0.5 | 3 | 2 |
| 3 J1c | 4.7 J2c | -1.7 | 3 | 3 |
| ND<5 U | 4.7 J2c | 0.3 | 4 | 3 |
| 10 J | 4.7 J2c | 5.3 | 5 | 3 |
| ND<10 U | 4.7 J2c | 5.3 | 6 | 3 |
| 38.2 | 4.7 J2c | 33.5 | 7 | 3 |
| ND<5 U | 4.7 J2c | 0.3 | 8 | 3 |
| ND<5 U | 4.7 J2c | 0.3 | 9 | 3 |
| ND<5 U | 4.7 J2c | 0.3 | 10 | 3 |
| ND<5 U | 4.7 J2c | 0.3 | 11 | 3 |
| | | | | |
| 9.1 J | 4.8 J1c3c | 4.3 | 12 | 3 |
| 5.4 J | 4.8 J1c3c | 0.6 | 13 | 3 |
| 3.6 J | 4.8 J1c3c | -1.2 | 13 | 4 |
| ND<5 U | 4.8 J1c3c | 0.2 | 14 | 4 |
| 4.2 J1c | 4.8 J1c3c | -0.6 | 14 | 5 |
| 3 J1c | 4.8 J1c3c | -1.8 | 14 | 6 |
| ND<5 U | 4.8 J1c3c | 0.2 | 15 | 6 |
| 10 J | 4.8 J1c3c | 5.2 | 16 | 6 |
| ND<10 U | 4.8 J1c3c | 5.2 | 17 | 6 |
| 38.2 | 4.8 J1c3c | 33.4 | 18 | 6 |
| ND<5 U | 4.8 J1c3c | 0.2 | 19 | 6 |
| ND<5 U | 4.8 J1c3c | 0.2 | 20 | 6 |
| ND<5 U | 4.8 J1c3c | 0.2 | 21 | 6 |
| ND<5 U | 4.8 J1c3c | 0.2 | 22 | 6 |
| | | | | |
| 5.4 J | 9.1 J | -3.7 | 22 | 7 |
| 3.6 J | 9.1 J | -5.5 | 22 | 8 |
| ND<5 U | 9.1 J | -4.1 | 22 | 9 |
| 4.2 J1c | 9.1 J | -4.9 | 22 | 10 |
| 3 J1c | 9.1 J | -6.1 | 22 | 11 |
| ND<5 U | 9.1 J | -4.1 | 22 | 12 |
| 10 J | 9.1 J | 0.9 | 23 | 12 |
| ND<10 U | 9.1 J | 0.9 | 24 | 12 |
| 38.2 | 9.1 J | 29.1 | 25 | 12 |
| ND<5 U | 9.1 J | -4.1 | 25 | 13 |
| ND<5 U | 9.1 J | -4.1 | 25 | 14 |
| ND<5 U | 9.1 J | -4.1 | 25 | 15 |
| ND<5 U | 9.1 J | -4.1 | 25 | 16 |
| | | | | |
| 3.6 J | 5.4 J | -1.8 | 25 | 17 |
| ND<5 U | 5.4 J | -0.4 | 25 | 18 |

| | | | | |
|---|---|---|---|---|
| 4.2 J1c | 5.4 J | -1.2 | 25 | 19 |
| 3 J1c | 5.4 J | -2.4 | 25 | 20 |
| ND<5 U | 5.4 J | -0.4 | 25 | 21 |
| 10 J | 5.4 J | 4.6 | 26 | 21 |
| ND<10 U | 5.4 J | 4.6 | 27 | 21 |
| 38.2 | 5.4 J | 32.8 | 28 | 21 |
| ND<5 U | 5.4 J | -0.4 | 28 | 22 |
| ND<5 U | 5.4 J | -0.4 | 28 | 23 |
| ND<5 U | 5.4 J | -0.4 | 28 | 24 |
| ND<5 U | 5.4 J | -0.4 | 28 | 25 |
| | | | | |
| ND<5 U | 3.6 J | 1.4 | 29 | 25 |
| 4.2 J1c | 3.6 J | 0.6 | 30 | 25 |
| 3 J1c | 3.6 J | -0.6 | 30 | 26 |
| ND<5 U | 3.6 J | 1.4 | 31 | 26 |
| 10 J | 3.6 J | 6.4 | 32 | 26 |
| ND<10 U | 3.6 J | 6.4 | 33 | 26 |
| 38.2 | 3.6 J | 34.6 | 34 | 26 |
| ND<5 U | 3.6 J | 1.4 | 35 | 26 |
| ND<5 U | 3.6 J | 1.4 | 36 | 26 |
| ND<5 U | 3.6 J | 1.4 | 37 | 26 |
| ND<5 U | 3.6 J | 1.4 | 38 | 26 |
| | | | | |
| 4.2 J1c | ND<5 U | -0.8 | 38 | 27 |
| 3 J1c | ND<5 U | -2 | 38 | 28 |
| ND<5 U | ND<5 U | 0 | 38 | 28 |
| 10 J | ND<5 U | 5 | 39 | 28 |
| ND<10 U | ND<5 U | 5 | 40 | 28 |
| 38.2 | ND<5 U | 33.2 | 41 | 28 |
| ND<5 U | ND<5 U | 0 | 41 | 28 |
| ND<5 U | ND<5 U | 0 | 41 | 28 |
| ND<5 U | ND<5 U | 0 | 41 | 28 |
| ND<5 U | ND<5 U | 0 | 41 | 28 |
| | | | | |
| 3 J1c | 4.2 J1c | -1.2 | 41 | 29 |
| ND<5 U | 4.2 J1c | 0.8 | 42 | 29 |
| 10 J | 4.2 J1c | 5.8 | 43 | 29 |
| ND<10 U | 4.2 J1c | 5.8 | 44 | 29 |
| 38.2 | 4.2 J1c | 34 | 45 | 29 |
| ND<5 U | 4.2 J1c | 0.8 | 46 | 29 |
| ND<5 U | 4.2 J1c | 0.8 | 47 | 29 |
| ND<5 U | 4.2 J1c | 0.8 | 48 | 29 |
| ND<5 U | 4.2 J1c | 0.8 | 49 | 29 |
| | | | | |
| ND<5 U | 3 J1c | 2 | 50 | 29 |
| 10 J | 3 J1c | 7 | 51 | 29 |
| ND<10 U | 3 J1c | 7 | 52 | 29 |
| 38.2 | 3 J1c | 35.2 | 53 | 29 |
| ND<5 U | 3 J1c | 2 | 54 | 29 |
| ND<5 U | 3 J1c | 2 | 55 | 29 |
| ND<5 U | 3 J1c | 2 | 56 | 29 |
| ND<5 U | 3 J1c | 2 | 57 | 29 |
| | | | | |
| 10 J | ND<5 U | 5 | 58 | 29 |
| ND<10 U | ND<5 U | 5 | 59 | 29 |
| 38.2 | ND<5 U | 33.2 | 60 | 29 |
| ND<5 U | ND<5 U | 0 | 60 | 29 |

| | | | | |
|---|---|---|---|---|
| ND<5 U | ND<5 U | 0 | 60 | 29 |
| ND<5 U | ND<5 U | 0 | 60 | 29 |
| ND<5 U | ND<5 U | 0 | 60 | 29 |
| | | | | |
| ND<10 U | 10 J | 0 | 60 | 29 |
| 38.2 | 10 J | 28.2 | 61 | 29 |
| ND<5 U | 10 J | -5 | 61 | 30 |
| ND<5 U | 10 J | -5 | 61 | 31 |
| ND<5 U | 10 J | -5 | 61 | 32 |
| ND<5 U | 10 J | -5 | 61 | 33 |
| | | | | |
| 38.2 | ND<10 U | 28.2 | 62 | 33 |
| ND<5 U | ND<10 U | -5 | 62 | 34 |
| ND<5 U | ND<10 U | -5 | 62 | 35 |
| ND<5 U | ND<10 U | -5 | 62 | 36 |
| ND<5 U | ND<10 U | -5 | 62 | 37 |
| | | | | |
| ND<5 U | 38.2 | -33.2 | 62 | 38 |
| ND<5 U | 38.2 | -33.2 | 62 | 39 |
| ND<5 U | 38.2 | -33.2 | 62 | 40 |
| ND<5 U | 38.2 | -33.2 | 62 | 41 |
| | | | | |
| ND<5 U | ND<5 U | 0 | 62 | 41 |
| ND<5 U | ND<5 U | 0 | 62 | 41 |
| ND<5 U | ND<5 U | 0 | 62 | 41 |
| | | | | |
| ND<5 U | ND<5 U | 0 | 62 | 41 |
| ND<5 U | ND<5 U | 0 | 62 | 41 |
| | | | | |
| ND<5 U | ND<5 U | 0 | 62 | 41 |

S Statistic = 62 - 41 = 21

| Tied Group | Value | Members |
|---|---|---|
| 1 | 5 | 6 |
| 2 | 10 | 2 |

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 528

B = 18
C = 120
D = 0
E = 32
F = 2
a = 8880
b = 30240
c = 480
Group Variance = 463.133
Z-Score = 0.929345
Comparison Level at 95% confidence level = -1.65463 (downward trend)
0.929345 >= -1.65463 indicating no evidence of a downward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RWE-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 489 1c3c | 468 2c | Same Date | 0 | 0 |
| 422 | 468 2c | -46 | 0 | 1 |
| 261 | 468 2c | -207 | 0 | 2 |
| 303 | 468 2c | -165 | 0 | 3 |
| 1360 | 468 2c | 892 | 1 | 3 |
| 22100 1c | 468 2c | 21632 | 2 | 3 |
| 156 1c | 468 2c | -312 | 2 | 4 |
| 21900 | 468 2c | 21432 | 3 | 4 |
| 1630 | 468 2c | 1162 | 4 | 4 |
| 174 | 468 2c | -294 | 4 | 5 |
| 8214 | 468 2c | 7746 | 5 | 5 |
| 8214 | 468 2c | 7746 | 6 | 5 |
| 4432 | 468 2c | 3964 | 7 | 5 |
| 7079 | 468 2c | 6611 | 8 | 5 |
| 13660 | 468 2c | 13192 | 9 | 5 |
| 12150 | 468 2c | 11682 | 10 | 5 |
| | | | | |
| 422 | 489 1c3c | -67 | 10 | 6 |
| 261 | 489 1c3c | -228 | 10 | 7 |
| 303 | 489 1c3c | -186 | 10 | 8 |
| 1360 | 489 1c3c | 871 | 11 | 8 |
| 22100 1c | 489 1c3c | 21611 | 12 | 8 |
| 156 1c | 489 1c3c | -333 | 12 | 9 |
| 21900 | 489 1c3c | 21411 | 13 | 9 |
| 1630 | 489 1c3c | 1141 | 14 | 9 |
| 174 | 489 1c3c | -315 | 14 | 10 |
| 8214 | 489 1c3c | 7725 | 15 | 10 |
| 8214 | 489 1c3c | 7725 | 16 | 10 |
| 4432 | 489 1c3c | 3943 | 17 | 10 |
| 7079 | 489 1c3c | 6590 | 18 | 10 |
| 13660 | 489 1c3c | 13171 | 19 | 10 |
| 12150 | 489 1c3c | 11661 | 20 | 10 |
| | | | | |
| 261 | 422 | -161 | 20 | 11 |
| 303 | 422 | -119 | 20 | 12 |
| 1360 | 422 | 938 | 21 | 12 |
| 22100 1c | 422 | 21678 | 22 | 12 |
| 156 1c | 422 | -266 | 22 | 13 |
| 21900 | 422 | 21478 | 23 | 13 |
| 1630 | 422 | 1208 | 24 | 13 |
| 174 | 422 | -248 | 24 | 14 |
| 8214 | 422 | 7792 | 25 | 14 |
| 8214 | 422 | 7792 | 26 | 14 |
| 4432 | 422 | 4010 | 27 | 14 |
| 7079 | 422 | 6657 | 28 | 14 |
| 13660 | 422 | 13238 | 29 | 14 |
| 12150 | 422 | 11728 | 30 | 14 |

| | | | | |
|---|---|---|---|---|
| 303 | 261 | 42 | 31 | 14 |
| 1360 | 261 | 1099 | 32 | 14 |
| 22100 1c | 261 | 21839 | 33 | 14 |
| 156 1c | 261 | -105 | 33 | 15 |
| 21900 | 261 | 21639 | 34 | 15 |
| 1630 | 261 | 1369 | 35 | 15 |
| 174 | 261 | -87 | 35 | 16 |
| 8214 | 261 | 7953 | 36 | 16 |
| 8214 | 261 | 7953 | 37 | 16 |
| 4432 | 261 | 4171 | 38 | 16 |
| 7079 | 261 | 6818 | 39 | 16 |
| 13660 | 261 | 13399 | 40 | 16 |
| 12150 | 261 | 11889 | 41 | 16 |
| | | | | |
| 1360 | 303 | 1057 | 42 | 16 |
| 22100 1c | 303 | 21797 | 43 | 16 |
| 156 1c | 303 | -147 | 43 | 17 |
| 21900 | 303 | 21597 | 44 | 17 |
| 1630 | 303 | 1327 | 45 | 17 |
| 174 | 303 | -129 | 45 | 18 |
| 8214 | 303 | 7911 | 46 | 18 |
| 8214 | 303 | 7911 | 47 | 18 |
| 4432 | 303 | 4129 | 48 | 18 |
| 7079 | 303 | 6776 | 49 | 18 |
| 13660 | 303 | 13357 | 50 | 18 |
| 12150 | 303 | 11847 | 51 | 18 |
| | | | | |
| 22100 1c | 1360 | 20740 | 52 | 18 |
| 156 1c | 1360 | -1204 | 52 | 19 |
| 21900 | 1360 | 20540 | 53 | 19 |
| 1630 | 1360 | 270 | 54 | 19 |
| 174 | 1360 | -1186 | 54 | 20 |
| 8214 | 1360 | 6854 | 55 | 20 |
| 8214 | 1360 | 6854 | 56 | 20 |
| 4432 | 1360 | 3072 | 57 | 20 |
| 7079 | 1360 | 5719 | 58 | 20 |
| 13660 | 1360 | 12300 | 59 | 20 |
| 12150 | 1360 | 10790 | 60 | 20 |
| | | | | |
| 156 1c | 22100 1c | -21944 | 60 | 21 |
| 21900 | 22100 1c | -200 | 60 | 22 |
| 1630 | 22100 1c | -20470 | 60 | 23 |
| 174 | 22100 1c | -21926 | 60 | 24 |
| 8214 | 22100 1c | -13886 | 60 | 25 |
| 8214 | 22100 1c | -13886 | 60 | 26 |
| 4432 | 22100 1c | -17668 | 60 | 27 |
| 7079 | 22100 1c | -15021 | 60 | 28 |
| 13660 | 22100 1c | -8440 | 60 | 29 |
| 12150 | 22100 1c | -9950 | 60 | 30 |
| | | | | |
| 21900 | 156 1c | 21744 | 61 | 30 |
| 1630 | 156 1c | 1474 | 62 | 30 |
| 174 | 156 1c | 18 | 63 | 30 |
| 8214 | 156 1c | 8058 | 64 | 30 |
| 8214 | 156 1c | 8058 | 65 | 30 |
| 4432 | 156 1c | 4276 | 66 | 30 |

| | | | | |
|---|---|---|---|---|
| 7079 | 156 1c | 6923 | 67 | 30 |
| 13660 | 156 1c | 13504 | 68 | 30 |
| 12150 | 156 1c | 11994 | 69 | 30 |
| | | | | |
| 1630 | 21900 | -20270 | 69 | 31 |
| 174 | 21900 | -21726 | 69 | 32 |
| 8214 | 21900 | -13686 | 69 | 33 |
| 8214 | 21900 | -13686 | 69 | 34 |
| 4432 | 21900 | -17468 | 69 | 35 |
| 7079 | 21900 | -14821 | 69 | 36 |
| 13660 | 21900 | -8240 | 69 | 37 |
| 12150 | 21900 | -9750 | 69 | 38 |
| | | | | |
| 174 | 1630 | -1456 | 69 | 39 |
| 8214 | 1630 | 6584 | 70 | 39 |
| 8214 | 1630 | 6584 | 71 | 39 |
| 4432 | 1630 | 2802 | 72 | 39 |
| 7079 | 1630 | 5449 | 73 | 39 |
| 13660 | 1630 | 12030 | 74 | 39 |
| 12150 | 1630 | 10520 | 75 | 39 |
| | | | | |
| 8214 | 174 | 8040 | 76 | 39 |
| 8214 | 174 | 8040 | 77 | 39 |
| 4432 | 174 | 4258 | 78 | 39 |
| 7079 | 174 | 6905 | 79 | 39 |
| 13660 | 174 | 13486 | 80 | 39 |
| 12150 | 174 | 11976 | 81 | 39 |
| | | | | |
| 8214 | 8214 | Same Date | 81 | 39 |
| 4432 | 8214 | -3782 | 81 | 40 |
| 7079 | 8214 | -1135 | 81 | 41 |
| 13660 | 8214 | 5446 | 82 | 41 |
| 12150 | 8214 | 3936 | 83 | 41 |
| | | | | |
| 4432 | 8214 | -3782 | 83 | 42 |
| 7079 | 8214 | -1135 | 83 | 43 |
| 13660 | 8214 | 5446 | 84 | 43 |
| 12150 | 8214 | 3936 | 85 | 43 |
| | | | | |
| 7079 | 4432 | 2647 | 86 | 43 |
| 13660 | 4432 | 9228 | 87 | 43 |
| 12150 | 4432 | 7718 | 88 | 43 |
| | | | | |
| 13660 | 7079 | 6581 | 89 | 43 |
| 12150 | 7079 | 5071 | 90 | 43 |
| | | | | |
| 12150 | 13660 | -1510 | 90 | 44 |

S Statistic = 90 - 44 = 46

| Tied Group | Value | Members |
|---|---|---|
| 1 | 8214 | 2 |

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |

| | |
|---|---|
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 2 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 2 time periods with multiple data

---

A = 18
B = 36
C = 0
D = 0
E = 2
F = 4
a = 10608
b = 36720
c = 544
Group Variance = 586.348
Z-Score = 1.85838
Comparison Level at 95% confidence level = -1.65463 (downward trend)
1.85838 >= -1.65463 indicating no evidence of a downward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RWF-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 38600 M6 | 39100 | Same Date | 0 | 0 |
| 34300 | 39100 | -4800 | 0 | 1 |
| 35000 | 39100 | -4100 | 0 | 2 |
| 33900 | 39100 | -5200 | 0 | 3 |
| 31200 | 39100 | -7900 | 0 | 4 |
| 44400 1c | 39100 | 5300 | 1 | 4 |
| 39000 1c | 39100 | -100 | 1 | 5 |
| 32800 B | 39100 | -6300 | 1 | 6 |
| 25200 | 39100 | -13900 | 1 | 7 |
| 33600 | 39100 | -5500 | 1 | 8 |
| 24250 | 39100 | -14850 | 1 | 9 |
| 20160 | 39100 | -18940 | 1 | 10 |
| 29160 | 39100 | -9940 | 1 | 11 |
| 22400 | 39100 | -16700 | 1 | 12 |
| 19130 | 39100 | -19970 | 1 | 13 |
| | | | | |
| 34300 | 38600 M6 | -4300 | 1 | 14 |
| 35000 | 38600 M6 | -3600 | 1 | 15 |
| 33900 | 38600 M6 | -4700 | 1 | 16 |
| 31200 | 38600 M6 | -7400 | 1 | 17 |
| 44400 1c | 38600 M6 | 5800 | 2 | 17 |
| 39000 1c | 38600 M6 | 400 | 3 | 17 |
| 32800 B | 38600 M6 | -5800 | 3 | 18 |
| 25200 | 38600 M6 | -13400 | 3 | 19 |
| 33600 | 38600 M6 | -5000 | 3 | 20 |
| 24250 | 38600 M6 | -14350 | 3 | 21 |
| 20160 | 38600 M6 | -18440 | 3 | 22 |
| 29160 | 38600 M6 | -9440 | 3 | 23 |
| 22400 | 38600 M6 | -16200 | 3 | 24 |
| 19130 | 38600 M6 | -19470 | 3 | 25 |
| | | | | |
| 35000 | 34300 | 700 | 4 | 25 |
| 33900 | 34300 | -400 | 4 | 26 |
| 31200 | 34300 | -3100 | 4 | 27 |
| 44400 1c | 34300 | 10100 | 5 | 27 |
| 39000 1c | 34300 | 4700 | 6 | 27 |
| 32800 B | 34300 | -1500 | 6 | 28 |
| 25200 | 34300 | -9100 | 6 | 29 |
| 33600 | 34300 | -700 | 6 | 30 |
| 24250 | 34300 | -10050 | 6 | 31 |
| 20160 | 34300 | -14140 | 6 | 32 |
| 29160 | 34300 | -5140 | 6 | 33 |
| 22400 | 34300 | -11900 | 6 | 34 |
| 19130 | 34300 | -15170 | 6 | 35 |
| | | | | |
| 33900 | 35000 | -1100 | 6 | 36 |
| 31200 | 35000 | -3800 | 6 | 37 |

| | | | | |
|---|---|---|---|---|
| 44400 1c | 35000 | 9400 | 7 | 37 |
| 39000 1c | 35000 | 4000 | 8 | 37 |
| 32800 B | 35000 | -2200 | 8 | 38 |
| 25200 | 35000 | -9800 | 8 | 39 |
| 33600 | 35000 | -1400 | 8 | 40 |
| 24250 | 35000 | -10750 | 8 | 41 |
| 20160 | 35000 | -14840 | 8 | 42 |
| 29160 | 35000 | -5840 | 8 | 43 |
| 22400 | 35000 | -12600 | 8 | 44 |
| 19130 | 35000 | -15870 | 8 | 45 |
| | | | | |
| 31200 | 33900 | -2700 | 8 | 46 |
| 44400 1c | 33900 | 10500 | 9 | 46 |
| 39000 1c | 33900 | 5100 | 10 | 46 |
| 32800 B | 33900 | -1100 | 10 | 47 |
| 25200 | 33900 | -8700 | 10 | 48 |
| 33600 | 33900 | -300 | 10 | 49 |
| 24250 | 33900 | -9650 | 10 | 50 |
| 20160 | 33900 | -13740 | 10 | 51 |
| 29160 | 33900 | -4740 | 10 | 52 |
| 22400 | 33900 | -11500 | 10 | 53 |
| 19130 | 33900 | -14770 | 10 | 54 |
| | | | | |
| 44400 1c | 31200 | 13200 | 11 | 54 |
| 39000 1c | 31200 | 7800 | 12 | 54 |
| 32800 B | 31200 | 1600 | 13 | 54 |
| 25200 | 31200 | -6000 | 13 | 55 |
| 33600 | 31200 | 2400 | 14 | 55 |
| 24250 | 31200 | -6950 | 14 | 56 |
| 20160 | 31200 | -11040 | 14 | 57 |
| 29160 | 31200 | -2040 | 14 | 58 |
| 22400 | 31200 | -8800 | 14 | 59 |
| 19130 | 31200 | -12070 | 14 | 60 |
| | | | | |
| 39000 1c | 44400 1c | -5400 | 14 | 61 |
| 32800 B | 44400 1c | -11600 | 14 | 62 |
| 25200 | 44400 1c | -19200 | 14 | 63 |
| 33600 | 44400 1c | -10800 | 14 | 64 |
| 24250 | 44400 1c | -20150 | 14 | 65 |
| 20160 | 44400 1c | -24240 | 14 | 66 |
| 29160 | 44400 1c | -15240 | 14 | 67 |
| 22400 | 44400 1c | -22000 | 14 | 68 |
| 19130 | 44400 1c | -25270 | 14 | 69 |
| | | | | |
| 32800 B | 39000 1c | -6200 | 14 | 70 |
| 25200 | 39000 1c | -13800 | 14 | 71 |
| 33600 | 39000 1c | -5400 | 14 | 72 |
| 24250 | 39000 1c | -14750 | 14 | 73 |
| 20160 | 39000 1c | -18840 | 14 | 74 |
| 29160 | 39000 1c | -9840 | 14 | 75 |
| 22400 | 39000 1c | -16600 | 14 | 76 |
| 19130 | 39000 1c | -19870 | 14 | 77 |
| | | | | |
| 25200 | 32800 B | -7600 | 14 | 78 |
| 33600 | 32800 B | 800 | 15 | 78 |
| 24250 | 32800 B | -8550 | 15 | 79 |
| 20160 | 32800 B | -12640 | 15 | 80 |

| | | | | |
|---|---|---|---|---|
| 29160 | 32800 B | -3640 | 15 | 81 |
| 22400 | 32800 B | -10400 | 15 | 82 |
| 19130 | 32800 B | -13670 | 15 | 83 |
| | | | | |
| 33600 | 25200 | 8400 | 16 | 83 |
| 24250 | 25200 | -950 | 16 | 84 |
| 20160 | 25200 | -5040 | 16 | 85 |
| 29160 | 25200 | 3960 | 17 | 85 |
| 22400 | 25200 | -2800 | 17 | 86 |
| 19130 | 25200 | -6070 | 17 | 87 |
| | | | | |
| 24250 | 33600 | -9350 | 17 | 88 |
| 20160 | 33600 | -13440 | 17 | 89 |
| 29160 | 33600 | -4440 | 17 | 90 |
| 22400 | 33600 | -11200 | 17 | 91 |
| 19130 | 33600 | -14470 | 17 | 92 |
| | | | | |
| 20160 | 24250 | -4090 | 17 | 93 |
| 29160 | 24250 | 4910 | 18 | 93 |
| 22400 | 24250 | -1850 | 18 | 94 |
| 19130 | 24250 | -5120 | 18 | 95 |
| | | | | |
| 29160 | 20160 | 9000 | 19 | 95 |
| 22400 | 20160 | 2240 | 20 | 95 |
| 19130 | 20160 | -1030 | 20 | 96 |
| | | | | |
| 22400 | 29160 | -6760 | 20 | 97 |
| 19130 | 29160 | -10030 | 20 | 98 |
| | | | | |
| 19130 | 22400 | -3270 | 20 | 99 |

S Statistic = 20 - 99 = -79

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 0
B = 18
C = 0

D = 0
E = 0
F = 2
a = 8880
b = 30240
c = 480
Group Variance = 492.333
Z-Score = -3.51532
Comparison Level at 95% confidence level = -1.65463 (downward trend)
**-3.51532 < -1.65463 indicating a downward trend**

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RWG-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 4.7 J1c3c | ND<5 U2c | Same Date | 0 | 0 |
| ND<5 U | ND<5 U2c | 0 | 0 | 0 |
| 194 | ND<5 U2c | 189 | 1 | 0 |
| 2.9 J | ND<5 U2c | -2.1 | 1 | 1 |
| 9.8 J | ND<5 U2c | 4.8 | 2 | 1 |
| ND<5 U1c | ND<5 U2c | 0 | 2 | 1 |
| ND<5 U1c | ND<5 U2c | 0 | 2 | 1 |
| ND<5 U | 4.7 J1c3c | 0.3 | 3 | 1 |
| 194 | 4.7 J1c3c | 189.3 | 4 | 1 |
| 2.9 J | 4.7 J1c3c | -1.8 | 4 | 2 |
| 9.8 J | 4.7 J1c3c | 5.1 | 5 | 2 |
| ND<5 U1c | 4.7 J1c3c | 0.3 | 6 | 2 |
| ND<5 U1c | 4.7 J1c3c | 0.3 | 7 | 2 |
| 194 | ND<5 U | 189 | 8 | 2 |
| 2.9 J | ND<5 U | -2.1 | 8 | 3 |
| 9.8 J | ND<5 U | 4.8 | 9 | 3 |
| ND<5 U1c | ND<5 U | 0 | 9 | 3 |
| ND<5 U1c | ND<5 U | 0 | 9 | 3 |
| 2.9 J | 194 | -191.1 | 9 | 4 |
| 9.8 J | 194 | -184.2 | 9 | 5 |
| ND<5 U1c | 194 | -189 | 9 | 6 |
| ND<5 U1c | 194 | -189 | 9 | 7 |
| 9.8 J | 2.9 J | 6.9 | 10 | 7 |
| ND<5 U1c | 2.9 J | 2.1 | 11 | 7 |
| ND<5 U1c | 2.9 J | 2.1 | 12 | 7 |
| ND<5 U1c | 9.8 J | -4.8 | 12 | 8 |
| ND<5 U1c | 9.8 J | -4.8 | 12 | 9 |
| ND<5 U1c | ND<5 U1c | 0 | 12 | 9 |

S Statistic = 12 - 9 = 3

| Tied Group | Value | Members |
|---|---|---|
| 1 | 5 | 4 |

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |

6/1/2020 1
9/1/2020 1
11/1/2020 1
There are 1 time periods with multiple data

---

A = 156
B = 18
C = 24
D = 0
E = 12
F = 2
a = 1176
b = 3024
c = 112
Group Variance = 55.881
Z-Score = 0.267546
Comparison Level at 95% confidence level = -1.65463 (downward trend)
0.267546 >= -1.65463 indicating no evidence of a downward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RWH-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 3880 | 367 | Same Date | 0 | 0 |
| 60600 1c | 367 | 60233 | 1 | 0 |
| 2600 | 367 | 2233 | 2 | 0 |
| 19300 | 367 | 18933 | 3 | 0 |
| 48.9 | 367 | -318.1 | 3 | 1 |
| 5330 | 367 | 4963 | 4 | 1 |
| 1310 | 367 | 943 | 5 | 1 |
| 3400 | 367 | 3033 | 6 | 1 |
| 6670 | 367 | 6303 | 7 | 1 |
| 3270 | 367 | 2903 | 8 | 1 |
| 2468 | 367 | 2101 | 9 | 1 |
| 5340 | 367 | 4973 | 10 | 1 |
| 17390 | 367 | 17023 | 11 | 1 |
| 8314 | 367 | 7947 | 12 | 1 |
| 153900 | 367 | 153533 | 13 | 1 |
| | | | | |
| 60600 1c | 3880 | 56720 | 14 | 1 |
| 2600 | 3880 | -1280 | 14 | 2 |
| 19300 | 3880 | 15420 | 15 | 2 |
| 48.9 | 3880 | -3831.1 | 15 | 3 |
| 5330 | 3880 | 1450 | 16 | 3 |
| 1310 | 3880 | -2570 | 16 | 4 |
| 3400 | 3880 | -480 | 16 | 5 |
| 6670 | 3880 | 2790 | 17 | 5 |
| 3270 | 3880 | -610 | 17 | 6 |
| 2468 | 3880 | -1412 | 17 | 7 |
| 5340 | 3880 | 1460 | 18 | 7 |
| 17390 | 3880 | 13510 | 19 | 7 |
| 8314 | 3880 | 4434 | 20 | 7 |
| 153900 | 3880 | 150020 | 21 | 7 |
| | | | | |
| 2600 | 60600 1c | -58000 | 21 | 8 |
| 19300 | 60600 1c | -41300 | 21 | 9 |
| 48.9 | 60600 1c | -60551.1 | 21 | 10 |
| 5330 | 60600 1c | -55270 | 21 | 11 |
| 1310 | 60600 1c | -59290 | 21 | 12 |
| 3400 | 60600 1c | -57200 | 21 | 13 |
| 6670 | 60600 1c | -53930 | 21 | 14 |
| 3270 | 60600 1c | -57330 | 21 | 15 |
| 2468 | 60600 1c | -58132 | 21 | 16 |
| 5340 | 60600 1c | -55260 | 21 | 17 |
| 17390 | 60600 1c | -43210 | 21 | 18 |
| 8314 | 60600 1c | -52286 | 21 | 19 |
| 153900 | 60600 1c | 93300 | 22 | 19 |
| | | | | |
| 19300 | 2600 | 16700 | 23 | 19 |
| 48.9 | 2600 | -2551.1 | 23 | 20 |

| | | | | |
|---|---|---|---|---|
| 5330 | 2600 | 2730 | 24 | 20 |
| 1310 | 2600 | -1290 | 24 | 21 |
| 3400 | 2600 | 800 | 25 | 21 |
| 6670 | 2600 | 4070 | 26 | 21 |
| 3270 | 2600 | 670 | 27 | 21 |
| 2468 | 2600 | -132 | 27 | 22 |
| 5340 | 2600 | 2740 | 28 | 22 |
| 17390 | 2600 | 14790 | 29 | 22 |
| 8314 | 2600 | 5714 | 30 | 22 |
| 153900 | 2600 | 151300 | 31 | 22 |
| | | | | |
| 48.9 | 19300 | -19251.1 | 31 | 23 |
| 5330 | 19300 | -13970 | 31 | 24 |
| 1310 | 19300 | -17990 | 31 | 25 |
| 3400 | 19300 | -15900 | 31 | 26 |
| 6670 | 19300 | -12630 | 31 | 27 |
| 3270 | 19300 | -16030 | 31 | 28 |
| 2468 | 19300 | -16832 | 31 | 29 |
| 5340 | 19300 | -13960 | 31 | 30 |
| 17390 | 19300 | -1910 | 31 | 31 |
| 8314 | 19300 | -10986 | 31 | 32 |
| 153900 | 19300 | 134600 | 32 | 32 |
| | | | | |
| 5330 | 48.9 | 5281.1 | 33 | 32 |
| 1310 | 48.9 | 1261.1 | 34 | 32 |
| 3400 | 48.9 | 3351.1 | 35 | 32 |
| 6670 | 48.9 | 6621.1 | 36 | 32 |
| 3270 | 48.9 | 3221.1 | 37 | 32 |
| 2468 | 48.9 | 2419.1 | 38 | 32 |
| 5340 | 48.9 | 5291.1 | 39 | 32 |
| 17390 | 48.9 | 17341.1 | 40 | 32 |
| 8314 | 48.9 | 8265.1 | 41 | 32 |
| 153900 | 48.9 | 153851 | 42 | 32 |
| | | | | |
| 1310 | 5330 | -4020 | 42 | 33 |
| 3400 | 5330 | -1930 | 42 | 34 |
| 6670 | 5330 | 1340 | 43 | 34 |
| 3270 | 5330 | -2060 | 43 | 35 |
| 2468 | 5330 | -2862 | 43 | 36 |
| 5340 | 5330 | 10 | 44 | 36 |
| 17390 | 5330 | 12060 | 45 | 36 |
| 8314 | 5330 | 2984 | 46 | 36 |
| 153900 | 5330 | 148570 | 47 | 36 |
| | | | | |
| 3400 | 1310 | 2090 | 48 | 36 |
| 6670 | 1310 | 5360 | 49 | 36 |
| 3270 | 1310 | 1960 | 50 | 36 |
| 2468 | 1310 | 1158 | 51 | 36 |
| 5340 | 1310 | 4030 | 52 | 36 |
| 17390 | 1310 | 16080 | 53 | 36 |
| 8314 | 1310 | 7004 | 54 | 36 |
| 153900 | 1310 | 152590 | 55 | 36 |
| | | | | |
| 6670 | 3400 | 3270 | 56 | 36 |
| 3270 | 3400 | -130 | 56 | 37 |
| 2468 | 3400 | -932 | 56 | 38 |
| 5340 | 3400 | 1940 | 57 | 38 |

| | | | | |
|---|---|---|---|---|
| 17390 | 3400 | 13990 | 58 | 38 |
| 8314 | 3400 | 4914 | 59 | 38 |
| 153900 | 3400 | 150500 | 60 | 38 |
| | | | | |
| 3270 | 6670 | -3400 | 60 | 39 |
| 2468 | 6670 | -4202 | 60 | 40 |
| 5340 | 6670 | -1330 | 60 | 41 |
| 17390 | 6670 | 10720 | 61 | 41 |
| 8314 | 6670 | 1644 | 62 | 41 |
| 153900 | 6670 | 147230 | 63 | 41 |
| | | | | |
| 2468 | 3270 | -802 | 63 | 42 |
| 5340 | 3270 | 2070 | 64 | 42 |
| 17390 | 3270 | 14120 | 65 | 42 |
| 8314 | 3270 | 5044 | 66 | 42 |
| 153900 | 3270 | 150630 | 67 | 42 |
| | | | | |
| 5340 | 2468 | 2872 | 68 | 42 |
| 17390 | 2468 | 14922 | 69 | 42 |
| 8314 | 2468 | 5846 | 70 | 42 |
| 153900 | 2468 | 151432 | 71 | 42 |
| | | | | |
| 17390 | 5340 | 12050 | 72 | 42 |
| 8314 | 5340 | 2974 | 73 | 42 |
| 153900 | 5340 | 148560 | 74 | 42 |
| | | | | |
| 8314 | 17390 | -9076 | 74 | 43 |
| 153900 | 17390 | 136510 | 75 | 43 |
| | | | | |
| 153900 | 8314 | 145586 | 76 | 43 |

S Statistic = 76 - 43 = 33

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 0
B = 18
C = 0

D = 0
E = 0
F = 2
a = 8880
b = 30240
c = 480
Group Variance = 492.333
Z-Score = 1.44218
Comparison Level at 95% confidence level = -1.65463 (downward trend)
1.44218 >= -1.65463 indicating no evidence of a downward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RWI-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 27500 | 25800 | Same Date | 0 | 0 |
| 26200 1c | 25800 | 400 | 1 | 0 |
| 32400 | 25800 | 6600 | 2 | 0 |
| 1510 | 25800 | -24290 | 2 | 1 |
| 211 | 25800 | -25589 | 2 | 2 |
| 2 J | 25800 | -25798 | 2 | 3 |
| 24300 | 25800 | -1500 | 2 | 4 |
| 17540 | 25800 | -8260 | 2 | 5 |
| 82.62 | 25800 | -25717.4 | 2 | 6 |
| | | | | |
| 26200 1c | 27500 | -1300 | 2 | 7 |
| 32400 | 27500 | 4900 | 3 | 7 |
| 1510 | 27500 | -25990 | 3 | 8 |
| 211 | 27500 | -27289 | 3 | 9 |
| 2 J | 27500 | -27498 | 3 | 10 |
| 24300 | 27500 | -3200 | 3 | 11 |
| 17540 | 27500 | -9960 | 3 | 12 |
| 82.62 | 27500 | -27417.4 | 3 | 13 |
| | | | | |
| 32400 | 26200 1c | 6200 | 4 | 13 |
| 1510 | 26200 1c | -24690 | 4 | 14 |
| 211 | 26200 1c | -25989 | 4 | 15 |
| 2 J | 26200 1c | -26198 | 4 | 16 |
| 24300 | 26200 1c | -1900 | 4 | 17 |
| 17540 | 26200 1c | -8660 | 4 | 18 |
| 82.62 | 26200 1c | -26117.4 | 4 | 19 |
| | | | | |
| 1510 | 32400 | -30890 | 4 | 20 |
| 211 | 32400 | -32189 | 4 | 21 |
| 2 J | 32400 | -32398 | 4 | 22 |
| 24300 | 32400 | -8100 | 4 | 23 |
| 17540 | 32400 | -14860 | 4 | 24 |
| 82.62 | 32400 | -32317.4 | 4 | 25 |
| | | | | |
| 211 | 1510 | -1299 | 4 | 26 |
| 2 J | 1510 | -1508 | 4 | 27 |
| 24300 | 1510 | 22790 | 5 | 27 |
| 17540 | 1510 | 16030 | 6 | 27 |
| 82.62 | 1510 | -1427.38 | 6 | 28 |
| | | | | |
| 2 J | 211 | -209 | 6 | 29 |
| 24300 | 211 | 24089 | 7 | 29 |
| 17540 | 211 | 17329 | 8 | 29 |
| 82.62 | 211 | -128.38 | 8 | 30 |
| | | | | |
| 24300 | 2 J | 24298 | 9 | 30 |
| 17540 | 2 J | 17538 | 10 | 30 |

| | | | | |
|---|---|---|---|---|
| 82.62 | 2 J | 80.62 | 11 | 30 |
| 17540 | 24300 | -6760 | 11 | 31 |
| 82.62 | 24300 | -24217.4 | 11 | 32 |
| 82.62 | 17540 | -17457.4 | 11 | 33 |

S Statistic = 11 - 33 = -22

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 11/1/2021 | 1 |
| 3/1/2022 | 1 |
| 3/1/2023 | 1 |
| 3/1/2024 | 1 |

There are 1 time periods with multiple data

A = 0
B = 18
C = 0
D = 0
E = 0
F = 2
a = 2250
b = 6480
c = 180
Group Variance = 124
Z-Score = -1.88586
Comparison Level at 95% confidence level = -1.65463 (downward trend)
**-1.88586 < -1.65463 indicating a downward trend**

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RWJ-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 42.7 | ND<5 U1c | Same Date | 0 | 0 |
| 27.3 1c | ND<5 U1c | 22.3 | 1 | 0 |
| 8.3 J | ND<5 U1c | 3.3 | 2 | 0 |
| ND<5 U | ND<5 U1c | 0 | 2 | 0 |
| 4 J | ND<5 U1c | -1 | 2 | 1 |
| 2.6 J | ND<5 U1c | -2.4 | 2 | 2 |
| ND<5 U | ND<5 U1c | 0 | 2 | 2 |
| ND<5 U | ND<5 U1c | 0 | 2 | 2 |
| 38.2 | ND<5 U1c | 33.2 | 3 | 2 |
| ND<10 U | ND<5 U1c | 5 | 4 | 2 |
| ND<5 U | ND<5 U1c | 0 | 4 | 2 |
| ND<5 U | ND<5 U1c | 0 | 4 | 2 |
| 3.539 J | ND<5 U1c | -1.461 | 4 | 3 |
| 19.81 | ND<5 U1c | 14.81 | 5 | 3 |
| ND<5 U | ND<5 U1c | 0 | 5 | 3 |
| | | | | |
| 27.3 1c | 42.7 | -15.4 | 5 | 4 |
| 8.3 J | 42.7 | -34.4 | 5 | 5 |
| ND<5 U | 42.7 | -37.7 | 5 | 6 |
| 4 J | 42.7 | -38.7 | 5 | 7 |
| 2.6 J | 42.7 | -40.1 | 5 | 8 |
| ND<5 U | 42.7 | -37.7 | 5 | 9 |
| ND<5 U | 42.7 | -37.7 | 5 | 10 |
| 38.2 | 42.7 | -4.5 | 5 | 11 |
| ND<10 U | 42.7 | -32.7 | 5 | 12 |
| ND<5 U | 42.7 | -37.7 | 5 | 13 |
| ND<5 U | 42.7 | -37.7 | 5 | 14 |
| 3.539 J | 42.7 | -39.161 | 5 | 15 |
| 19.81 | 42.7 | -22.89 | 5 | 16 |
| ND<5 U | 42.7 | -37.7 | 5 | 17 |
| | | | | |
| 8.3 J | 27.3 1c | -19 | 5 | 18 |
| ND<5 U | 27.3 1c | -22.3 | 5 | 19 |
| 4 J | 27.3 1c | -23.3 | 5 | 20 |
| 2.6 J | 27.3 1c | -24.7 | 5 | 21 |
| ND<5 U | 27.3 1c | -22.3 | 5 | 22 |
| ND<5 U | 27.3 1c | -22.3 | 5 | 23 |
| 38.2 | 27.3 1c | 10.9 | 6 | 23 |
| ND<10 U | 27.3 1c | -17.3 | 6 | 24 |
| ND<5 U | 27.3 1c | -22.3 | 6 | 25 |
| ND<5 U | 27.3 1c | -22.3 | 6 | 26 |
| 3.539 J | 27.3 1c | -23.761 | 6 | 27 |
| 19.81 | 27.3 1c | -7.49 | 6 | 28 |
| ND<5 U | 27.3 1c | -22.3 | 6 | 29 |
| | | | | |
| ND<5 U | 8.3 J | -3.3 | 6 | 30 |
| 4 J | 8.3 J | -4.3 | 6 | 31 |

| | | | | |
|---|---|---|---|---|
| 2.6 J | 8.3 J | -5.7 | 6 | 32 |
| ND<5 U | 8.3 J | -3.3 | 6 | 33 |
| ND<5 U | 8.3 J | -3.3 | 6 | 34 |
| 38.2 | 8.3 J | 29.9 | 7 | 34 |
| ND<10 U | 8.3 J | 1.7 | 8 | 34 |
| ND<5 U | 8.3 J | -3.3 | 8 | 35 |
| ND<5 U | 8.3 J | -3.3 | 8 | 36 |
| 3.539 J | 8.3 J | -4.761 | 8 | 37 |
| 19.81 | 8.3 J | 11.51 | 9 | 37 |
| ND<5 U | 8.3 J | -3.3 | 9 | 38 |
| | | | | |
| 4 J | ND<5 U | -1 | 9 | 39 |
| 2.6 J | ND<5 U | -2.4 | 9 | 40 |
| ND<5 U | ND<5 U | 0 | 9 | 40 |
| ND<5 U | ND<5 U | 0 | 9 | 40 |
| 38.2 | ND<5 U | 33.2 | 10 | 40 |
| ND<10 U | ND<5 U | 5 | 11 | 40 |
| ND<5 U | ND<5 U | 0 | 11 | 40 |
| ND<5 U | ND<5 U | 0 | 11 | 40 |
| 3.539 J | ND<5 U | -1.461 | 11 | 41 |
| 19.81 | ND<5 U | 14.81 | 12 | 41 |
| ND<5 U | ND<5 U | 0 | 12 | 41 |
| | | | | |
| 2.6 J | 4 J | -1.4 | 12 | 42 |
| ND<5 U | 4 J | 1 | 13 | 42 |
| ND<5 U | 4 J | 1 | 14 | 42 |
| 38.2 | 4 J | 34.2 | 15 | 42 |
| ND<10 U | 4 J | 6 | 16 | 42 |
| ND<5 U | 4 J | 1 | 17 | 42 |
| ND<5 U | 4 J | 1 | 18 | 42 |
| 3.539 J | 4 J | -0.461 | 18 | 43 |
| 19.81 | 4 J | 15.81 | 19 | 43 |
| ND<5 U | 4 J | 1 | 20 | 43 |
| | | | | |
| ND<5 U | 2.6 J | 2.4 | 21 | 43 |
| ND<5 U | 2.6 J | 2.4 | 22 | 43 |
| 38.2 | 2.6 J | 35.6 | 23 | 43 |
| ND<10 U | 2.6 J | 7.4 | 24 | 43 |
| ND<5 U | 2.6 J | 2.4 | 25 | 43 |
| ND<5 U | 2.6 J | 2.4 | 26 | 43 |
| 3.539 J | 2.6 J | 0.939 | 27 | 43 |
| 19.81 | 2.6 J | 17.21 | 28 | 43 |
| ND<5 U | 2.6 J | 2.4 | 29 | 43 |
| | | | | |
| ND<5 U | ND<5 U | 0 | 29 | 43 |
| 38.2 | ND<5 U | 33.2 | 30 | 43 |
| ND<10 U | ND<5 U | 5 | 31 | 43 |
| ND<5 U | ND<5 U | 0 | 31 | 43 |
| ND<5 U | ND<5 U | 0 | 31 | 43 |
| 3.539 J | ND<5 U | -1.461 | 31 | 44 |
| 19.81 | ND<5 U | 14.81 | 32 | 44 |
| ND<5 U | ND<5 U | 0 | 32 | 44 |
| | | | | |
| 38.2 | ND<5 U | 33.2 | 33 | 44 |
| ND<10 U | ND<5 U | 5 | 34 | 44 |
| ND<5 U | ND<5 U | 0 | 34 | 44 |
| ND<5 U | ND<5 U | 0 | 34 | 44 |

| | | | | |
|---|---|---|---|---|
| 3.539 J | ND<5 U | -1.461 | 34 | 45 |
| 19.81 | ND<5 U | 14.81 | 35 | 45 |
| ND<5 U | ND<5 U | 0 | 35 | 45 |
| | | | | |
| ND<10 U | 38.2 | -28.2 | 35 | 46 |
| ND<5 U | 38.2 | -33.2 | 35 | 47 |
| ND<5 U | 38.2 | -33.2 | 35 | 48 |
| 3.539 J | 38.2 | -34.661 | 35 | 49 |
| 19.81 | 38.2 | -18.39 | 35 | 50 |
| ND<5 U | 38.2 | -33.2 | 35 | 51 |
| | | | | |
| ND<5 U | ND<10 U | -5 | 35 | 52 |
| ND<5 U | ND<10 U | -5 | 35 | 53 |
| 3.539 J | ND<10 U | -6.461 | 35 | 54 |
| 19.81 | ND<10 U | 9.81 | 36 | 54 |
| ND<5 U | ND<10 U | -5 | 36 | 55 |
| | | | | |
| ND<5 U | ND<5 U | 0 | 36 | 55 |
| 3.539 J | ND<5 U | -1.461 | 36 | 56 |
| 19.81 | ND<5 U | 14.81 | 37 | 56 |
| ND<5 U | ND<5 U | 0 | 37 | 56 |
| | | | | |
| 3.539 J | ND<5 U | -1.461 | 37 | 57 |
| 19.81 | ND<5 U | 14.81 | 38 | 57 |
| ND<5 U | ND<5 U | 0 | 38 | 57 |
| | | | | |
| 19.81 | 3.539 J | 16.271 | 39 | 57 |
| ND<5 U | 3.539 J | 1.461 | 40 | 57 |
| | | | | |
| ND<5 U | 19.81 | -14.81 | 40 | 58 |

S Statistic = 40 - 58 = -18

| Tied Group | Value | Members |
|---|---|---|
| 1 | 5 | 7 |

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 798
B = 18

C = 210
D = 0
E = 42
F = 2
a = 8880
b = 30240
c = 480
Group Variance = 448.175
Z-Score = -0.803018
Comparison Level at 95% confidence level = -1.65463 (downward trend)
-0.803018 >= -1.65463 indicating no evidence of a downward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RWK-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 6710 M61c2c | 9130 M6 | Same Date | 0 | 0 |
| 19200 1c | 9130 M6 | 10070 | 1 | 0 |
| 20600 | 9130 M6 | 11470 | 2 | 0 |
| 16400 | 9130 M6 | 7270 | 3 | 0 |
| 10400 | 9130 M6 | 1270 | 4 | 0 |
| 16800 | 9130 M6 | 7670 | 5 | 0 |
| 18100 MH | 9130 M6 | 8970 | 6 | 0 |
| 22200 | 9130 M6 | 13070 | 7 | 0 |
| 18500 | 9130 M6 | 9370 | 8 | 0 |
| 22300 | 9130 M6 | 13170 | 9 | 0 |
| 24170 | 9130 M6 | 15040 | 10 | 0 |
| 24920 | 9130 M6 | 15790 | 11 | 0 |
| 21550 | 9130 M6 | 12420 | 12 | 0 |
| 18610 | 9130 M6 | 9480 | 13 | 0 |
| 20750 | 9130 M6 | 11620 | 14 | 0 |
| | | | | |
| 19200 1c | 6710 M61c2c | 12490 | 15 | 0 |
| 20600 | 6710 M61c2c | 13890 | 16 | 0 |
| 16400 | 6710 M61c2c | 9690 | 17 | 0 |
| 10400 | 6710 M61c2c | 3690 | 18 | 0 |
| 16800 | 6710 M61c2c | 10090 | 19 | 0 |
| 18100 MH | 6710 M61c2c | 11390 | 20 | 0 |
| 22200 | 6710 M61c2c | 15490 | 21 | 0 |
| 18500 | 6710 M61c2c | 11790 | 22 | 0 |
| 22300 | 6710 M61c2c | 15590 | 23 | 0 |
| 24170 | 6710 M61c2c | 17460 | 24 | 0 |
| 24920 | 6710 M61c2c | 18210 | 25 | 0 |
| 21550 | 6710 M61c2c | 14840 | 26 | 0 |
| 18610 | 6710 M61c2c | 11900 | 27 | 0 |
| 20750 | 6710 M61c2c | 14040 | 28 | 0 |
| | | | | |
| 20600 | 19200 1c | 1400 | 29 | 0 |
| 16400 | 19200 1c | -2800 | 29 | 1 |
| 10400 | 19200 1c | -8800 | 29 | 2 |
| 16800 | 19200 1c | -2400 | 29 | 3 |
| 18100 MH | 19200 1c | -1100 | 29 | 4 |
| 22200 | 19200 1c | 3000 | 30 | 4 |
| 18500 | 19200 1c | -700 | 30 | 5 |
| 22300 | 19200 1c | 3100 | 31 | 5 |
| 24170 | 19200 1c | 4970 | 32 | 5 |
| 24920 | 19200 1c | 5720 | 33 | 5 |
| 21550 | 19200 1c | 2350 | 34 | 5 |
| 18610 | 19200 1c | -590 | 34 | 6 |
| 20750 | 19200 1c | 1550 | 35 | 6 |
| | | | | |
| 16400 | 20600 | -4200 | 35 | 7 |
| 10400 | 20600 | -10200 | 35 | 8 |

| | | | | |
|---|---|---|---|---|
| 16800 | 20600 | -3800 | 35 | 9 |
| 18100 MH | 20600 | -2500 | 35 | 10 |
| 22200 | 20600 | 1600 | 36 | 10 |
| 18500 | 20600 | -2100 | 36 | 11 |
| 22300 | 20600 | 1700 | 37 | 11 |
| 24170 | 20600 | 3570 | 38 | 11 |
| 24920 | 20600 | 4320 | 39 | 11 |
| 21550 | 20600 | 950 | 40 | 11 |
| 18610 | 20600 | -1990 | 40 | 12 |
| 20750 | 20600 | 150 | 41 | 12 |
| | | | | |
| 10400 | 16400 | -6000 | 41 | 13 |
| 16800 | 16400 | 400 | 42 | 13 |
| 18100 MH | 16400 | 1700 | 43 | 13 |
| 22200 | 16400 | 5800 | 44 | 13 |
| 18500 | 16400 | 2100 | 45 | 13 |
| 22300 | 16400 | 5900 | 46 | 13 |
| 24170 | 16400 | 7770 | 47 | 13 |
| 24920 | 16400 | 8520 | 48 | 13 |
| 21550 | 16400 | 5150 | 49 | 13 |
| 18610 | 16400 | 2210 | 50 | 13 |
| 20750 | 16400 | 4350 | 51 | 13 |
| | | | | |
| 16800 | 10400 | 6400 | 52 | 13 |
| 18100 MH | 10400 | 7700 | 53 | 13 |
| 22200 | 10400 | 11800 | 54 | 13 |
| 18500 | 10400 | 8100 | 55 | 13 |
| 22300 | 10400 | 11900 | 56 | 13 |
| 24170 | 10400 | 13770 | 57 | 13 |
| 24920 | 10400 | 14520 | 58 | 13 |
| 21550 | 10400 | 11150 | 59 | 13 |
| 18610 | 10400 | 8210 | 60 | 13 |
| 20750 | 10400 | 10350 | 61 | 13 |
| | | | | |
| 18100 MH | 16800 | 1300 | 62 | 13 |
| 22200 | 16800 | 5400 | 63 | 13 |
| 18500 | 16800 | 1700 | 64 | 13 |
| 22300 | 16800 | 5500 | 65 | 13 |
| 24170 | 16800 | 7370 | 66 | 13 |
| 24920 | 16800 | 8120 | 67 | 13 |
| 21550 | 16800 | 4750 | 68 | 13 |
| 18610 | 16800 | 1810 | 69 | 13 |
| 20750 | 16800 | 3950 | 70 | 13 |
| | | | | |
| 22200 | 18100 MH | 4100 | 71 | 13 |
| 18500 | 18100 MH | 400 | 72 | 13 |
| 22300 | 18100 MH | 4200 | 73 | 13 |
| 24170 | 18100 MH | 6070 | 74 | 13 |
| 24920 | 18100 MH | 6820 | 75 | 13 |
| 21550 | 18100 MH | 3450 | 76 | 13 |
| 18610 | 18100 MH | 510 | 77 | 13 |
| 20750 | 18100 MH | 2650 | 78 | 13 |
| | | | | |
| 18500 | 22200 | -3700 | 78 | 14 |
| 22300 | 22200 | 100 | 79 | 14 |
| 24170 | 22200 | 1970 | 80 | 14 |
| 24920 | 22200 | 2720 | 81 | 14 |

| | | | | |
|---|---|---|---|---|
| 21550 | 22200 | -650 | 81 | 15 |
| 18610 | 22200 | -3590 | 81 | 16 |
| 20750 | 22200 | -1450 | 81 | 17 |
| | | | | |
| 22300 | 18500 | 3800 | 82 | 17 |
| 24170 | 18500 | 5670 | 83 | 17 |
| 24920 | 18500 | 6420 | 84 | 17 |
| 21550 | 18500 | 3050 | 85 | 17 |
| 18610 | 18500 | 110 | 86 | 17 |
| 20750 | 18500 | 2250 | 87 | 17 |
| | | | | |
| 24170 | 22300 | 1870 | 88 | 17 |
| 24920 | 22300 | 2620 | 89 | 17 |
| 21550 | 22300 | -750 | 89 | 18 |
| 18610 | 22300 | -3690 | 89 | 19 |
| 20750 | 22300 | -1550 | 89 | 20 |
| | | | | |
| 24920 | 24170 | 750 | 90 | 20 |
| 21550 | 24170 | -2620 | 90 | 21 |
| 18610 | 24170 | -5560 | 90 | 22 |
| 20750 | 24170 | -3420 | 90 | 23 |
| | | | | |
| 21550 | 24920 | -3370 | 90 | 24 |
| 18610 | 24920 | -6310 | 90 | 25 |
| 20750 | 24920 | -4170 | 90 | 26 |
| | | | | |
| 18610 | 21550 | -2940 | 90 | 27 |
| 20750 | 21550 | -800 | 90 | 28 |
| | | | | |
| 20750 | 18610 | 2140 | 91 | 28 |

S Statistic = 91 - 28 = 63

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 0
B = 18
C = 0

D = 0
E = 0
F = 2
a = 8880
b = 30240
c = 480
Group Variance = 492.333
Z-Score = 2.79423
Comparison Level at 95% confidence level = -1.65463 (downward trend)
2.79423 >= -1.65463 indicating no evidence of a downward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RWL-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 8480 1c | 6280 | Same Date | 0 | 0 |
| 9180 | 6280 | 2900 | 1 | 0 |
| 15500 | 6280 | 9220 | 2 | 0 |
| 861 | 6280 | -5419 | 2 | 1 |
| 16100 | 6280 | 9820 | 3 | 1 |
| 15000 MH | 6280 | 8720 | 4 | 1 |
| 14200 | 6280 | 7920 | 5 | 1 |
| 16000 | 6280 | 9720 | 6 | 1 |
| 14900 | 6280 | 8620 | 7 | 1 |
| 12500 | 6280 | 6220 | 8 | 1 |
| 11470 | 6280 | 5190 | 9 | 1 |
| 19240 | 6280 | 12960 | 10 | 1 |
| 6219 | 6280 | -61 | 10 | 2 |
| 3047 | 6280 | -3233 | 10 | 3 |
| 24050 | 6280 | 17770 | 11 | 3 |
| | | | | |
| 9180 | 8480 1c | 700 | 12 | 3 |
| 15500 | 8480 1c | 7020 | 13 | 3 |
| 861 | 8480 1c | -7619 | 13 | 4 |
| 16100 | 8480 1c | 7620 | 14 | 4 |
| 15000 MH | 8480 1c | 6520 | 15 | 4 |
| 14200 | 8480 1c | 5720 | 16 | 4 |
| 16000 | 8480 1c | 7520 | 17 | 4 |
| 14900 | 8480 1c | 6420 | 18 | 4 |
| 12500 | 8480 1c | 4020 | 19 | 4 |
| 11470 | 8480 1c | 2990 | 20 | 4 |
| 19240 | 8480 1c | 10760 | 21 | 4 |
| 6219 | 8480 1c | -2261 | 21 | 5 |
| 3047 | 8480 1c | -5433 | 21 | 6 |
| 24050 | 8480 1c | 15570 | 22 | 6 |
| | | | | |
| 15500 | 9180 | 6320 | 23 | 6 |
| 861 | 9180 | -8319 | 23 | 7 |
| 16100 | 9180 | 6920 | 24 | 7 |
| 15000 MH | 9180 | 5820 | 25 | 7 |
| 14200 | 9180 | 5020 | 26 | 7 |
| 16000 | 9180 | 6820 | 27 | 7 |
| 14900 | 9180 | 5720 | 28 | 7 |
| 12500 | 9180 | 3320 | 29 | 7 |
| 11470 | 9180 | 2290 | 30 | 7 |
| 19240 | 9180 | 10060 | 31 | 7 |
| 6219 | 9180 | -2961 | 31 | 8 |
| 3047 | 9180 | -6133 | 31 | 9 |
| 24050 | 9180 | 14870 | 32 | 9 |
| | | | | |
| 861 | 15500 | -14639 | 32 | 10 |
| 16100 | 15500 | 600 | 33 | 10 |

| | | | | |
|---|---|---|---|---|
| 15000 MH | 15500 | -500 | 33 | 11 |
| 14200 | 15500 | -1300 | 33 | 12 |
| 16000 | 15500 | 500 | 34 | 12 |
| 14900 | 15500 | -600 | 34 | 13 |
| 12500 | 15500 | -3000 | 34 | 14 |
| 11470 | 15500 | -4030 | 34 | 15 |
| 19240 | 15500 | 3740 | 35 | 15 |
| 6219 | 15500 | -9281 | 35 | 16 |
| 3047 | 15500 | -12453 | 35 | 17 |
| 24050 | 15500 | 8550 | 36 | 17 |
| | | | | |
| 16100 | 861 | 15239 | 37 | 17 |
| 15000 MH | 861 | 14139 | 38 | 17 |
| 14200 | 861 | 13339 | 39 | 17 |
| 16000 | 861 | 15139 | 40 | 17 |
| 14900 | 861 | 14039 | 41 | 17 |
| 12500 | 861 | 11639 | 42 | 17 |
| 11470 | 861 | 10609 | 43 | 17 |
| 19240 | 861 | 18379 | 44 | 17 |
| 6219 | 861 | 5358 | 45 | 17 |
| 3047 | 861 | 2186 | 46 | 17 |
| 24050 | 861 | 23189 | 47 | 17 |
| | | | | |
| 15000 MH | 16100 | -1100 | 47 | 18 |
| 14200 | 16100 | -1900 | 47 | 19 |
| 16000 | 16100 | -100 | 47 | 20 |
| 14900 | 16100 | -1200 | 47 | 21 |
| 12500 | 16100 | -3600 | 47 | 22 |
| 11470 | 16100 | -4630 | 47 | 23 |
| 19240 | 16100 | 3140 | 48 | 23 |
| 6219 | 16100 | -9881 | 48 | 24 |
| 3047 | 16100 | -13053 | 48 | 25 |
| 24050 | 16100 | 7950 | 49 | 25 |
| | | | | |
| 14200 | 15000 MH | -800 | 49 | 26 |
| 16000 | 15000 MH | 1000 | 50 | 26 |
| 14900 | 15000 MH | -100 | 50 | 27 |
| 12500 | 15000 MH | -2500 | 50 | 28 |
| 11470 | 15000 MH | -3530 | 50 | 29 |
| 19240 | 15000 MH | 4240 | 51 | 29 |
| 6219 | 15000 MH | -8781 | 51 | 30 |
| 3047 | 15000 MH | -11953 | 51 | 31 |
| 24050 | 15000 MH | 9050 | 52 | 31 |
| | | | | |
| 16000 | 14200 | 1800 | 53 | 31 |
| 14900 | 14200 | 700 | 54 | 31 |
| 12500 | 14200 | -1700 | 54 | 32 |
| 11470 | 14200 | -2730 | 54 | 33 |
| 19240 | 14200 | 5040 | 55 | 33 |
| 6219 | 14200 | -7981 | 55 | 34 |
| 3047 | 14200 | -11153 | 55 | 35 |
| 24050 | 14200 | 9850 | 56 | 35 |
| | | | | |
| 14900 | 16000 | -1100 | 56 | 36 |
| 12500 | 16000 | -3500 | 56 | 37 |
| 11470 | 16000 | -4530 | 56 | 38 |
| 19240 | 16000 | 3240 | 57 | 38 |

| | | | | |
|---|---|---|---|---|
| 6219 | 16000 | -9781 | 57 | 39 |
| 3047 | 16000 | -12953 | 57 | 40 |
| 24050 | 16000 | 8050 | 58 | 40 |
| | | | | |
| 12500 | 14900 | -2400 | 58 | 41 |
| 11470 | 14900 | -3430 | 58 | 42 |
| 19240 | 14900 | 4340 | 59 | 42 |
| 6219 | 14900 | -8681 | 59 | 43 |
| 3047 | 14900 | -11853 | 59 | 44 |
| 24050 | 14900 | 9150 | 60 | 44 |
| | | | | |
| 11470 | 12500 | -1030 | 60 | 45 |
| 19240 | 12500 | 6740 | 61 | 45 |
| 6219 | 12500 | -6281 | 61 | 46 |
| 3047 | 12500 | -9453 | 61 | 47 |
| 24050 | 12500 | 11550 | 62 | 47 |
| | | | | |
| 19240 | 11470 | 7770 | 63 | 47 |
| 6219 | 11470 | -5251 | 63 | 48 |
| 3047 | 11470 | -8423 | 63 | 49 |
| 24050 | 11470 | 12580 | 64 | 49 |
| | | | | |
| 6219 | 19240 | -13021 | 64 | 50 |
| 3047 | 19240 | -16193 | 64 | 51 |
| 24050 | 19240 | 4810 | 65 | 51 |
| | | | | |
| 3047 | 6219 | -3172 | 65 | 52 |
| 24050 | 6219 | 17831 | 66 | 52 |
| | | | | |
| 24050 | 3047 | 21003 | 67 | 52 |

S Statistic = 67 - 52 = 15

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 0
B = 18
C = 0

D = 0
E = 0
F = 2
a = 8880
b = 30240
c = 480
Group Variance = 492.333
Z-Score = 0.630955
Comparison Level at 95% confidence level = -1.65463 (downward trend)
0.630955 >= -1.65463 indicating no evidence of a downward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RWM-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 6 J | 10.5 | Same Date | 0 | 0 |
| 4 J | 10.5 | -6.5 | 0 | 1 |
| 11.6 | 10.5 | 1.1 | 1 | 1 |
| 4.8 J | 10.5 | -5.7 | 1 | 2 |
| 21.8 | 10.5 | 11.3 | 2 | 2 |
| 7.8 J2c | 10.5 | -2.7 | 2 | 3 |
| 10.6 | 10.5 | 0.1 | 3 | 3 |
| | | | | |
| 4 J | 6 J | -2 | 3 | 4 |
| 11.6 | 6 J | 5.6 | 4 | 4 |
| 4.8 J | 6 J | -1.2 | 4 | 5 |
| 21.8 | 6 J | 15.8 | 5 | 5 |
| 7.8 J2c | 6 J | 1.8 | 6 | 5 |
| 10.6 | 6 J | 4.6 | 7 | 5 |
| | | | | |
| 11.6 | 4 J | 7.6 | 8 | 5 |
| 4.8 J | 4 J | 0.8 | 9 | 5 |
| 21.8 | 4 J | 17.8 | 10 | 5 |
| 7.8 J2c | 4 J | 3.8 | 11 | 5 |
| 10.6 | 4 J | 6.6 | 12 | 5 |
| | | | | |
| 4.8 J | 11.6 | -6.8 | 12 | 6 |
| 21.8 | 11.6 | 10.2 | 13 | 6 |
| 7.8 J2c | 11.6 | -3.8 | 13 | 7 |
| 10.6 | 11.6 | -1 | 13 | 8 |
| | | | | |
| 21.8 | 4.8 J | 17 | 14 | 8 |
| 7.8 J2c | 4.8 J | 3 | 15 | 8 |
| 10.6 | 4.8 J | 5.8 | 16 | 8 |
| | | | | |
| 7.8 J2c | 21.8 | -14 | 16 | 9 |
| 10.6 | 21.8 | -11.2 | 16 | 10 |
| | | | | |
| 10.6 | 7.8 J2c | 2.8 | 17 | 10 |

S Statistic = 17 - 10 = 7

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |

9/1/2020 1
11/1/2020 1
There are 1 time periods with multiple data

---

A = 0
B = 18
C = 0
D = 0
E = 0
F = 2
a = 1176
b = 3024
c = 112
Group Variance = 64.3333
Z-Score = 0.748054
Comparison Level at 95% confidence level = -1.65463 (downward trend)
0.748054 >= -1.65463 indicating no evidence of a downward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RWN-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 978000 | 1.02e+006 | Same Date | 0 | 0 |
| 964000 | 1.02e+006 | -56000 | 0 | 1 |
| 943000 | 1.02e+006 | -77000 | 0 | 2 |
| 1.17e+006 ML | 1.02e+006 | 150000 | 1 | 2 |
| 884000 | 1.02e+006 | -136000 | 1 | 3 |
| 1.14e+006 | 1.02e+006 | 120000 | 2 | 3 |
| 709000 1c | 1.02e+006 | -311000 | 2 | 4 |
| 745000 | 1.02e+006 | -275000 | 2 | 5 |
| 548000 | 1.02e+006 | -472000 | 2 | 6 |
| 546700 | 1.02e+006 | -473300 | 2 | 7 |
| 662200 | 1.02e+006 | -357800 | 2 | 8 |
| | | | | |
| 964000 | 978000 | -14000 | 2 | 9 |
| 943000 | 978000 | -35000 | 2 | 10 |
| 1.17e+006 ML | 978000 | 192000 | 3 | 10 |
| 884000 | 978000 | -94000 | 3 | 11 |
| 1.14e+006 | 978000 | 162000 | 4 | 11 |
| 709000 1c | 978000 | -269000 | 4 | 12 |
| 745000 | 978000 | -233000 | 4 | 13 |
| 548000 | 978000 | -430000 | 4 | 14 |
| 546700 | 978000 | -431300 | 4 | 15 |
| 662200 | 978000 | -315800 | 4 | 16 |
| | | | | |
| 943000 | 964000 | -21000 | 4 | 17 |
| 1.17e+006 ML | 964000 | 206000 | 5 | 17 |
| 884000 | 964000 | -80000 | 5 | 18 |
| 1.14e+006 | 964000 | 176000 | 6 | 18 |
| 709000 1c | 964000 | -255000 | 6 | 19 |
| 745000 | 964000 | -219000 | 6 | 20 |
| 548000 | 964000 | -416000 | 6 | 21 |
| 546700 | 964000 | -417300 | 6 | 22 |
| 662200 | 964000 | -301800 | 6 | 23 |
| | | | | |
| 1.17e+006 ML | 943000 | 227000 | 7 | 23 |
| 884000 | 943000 | -59000 | 7 | 24 |
| 1.14e+006 | 943000 | 197000 | 8 | 24 |
| 709000 1c | 943000 | -234000 | 8 | 25 |
| 745000 | 943000 | -198000 | 8 | 26 |
| 548000 | 943000 | -395000 | 8 | 27 |
| 546700 | 943000 | -396300 | 8 | 28 |
| 662200 | 943000 | -280800 | 8 | 29 |
| | | | | |
| 884000 | 1.17e+006 ML | -286000 | 8 | 30 |
| 1.14e+006 | 1.17e+006 ML | -30000 | 8 | 31 |
| 709000 1c | 1.17e+006 ML | -461000 | 8 | 32 |
| 745000 | 1.17e+006 ML | -425000 | 8 | 33 |
| 548000 | 1.17e+006 ML | -622000 | 8 | 34 |

| | | | | |
|---|---|---|---|---|
| 546700 | 1.17e+006 ML | -623300 | 8 | 35 |
| 662200 | 1.17e+006 ML | -507800 | 8 | 36 |
| | | | | |
| 1.14e+006 | 884000 | 256000 | 9 | 36 |
| 709000 1c | 884000 | -175000 | 9 | 37 |
| 745000 | 884000 | -139000 | 9 | 38 |
| 548000 | 884000 | -336000 | 9 | 39 |
| 546700 | 884000 | -337300 | 9 | 40 |
| 662200 | 884000 | -221800 | 9 | 41 |
| | | | | |
| 709000 1c | 1.14e+006 | -431000 | 9 | 42 |
| 745000 | 1.14e+006 | -395000 | 9 | 43 |
| 548000 | 1.14e+006 | -592000 | 9 | 44 |
| 546700 | 1.14e+006 | -593300 | 9 | 45 |
| 662200 | 1.14e+006 | -477800 | 9 | 46 |
| | | | | |
| 745000 | 709000 1c | 36000 | 10 | 46 |
| 548000 | 709000 1c | -161000 | 10 | 47 |
| 546700 | 709000 1c | -162300 | 10 | 48 |
| 662200 | 709000 1c | -46800 | 10 | 49 |
| | | | | |
| 548000 | 745000 | -197000 | 10 | 50 |
| 546700 | 745000 | -198300 | 10 | 51 |
| 662200 | 745000 | -82800 | 10 | 52 |
| | | | | |
| 546700 | 548000 | -1300 | 10 | 53 |
| 662200 | 548000 | 114200 | 11 | 53 |
| | | | | |
| 662200 | 546700 | 115500 | 12 | 53 |

S Statistic = 12 - 53 = -41

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 3/1/2022 | 1 |
| 3/1/2023 | 1 |
| 3/1/2024 | 1 |

There are 1 time periods with multiple data

A = 0
B = 18
C = 0
D = 0
E = 0
F = 2
a = 3828
b = 11880

c = 264
Group Variance = 211.667
Z-Score = -2.74937
Comparison Level at 95% confidence level = -1.65463 (downward trend)
**-2.74937 < -1.65463 indicating a downward trend**

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RWO-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 2660 2c | 3200 1c4c | Same Date | 0 | 0 |
| 6790 1c | 3200 1c4c | 3590 | 1 | 0 |
| 3720 | 3200 1c4c | 520 | 2 | 0 |
| 6220 | 3200 1c4c | 3020 | 3 | 0 |
| 11100 | 3200 1c4c | 7900 | 4 | 0 |
| 5030 3c | 3200 1c4c | 1830 | 5 | 0 |
| 2750 | 3200 1c4c | -450 | 5 | 1 |
| 1130 | 3200 1c4c | -2070 | 5 | 2 |
| 694 | 3200 1c4c | -2506 | 5 | 3 |
| 397 | 3200 1c4c | -2803 | 5 | 4 |
| 49.32 | 3200 1c4c | -3150.68 | 5 | 5 |
| ND<5 U | 3200 1c4c | -3195 | 5 | 6 |
| ND<5 U | 3200 1c4c | -3195 | 5 | 7 |
| ND<5 U | 3200 1c4c | -3195 | 5 | 8 |
| ND<250 U | 3200 1c4c | -2950 | 5 | 9 |
| | | | | |
| 6790 1c | 2660 2c | 4130 | 6 | 9 |
| 3720 | 2660 2c | 1060 | 7 | 9 |
| 6220 | 2660 2c | 3560 | 8 | 9 |
| 11100 | 2660 2c | 8440 | 9 | 9 |
| 5030 3c | 2660 2c | 2370 | 10 | 9 |
| 2750 | 2660 2c | 90 | 11 | 9 |
| 1130 | 2660 2c | -1530 | 11 | 10 |
| 694 | 2660 2c | -1966 | 11 | 11 |
| 397 | 2660 2c | -2263 | 11 | 12 |
| 49.32 | 2660 2c | -2610.68 | 11 | 13 |
| ND<5 U | 2660 2c | -2655 | 11 | 14 |
| ND<5 U | 2660 2c | -2655 | 11 | 15 |
| ND<5 U | 2660 2c | -2655 | 11 | 16 |
| ND<250 U | 2660 2c | -2410 | 11 | 17 |
| | | | | |
| 3720 | 6790 1c | -3070 | 11 | 18 |
| 6220 | 6790 1c | -570 | 11 | 19 |
| 11100 | 6790 1c | 4310 | 12 | 19 |
| 5030 3c | 6790 1c | -1760 | 12 | 20 |
| 2750 | 6790 1c | -4040 | 12 | 21 |
| 1130 | 6790 1c | -5660 | 12 | 22 |
| 694 | 6790 1c | -6096 | 12 | 23 |
| 397 | 6790 1c | -6393 | 12 | 24 |
| 49.32 | 6790 1c | -6740.68 | 12 | 25 |
| ND<5 U | 6790 1c | -6785 | 12 | 26 |
| ND<5 U | 6790 1c | -6785 | 12 | 27 |
| ND<5 U | 6790 1c | -6785 | 12 | 28 |
| ND<250 U | 6790 1c | -6540 | 12 | 29 |
| | | | | |
| 6220 | 3720 | 2500 | 13 | 29 |
| 11100 | 3720 | 7380 | 14 | 29 |

| | | | | |
|---|---|---|---|---|
| 5030 3c | 3720 | 1310 | 15 | 29 |
| 2750 | 3720 | -970 | 15 | 30 |
| 1130 | 3720 | -2590 | 15 | 31 |
| 694 | 3720 | -3026 | 15 | 32 |
| 397 | 3720 | -3323 | 15 | 33 |
| 49.32 | 3720 | -3670.68 | 15 | 34 |
| ND<5 U | 3720 | -3715 | 15 | 35 |
| ND<5 U | 3720 | -3715 | 15 | 36 |
| ND<5 U | 3720 | -3715 | 15 | 37 |
| ND<250 U | 3720 | -3470 | 15 | 38 |
| | | | | |
| 11100 | 6220 | 4880 | 16 | 38 |
| 5030 3c | 6220 | -1190 | 16 | 39 |
| 2750 | 6220 | -3470 | 16 | 40 |
| 1130 | 6220 | -5090 | 16 | 41 |
| 694 | 6220 | -5526 | 16 | 42 |
| 397 | 6220 | -5823 | 16 | 43 |
| 49.32 | 6220 | -6170.68 | 16 | 44 |
| ND<5 U | 6220 | -6215 | 16 | 45 |
| ND<5 U | 6220 | -6215 | 16 | 46 |
| ND<5 U | 6220 | -6215 | 16 | 47 |
| ND<250 U | 6220 | -5970 | 16 | 48 |
| | | | | |
| 5030 3c | 11100 | -6070 | 16 | 49 |
| 2750 | 11100 | -8350 | 16 | 50 |
| 1130 | 11100 | -9970 | 16 | 51 |
| 694 | 11100 | -10406 | 16 | 52 |
| 397 | 11100 | -10703 | 16 | 53 |
| 49.32 | 11100 | -11050.7 | 16 | 54 |
| ND<5 U | 11100 | -11095 | 16 | 55 |
| ND<5 U | 11100 | -11095 | 16 | 56 |
| ND<5 U | 11100 | -11095 | 16 | 57 |
| ND<250 U | 11100 | -10850 | 16 | 58 |
| | | | | |
| 2750 | 5030 3c | -2280 | 16 | 59 |
| 1130 | 5030 3c | -3900 | 16 | 60 |
| 694 | 5030 3c | -4336 | 16 | 61 |
| 397 | 5030 3c | -4633 | 16 | 62 |
| 49.32 | 5030 3c | -4980.68 | 16 | 63 |
| ND<5 U | 5030 3c | -5025 | 16 | 64 |
| ND<5 U | 5030 3c | -5025 | 16 | 65 |
| ND<5 U | 5030 3c | -5025 | 16 | 66 |
| ND<250 U | 5030 3c | -4780 | 16 | 67 |
| | | | | |
| 1130 | 2750 | -1620 | 16 | 68 |
| 694 | 2750 | -2056 | 16 | 69 |
| 397 | 2750 | -2353 | 16 | 70 |
| 49.32 | 2750 | -2700.68 | 16 | 71 |
| ND<5 U | 2750 | -2745 | 16 | 72 |
| ND<5 U | 2750 | -2745 | 16 | 73 |
| ND<5 U | 2750 | -2745 | 16 | 74 |
| ND<250 U | 2750 | -2500 | 16 | 75 |
| | | | | |
| 694 | 1130 | -436 | 16 | 76 |
| 397 | 1130 | -733 | 16 | 77 |
| 49.32 | 1130 | -1080.68 | 16 | 78 |
| ND<5 U | 1130 | -1125 | 16 | 79 |

| | | | | |
|---|---|---|---|---|
| ND<5 U | 1130 | -1125 | 16 | 80 |
| ND<5 U | 1130 | -1125 | 16 | 81 |
| ND<250 U | 1130 | -880 | 16 | 82 |
| | | | | |
| 397 | 694 | -297 | 16 | 83 |
| 49.32 | 694 | -644.68 | 16 | 84 |
| ND<5 U | 694 | -689 | 16 | 85 |
| ND<5 U | 694 | -689 | 16 | 86 |
| ND<5 U | 694 | -689 | 16 | 87 |
| ND<250 U | 694 | -444 | 16 | 88 |
| | | | | |
| 49.32 | 397 | -347.68 | 16 | 89 |
| ND<5 U | 397 | -392 | 16 | 90 |
| ND<5 U | 397 | -392 | 16 | 91 |
| ND<5 U | 397 | -392 | 16 | 92 |
| ND<250 U | 397 | -147 | 16 | 93 |
| | | | | |
| ND<5 U | 49.32 | -44.32 | 16 | 94 |
| ND<5 U | 49.32 | -44.32 | 16 | 95 |
| ND<5 U | 49.32 | -44.32 | 16 | 96 |
| ND<250 U | 49.32 | 200.68 | 17 | 96 |
| | | | | |
| ND<5 U | ND<5 U | 0 | 17 | 96 |
| ND<5 U | ND<5 U | 0 | 17 | 96 |
| ND<250 U | ND<5 U | 245 | 18 | 96 |
| | | | | |
| ND<5 U | ND<5 U | 0 | 18 | 96 |
| ND<250 U | ND<5 U | 245 | 19 | 96 |
| | | | | |
| ND<250 U | ND<5 U | 245 | 20 | 96 |

S Statistic = 20 - 96 = -76

| Tied Group | Value | Members |
|---|---|---|
| 1 | 5 | 3 |

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 66
B = 18

C = 6
D = 0
E = 6
F = 2
a = 8880
b = 30240
c = 480
Group Variance = 488.692
Z-Score = -3.39269
Comparison Level at 95% confidence level = -1.65463 (downward trend)
**-3.39269 < -1.65463 indicating a downward trend**

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RWQ-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 148 | 146 | Same Date | 0 | 0 |
| 147 1c | 146 | 1 | 1 | 0 |
| 182 | 146 | 36 | 2 | 0 |
| 194 | 146 | 48 | 3 | 0 |
| 149 | 146 | 3 | 4 | 0 |
| 162 3c | 146 | 16 | 5 | 0 |
| 152 | 146 | 6 | 6 | 0 |
| 158 | 146 | 12 | 7 | 0 |
| 166 | 146 | 20 | 8 | 0 |
| 239 | 146 | 93 | 9 | 0 |
| 133.8 | 146 | -12.2 | 9 | 1 |
| 94.51 | 146 | -51.49 | 9 | 2 |
| 116.6 | 146 | -29.4 | 9 | 3 |
| 153.7 | 146 | 7.7 | 10 | 3 |
| 211.7 | 146 | 65.7 | 11 | 3 |
| | | | | |
| 147 1c | 148 | -1 | 11 | 4 |
| 182 | 148 | 34 | 12 | 4 |
| 194 | 148 | 46 | 13 | 4 |
| 149 | 148 | 1 | 14 | 4 |
| 162 3c | 148 | 14 | 15 | 4 |
| 152 | 148 | 4 | 16 | 4 |
| 158 | 148 | 10 | 17 | 4 |
| 166 | 148 | 18 | 18 | 4 |
| 239 | 148 | 91 | 19 | 4 |
| 133.8 | 148 | -14.2 | 19 | 5 |
| 94.51 | 148 | -53.49 | 19 | 6 |
| 116.6 | 148 | -31.4 | 19 | 7 |
| 153.7 | 148 | 5.7 | 20 | 7 |
| 211.7 | 148 | 63.7 | 21 | 7 |
| | | | | |
| 182 | 147 1c | 35 | 22 | 7 |
| 194 | 147 1c | 47 | 23 | 7 |
| 149 | 147 1c | 2 | 24 | 7 |
| 162 3c | 147 1c | 15 | 25 | 7 |
| 152 | 147 1c | 5 | 26 | 7 |
| 158 | 147 1c | 11 | 27 | 7 |
| 166 | 147 1c | 19 | 28 | 7 |
| 239 | 147 1c | 92 | 29 | 7 |
| 133.8 | 147 1c | -13.2 | 29 | 8 |
| 94.51 | 147 1c | -52.49 | 29 | 9 |
| 116.6 | 147 1c | -30.4 | 29 | 10 |
| 153.7 | 147 1c | 6.7 | 30 | 10 |
| 211.7 | 147 1c | 64.7 | 31 | 10 |
| | | | | |
| 194 | 182 | 12 | 32 | 10 |
| 149 | 182 | -33 | 32 | 11 |

| | | | | |
|---|---|---|---|---|
| 162 3c | 182 | -20 | 32 | 12 |
| 152 | 182 | -30 | 32 | 13 |
| 158 | 182 | -24 | 32 | 14 |
| 166 | 182 | -16 | 32 | 15 |
| 239 | 182 | 57 | 33 | 15 |
| 133.8 | 182 | -48.2 | 33 | 16 |
| 94.51 | 182 | -87.49 | 33 | 17 |
| 116.6 | 182 | -65.4 | 33 | 18 |
| 153.7 | 182 | -28.3 | 33 | 19 |
| 211.7 | 182 | 29.7 | 34 | 19 |
| | | | | |
| 149 | 194 | -45 | 34 | 20 |
| 162 3c | 194 | -32 | 34 | 21 |
| 152 | 194 | -42 | 34 | 22 |
| 158 | 194 | -36 | 34 | 23 |
| 166 | 194 | -28 | 34 | 24 |
| 239 | 194 | 45 | 35 | 24 |
| 133.8 | 194 | -60.2 | 35 | 25 |
| 94.51 | 194 | -99.49 | 35 | 26 |
| 116.6 | 194 | -77.4 | 35 | 27 |
| 153.7 | 194 | -40.3 | 35 | 28 |
| 211.7 | 194 | 17.7 | 36 | 28 |
| | | | | |
| 162 3c | 149 | 13 | 37 | 28 |
| 152 | 149 | 3 | 38 | 28 |
| 158 | 149 | 9 | 39 | 28 |
| 166 | 149 | 17 | 40 | 28 |
| 239 | 149 | 90 | 41 | 28 |
| 133.8 | 149 | -15.2 | 41 | 29 |
| 94.51 | 149 | -54.49 | 41 | 30 |
| 116.6 | 149 | -32.4 | 41 | 31 |
| 153.7 | 149 | 4.7 | 42 | 31 |
| 211.7 | 149 | 62.7 | 43 | 31 |
| | | | | |
| 152 | 162 3c | -10 | 43 | 32 |
| 158 | 162 3c | -4 | 43 | 33 |
| 166 | 162 3c | 4 | 44 | 33 |
| 239 | 162 3c | 77 | 45 | 33 |
| 133.8 | 162 3c | -28.2 | 45 | 34 |
| 94.51 | 162 3c | -67.49 | 45 | 35 |
| 116.6 | 162 3c | -45.4 | 45 | 36 |
| 153.7 | 162 3c | -8.3 | 45 | 37 |
| 211.7 | 162 3c | 49.7 | 46 | 37 |
| | | | | |
| 158 | 152 | 6 | 47 | 37 |
| 166 | 152 | 14 | 48 | 37 |
| 239 | 152 | 87 | 49 | 37 |
| 133.8 | 152 | -18.2 | 49 | 38 |
| 94.51 | 152 | -57.49 | 49 | 39 |
| 116.6 | 152 | -35.4 | 49 | 40 |
| 153.7 | 152 | 1.7 | 50 | 40 |
| 211.7 | 152 | 59.7 | 51 | 40 |
| | | | | |
| 166 | 158 | 8 | 52 | 40 |
| 239 | 158 | 81 | 53 | 40 |
| 133.8 | 158 | -24.2 | 53 | 41 |
| 94.51 | 158 | -63.49 | 53 | 42 |

| | | | | |
|---|---|---|---|---|
| 116.6 | 158 | -41.4 | 53 | 43 |
| 153.7 | 158 | -4.3 | 53 | 44 |
| 211.7 | 158 | 53.7 | 54 | 44 |
| | | | | |
| 239 | 166 | 73 | 55 | 44 |
| 133.8 | 166 | -32.2 | 55 | 45 |
| 94.51 | 166 | -71.49 | 55 | 46 |
| 116.6 | 166 | -49.4 | 55 | 47 |
| 153.7 | 166 | -12.3 | 55 | 48 |
| 211.7 | 166 | 45.7 | 56 | 48 |
| | | | | |
| 133.8 | 239 | -105.2 | 56 | 49 |
| 94.51 | 239 | -144.49 | 56 | 50 |
| 116.6 | 239 | -122.4 | 56 | 51 |
| 153.7 | 239 | -85.3 | 56 | 52 |
| 211.7 | 239 | -27.3 | 56 | 53 |
| | | | | |
| 94.51 | 133.8 | -39.29 | 56 | 54 |
| 116.6 | 133.8 | -17.2 | 56 | 55 |
| 153.7 | 133.8 | 19.9 | 57 | 55 |
| 211.7 | 133.8 | 77.9 | 58 | 55 |
| | | | | |
| 116.6 | 94.51 | 22.09 | 59 | 55 |
| 153.7 | 94.51 | 59.19 | 60 | 55 |
| 211.7 | 94.51 | 117.19 | 61 | 55 |
| | | | | |
| 153.7 | 116.6 | 37.1 | 62 | 55 |
| 211.7 | 116.6 | 95.1 | 63 | 55 |
| | | | | |
| 211.7 | 153.7 | 58 | 64 | 55 |

S Statistic = 64 - 55 = 9

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 0
B = 18
C = 0

D = 0
E = 0
F = 2
a = 8880
b = 30240
c = 480
Group Variance = 492.333
Z-Score = 0.360546
Comparison Level at 95% confidence level = -1.65463 (downward trend)
0.360546 >= -1.65463 indicating no evidence of a downward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RWR-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 213000 2c | 214000 1c4c | Same Date | 0 | 0 |
| 245000 M61c2c | 214000 1c4c | 31000 | 1 | 0 |
| 320000 | 214000 1c4c | 106000 | 2 | 0 |
| 344000 | 214000 1c4c | 130000 | 3 | 0 |
| 327000 | 214000 1c4c | 113000 | 4 | 0 |
| 326000 | 214000 1c4c | 112000 | 5 | 0 |
| 293000 MH1c | 214000 1c4c | 79000 | 6 | 0 |
| 269000 P6 | 214000 1c4c | 55000 | 7 | 0 |
| 298000 | 214000 1c4c | 84000 | 8 | 0 |
| 267000 | 214000 1c4c | 53000 | 9 | 0 |
| 205000 | 214000 1c4c | -9000 | 9 | 1 |
| 233900 | 214000 1c4c | 19900 | 10 | 1 |
| 243900 | 214000 1c4c | 29900 | 11 | 1 |
| 280800 | 214000 1c4c | 66800 | 12 | 1 |
| 455600 | 214000 1c4c | 241600 | 13 | 1 |
| | | | | |
| 245000 M61c2c | 213000 2c | 32000 | 14 | 1 |
| 320000 | 213000 2c | 107000 | 15 | 1 |
| 344000 | 213000 2c | 131000 | 16 | 1 |
| 327000 | 213000 2c | 114000 | 17 | 1 |
| 326000 | 213000 2c | 113000 | 18 | 1 |
| 293000 MH1c | 213000 2c | 80000 | 19 | 1 |
| 269000 P6 | 213000 2c | 56000 | 20 | 1 |
| 298000 | 213000 2c | 85000 | 21 | 1 |
| 267000 | 213000 2c | 54000 | 22 | 1 |
| 205000 | 213000 2c | -8000 | 22 | 2 |
| 233900 | 213000 2c | 20900 | 23 | 2 |
| 243900 | 213000 2c | 30900 | 24 | 2 |
| 280800 | 213000 2c | 67800 | 25 | 2 |
| 455600 | 213000 2c | 242600 | 26 | 2 |
| | | | | |
| 320000 | 245000 M61c2c | 75000 | 27 | 2 |
| 344000 | 245000 M61c2c | 99000 | 28 | 2 |
| 327000 | 245000 M61c2c | 82000 | 29 | 2 |
| 326000 | 245000 M61c2c | 81000 | 30 | 2 |
| 293000 MH1c | 245000 M61c2c | 48000 | 31 | 2 |
| 269000 P6 | 245000 M61c2c | 24000 | 32 | 2 |
| 298000 | 245000 M61c2c | 53000 | 33 | 2 |
| 267000 | 245000 M61c2c | 22000 | 34 | 2 |
| 205000 | 245000 M61c2c | -40000 | 34 | 3 |
| 233900 | 245000 M61c2c | -11100 | 34 | 4 |
| 243900 | 245000 M61c2c | -1100 | 34 | 5 |
| 280800 | 245000 M61c2c | 35800 | 35 | 5 |
| 455600 | 245000 M61c2c | 210600 | 36 | 5 |
| | | | | |
| 344000 | 320000 | 24000 | 37 | 5 |
| 327000 | 320000 | 7000 | 38 | 5 |

| | | | | |
|---|---|---|---|---|
| 326000 | 320000 | 6000 | 39 | 5 |
| 293000 MH1c | 320000 | -27000 | 39 | 6 |
| 269000 P6 | 320000 | -51000 | 39 | 7 |
| 298000 | 320000 | -22000 | 39 | 8 |
| 267000 | 320000 | -53000 | 39 | 9 |
| 205000 | 320000 | -115000 | 39 | 10 |
| 233900 | 320000 | -86100 | 39 | 11 |
| 243900 | 320000 | -76100 | 39 | 12 |
| 280800 | 320000 | -39200 | 39 | 13 |
| 455600 | 320000 | 135600 | 40 | 13 |
| | | | | |
| 327000 | 344000 | -17000 | 40 | 14 |
| 326000 | 344000 | -18000 | 40 | 15 |
| 293000 MH1c | 344000 | -51000 | 40 | 16 |
| 269000 P6 | 344000 | -75000 | 40 | 17 |
| 298000 | 344000 | -46000 | 40 | 18 |
| 267000 | 344000 | -77000 | 40 | 19 |
| 205000 | 344000 | -139000 | 40 | 20 |
| 233900 | 344000 | -110100 | 40 | 21 |
| 243900 | 344000 | -100100 | 40 | 22 |
| 280800 | 344000 | -63200 | 40 | 23 |
| 455600 | 344000 | 111600 | 41 | 23 |
| | | | | |
| 326000 | 327000 | -1000 | 41 | 24 |
| 293000 MH1c | 327000 | -34000 | 41 | 25 |
| 269000 P6 | 327000 | -58000 | 41 | 26 |
| 298000 | 327000 | -29000 | 41 | 27 |
| 267000 | 327000 | -60000 | 41 | 28 |
| 205000 | 327000 | -122000 | 41 | 29 |
| 233900 | 327000 | -93100 | 41 | 30 |
| 243900 | 327000 | -83100 | 41 | 31 |
| 280800 | 327000 | -46200 | 41 | 32 |
| 455600 | 327000 | 128600 | 42 | 32 |
| | | | | |
| 293000 MH1c | 326000 | -33000 | 42 | 33 |
| 269000 P6 | 326000 | -57000 | 42 | 34 |
| 298000 | 326000 | -28000 | 42 | 35 |
| 267000 | 326000 | -59000 | 42 | 36 |
| 205000 | 326000 | -121000 | 42 | 37 |
| 233900 | 326000 | -92100 | 42 | 38 |
| 243900 | 326000 | -82100 | 42 | 39 |
| 280800 | 326000 | -45200 | 42 | 40 |
| 455600 | 326000 | 129600 | 43 | 40 |
| | | | | |
| 269000 P6 | 293000 MH1c | -24000 | 43 | 41 |
| 298000 | 293000 MH1c | 5000 | 44 | 41 |
| 267000 | 293000 MH1c | -26000 | 44 | 42 |
| 205000 | 293000 MH1c | -88000 | 44 | 43 |
| 233900 | 293000 MH1c | -59100 | 44 | 44 |
| 243900 | 293000 MH1c | -49100 | 44 | 45 |
| 280800 | 293000 MH1c | -12200 | 44 | 46 |
| 455600 | 293000 MH1c | 162600 | 45 | 46 |
| | | | | |
| 298000 | 269000 P6 | 29000 | 46 | 46 |
| 267000 | 269000 P6 | -2000 | 46 | 47 |
| 205000 | 269000 P6 | -64000 | 46 | 48 |
| 233900 | 269000 P6 | -35100 | 46 | 49 |

| | | | | |
|---|---|---|---|---|
| 243900 | 269000 P6 | -25100 | 46 | 50 |
| 280800 | 269000 P6 | 11800 | 47 | 50 |
| 455600 | 269000 P6 | 186600 | 48 | 50 |
| | | | | |
| 267000 | 298000 | -31000 | 48 | 51 |
| 205000 | 298000 | -93000 | 48 | 52 |
| 233900 | 298000 | -64100 | 48 | 53 |
| 243900 | 298000 | -54100 | 48 | 54 |
| 280800 | 298000 | -17200 | 48 | 55 |
| 455600 | 298000 | 157600 | 49 | 55 |
| | | | | |
| 205000 | 267000 | -62000 | 49 | 56 |
| 233900 | 267000 | -33100 | 49 | 57 |
| 243900 | 267000 | -23100 | 49 | 58 |
| 280800 | 267000 | 13800 | 50 | 58 |
| 455600 | 267000 | 188600 | 51 | 58 |
| | | | | |
| 233900 | 205000 | 28900 | 52 | 58 |
| 243900 | 205000 | 38900 | 53 | 58 |
| 280800 | 205000 | 75800 | 54 | 58 |
| 455600 | 205000 | 250600 | 55 | 58 |
| | | | | |
| 243900 | 233900 | 10000 | 56 | 58 |
| 280800 | 233900 | 46900 | 57 | 58 |
| 455600 | 233900 | 221700 | 58 | 58 |
| | | | | |
| 280800 | 243900 | 36900 | 59 | 58 |
| 455600 | 243900 | 211700 | 60 | 58 |
| | | | | |
| 455600 | 280800 | 174800 | 61 | 58 |

S Statistic = 61 - 58 = 3

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 0
B = 18
C = 0

D = 0
E = 0
F = 2
a = 8880
b = 30240
c = 480
Group Variance = 492.333
Z-Score = 0.0901364
Comparison Level at 95% confidence level = -1.65463 (downward trend)
0.0901364 >= -1.65463 indicating no evidence of a downward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RWS-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 10100 | 9740 | Same Date | 0 | 0 |
| 1980 1c | 9740 | -7760 | 0 | 1 |
| 2970 | 9740 | -6770 | 0 | 2 |
| 19100 | 9740 | 9360 | 1 | 2 |
| 954000 | 9740 | 944260 | 2 | 2 |
| 60300 MH | 9740 | 50560 | 3 | 2 |
| 7260 | 9740 | -2480 | 3 | 3 |
| 116000 | 9740 | 106260 | 4 | 3 |
| 36700 | 9740 | 26960 | 5 | 3 |
| 97500 | 9740 | 87760 | 6 | 3 |
| 22290 | 9740 | 12550 | 7 | 3 |
| 158800 | 9740 | 149060 | 8 | 3 |
| 62160 | 9740 | 52420 | 9 | 3 |
| 167200 | 9740 | 157460 | 10 | 3 |
| 166800 | 9740 | 157060 | 11 | 3 |
| | | | | |
| 1980 1c | 10100 | -8120 | 11 | 4 |
| 2970 | 10100 | -7130 | 11 | 5 |
| 19100 | 10100 | 9000 | 12 | 5 |
| 954000 | 10100 | 943900 | 13 | 5 |
| 60300 MH | 10100 | 50200 | 14 | 5 |
| 7260 | 10100 | -2840 | 14 | 6 |
| 116000 | 10100 | 105900 | 15 | 6 |
| 36700 | 10100 | 26600 | 16 | 6 |
| 97500 | 10100 | 87400 | 17 | 6 |
| 22290 | 10100 | 12190 | 18 | 6 |
| 158800 | 10100 | 148700 | 19 | 6 |
| 62160 | 10100 | 52060 | 20 | 6 |
| 167200 | 10100 | 157100 | 21 | 6 |
| 166800 | 10100 | 156700 | 22 | 6 |
| | | | | |
| 2970 | 1980 1c | 990 | 23 | 6 |
| 19100 | 1980 1c | 17120 | 24 | 6 |
| 954000 | 1980 1c | 952020 | 25 | 6 |
| 60300 MH | 1980 1c | 58320 | 26 | 6 |
| 7260 | 1980 1c | 5280 | 27 | 6 |
| 116000 | 1980 1c | 114020 | 28 | 6 |
| 36700 | 1980 1c | 34720 | 29 | 6 |
| 97500 | 1980 1c | 95520 | 30 | 6 |
| 22290 | 1980 1c | 20310 | 31 | 6 |
| 158800 | 1980 1c | 156820 | 32 | 6 |
| 62160 | 1980 1c | 60180 | 33 | 6 |
| 167200 | 1980 1c | 165220 | 34 | 6 |
| 166800 | 1980 1c | 164820 | 35 | 6 |
| | | | | |
| 19100 | 2970 | 16130 | 36 | 6 |
| 954000 | 2970 | 951030 | 37 | 6 |

| | | | | |
|---|---|---|---|---|
| 60300 MH | 2970 | 57330 | 38 | 6 |
| 7260 | 2970 | 4290 | 39 | 6 |
| 116000 | 2970 | 113030 | 40 | 6 |
| 36700 | 2970 | 33730 | 41 | 6 |
| 97500 | 2970 | 94530 | 42 | 6 |
| 22290 | 2970 | 19320 | 43 | 6 |
| 158800 | 2970 | 155830 | 44 | 6 |
| 62160 | 2970 | 59190 | 45 | 6 |
| 167200 | 2970 | 164230 | 46 | 6 |
| 166800 | 2970 | 163830 | 47 | 6 |
| | | | | |
| 954000 | 19100 | 934900 | 48 | 6 |
| 60300 MH | 19100 | 41200 | 49 | 6 |
| 7260 | 19100 | -11840 | 49 | 7 |
| 116000 | 19100 | 96900 | 50 | 7 |
| 36700 | 19100 | 17600 | 51 | 7 |
| 97500 | 19100 | 78400 | 52 | 7 |
| 22290 | 19100 | 3190 | 53 | 7 |
| 158800 | 19100 | 139700 | 54 | 7 |
| 62160 | 19100 | 43060 | 55 | 7 |
| 167200 | 19100 | 148100 | 56 | 7 |
| 166800 | 19100 | 147700 | 57 | 7 |
| | | | | |
| 60300 MH | 954000 | -893700 | 57 | 8 |
| 7260 | 954000 | -946740 | 57 | 9 |
| 116000 | 954000 | -838000 | 57 | 10 |
| 36700 | 954000 | -917300 | 57 | 11 |
| 97500 | 954000 | -856500 | 57 | 12 |
| 22290 | 954000 | -931710 | 57 | 13 |
| 158800 | 954000 | -795200 | 57 | 14 |
| 62160 | 954000 | -891840 | 57 | 15 |
| 167200 | 954000 | -786800 | 57 | 16 |
| 166800 | 954000 | -787200 | 57 | 17 |
| | | | | |
| 7260 | 60300 MH | -53040 | 57 | 18 |
| 116000 | 60300 MH | 55700 | 58 | 18 |
| 36700 | 60300 MH | -23600 | 58 | 19 |
| 97500 | 60300 MH | 37200 | 59 | 19 |
| 22290 | 60300 MH | -38010 | 59 | 20 |
| 158800 | 60300 MH | 98500 | 60 | 20 |
| 62160 | 60300 MH | 1860 | 61 | 20 |
| 167200 | 60300 MH | 106900 | 62 | 20 |
| 166800 | 60300 MH | 106500 | 63 | 20 |
| | | | | |
| 116000 | 7260 | 108740 | 64 | 20 |
| 36700 | 7260 | 29440 | 65 | 20 |
| 97500 | 7260 | 90240 | 66 | 20 |
| 22290 | 7260 | 15030 | 67 | 20 |
| 158800 | 7260 | 151540 | 68 | 20 |
| 62160 | 7260 | 54900 | 69 | 20 |
| 167200 | 7260 | 159940 | 70 | 20 |
| 166800 | 7260 | 159540 | 71 | 20 |
| | | | | |
| 36700 | 116000 | -79300 | 71 | 21 |
| 97500 | 116000 | -18500 | 71 | 22 |
| 22290 | 116000 | -93710 | 71 | 23 |
| 158800 | 116000 | 42800 | 72 | 23 |

| | | | | |
|---|---|---|---|---|
| 62160 | 116000 | -53840 | 72 | 24 |
| 167200 | 116000 | 51200 | 73 | 24 |
| 166800 | 116000 | 50800 | 74 | 24 |
| | | | | |
| 97500 | 36700 | 60800 | 75 | 24 |
| 22290 | 36700 | -14410 | 75 | 25 |
| 158800 | 36700 | 122100 | 76 | 25 |
| 62160 | 36700 | 25460 | 77 | 25 |
| 167200 | 36700 | 130500 | 78 | 25 |
| 166800 | 36700 | 130100 | 79 | 25 |
| | | | | |
| 22290 | 97500 | -75210 | 79 | 26 |
| 158800 | 97500 | 61300 | 80 | 26 |
| 62160 | 97500 | -35340 | 80 | 27 |
| 167200 | 97500 | 69700 | 81 | 27 |
| 166800 | 97500 | 69300 | 82 | 27 |
| | | | | |
| 158800 | 22290 | 136510 | 83 | 27 |
| 62160 | 22290 | 39870 | 84 | 27 |
| 167200 | 22290 | 144910 | 85 | 27 |
| 166800 | 22290 | 144510 | 86 | 27 |
| | | | | |
| 62160 | 158800 | -96640 | 86 | 28 |
| 167200 | 158800 | 8400 | 87 | 28 |
| 166800 | 158800 | 8000 | 88 | 28 |
| | | | | |
| 167200 | 62160 | 105040 | 89 | 28 |
| 166800 | 62160 | 104640 | 90 | 28 |
| | | | | |
| 166800 | 167200 | -400 | 90 | 29 |

S Statistic = 90 - 29 = 61

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 0
B = 18
C = 0

D = 0
E = 0
F = 2
a = 8880
b = 30240
c = 480
Group Variance = 492.333
Z-Score = 2.70409
Comparison Level at 95% confidence level = -1.65463 (downward trend)
2.70409 >= -1.65463 indicating no evidence of a downward trend

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RW01-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 1.2 J | 1.6 J | -0.4 | 0 | 1 |
| 1.7 J | 1.6 J | 0.1 | 1 | 1 |
| 21.7 | 1.6 J | 20.1 | 2 | 1 |
| 98 | 1.6 J | 96.4 | 3 | 1 |
| 23.9 | 1.6 J | 22.3 | 4 | 1 |
| 7.6 | 1.6 J | 6 | 5 | 1 |
| 1.6 J | 1.6 J | 0 | 5 | 1 |
| 0.97 J | 1.6 J | -0.63 | 5 | 2 |
| 2.5 J | 1.6 J | 0.9 | 6 | 2 |
| 2.3 J | 1.6 J | 0.7 | 7 | 2 |
| 4.7 | 1.6 J | 3.1 | 8 | 2 |
| 4.8 | 1.6 J | 3.2 | 9 | 2 |
| 4.3 2c | 1.6 J | 2.7 | 10 | 2 |
| 3.9 B | 1.6 J | 2.3 | 11 | 2 |
| 4.4 | 1.6 J | 2.8 | 12 | 2 |
| 1.6 J | 1.6 J | 0 | 12 | 2 |
| 1.3 J | 1.6 J | -0.3 | 12 | 3 |
| 1.1 J | 1.6 J | -0.5 | 12 | 4 |
| 0.4 J | 1.6 J | -1.2 | 12 | 5 |
| ND<0.5 U | 1.6 J | -1.1 | 12 | 6 |
| ND<1 U | 1.6 J | -0.6 | 12 | 7 |
| 0.552 | 1.6 J | -1.048 | 12 | 8 |
| 0.5374 | 1.6 J | -1.0626 | 12 | 9 |
| | | | | |
| 1.7 J | 1.2 J | 0.5 | 13 | 9 |
| 21.7 | 1.2 J | 20.5 | 14 | 9 |
| 98 | 1.2 J | 96.8 | 15 | 9 |
| 23.9 | 1.2 J | 22.7 | 16 | 9 |
| 7.6 | 1.2 J | 6.4 | 17 | 9 |
| 1.6 J | 1.2 J | 0.4 | 18 | 9 |
| 0.97 J | 1.2 J | -0.23 | 18 | 10 |
| 2.5 J | 1.2 J | 1.3 | 19 | 10 |
| 2.3 J | 1.2 J | 1.1 | 20 | 10 |
| 4.7 | 1.2 J | 3.5 | 21 | 10 |
| 4.8 | 1.2 J | 3.6 | 22 | 10 |
| 4.3 2c | 1.2 J | 3.1 | 23 | 10 |
| 3.9 B | 1.2 J | 2.7 | 24 | 10 |
| 4.4 | 1.2 J | 3.2 | 25 | 10 |
| 1.6 J | 1.2 J | 0.4 | 26 | 10 |
| 1.3 J | 1.2 J | 0.1 | 27 | 10 |
| 1.1 J | 1.2 J | -0.1 | 27 | 11 |
| 0.4 J | 1.2 J | -0.8 | 27 | 12 |
| ND<0.5 U | 1.2 J | -0.7 | 27 | 13 |
| ND<1 U | 1.2 J | -0.2 | 27 | 14 |
| 0.552 | 1.2 J | -0.648 | 27 | 15 |
| 0.5374 | 1.2 J | -0.6626 | 27 | 16 |

| | | | | |
|---|---|---|---|---|
| 21.7 | 1.7 J | 20 | 28 | 16 |
| 98 | 1.7 J | 96.3 | 29 | 16 |
| 23.9 | 1.7 J | 22.2 | 30 | 16 |
| 7.6 | 1.7 J | 5.9 | 31 | 16 |
| 1.6 J | 1.7 J | -0.1 | 31 | 17 |
| 0.97 J | 1.7 J | -0.73 | 31 | 18 |
| 2.5 J | 1.7 J | 0.8 | 32 | 18 |
| 2.3 J | 1.7 J | 0.6 | 33 | 18 |
| 4.7 | 1.7 J | 3 | 34 | 18 |
| 4.8 | 1.7 J | 3.1 | 35 | 18 |
| 4.3 2c | 1.7 J | 2.6 | 36 | 18 |
| 3.9 B | 1.7 J | 2.2 | 37 | 18 |
| 4.4 | 1.7 J | 2.7 | 38 | 18 |
| 1.6 J | 1.7 J | -0.1 | 38 | 19 |
| 1.3 J | 1.7 J | -0.4 | 38 | 20 |
| 1.1 J | 1.7 J | -0.6 | 38 | 21 |
| 0.4 J | 1.7 J | -1.3 | 38 | 22 |
| ND<0.5 U | 1.7 J | -1.2 | 38 | 23 |
| ND<1 U | 1.7 J | -0.7 | 38 | 24 |
| 0.552 | 1.7 J | -1.148 | 38 | 25 |
| 0.5374 | 1.7 J | -1.1626 | 38 | 26 |
| | | | | |
| 98 | 21.7 | 76.3 | 39 | 26 |
| 23.9 | 21.7 | 2.2 | 40 | 26 |
| 7.6 | 21.7 | -14.1 | 40 | 27 |
| 1.6 J | 21.7 | -20.1 | 40 | 28 |
| 0.97 J | 21.7 | -20.73 | 40 | 29 |
| 2.5 J | 21.7 | -19.2 | 40 | 30 |
| 2.3 J | 21.7 | -19.4 | 40 | 31 |
| 4.7 | 21.7 | -17 | 40 | 32 |
| 4.8 | 21.7 | -16.9 | 40 | 33 |
| 4.3 2c | 21.7 | -17.4 | 40 | 34 |
| 3.9 B | 21.7 | -17.8 | 40 | 35 |
| 4.4 | 21.7 | -17.3 | 40 | 36 |
| 1.6 J | 21.7 | -20.1 | 40 | 37 |
| 1.3 J | 21.7 | -20.4 | 40 | 38 |
| 1.1 J | 21.7 | -20.6 | 40 | 39 |
| 0.4 J | 21.7 | -21.3 | 40 | 40 |
| ND<0.5 U | 21.7 | -21.2 | 40 | 41 |
| ND<1 U | 21.7 | -20.7 | 40 | 42 |
| 0.552 | 21.7 | -21.148 | 40 | 43 |
| 0.5374 | 21.7 | -21.1626 | 40 | 44 |
| | | | | |
| 23.9 | 98 | -74.1 | 40 | 45 |
| 7.6 | 98 | -90.4 | 40 | 46 |
| 1.6 J | 98 | -96.4 | 40 | 47 |
| 0.97 J | 98 | -97.03 | 40 | 48 |
| 2.5 J | 98 | -95.5 | 40 | 49 |
| 2.3 J | 98 | -95.7 | 40 | 50 |
| 4.7 | 98 | -93.3 | 40 | 51 |
| 4.8 | 98 | -93.2 | 40 | 52 |
| 4.3 2c | 98 | -93.7 | 40 | 53 |
| 3.9 B | 98 | -94.1 | 40 | 54 |
| 4.4 | 98 | -93.6 | 40 | 55 |
| 1.6 J | 98 | -96.4 | 40 | 56 |
| 1.3 J | 98 | -96.7 | 40 | 57 |
| 1.1 J | 98 | -96.9 | 40 | 58 |

| | | | | |
|---|---|---|---|---|
| 0.4 J | 98 | -97.6 | 40 | 59 |
| ND<0.5 U | 98 | -97.5 | 40 | 60 |
| ND<1 U | 98 | -97 | 40 | 61 |
| 0.552 | 98 | -97.448 | 40 | 62 |
| 0.5374 | 98 | -97.4626 | 40 | 63 |
| | | | | |
| 7.6 | 23.9 | -16.3 | 40 | 64 |
| 1.6 J | 23.9 | -22.3 | 40 | 65 |
| 0.97 J | 23.9 | -22.93 | 40 | 66 |
| 2.5 J | 23.9 | -21.4 | 40 | 67 |
| 2.3 J | 23.9 | -21.6 | 40 | 68 |
| 4.7 | 23.9 | -19.2 | 40 | 69 |
| 4.8 | 23.9 | -19.1 | 40 | 70 |
| 4.3 2c | 23.9 | -19.6 | 40 | 71 |
| 3.9 B | 23.9 | -20 | 40 | 72 |
| 4.4 | 23.9 | -19.5 | 40 | 73 |
| 1.6 J | 23.9 | -22.3 | 40 | 74 |
| 1.3 J | 23.9 | -22.6 | 40 | 75 |
| 1.1 J | 23.9 | -22.8 | 40 | 76 |
| 0.4 J | 23.9 | -23.5 | 40 | 77 |
| ND<0.5 U | 23.9 | -23.4 | 40 | 78 |
| ND<1 U | 23.9 | -22.9 | 40 | 79 |
| 0.552 | 23.9 | -23.348 | 40 | 80 |
| 0.5374 | 23.9 | -23.3626 | 40 | 81 |
| | | | | |
| 1.6 J | 7.6 | -6 | 40 | 82 |
| 0.97 J | 7.6 | -6.63 | 40 | 83 |
| 2.5 J | 7.6 | -5.1 | 40 | 84 |
| 2.3 J | 7.6 | -5.3 | 40 | 85 |
| 4.7 | 7.6 | -2.9 | 40 | 86 |
| 4.8 | 7.6 | -2.8 | 40 | 87 |
| 4.3 2c | 7.6 | -3.3 | 40 | 88 |
| 3.9 B | 7.6 | -3.7 | 40 | 89 |
| 4.4 | 7.6 | -3.2 | 40 | 90 |
| 1.6 J | 7.6 | -6 | 40 | 91 |
| 1.3 J | 7.6 | -6.3 | 40 | 92 |
| 1.1 J | 7.6 | -6.5 | 40 | 93 |
| 0.4 J | 7.6 | -7.2 | 40 | 94 |
| ND<0.5 U | 7.6 | -7.1 | 40 | 95 |
| ND<1 U | 7.6 | -6.6 | 40 | 96 |
| 0.552 | 7.6 | -7.048 | 40 | 97 |
| 0.5374 | 7.6 | -7.0626 | 40 | 98 |
| | | | | |
| 0.97 J | 1.6 J | -0.63 | 40 | 99 |
| 2.5 J | 1.6 J | 0.9 | 41 | 99 |
| 2.3 J | 1.6 J | 0.7 | 42 | 99 |
| 4.7 | 1.6 J | 3.1 | 43 | 99 |
| 4.8 | 1.6 J | 3.2 | 44 | 99 |
| 4.3 2c | 1.6 J | 2.7 | 45 | 99 |
| 3.9 B | 1.6 J | 2.3 | 46 | 99 |
| 4.4 | 1.6 J | 2.8 | 47 | 99 |
| 1.6 J | 1.6 J | 0 | 47 | 99 |
| 1.3 J | 1.6 J | -0.3 | 47 | 100 |
| 1.1 J | 1.6 J | -0.5 | 47 | 101 |
| 0.4 J | 1.6 J | -1.2 | 47 | 102 |
| ND<0.5 U | 1.6 J | -1.1 | 47 | 103 |
| ND<1 U | 1.6 J | -0.6 | 47 | 104 |

| | | | | |
|---|---|---|---|---|
| 0.552 | 1.6 J | -1.048 | 47 | 105 |
| 0.5374 | 1.6 J | -1.0626 | 47 | 106 |
| | | | | |
| 2.5 J | 0.97 J | 1.53 | 48 | 106 |
| 2.3 J | 0.97 J | 1.33 | 49 | 106 |
| 4.7 | 0.97 J | 3.73 | 50 | 106 |
| 4.8 | 0.97 J | 3.83 | 51 | 106 |
| 4.3 2c | 0.97 J | 3.33 | 52 | 106 |
| 3.9 B | 0.97 J | 2.93 | 53 | 106 |
| 4.4 | 0.97 J | 3.43 | 54 | 106 |
| 1.6 J | 0.97 J | 0.63 | 55 | 106 |
| 1.3 J | 0.97 J | 0.33 | 56 | 106 |
| 1.1 J | 0.97 J | 0.13 | 57 | 106 |
| 0.4 J | 0.97 J | -0.57 | 57 | 107 |
| ND<0.5 U | 0.97 J | -0.47 | 57 | 108 |
| ND<1 U | 0.97 J | 0.03 | 58 | 108 |
| 0.552 | 0.97 J | -0.418 | 58 | 109 |
| 0.5374 | 0.97 J | -0.4326 | 58 | 110 |
| | | | | |
| 2.3 J | 2.5 J | Same Date | 58 | 110 |
| 4.7 | 2.5 J | 2.2 | 59 | 110 |
| 4.8 | 2.5 J | 2.3 | 60 | 110 |
| 4.3 2c | 2.5 J | 1.8 | 61 | 110 |
| 3.9 B | 2.5 J | 1.4 | 62 | 110 |
| 4.4 | 2.5 J | 1.9 | 63 | 110 |
| 1.6 J | 2.5 J | -0.9 | 63 | 111 |
| 1.3 J | 2.5 J | -1.2 | 63 | 112 |
| 1.1 J | 2.5 J | -1.4 | 63 | 113 |
| 0.4 J | 2.5 J | -2.1 | 63 | 114 |
| ND<0.5 U | 2.5 J | -2 | 63 | 115 |
| ND<1 U | 2.5 J | -1.5 | 63 | 116 |
| 0.552 | 2.5 J | -1.948 | 63 | 117 |
| 0.5374 | 2.5 J | -1.9626 | 63 | 118 |
| | | | | |
| 4.7 | 2.3 J | 2.4 | 64 | 118 |
| 4.8 | 2.3 J | 2.5 | 65 | 118 |
| 4.3 2c | 2.3 J | 2 | 66 | 118 |
| 3.9 B | 2.3 J | 1.6 | 67 | 118 |
| 4.4 | 2.3 J | 2.1 | 68 | 118 |
| 1.6 J | 2.3 J | -0.7 | 68 | 119 |
| 1.3 J | 2.3 J | -1 | 68 | 120 |
| 1.1 J | 2.3 J | -1.2 | 68 | 121 |
| 0.4 J | 2.3 J | -1.9 | 68 | 122 |
| ND<0.5 U | 2.3 J | -1.8 | 68 | 123 |
| ND<1 U | 2.3 J | -1.3 | 68 | 124 |
| 0.552 | 2.3 J | -1.748 | 68 | 125 |
| 0.5374 | 2.3 J | -1.7626 | 68 | 126 |
| | | | | |
| 4.8 | 4.7 | Same Date | 68 | 126 |
| 4.3 2c | 4.7 | -0.4 | 68 | 127 |
| 3.9 B | 4.7 | -0.8 | 68 | 128 |
| 4.4 | 4.7 | -0.3 | 68 | 129 |
| 1.6 J | 4.7 | -3.1 | 68 | 130 |
| 1.3 J | 4.7 | -3.4 | 68 | 131 |
| 1.1 J | 4.7 | -3.6 | 68 | 132 |
| 0.4 J | 4.7 | -4.3 | 68 | 133 |
| ND<0.5 U | 4.7 | -4.2 | 68 | 134 |

| | | | | |
|---|---|---|---|---|
| ND<1 U | 4.7 | -3.7 | 68 | 135 |
| 0.552 | 4.7 | -4.148 | 68 | 136 |
| 0.5374 | 4.7 | -4.1626 | 68 | 137 |
| | | | | |
| 4.3 2c | 4.8 | -0.5 | 68 | 138 |
| 3.9 B | 4.8 | -0.9 | 68 | 139 |
| 4.4 | 4.8 | -0.4 | 68 | 140 |
| 1.6 J | 4.8 | -3.2 | 68 | 141 |
| 1.3 J | 4.8 | -3.5 | 68 | 142 |
| 1.1 J | 4.8 | -3.7 | 68 | 143 |
| 0.4 J | 4.8 | -4.4 | 68 | 144 |
| ND<0.5 U | 4.8 | -4.3 | 68 | 145 |
| ND<1 U | 4.8 | -3.8 | 68 | 146 |
| 0.552 | 4.8 | -4.248 | 68 | 147 |
| 0.5374 | 4.8 | -4.2626 | 68 | 148 |
| | | | | |
| 3.9 B | 4.3 2c | -0.4 | 68 | 149 |
| 4.4 | 4.3 2c | 0.1 | 69 | 149 |
| 1.6 J | 4.3 2c | -2.7 | 69 | 150 |
| 1.3 J | 4.3 2c | -3 | 69 | 151 |
| 1.1 J | 4.3 2c | -3.2 | 69 | 152 |
| 0.4 J | 4.3 2c | -3.9 | 69 | 153 |
| ND<0.5 U | 4.3 2c | -3.8 | 69 | 154 |
| ND<1 U | 4.3 2c | -3.3 | 69 | 155 |
| 0.552 | 4.3 2c | -3.748 | 69 | 156 |
| 0.5374 | 4.3 2c | -3.7626 | 69 | 157 |
| | | | | |
| 4.4 | 3.9 B | 0.5 | 70 | 157 |
| 1.6 J | 3.9 B | -2.3 | 70 | 158 |
| 1.3 J | 3.9 B | -2.6 | 70 | 159 |
| 1.1 J | 3.9 B | -2.8 | 70 | 160 |
| 0.4 J | 3.9 B | -3.5 | 70 | 161 |
| ND<0.5 U | 3.9 B | -3.4 | 70 | 162 |
| ND<1 U | 3.9 B | -2.9 | 70 | 163 |
| 0.552 | 3.9 B | -3.348 | 70 | 164 |
| 0.5374 | 3.9 B | -3.3626 | 70 | 165 |
| | | | | |
| 1.6 J | 4.4 | -2.8 | 70 | 166 |
| 1.3 J | 4.4 | -3.1 | 70 | 167 |
| 1.1 J | 4.4 | -3.3 | 70 | 168 |
| 0.4 J | 4.4 | -4 | 70 | 169 |
| ND<0.5 U | 4.4 | -3.9 | 70 | 170 |
| ND<1 U | 4.4 | -3.4 | 70 | 171 |
| 0.552 | 4.4 | -3.848 | 70 | 172 |
| 0.5374 | 4.4 | -3.8626 | 70 | 173 |
| | | | | |
| 1.3 J | 1.6 J | -0.3 | 70 | 174 |
| 1.1 J | 1.6 J | -0.5 | 70 | 175 |
| 0.4 J | 1.6 J | -1.2 | 70 | 176 |
| ND<0.5 U | 1.6 J | -1.1 | 70 | 177 |
| ND<1 U | 1.6 J | -0.6 | 70 | 178 |
| 0.552 | 1.6 J | -1.048 | 70 | 179 |
| 0.5374 | 1.6 J | -1.0626 | 70 | 180 |
| | | | | |
| 1.1 J | 1.3 J | -0.2 | 70 | 181 |
| 0.4 J | 1.3 J | -0.9 | 70 | 182 |
| ND<0.5 U | 1.3 J | -0.8 | 70 | 183 |

| | | | | |
|---|---|---|---|---|
| ND<1 U | 1.3 J | -0.3 | 70 | 184 |
| 0.552 | 1.3 J | -0.748 | 70 | 185 |
| 0.5374 | 1.3 J | -0.7626 | 70 | 186 |
| | | | | |
| 0.4 J | 1.1 J | -0.7 | 70 | 187 |
| ND<0.5 U | 1.1 J | -0.6 | 70 | 188 |
| ND<1 U | 1.1 J | -0.1 | 70 | 189 |
| 0.552 | 1.1 J | -0.548 | 70 | 190 |
| 0.5374 | 1.1 J | -0.5626 | 70 | 191 |
| | | | | |
| ND<0.5 U | 0.4 J | 0.1 | 71 | 191 |
| ND<1 U | 0.4 J | 0.6 | 72 | 191 |
| 0.552 | 0.4 J | 0.152 | 73 | 191 |
| 0.5374 | 0.4 J | 0.1374 | 74 | 191 |
| | | | | |
| ND<1 U | ND<0.5 U | 0.5 | 75 | 191 |
| 0.552 | ND<0.5 U | 0.052 | 76 | 191 |
| 0.5374 | ND<0.5 U | 0.0374 | 77 | 191 |
| | | | | |
| 0.552 | ND<1 U | -0.448 | 77 | 192 |
| 0.5374 | ND<1 U | -0.4626 | 77 | 193 |
| | | | | |
| 0.5374 | 0.552 | -0.0146 | 77 | 194 |

S Statistic = 77 - 194 = -117

| Tied Group | Value | Members |
|---|---|---|
| 1 | 1.6 | 3 |

| Time Period | Observations |
|---|---|
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |

There are 2 time periods with multiple data

A = 66
B = 36

C = 6
D = 0
E = 6
F = 4
a = 29256
b = 109296
c = 1104
Group Variance = 1619.69
Z-Score = -2.88232
Comparison Level at 95% confidence level = 1.65463 (upward trend)
-2.88232 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RW02-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 11.8 | 12 | -0.2 | 0 | 1 |
| 9.1 | 12 | -2.9 | 0 | 2 |
| 7.7 | 12 | -4.3 | 0 | 3 |
| ND<1.5 U | 12 | -10.5 | 0 | 4 |
| 13.1 | 12 | 1.1 | 1 | 4 |
| 16.7 | 12 | 4.7 | 2 | 4 |
| 5.2 | 12 | -6.8 | 2 | 5 |
| 3.4 | 12 | -8.6 | 2 | 6 |
| 4.1 | 12 | -7.9 | 2 | 7 |
| 3.8 | 12 | -8.2 | 2 | 8 |
| 2 J | 12 | -10 | 2 | 9 |
| 1.7 J | 12 | -10.3 | 2 | 10 |
| 1.1 J2c | 12 | -10.9 | 2 | 11 |
| 0.55 JB | 12 | -11.45 | 2 | 12 |
| 0.97 J | 12 | -11.03 | 2 | 13 |
| 0.61 J | 12 | -11.39 | 2 | 14 |
| 0.43 J | 12 | -11.57 | 2 | 15 |
| 0.58 J | 12 | -11.42 | 2 | 16 |
| ND<1.5 U | 12 | -10.5 | 2 | 17 |
| ND<0.5 U | 12 | -11.5 | 2 | 18 |
| ND<1 U | 12 | -11 | 2 | 19 |
| 0.1269 J | 12 | -11.8731 | 2 | 20 |
| ND<0.1 U | 12 | -11.9 | 2 | 21 |
| | | | | |
| 9.1 | 11.8 | -2.7 | 2 | 22 |
| 7.7 | 11.8 | -4.1 | 2 | 23 |
| ND<1.5 U | 11.8 | -10.3 | 2 | 24 |
| 13.1 | 11.8 | 1.3 | 3 | 24 |
| 16.7 | 11.8 | 4.9 | 4 | 24 |
| 5.2 | 11.8 | -6.6 | 4 | 25 |
| 3.4 | 11.8 | -8.4 | 4 | 26 |
| 4.1 | 11.8 | -7.7 | 4 | 27 |
| 3.8 | 11.8 | -8 | 4 | 28 |
| 2 J | 11.8 | -9.8 | 4 | 29 |
| 1.7 J | 11.8 | -10.1 | 4 | 30 |
| 1.1 J2c | 11.8 | -10.7 | 4 | 31 |
| 0.55 JB | 11.8 | -11.25 | 4 | 32 |
| 0.97 J | 11.8 | -10.83 | 4 | 33 |
| 0.61 J | 11.8 | -11.19 | 4 | 34 |
| 0.43 J | 11.8 | -11.37 | 4 | 35 |
| 0.58 J | 11.8 | -11.22 | 4 | 36 |
| ND<1.5 U | 11.8 | -10.3 | 4 | 37 |
| ND<0.5 U | 11.8 | -11.3 | 4 | 38 |
| ND<1 U | 11.8 | -10.8 | 4 | 39 |
| 0.1269 J | 11.8 | -11.6731 | 4 | 40 |
| ND<0.1 U | 11.8 | -11.7 | 4 | 41 |

| | | | | |
|---|---|---|---|---|
| 7.7 | 9.1 | -1.4 | 4 | 42 |
| ND<1.5 U | 9.1 | -7.6 | 4 | 43 |
| 13.1 | 9.1 | 4 | 5 | 43 |
| 16.7 | 9.1 | 7.6 | 6 | 43 |
| 5.2 | 9.1 | -3.9 | 6 | 44 |
| 3.4 | 9.1 | -5.7 | 6 | 45 |
| 4.1 | 9.1 | -5 | 6 | 46 |
| 3.8 | 9.1 | -5.3 | 6 | 47 |
| 2 J | 9.1 | -7.1 | 6 | 48 |
| 1.7 J | 9.1 | -7.4 | 6 | 49 |
| 1.1 J2c | 9.1 | -8 | 6 | 50 |
| 0.55 JB | 9.1 | -8.55 | 6 | 51 |
| 0.97 J | 9.1 | -8.13 | 6 | 52 |
| 0.61 J | 9.1 | -8.49 | 6 | 53 |
| 0.43 J | 9.1 | -8.67 | 6 | 54 |
| 0.58 J | 9.1 | -8.52 | 6 | 55 |
| ND<1.5 U | 9.1 | -7.6 | 6 | 56 |
| ND<0.5 U | 9.1 | -8.6 | 6 | 57 |
| ND<1 U | 9.1 | -8.1 | 6 | 58 |
| 0.1269 J | 9.1 | -8.9731 | 6 | 59 |
| ND<0.1 U | 9.1 | -9 | 6 | 60 |
| | | | | |
| ND<1.5 U | 7.7 | -6.2 | 6 | 61 |
| 13.1 | 7.7 | 5.4 | 7 | 61 |
| 16.7 | 7.7 | 9 | 8 | 61 |
| 5.2 | 7.7 | -2.5 | 8 | 62 |
| 3.4 | 7.7 | -4.3 | 8 | 63 |
| 4.1 | 7.7 | -3.6 | 8 | 64 |
| 3.8 | 7.7 | -3.9 | 8 | 65 |
| 2 J | 7.7 | -5.7 | 8 | 66 |
| 1.7 J | 7.7 | -6 | 8 | 67 |
| 1.1 J2c | 7.7 | -6.6 | 8 | 68 |
| 0.55 JB | 7.7 | -7.15 | 8 | 69 |
| 0.97 J | 7.7 | -6.73 | 8 | 70 |
| 0.61 J | 7.7 | -7.09 | 8 | 71 |
| 0.43 J | 7.7 | -7.27 | 8 | 72 |
| 0.58 J | 7.7 | -7.12 | 8 | 73 |
| ND<1.5 U | 7.7 | -6.2 | 8 | 74 |
| ND<0.5 U | 7.7 | -7.2 | 8 | 75 |
| ND<1 U | 7.7 | -6.7 | 8 | 76 |
| 0.1269 J | 7.7 | -7.5731 | 8 | 77 |
| ND<0.1 U | 7.7 | -7.6 | 8 | 78 |
| | | | | |
| 13.1 | ND<1.5 U | 11.6 | 9 | 78 |
| 16.7 | ND<1.5 U | 15.2 | 10 | 78 |
| 5.2 | ND<1.5 U | 3.7 | 11 | 78 |
| 3.4 | ND<1.5 U | 1.9 | 12 | 78 |
| 4.1 | ND<1.5 U | 2.6 | 13 | 78 |
| 3.8 | ND<1.5 U | 2.3 | 14 | 78 |
| 2 J | ND<1.5 U | 0.5 | 15 | 78 |
| 1.7 J | ND<1.5 U | 0.2 | 16 | 78 |
| 1.1 J2c | ND<1.5 U | -0.4 | 16 | 79 |
| 0.55 JB | ND<1.5 U | -0.95 | 16 | 80 |
| 0.97 J | ND<1.5 U | -0.53 | 16 | 81 |
| 0.61 J | ND<1.5 U | -0.89 | 16 | 82 |
| 0.43 J | ND<1.5 U | -1.07 | 16 | 83 |
| 0.58 J | ND<1.5 U | -0.92 | 16 | 84 |

| | | | | |
|---|---|---|---|---|
| ND<1.5 U | ND<1.5 U | 0 | 16 | 84 |
| ND<0.5 U | ND<1.5 U | -1 | 16 | 85 |
| ND<1 U | ND<1.5 U | -0.5 | 16 | 86 |
| 0.1269 J | ND<1.5 U | -1.3731 | 16 | 87 |
| ND<0.1 U | ND<1.5 U | -1.4 | 16 | 88 |
| | | | | |
| 16.7 | 13.1 | 3.6 | 17 | 88 |
| 5.2 | 13.1 | -7.9 | 17 | 89 |
| 3.4 | 13.1 | -9.7 | 17 | 90 |
| 4.1 | 13.1 | -9 | 17 | 91 |
| 3.8 | 13.1 | -9.3 | 17 | 92 |
| 2 J | 13.1 | -11.1 | 17 | 93 |
| 1.7 J | 13.1 | -11.4 | 17 | 94 |
| 1.1 J2c | 13.1 | -12 | 17 | 95 |
| 0.55 JB | 13.1 | -12.55 | 17 | 96 |
| 0.97 J | 13.1 | -12.13 | 17 | 97 |
| 0.61 J | 13.1 | -12.49 | 17 | 98 |
| 0.43 J | 13.1 | -12.67 | 17 | 99 |
| 0.58 J | 13.1 | -12.52 | 17 | 100 |
| ND<1.5 U | 13.1 | -11.6 | 17 | 101 |
| ND<0.5 U | 13.1 | -12.6 | 17 | 102 |
| ND<1 U | 13.1 | -12.1 | 17 | 103 |
| 0.1269 J | 13.1 | -12.9731 | 17 | 104 |
| ND<0.1 U | 13.1 | -13 | 17 | 105 |
| | | | | |
| 5.2 | 16.7 | -11.5 | 17 | 106 |
| 3.4 | 16.7 | -13.3 | 17 | 107 |
| 4.1 | 16.7 | -12.6 | 17 | 108 |
| 3.8 | 16.7 | -12.9 | 17 | 109 |
| 2 J | 16.7 | -14.7 | 17 | 110 |
| 1.7 J | 16.7 | -15 | 17 | 111 |
| 1.1 J2c | 16.7 | -15.6 | 17 | 112 |
| 0.55 JB | 16.7 | -16.15 | 17 | 113 |
| 0.97 J | 16.7 | -15.73 | 17 | 114 |
| 0.61 J | 16.7 | -16.09 | 17 | 115 |
| 0.43 J | 16.7 | -16.27 | 17 | 116 |
| 0.58 J | 16.7 | -16.12 | 17 | 117 |
| ND<1.5 U | 16.7 | -15.2 | 17 | 118 |
| ND<0.5 U | 16.7 | -16.2 | 17 | 119 |
| ND<1 U | 16.7 | -15.7 | 17 | 120 |
| 0.1269 J | 16.7 | -16.5731 | 17 | 121 |
| ND<0.1 U | 16.7 | -16.6 | 17 | 122 |
| | | | | |
| 3.4 | 5.2 | -1.8 | 17 | 123 |
| 4.1 | 5.2 | -1.1 | 17 | 124 |
| 3.8 | 5.2 | -1.4 | 17 | 125 |
| 2 J | 5.2 | -3.2 | 17 | 126 |
| 1.7 J | 5.2 | -3.5 | 17 | 127 |
| 1.1 J2c | 5.2 | -4.1 | 17 | 128 |
| 0.55 JB | 5.2 | -4.65 | 17 | 129 |
| 0.97 J | 5.2 | -4.23 | 17 | 130 |
| 0.61 J | 5.2 | -4.59 | 17 | 131 |
| 0.43 J | 5.2 | -4.77 | 17 | 132 |
| 0.58 J | 5.2 | -4.62 | 17 | 133 |
| ND<1.5 U | 5.2 | -3.7 | 17 | 134 |
| ND<0.5 U | 5.2 | -4.7 | 17 | 135 |
| ND<1 U | 5.2 | -4.2 | 17 | 136 |

| | | | | |
|---|---|---|---|---|
| 0.1269 J | 5.2 | -5.0731 | 17 | 137 |
| ND<0.1 U | 5.2 | -5.1 | 17 | 138 |
| | | | | |
| 4.1 | 3.4 | 0.7 | 18 | 138 |
| 3.8 | 3.4 | 0.4 | 19 | 138 |
| 2 J | 3.4 | -1.4 | 19 | 139 |
| 1.7 J | 3.4 | -1.7 | 19 | 140 |
| 1.1 J2c | 3.4 | -2.3 | 19 | 141 |
| 0.55 JB | 3.4 | -2.85 | 19 | 142 |
| 0.97 J | 3.4 | -2.43 | 19 | 143 |
| 0.61 J | 3.4 | -2.79 | 19 | 144 |
| 0.43 J | 3.4 | -2.97 | 19 | 145 |
| 0.58 J | 3.4 | -2.82 | 19 | 146 |
| ND<1.5 U | 3.4 | -1.9 | 19 | 147 |
| ND<0.5 U | 3.4 | -2.9 | 19 | 148 |
| ND<1 U | 3.4 | -2.4 | 19 | 149 |
| 0.1269 J | 3.4 | -3.2731 | 19 | 150 |
| ND<0.1 U | 3.4 | -3.3 | 19 | 151 |
| | | | | |
| 3.8 | 4.1 | Same Date | 19 | 151 |
| 2 J | 4.1 | -2.1 | 19 | 152 |
| 1.7 J | 4.1 | -2.4 | 19 | 153 |
| 1.1 J2c | 4.1 | -3 | 19 | 154 |
| 0.55 JB | 4.1 | -3.55 | 19 | 155 |
| 0.97 J | 4.1 | -3.13 | 19 | 156 |
| 0.61 J | 4.1 | -3.49 | 19 | 157 |
| 0.43 J | 4.1 | -3.67 | 19 | 158 |
| 0.58 J | 4.1 | -3.52 | 19 | 159 |
| ND<1.5 U | 4.1 | -2.6 | 19 | 160 |
| ND<0.5 U | 4.1 | -3.6 | 19 | 161 |
| ND<1 U | 4.1 | -3.1 | 19 | 162 |
| 0.1269 J | 4.1 | -3.9731 | 19 | 163 |
| ND<0.1 U | 4.1 | -4 | 19 | 164 |
| | | | | |
| 2 J | 3.8 | -1.8 | 19 | 165 |
| 1.7 J | 3.8 | -2.1 | 19 | 166 |
| 1.1 J2c | 3.8 | -2.7 | 19 | 167 |
| 0.55 JB | 3.8 | -3.25 | 19 | 168 |
| 0.97 J | 3.8 | -2.83 | 19 | 169 |
| 0.61 J | 3.8 | -3.19 | 19 | 170 |
| 0.43 J | 3.8 | -3.37 | 19 | 171 |
| 0.58 J | 3.8 | -3.22 | 19 | 172 |
| ND<1.5 U | 3.8 | -2.3 | 19 | 173 |
| ND<0.5 U | 3.8 | -3.3 | 19 | 174 |
| ND<1 U | 3.8 | -2.8 | 19 | 175 |
| 0.1269 J | 3.8 | -3.6731 | 19 | 176 |
| ND<0.1 U | 3.8 | -3.7 | 19 | 177 |
| | | | | |
| 1.7 J | 2 J | Same Date | 19 | 177 |
| 1.1 J2c | 2 J | -0.9 | 19 | 178 |
| 0.55 JB | 2 J | -1.45 | 19 | 179 |
| 0.97 J | 2 J | -1.03 | 19 | 180 |
| 0.61 J | 2 J | -1.39 | 19 | 181 |
| 0.43 J | 2 J | -1.57 | 19 | 182 |
| 0.58 J | 2 J | -1.42 | 19 | 183 |
| ND<1.5 U | 2 J | -0.5 | 19 | 184 |
| ND<0.5 U | 2 J | -1.5 | 19 | 185 |

| | | | | |
|---|---|---|---|---|
| ND<1 U | 2 J | -1 | 19 | 186 |
| 0.1269 J | 2 J | -1.8731 | 19 | 187 |
| ND<0.1 U | 2 J | -1.9 | 19 | 188 |
| | | | | |
| 1.1 J2c | 1.7 J | -0.6 | 19 | 189 |
| 0.55 JB | 1.7 J | -1.15 | 19 | 190 |
| 0.97 J | 1.7 J | -0.73 | 19 | 191 |
| 0.61 J | 1.7 J | -1.09 | 19 | 192 |
| 0.43 J | 1.7 J | -1.27 | 19 | 193 |
| 0.58 J | 1.7 J | -1.12 | 19 | 194 |
| ND<1.5 U | 1.7 J | -0.2 | 19 | 195 |
| ND<0.5 U | 1.7 J | -1.2 | 19 | 196 |
| ND<1 U | 1.7 J | -0.7 | 19 | 197 |
| 0.1269 J | 1.7 J | -1.5731 | 19 | 198 |
| ND<0.1 U | 1.7 J | -1.6 | 19 | 199 |
| | | | | |
| 0.55 JB | 1.1 J2c | -0.55 | 19 | 200 |
| 0.97 J | 1.1 J2c | -0.13 | 19 | 201 |
| 0.61 J | 1.1 J2c | -0.49 | 19 | 202 |
| 0.43 J | 1.1 J2c | -0.67 | 19 | 203 |
| 0.58 J | 1.1 J2c | -0.52 | 19 | 204 |
| ND<1.5 U | 1.1 J2c | 0.4 | 20 | 204 |
| ND<0.5 U | 1.1 J2c | -0.6 | 20 | 205 |
| ND<1 U | 1.1 J2c | -0.1 | 20 | 206 |
| 0.1269 J | 1.1 J2c | -0.9731 | 20 | 207 |
| ND<0.1 U | 1.1 J2c | -1 | 20 | 208 |
| | | | | |
| 0.97 J | 0.55 JB | 0.42 | 21 | 208 |
| 0.61 J | 0.55 JB | 0.06 | 22 | 208 |
| 0.43 J | 0.55 JB | -0.12 | 22 | 209 |
| 0.58 J | 0.55 JB | 0.03 | 23 | 209 |
| ND<1.5 U | 0.55 JB | 0.95 | 24 | 209 |
| ND<0.5 U | 0.55 JB | -0.05 | 24 | 210 |
| ND<1 U | 0.55 JB | 0.45 | 25 | 210 |
| 0.1269 J | 0.55 JB | -0.4231 | 25 | 211 |
| ND<0.1 U | 0.55 JB | -0.45 | 25 | 212 |
| | | | | |
| 0.61 J | 0.97 J | -0.36 | 25 | 213 |
| 0.43 J | 0.97 J | -0.54 | 25 | 214 |
| 0.58 J | 0.97 J | -0.39 | 25 | 215 |
| ND<1.5 U | 0.97 J | 0.53 | 26 | 215 |
| ND<0.5 U | 0.97 J | -0.47 | 26 | 216 |
| ND<1 U | 0.97 J | 0.03 | 27 | 216 |
| 0.1269 J | 0.97 J | -0.8431 | 27 | 217 |
| ND<0.1 U | 0.97 J | -0.87 | 27 | 218 |
| | | | | |
| 0.43 J | 0.61 J | -0.18 | 27 | 219 |
| 0.58 J | 0.61 J | -0.03 | 27 | 220 |
| ND<1.5 U | 0.61 J | 0.89 | 28 | 220 |
| ND<0.5 U | 0.61 J | -0.11 | 28 | 221 |
| ND<1 U | 0.61 J | 0.39 | 29 | 221 |
| 0.1269 J | 0.61 J | -0.4831 | 29 | 222 |
| ND<0.1 U | 0.61 J | -0.51 | 29 | 223 |
| | | | | |
| 0.58 J | 0.43 J | 0.15 | 30 | 223 |
| ND<1.5 U | 0.43 J | 1.07 | 31 | 223 |
| ND<0.5 U | 0.43 J | 0.07 | 32 | 223 |

| | | | | |
|---|---|---|---|---|
| ND<1 U | 0.43 J | 0.57 | 33 | 223 |
| 0.1269 J | 0.43 J | -0.3031 | 33 | 224 |
| ND<0.1 U | 0.43 J | -0.33 | 33 | 225 |
| | | | | |
| ND<1.5 U | 0.58 J | 0.92 | 34 | 225 |
| ND<0.5 U | 0.58 J | -0.08 | 34 | 226 |
| ND<1 U | 0.58 J | 0.42 | 35 | 226 |
| 0.1269 J | 0.58 J | -0.4531 | 35 | 227 |
| ND<0.1 U | 0.58 J | -0.48 | 35 | 228 |
| | | | | |
| ND<0.5 U | ND<1.5 U | -1 | 35 | 229 |
| ND<1 U | ND<1.5 U | -0.5 | 35 | 230 |
| 0.1269 J | ND<1.5 U | -1.3731 | 35 | 231 |
| ND<0.1 U | ND<1.5 U | -1.4 | 35 | 232 |
| | | | | |
| ND<1 U | ND<0.5 U | 0.5 | 36 | 232 |
| 0.1269 J | ND<0.5 U | -0.3731 | 36 | 233 |
| ND<0.1 U | ND<0.5 U | -0.4 | 36 | 234 |
| | | | | |
| 0.1269 J | ND<1 U | -0.8731 | 36 | 235 |
| ND<0.1 U | ND<1 U | -0.9 | 36 | 236 |
| | | | | |
| ND<0.1 U | 0.1269 J | -0.0269 | 36 | 237 |

S Statistic = 36 - 237 = -201

| Tied Group | Value | Members |
|---|---|---|
| 1 | 1.5 | 2 |

| Time Period | Observations |
|---|---|
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |

There are 2 time periods with multiple data

A = 18
B = 36

C = 0
D = 0
E = 2
F = 4
a = 29256
b = 109296
c = 1104
Group Variance = 1622.34
Z-Score = -4.96545
Comparison Level at 95% confidence level = 1.65463 (upward trend)
-4.96545 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RW03R-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 0.1837 J | ND<0.1 U | 0.0837 | 1 | 0 |
| 0.1364 J | ND<0.1 U | 0.0364 | 2 | 0 |
| 0.0618 J | ND<0.1 U | -0.0382 | 2 | 1 |
| ND<5 U | ND<0.1 U | 4.9 | 3 | 1 |
| 0.1364 J | 0.1837 J | -0.0473 | 3 | 2 |
| 0.0618 J | 0.1837 J | -0.1219 | 3 | 3 |
| ND<5 U | 0.1837 J | 4.8163 | 4 | 3 |
| 0.0618 J | 0.1364 J | -0.0746 | 4 | 4 |
| ND<5 U | 0.1364 J | 4.8636 | 5 | 4 |
| ND<5 U | 0.0618 J | 4.9382 | 6 | 4 |

S Statistic = 6 - 4 = 2

Comparing at 95% confidence level (upward trend)

Probability of obtaining S >= 2 is 0.408

S < 0 or 0.408 >= 0.05 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RW04-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 1.2 J | 0.7 J | 0.5 | 1 | 0 |
| ND<1.5 U | 0.7 J | 0.8 | 2 | 0 |
| 0.71 J | 0.7 J | 0.01 | 3 | 0 |
| ND<1.5 U | 0.7 J | 0.8 | 4 | 0 |
| 1.1 J | 0.7 J | 0.4 | 5 | 0 |
| 1.1 J | 0.7 J | 0.4 | 6 | 0 |
| ND<1.5 U | 0.7 J | 0.8 | 7 | 0 |
| ND<1.5 U | 0.7 J | 0.8 | 8 | 0 |
| ND<1.5 U | 0.7 J | 0.8 | 9 | 0 |
| ND<1.5 U | 0.7 J | 0.8 | 10 | 0 |
| 0.43 J1c | 0.7 J | -0.27 | 10 | 1 |
| ND<1.5 U2c | 0.7 J | 0.8 | 11 | 1 |
| ND<1.5 U | 0.7 J | 0.8 | 12 | 1 |
| ND<1.5 U | 0.7 J | 0.8 | 13 | 1 |
| 0.55 J | 0.7 J | -0.15 | 13 | 2 |
| 1.8 J | 0.7 J | 1.1 | 14 | 2 |
| 1.7 J | 0.7 J | 1 | 15 | 2 |
| 0.99 J | 0.7 J | 0.29 | 16 | 2 |
| 0.62 J | 0.7 J | -0.08 | 16 | 3 |
| 0.38 J | 0.7 J | -0.32 | 16 | 4 |
| | | | | |
| ND<1.5 U | 1.2 J | 0.3 | 17 | 4 |
| 0.71 J | 1.2 J | -0.49 | 17 | 5 |
| ND<1.5 U | 1.2 J | 0.3 | 18 | 5 |
| 1.1 J | 1.2 J | -0.1 | 18 | 6 |
| 1.1 J | 1.2 J | -0.1 | 18 | 7 |
| ND<1.5 U | 1.2 J | 0.3 | 19 | 7 |
| ND<1.5 U | 1.2 J | 0.3 | 20 | 7 |
| ND<1.5 U | 1.2 J | 0.3 | 21 | 7 |
| ND<1.5 U | 1.2 J | 0.3 | 22 | 7 |
| 0.43 J1c | 1.2 J | -0.77 | 22 | 8 |
| ND<1.5 U2c | 1.2 J | 0.3 | 23 | 8 |
| ND<1.5 U | 1.2 J | 0.3 | 24 | 8 |
| ND<1.5 U | 1.2 J | 0.3 | 25 | 8 |
| 0.55 J | 1.2 J | -0.65 | 25 | 9 |
| 1.8 J | 1.2 J | 0.6 | 26 | 9 |
| 1.7 J | 1.2 J | 0.5 | 27 | 9 |
| 0.99 J | 1.2 J | -0.21 | 27 | 10 |
| 0.62 J | 1.2 J | -0.58 | 27 | 11 |
| 0.38 J | 1.2 J | -0.82 | 27 | 12 |
| | | | | |
| 0.71 J | ND<1.5 U | -0.79 | 27 | 13 |
| ND<1.5 U | ND<1.5 U | 0 | 27 | 13 |
| 1.1 J | ND<1.5 U | -0.4 | 27 | 14 |
| 1.1 J | ND<1.5 U | -0.4 | 27 | 15 |
| ND<1.5 U | ND<1.5 U | 0 | 27 | 15 |
| ND<1.5 U | ND<1.5 U | 0 | 27 | 15 |

| | | | | |
|---|---|---|---|---|
| ND<1.5 U | ND<1.5 U | 0 | 27 | 15 |
| ND<1.5 U | ND<1.5 U | 0 | 27 | 15 |
| 0.43 J1c | ND<1.5 U | -1.07 | 27 | 16 |
| ND<1.5 U2c | ND<1.5 U | 0 | 27 | 16 |
| ND<1.5 U | ND<1.5 U | 0 | 27 | 16 |
| ND<1.5 U | ND<1.5 U | 0 | 27 | 16 |
| 0.55 J | ND<1.5 U | -0.95 | 27 | 17 |
| 1.8 J | ND<1.5 U | 0.3 | 28 | 17 |
| 1.7 J | ND<1.5 U | 0.2 | 29 | 17 |
| 0.99 J | ND<1.5 U | -0.51 | 29 | 18 |
| 0.62 J | ND<1.5 U | -0.88 | 29 | 19 |
| 0.38 J | ND<1.5 U | -1.12 | 29 | 20 |
| | | | | |
| ND<1.5 U | 0.71 J | 0.79 | 30 | 20 |
| 1.1 J | 0.71 J | 0.39 | 31 | 20 |
| 1.1 J | 0.71 J | 0.39 | 32 | 20 |
| ND<1.5 U | 0.71 J | 0.79 | 33 | 20 |
| ND<1.5 U | 0.71 J | 0.79 | 34 | 20 |
| ND<1.5 U | 0.71 J | 0.79 | 35 | 20 |
| ND<1.5 U | 0.71 J | 0.79 | 36 | 20 |
| 0.43 J1c | 0.71 J | -0.28 | 36 | 21 |
| ND<1.5 U2c | 0.71 J | 0.79 | 37 | 21 |
| ND<1.5 U | 0.71 J | 0.79 | 38 | 21 |
| ND<1.5 U | 0.71 J | 0.79 | 39 | 21 |
| 0.55 J | 0.71 J | -0.16 | 39 | 22 |
| 1.8 J | 0.71 J | 1.09 | 40 | 22 |
| 1.7 J | 0.71 J | 0.99 | 41 | 22 |
| 0.99 J | 0.71 J | 0.28 | 42 | 22 |
| 0.62 J | 0.71 J | -0.09 | 42 | 23 |
| 0.38 J | 0.71 J | -0.33 | 42 | 24 |
| | | | | |
| 1.1 J | ND<1.5 U | -0.4 | 42 | 25 |
| 1.1 J | ND<1.5 U | -0.4 | 42 | 26 |
| ND<1.5 U | ND<1.5 U | 0 | 42 | 26 |
| ND<1.5 U | ND<1.5 U | 0 | 42 | 26 |
| ND<1.5 U | ND<1.5 U | 0 | 42 | 26 |
| ND<1.5 U | ND<1.5 U | 0 | 42 | 26 |
| 0.43 J1c | ND<1.5 U | -1.07 | 42 | 27 |
| ND<1.5 U2c | ND<1.5 U | 0 | 42 | 27 |
| ND<1.5 U | ND<1.5 U | 0 | 42 | 27 |
| ND<1.5 U | ND<1.5 U | 0 | 42 | 27 |
| 0.55 J | ND<1.5 U | -0.95 | 42 | 28 |
| 1.8 J | ND<1.5 U | 0.3 | 43 | 28 |
| 1.7 J | ND<1.5 U | 0.2 | 44 | 28 |
| 0.99 J | ND<1.5 U | -0.51 | 44 | 29 |
| 0.62 J | ND<1.5 U | -0.88 | 44 | 30 |
| 0.38 J | ND<1.5 U | -1.12 | 44 | 31 |
| | | | | |
| 1.1 J | 1.1 J | 0 | 44 | 31 |
| ND<1.5 U | 1.1 J | 0.4 | 45 | 31 |
| ND<1.5 U | 1.1 J | 0.4 | 46 | 31 |
| ND<1.5 U | 1.1 J | 0.4 | 47 | 31 |
| ND<1.5 U | 1.1 J | 0.4 | 48 | 31 |
| 0.43 J1c | 1.1 J | -0.67 | 48 | 32 |
| ND<1.5 U2c | 1.1 J | 0.4 | 49 | 32 |
| ND<1.5 U | 1.1 J | 0.4 | 50 | 32 |
| ND<1.5 U | 1.1 J | 0.4 | 51 | 32 |

| | | | | |
|---|---|---|---|---|
| 0.55 J | 1.1 J | -0.55 | 51 | 33 |
| 1.8 J | 1.1 J | 0.7 | 52 | 33 |
| 1.7 J | 1.1 J | 0.6 | 53 | 33 |
| 0.99 J | 1.1 J | -0.11 | 53 | 34 |
| 0.62 J | 1.1 J | -0.48 | 53 | 35 |
| 0.38 J | 1.1 J | -0.72 | 53 | 36 |
| | | | | |
| ND<1.5 U | 1.1 J | 0.4 | 54 | 36 |
| ND<1.5 U | 1.1 J | 0.4 | 55 | 36 |
| ND<1.5 U | 1.1 J | 0.4 | 56 | 36 |
| ND<1.5 U | 1.1 J | 0.4 | 57 | 36 |
| 0.43 J1c | 1.1 J | -0.67 | 57 | 37 |
| ND<1.5 U2c | 1.1 J | 0.4 | 58 | 37 |
| ND<1.5 U | 1.1 J | 0.4 | 59 | 37 |
| ND<1.5 U | 1.1 J | 0.4 | 60 | 37 |
| 0.55 J | 1.1 J | -0.55 | 60 | 38 |
| 1.8 J | 1.1 J | 0.7 | 61 | 38 |
| 1.7 J | 1.1 J | 0.6 | 62 | 38 |
| 0.99 J | 1.1 J | -0.11 | 62 | 39 |
| 0.62 J | 1.1 J | -0.48 | 62 | 40 |
| 0.38 J | 1.1 J | -0.72 | 62 | 41 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 62 | 41 |
| ND<1.5 U | ND<1.5 U | 0 | 62 | 41 |
| ND<1.5 U | ND<1.5 U | 0 | 62 | 41 |
| 0.43 J1c | ND<1.5 U | -1.07 | 62 | 42 |
| ND<1.5 U2c | ND<1.5 U | 0 | 62 | 42 |
| ND<1.5 U | ND<1.5 U | 0 | 62 | 42 |
| ND<1.5 U | ND<1.5 U | 0 | 62 | 42 |
| 0.55 J | ND<1.5 U | -0.95 | 62 | 43 |
| 1.8 J | ND<1.5 U | 0.3 | 63 | 43 |
| 1.7 J | ND<1.5 U | 0.2 | 64 | 43 |
| 0.99 J | ND<1.5 U | -0.51 | 64 | 44 |
| 0.62 J | ND<1.5 U | -0.88 | 64 | 45 |
| 0.38 J | ND<1.5 U | -1.12 | 64 | 46 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 64 | 46 |
| ND<1.5 U | ND<1.5 U | 0 | 64 | 46 |
| 0.43 J1c | ND<1.5 U | -1.07 | 64 | 47 |
| ND<1.5 U2c | ND<1.5 U | 0 | 64 | 47 |
| ND<1.5 U | ND<1.5 U | 0 | 64 | 47 |
| ND<1.5 U | ND<1.5 U | 0 | 64 | 47 |
| 0.55 J | ND<1.5 U | -0.95 | 64 | 48 |
| 1.8 J | ND<1.5 U | 0.3 | 65 | 48 |
| 1.7 J | ND<1.5 U | 0.2 | 66 | 48 |
| 0.99 J | ND<1.5 U | -0.51 | 66 | 49 |
| 0.62 J | ND<1.5 U | -0.88 | 66 | 50 |
| 0.38 J | ND<1.5 U | -1.12 | 66 | 51 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 66 | 51 |
| 0.43 J1c | ND<1.5 U | -1.07 | 66 | 52 |
| ND<1.5 U2c | ND<1.5 U | 0 | 66 | 52 |
| ND<1.5 U | ND<1.5 U | 0 | 66 | 52 |
| ND<1.5 U | ND<1.5 U | 0 | 66 | 52 |
| 0.55 J | ND<1.5 U | -0.95 | 66 | 53 |
| 1.8 J | ND<1.5 U | 0.3 | 67 | 53 |
| 1.7 J | ND<1.5 U | 0.2 | 68 | 53 |

| | | | | |
|---|---|---|---|---|
| 0.99 J | ND<1.5 U | -0.51 | 68 | 54 |
| 0.62 J | ND<1.5 U | -0.88 | 68 | 55 |
| 0.38 J | ND<1.5 U | -1.12 | 68 | 56 |
| | | | | |
| 0.43 J1c | ND<1.5 U | -1.07 | 68 | 57 |
| ND<1.5 U2c | ND<1.5 U | 0 | 68 | 57 |
| ND<1.5 U | ND<1.5 U | 0 | 68 | 57 |
| ND<1.5 U | ND<1.5 U | 0 | 68 | 57 |
| 0.55 J | ND<1.5 U | -0.95 | 68 | 58 |
| 1.8 J | ND<1.5 U | 0.3 | 69 | 58 |
| 1.7 J | ND<1.5 U | 0.2 | 70 | 58 |
| 0.99 J | ND<1.5 U | -0.51 | 70 | 59 |
| 0.62 J | ND<1.5 U | -0.88 | 70 | 60 |
| 0.38 J | ND<1.5 U | -1.12 | 70 | 61 |
| | | | | |
| ND<1.5 U2c | 0.43 J1c | Same Date | 70 | 61 |
| ND<1.5 U | 0.43 J1c | 1.07 | 71 | 61 |
| ND<1.5 U | 0.43 J1c | 1.07 | 72 | 61 |
| 0.55 J | 0.43 J1c | 0.12 | 73 | 61 |
| 1.8 J | 0.43 J1c | 1.37 | 74 | 61 |
| 1.7 J | 0.43 J1c | 1.27 | 75 | 61 |
| 0.99 J | 0.43 J1c | 0.56 | 76 | 61 |
| 0.62 J | 0.43 J1c | 0.19 | 77 | 61 |
| 0.38 J | 0.43 J1c | -0.05 | 77 | 62 |
| | | | | |
| ND<1.5 U | ND<1.5 U2c | 0 | 77 | 62 |
| ND<1.5 U | ND<1.5 U2c | 0 | 77 | 62 |
| 0.55 J | ND<1.5 U2c | -0.95 | 77 | 63 |
| 1.8 J | ND<1.5 U2c | 0.3 | 78 | 63 |
| 1.7 J | ND<1.5 U2c | 0.2 | 79 | 63 |
| 0.99 J | ND<1.5 U2c | -0.51 | 79 | 64 |
| 0.62 J | ND<1.5 U2c | -0.88 | 79 | 65 |
| 0.38 J | ND<1.5 U2c | -1.12 | 79 | 66 |
| | | | | |
| ND<1.5 U | ND<1.5 U | Same Date | 79 | 66 |
| 0.55 J | ND<1.5 U | -0.95 | 79 | 67 |
| 1.8 J | ND<1.5 U | 0.3 | 80 | 67 |
| 1.7 J | ND<1.5 U | 0.2 | 81 | 67 |
| 0.99 J | ND<1.5 U | -0.51 | 81 | 68 |
| 0.62 J | ND<1.5 U | -0.88 | 81 | 69 |
| 0.38 J | ND<1.5 U | -1.12 | 81 | 70 |
| | | | | |
| 0.55 J | ND<1.5 U | -0.95 | 81 | 71 |
| 1.8 J | ND<1.5 U | 0.3 | 82 | 71 |
| 1.7 J | ND<1.5 U | 0.2 | 83 | 71 |
| 0.99 J | ND<1.5 U | -0.51 | 83 | 72 |
| 0.62 J | ND<1.5 U | -0.88 | 83 | 73 |
| 0.38 J | ND<1.5 U | -1.12 | 83 | 74 |
| | | | | |
| 1.8 J | 0.55 J | 1.25 | 84 | 74 |
| 1.7 J | 0.55 J | 1.15 | 85 | 74 |
| 0.99 J | 0.55 J | 0.44 | 86 | 74 |
| 0.62 J | 0.55 J | 0.07 | 87 | 74 |
| 0.38 J | 0.55 J | -0.17 | 87 | 75 |
| | | | | |
| 1.7 J | 1.8 J | -0.1 | 87 | 76 |
| 0.99 J | 1.8 J | -0.81 | 87 | 77 |

| | | | | |
|---|---|---|---|---|
| 0.62 J | 1.8 J | -1.18 | 87 | 78 |
| 0.38 J | 1.8 J | -1.42 | 87 | 79 |
| | | | | |
| 0.99 J | 1.7 J | -0.71 | 87 | 80 |
| 0.62 J | 1.7 J | -1.08 | 87 | 81 |
| 0.38 J | 1.7 J | -1.32 | 87 | 82 |
| | | | | |
| 0.62 J | 0.99 J | -0.37 | 87 | 83 |
| 0.38 J | 0.99 J | -0.61 | 87 | 84 |
| | | | | |
| 0.38 J | 0.62 J | -0.24 | 87 | 85 |

S Statistic = 87 - 85 = 2

| Tied Group | Value | Members |
|---|---|---|
| 1 | 1.5 | 9 |
| 2 | 1.1 | 2 |

| Time Period | Observations |
|---|---|
| 6/1/2017 | 1 |
| 7/1/2017 | 1 |
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |

There are 2 time periods with multiple data

A = 1674
B = 36
C = 504
D = 0
E = 74
F = 4
a = 19740
b = 71820
c = 840
Group Variance = 1002.02
Z-Score = 0.0315909
Comparison Level at 95% confidence level = 1.65463 (upward trend)
0.0315909 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RW05-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 0.37 J | 4.9 | -4.53 | 0 | 1 |
| 1.2 J | 4.9 | -3.7 | 0 | 2 |
| ND<1.5 U | 4.9 | -3.4 | 0 | 3 |
| 8.4 | 4.9 | 3.5 | 1 | 3 |
| ND<1.5 U | 4.9 | -3.4 | 1 | 4 |
| ND<1.5 U | 4.9 | -3.4 | 1 | 5 |
| ND<1.5 U | 4.9 | -3.4 | 1 | 6 |
| ND<1.5 U | 4.9 | -3.4 | 1 | 7 |
| ND<1.5 U1c | 4.9 | -3.4 | 1 | 8 |
| ND<1.5 U2c | 4.9 | -3.4 | 1 | 9 |
| ND<1.5 U | 4.9 | -3.4 | 1 | 10 |
| ND<1.5 U | 4.9 | -3.4 | 1 | 11 |
| ND<1.5 U2c | 4.9 | -3.4 | 1 | 12 |
| ND<1.5 U | 4.9 | -3.4 | 1 | 13 |
| 0.52 J | 4.9 | -4.38 | 1 | 14 |
| 0.53 J | 4.9 | -4.37 | 1 | 15 |
| ND<1.5 U | 4.9 | -3.4 | 1 | 16 |
| ND<1.5 U | 4.9 | -3.4 | 1 | 17 |
| ND<1.5 U | 4.9 | -3.4 | 1 | 18 |
| ND<0.5 U | 4.9 | -4.4 | 1 | 19 |
| ND<1 U | 4.9 | -3.9 | 1 | 20 |
| 0.1181 J | 4.9 | -4.7819 | 1 | 21 |
| 0.1892 J | 4.9 | -4.7108 | 1 | 22 |
| | | | | |
| 1.2 J | 0.37 J | 0.83 | 2 | 22 |
| ND<1.5 U | 0.37 J | 1.13 | 3 | 22 |
| 8.4 | 0.37 J | 8.03 | 4 | 22 |
| ND<1.5 U | 0.37 J | 1.13 | 5 | 22 |
| ND<1.5 U | 0.37 J | 1.13 | 6 | 22 |
| ND<1.5 U | 0.37 J | 1.13 | 7 | 22 |
| ND<1.5 U | 0.37 J | 1.13 | 8 | 22 |
| ND<1.5 U1c | 0.37 J | 1.13 | 9 | 22 |
| ND<1.5 U2c | 0.37 J | 1.13 | 10 | 22 |
| ND<1.5 U | 0.37 J | 1.13 | 11 | 22 |
| ND<1.5 U | 0.37 J | 1.13 | 12 | 22 |
| ND<1.5 U2c | 0.37 J | 1.13 | 13 | 22 |
| ND<1.5 U | 0.37 J | 1.13 | 14 | 22 |
| 0.52 J | 0.37 J | 0.15 | 15 | 22 |
| 0.53 J | 0.37 J | 0.16 | 16 | 22 |
| ND<1.5 U | 0.37 J | 1.13 | 17 | 22 |
| ND<1.5 U | 0.37 J | 1.13 | 18 | 22 |
| ND<1.5 U | 0.37 J | 1.13 | 19 | 22 |
| ND<0.5 U | 0.37 J | 0.13 | 20 | 22 |
| ND<1 U | 0.37 J | 0.63 | 21 | 22 |
| 0.1181 J | 0.37 J | -0.2519 | 21 | 23 |
| 0.1892 J | 0.37 J | -0.1808 | 21 | 24 |

| | | | | |
|---|---|---|---|---|
| ND<1.5 U | 1.2 J | 0.3 | 22 | 24 |
| 8.4 | 1.2 J | 7.2 | 23 | 24 |
| ND<1.5 U | 1.2 J | 0.3 | 24 | 24 |
| ND<1.5 U | 1.2 J | 0.3 | 25 | 24 |
| ND<1.5 U | 1.2 J | 0.3 | 26 | 24 |
| ND<1.5 U | 1.2 J | 0.3 | 27 | 24 |
| ND<1.5 U1c | 1.2 J | 0.3 | 28 | 24 |
| ND<1.5 U2c | 1.2 J | 0.3 | 29 | 24 |
| ND<1.5 U | 1.2 J | 0.3 | 30 | 24 |
| ND<1.5 U | 1.2 J | 0.3 | 31 | 24 |
| ND<1.5 U2c | 1.2 J | 0.3 | 32 | 24 |
| ND<1.5 U | 1.2 J | 0.3 | 33 | 24 |
| 0.52 J | 1.2 J | -0.68 | 33 | 25 |
| 0.53 J | 1.2 J | -0.67 | 33 | 26 |
| ND<1.5 U | 1.2 J | 0.3 | 34 | 26 |
| ND<1.5 U | 1.2 J | 0.3 | 35 | 26 |
| ND<1.5 U | 1.2 J | 0.3 | 36 | 26 |
| ND<0.5 U | 1.2 J | -0.7 | 36 | 27 |
| ND<1 U | 1.2 J | -0.2 | 36 | 28 |
| 0.1181 J | 1.2 J | -1.0819 | 36 | 29 |
| 0.1892 J | 1.2 J | -1.0108 | 36 | 30 |
| | | | | |
| 8.4 | ND<1.5 U | 6.9 | 37 | 30 |
| ND<1.5 U | ND<1.5 U | 0 | 37 | 30 |
| ND<1.5 U | ND<1.5 U | 0 | 37 | 30 |
| ND<1.5 U | ND<1.5 U | 0 | 37 | 30 |
| ND<1.5 U | ND<1.5 U | 0 | 37 | 30 |
| ND<1.5 U1c | ND<1.5 U | 0 | 37 | 30 |
| ND<1.5 U2c | ND<1.5 U | 0 | 37 | 30 |
| ND<1.5 U | ND<1.5 U | 0 | 37 | 30 |
| ND<1.5 U | ND<1.5 U | 0 | 37 | 30 |
| ND<1.5 U2c | ND<1.5 U | 0 | 37 | 30 |
| ND<1.5 U | ND<1.5 U | 0 | 37 | 30 |
| 0.52 J | ND<1.5 U | -0.98 | 37 | 31 |
| 0.53 J | ND<1.5 U | -0.97 | 37 | 32 |
| ND<1.5 U | ND<1.5 U | 0 | 37 | 32 |
| ND<1.5 U | ND<1.5 U | 0 | 37 | 32 |
| ND<1.5 U | ND<1.5 U | 0 | 37 | 32 |
| ND<0.5 U | ND<1.5 U | -1 | 37 | 33 |
| ND<1 U | ND<1.5 U | -0.5 | 37 | 34 |
| 0.1181 J | ND<1.5 U | -1.3819 | 37 | 35 |
| 0.1892 J | ND<1.5 U | -1.3108 | 37 | 36 |
| | | | | |
| ND<1.5 U | 8.4 | -6.9 | 37 | 37 |
| ND<1.5 U | 8.4 | -6.9 | 37 | 38 |
| ND<1.5 U | 8.4 | -6.9 | 37 | 39 |
| ND<1.5 U | 8.4 | -6.9 | 37 | 40 |
| ND<1.5 U1c | 8.4 | -6.9 | 37 | 41 |
| ND<1.5 U2c | 8.4 | -6.9 | 37 | 42 |
| ND<1.5 U | 8.4 | -6.9 | 37 | 43 |
| ND<1.5 U | 8.4 | -6.9 | 37 | 44 |
| ND<1.5 U2c | 8.4 | -6.9 | 37 | 45 |
| ND<1.5 U | 8.4 | -6.9 | 37 | 46 |
| 0.52 J | 8.4 | -7.88 | 37 | 47 |
| 0.53 J | 8.4 | -7.87 | 37 | 48 |
| ND<1.5 U | 8.4 | -6.9 | 37 | 49 |
| ND<1.5 U | 8.4 | -6.9 | 37 | 50 |

| | | | | |
|---|---|---|---|---|
| ND<1.5 U | 8.4 | -6.9 | 37 | 51 |
| ND<0.5 U | 8.4 | -7.9 | 37 | 52 |
| ND<1 U | 8.4 | -7.4 | 37 | 53 |
| 0.1181 J | 8.4 | -8.2819 | 37 | 54 |
| 0.1892 J | 8.4 | -8.2108 | 37 | 55 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 37 | 55 |
| ND<1.5 U | ND<1.5 U | 0 | 37 | 55 |
| ND<1.5 U | ND<1.5 U | 0 | 37 | 55 |
| ND<1.5 U1c | ND<1.5 U | 0 | 37 | 55 |
| ND<1.5 U2c | ND<1.5 U | 0 | 37 | 55 |
| ND<1.5 U | ND<1.5 U | 0 | 37 | 55 |
| ND<1.5 U | ND<1.5 U | 0 | 37 | 55 |
| ND<1.5 U2c | ND<1.5 U | 0 | 37 | 55 |
| ND<1.5 U | ND<1.5 U | 0 | 37 | 55 |
| 0.52 J | ND<1.5 U | -0.98 | 37 | 56 |
| 0.53 J | ND<1.5 U | -0.97 | 37 | 57 |
| ND<1.5 U | ND<1.5 U | 0 | 37 | 57 |
| ND<1.5 U | ND<1.5 U | 0 | 37 | 57 |
| ND<1.5 U | ND<1.5 U | 0 | 37 | 57 |
| ND<0.5 U | ND<1.5 U | -1 | 37 | 58 |
| ND<1 U | ND<1.5 U | -0.5 | 37 | 59 |
| 0.1181 J | ND<1.5 U | -1.3819 | 37 | 60 |
| 0.1892 J | ND<1.5 U | -1.3108 | 37 | 61 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 37 | 61 |
| ND<1.5 U | ND<1.5 U | 0 | 37 | 61 |
| ND<1.5 U1c | ND<1.5 U | 0 | 37 | 61 |
| ND<1.5 U2c | ND<1.5 U | 0 | 37 | 61 |
| ND<1.5 U | ND<1.5 U | 0 | 37 | 61 |
| ND<1.5 U | ND<1.5 U | 0 | 37 | 61 |
| ND<1.5 U2c | ND<1.5 U | 0 | 37 | 61 |
| ND<1.5 U | ND<1.5 U | 0 | 37 | 61 |
| 0.52 J | ND<1.5 U | -0.98 | 37 | 62 |
| 0.53 J | ND<1.5 U | -0.97 | 37 | 63 |
| ND<1.5 U | ND<1.5 U | 0 | 37 | 63 |
| ND<1.5 U | ND<1.5 U | 0 | 37 | 63 |
| ND<1.5 U | ND<1.5 U | 0 | 37 | 63 |
| ND<0.5 U | ND<1.5 U | -1 | 37 | 64 |
| ND<1 U | ND<1.5 U | -0.5 | 37 | 65 |
| 0.1181 J | ND<1.5 U | -1.3819 | 37 | 66 |
| 0.1892 J | ND<1.5 U | -1.3108 | 37 | 67 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 37 | 67 |
| ND<1.5 U1c | ND<1.5 U | 0 | 37 | 67 |
| ND<1.5 U2c | ND<1.5 U | 0 | 37 | 67 |
| ND<1.5 U | ND<1.5 U | 0 | 37 | 67 |
| ND<1.5 U | ND<1.5 U | 0 | 37 | 67 |
| ND<1.5 U2c | ND<1.5 U | 0 | 37 | 67 |
| ND<1.5 U | ND<1.5 U | 0 | 37 | 67 |
| 0.52 J | ND<1.5 U | -0.98 | 37 | 68 |
| 0.53 J | ND<1.5 U | -0.97 | 37 | 69 |
| ND<1.5 U | ND<1.5 U | 0 | 37 | 69 |
| ND<1.5 U | ND<1.5 U | 0 | 37 | 69 |
| ND<1.5 U | ND<1.5 U | 0 | 37 | 69 |
| ND<0.5 U | ND<1.5 U | -1 | 37 | 70 |
| ND<1 U | ND<1.5 U | -0.5 | 37 | 71 |

| | | | | |
|---|---|---|---|---|
| 0.1181 J | ND<1.5 U | -1.3819 | 37 | 72 |
| 0.1892 J | ND<1.5 U | -1.3108 | 37 | 73 |
| | | | | |
| ND<1.5 U1c | ND<1.5 U | 0 | 37 | 73 |
| ND<1.5 U2c | ND<1.5 U | 0 | 37 | 73 |
| ND<1.5 U | ND<1.5 U | 0 | 37 | 73 |
| ND<1.5 U | ND<1.5 U | 0 | 37 | 73 |
| ND<1.5 U2c | ND<1.5 U | 0 | 37 | 73 |
| ND<1.5 U | ND<1.5 U | 0 | 37 | 73 |
| 0.52 J | ND<1.5 U | -0.98 | 37 | 74 |
| 0.53 J | ND<1.5 U | -0.97 | 37 | 75 |
| ND<1.5 U | ND<1.5 U | 0 | 37 | 75 |
| ND<1.5 U | ND<1.5 U | 0 | 37 | 75 |
| ND<1.5 U | ND<1.5 U | 0 | 37 | 75 |
| ND<0.5 U | ND<1.5 U | -1 | 37 | 76 |
| ND<1 U | ND<1.5 U | -0.5 | 37 | 77 |
| 0.1181 J | ND<1.5 U | -1.3819 | 37 | 78 |
| 0.1892 J | ND<1.5 U | -1.3108 | 37 | 79 |
| | | | | |
| ND<1.5 U2c | ND<1.5 U1c | Same Date | 37 | 79 |
| ND<1.5 U | ND<1.5 U1c | 0 | 37 | 79 |
| ND<1.5 U | ND<1.5 U1c | 0 | 37 | 79 |
| ND<1.5 U2c | ND<1.5 U1c | 0 | 37 | 79 |
| ND<1.5 U | ND<1.5 U1c | 0 | 37 | 79 |
| 0.52 J | ND<1.5 U1c | -0.98 | 37 | 80 |
| 0.53 J | ND<1.5 U1c | -0.97 | 37 | 81 |
| ND<1.5 U | ND<1.5 U1c | 0 | 37 | 81 |
| ND<1.5 U | ND<1.5 U1c | 0 | 37 | 81 |
| ND<1.5 U | ND<1.5 U1c | 0 | 37 | 81 |
| ND<0.5 U | ND<1.5 U1c | -1 | 37 | 82 |
| ND<1 U | ND<1.5 U1c | -0.5 | 37 | 83 |
| 0.1181 J | ND<1.5 U1c | -1.3819 | 37 | 84 |
| 0.1892 J | ND<1.5 U1c | -1.3108 | 37 | 85 |
| | | | | |
| ND<1.5 U | ND<1.5 U2c | 0 | 37 | 85 |
| ND<1.5 U | ND<1.5 U2c | 0 | 37 | 85 |
| ND<1.5 U2c | ND<1.5 U2c | 0 | 37 | 85 |
| ND<1.5 U | ND<1.5 U2c | 0 | 37 | 85 |
| 0.52 J | ND<1.5 U2c | -0.98 | 37 | 86 |
| 0.53 J | ND<1.5 U2c | -0.97 | 37 | 87 |
| ND<1.5 U | ND<1.5 U2c | 0 | 37 | 87 |
| ND<1.5 U | ND<1.5 U2c | 0 | 37 | 87 |
| ND<1.5 U | ND<1.5 U2c | 0 | 37 | 87 |
| ND<0.5 U | ND<1.5 U2c | -1 | 37 | 88 |
| ND<1 U | ND<1.5 U2c | -0.5 | 37 | 89 |
| 0.1181 J | ND<1.5 U2c | -1.3819 | 37 | 90 |
| 0.1892 J | ND<1.5 U2c | -1.3108 | 37 | 91 |
| | | | | |
| ND<1.5 U | ND<1.5 U | Same Date | 37 | 91 |
| ND<1.5 U2c | ND<1.5 U | 0 | 37 | 91 |
| ND<1.5 U | ND<1.5 U | 0 | 37 | 91 |
| 0.52 J | ND<1.5 U | -0.98 | 37 | 92 |
| 0.53 J | ND<1.5 U | -0.97 | 37 | 93 |
| ND<1.5 U | ND<1.5 U | 0 | 37 | 93 |
| ND<1.5 U | ND<1.5 U | 0 | 37 | 93 |
| ND<1.5 U | ND<1.5 U | 0 | 37 | 93 |
| ND<0.5 U | ND<1.5 U | -1 | 37 | 94 |

| | | | | |
|---|---|---|---|---|
| ND<1 U | ND<1.5 U | -0.5 | 37 | 95 |
| 0.1181 J | ND<1.5 U | -1.3819 | 37 | 96 |
| 0.1892 J | ND<1.5 U | -1.3108 | 37 | 97 |
| | | | | |
| ND<1.5 U2c | ND<1.5 U | 0 | 37 | 97 |
| ND<1.5 U | ND<1.5 U | 0 | 37 | 97 |
| 0.52 J | ND<1.5 U | -0.98 | 37 | 98 |
| 0.53 J | ND<1.5 U | -0.97 | 37 | 99 |
| ND<1.5 U | ND<1.5 U | 0 | 37 | 99 |
| ND<1.5 U | ND<1.5 U | 0 | 37 | 99 |
| ND<1.5 U | ND<1.5 U | 0 | 37 | 99 |
| ND<0.5 U | ND<1.5 U | -1 | 37 | 100 |
| ND<1 U | ND<1.5 U | -0.5 | 37 | 101 |
| 0.1181 J | ND<1.5 U | -1.3819 | 37 | 102 |
| 0.1892 J | ND<1.5 U | -1.3108 | 37 | 103 |
| | | | | |
| ND<1.5 U | ND<1.5 U2c | 0 | 37 | 103 |
| 0.52 J | ND<1.5 U2c | -0.98 | 37 | 104 |
| 0.53 J | ND<1.5 U2c | -0.97 | 37 | 105 |
| ND<1.5 U | ND<1.5 U2c | 0 | 37 | 105 |
| ND<1.5 U | ND<1.5 U2c | 0 | 37 | 105 |
| ND<1.5 U | ND<1.5 U2c | 0 | 37 | 105 |
| ND<0.5 U | ND<1.5 U2c | -1 | 37 | 106 |
| ND<1 U | ND<1.5 U2c | -0.5 | 37 | 107 |
| 0.1181 J | ND<1.5 U2c | -1.3819 | 37 | 108 |
| 0.1892 J | ND<1.5 U2c | -1.3108 | 37 | 109 |
| | | | | |
| 0.52 J | ND<1.5 U | -0.98 | 37 | 110 |
| 0.53 J | ND<1.5 U | -0.97 | 37 | 111 |
| ND<1.5 U | ND<1.5 U | 0 | 37 | 111 |
| ND<1.5 U | ND<1.5 U | 0 | 37 | 111 |
| ND<1.5 U | ND<1.5 U | 0 | 37 | 111 |
| ND<0.5 U | ND<1.5 U | -1 | 37 | 112 |
| ND<1 U | ND<1.5 U | -0.5 | 37 | 113 |
| 0.1181 J | ND<1.5 U | -1.3819 | 37 | 114 |
| 0.1892 J | ND<1.5 U | -1.3108 | 37 | 115 |
| | | | | |
| 0.53 J | 0.52 J | 0.01 | 38 | 115 |
| ND<1.5 U | 0.52 J | 0.98 | 39 | 115 |
| ND<1.5 U | 0.52 J | 0.98 | 40 | 115 |
| ND<1.5 U | 0.52 J | 0.98 | 41 | 115 |
| ND<0.5 U | 0.52 J | -0.02 | 41 | 116 |
| ND<1 U | 0.52 J | 0.48 | 42 | 116 |
| 0.1181 J | 0.52 J | -0.4019 | 42 | 117 |
| 0.1892 J | 0.52 J | -0.3308 | 42 | 118 |
| | | | | |
| ND<1.5 U | 0.53 J | 0.97 | 43 | 118 |
| ND<1.5 U | 0.53 J | 0.97 | 44 | 118 |
| ND<1.5 U | 0.53 J | 0.97 | 45 | 118 |
| ND<0.5 U | 0.53 J | -0.03 | 45 | 119 |
| ND<1 U | 0.53 J | 0.47 | 46 | 119 |
| 0.1181 J | 0.53 J | -0.4119 | 46 | 120 |
| 0.1892 J | 0.53 J | -0.3408 | 46 | 121 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 46 | 121 |
| ND<1.5 U | ND<1.5 U | 0 | 46 | 121 |
| ND<0.5 U | ND<1.5 U | -1 | 46 | 122 |

| | | | | |
|---|---|---|---|---|
| ND<1 U | ND<1.5 U | -0.5 | 46 | 123 |
| 0.1181 J | ND<1.5 U | -1.3819 | 46 | 124 |
| 0.1892 J | ND<1.5 U | -1.3108 | 46 | 125 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 46 | 125 |
| ND<0.5 U | ND<1.5 U | -1 | 46 | 126 |
| ND<1 U | ND<1.5 U | -0.5 | 46 | 127 |
| 0.1181 J | ND<1.5 U | -1.3819 | 46 | 128 |
| 0.1892 J | ND<1.5 U | -1.3108 | 46 | 129 |
| | | | | |
| ND<0.5 U | ND<1.5 U | -1 | 46 | 130 |
| ND<1 U | ND<1.5 U | -0.5 | 46 | 131 |
| 0.1181 J | ND<1.5 U | -1.3819 | 46 | 132 |
| 0.1892 J | ND<1.5 U | -1.3108 | 46 | 133 |
| | | | | |
| ND<1 U | ND<0.5 U | 0.5 | 47 | 133 |
| 0.1181 J | ND<0.5 U | -0.3819 | 47 | 134 |
| 0.1892 J | ND<0.5 U | -0.3108 | 47 | 135 |
| | | | | |
| 0.1181 J | ND<1 U | -0.8819 | 47 | 136 |
| 0.1892 J | ND<1 U | -0.8108 | 47 | 137 |
| | | | | |
| 0.1892 J | 0.1181 J | 0.0711 | 48 | 137 |

S Statistic = 48 - 137 = -89

| Tied Group | Value | Members |
|---|---|---|
| 1 | 1.5 | 14 |

| Time Period | Observations |
|---|---|
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |

There are 2 time periods with multiple data

A = 6006
B = 36

C = 2184
D = 0
E = 182
F = 4
a = 29256
b = 109296
c = 1104
Group Variance = 1290.33
Z-Score = -2.44981
Comparison Level at 95% confidence level = 1.65463 (upward trend)
-2.44981 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RW06R-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| ND<1.5 U | ND<1.5 U | 0 | 0 | 0 |
| ND<1.5 U2c | ND<1.5 U | 0 | 0 | 0 |
| ND<1.5 U1c | ND<1.5 U | 0 | 0 | 0 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 0 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 0 |
| 0.98 J | ND<1.5 U | -0.52 | 0 | 1 |
| 0.9 J | ND<1.5 U | -0.6 | 0 | 2 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 2 |
| ND<1 U | ND<1.5 U | -0.5 | 0 | 3 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 4 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 5 |
| | | | | |
| ND<1.5 U2c | ND<1.5 U | 0 | 0 | 5 |
| ND<1.5 U1c | ND<1.5 U | 0 | 0 | 5 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 5 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 5 |
| 0.98 J | ND<1.5 U | -0.52 | 0 | 6 |
| 0.9 J | ND<1.5 U | -0.6 | 0 | 7 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 7 |
| ND<1 U | ND<1.5 U | -0.5 | 0 | 8 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 9 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 10 |
| | | | | |
| ND<1.5 U1c | ND<1.5 U2c | Same Date | 0 | 10 |
| ND<1.5 U | ND<1.5 U2c | 0 | 0 | 10 |
| ND<1.5 U | ND<1.5 U2c | 0 | 0 | 10 |
| 0.98 J | ND<1.5 U2c | -0.52 | 0 | 11 |
| 0.9 J | ND<1.5 U2c | -0.6 | 0 | 12 |
| ND<1.5 U | ND<1.5 U2c | 0 | 0 | 12 |
| ND<1 U | ND<1.5 U2c | -0.5 | 0 | 13 |
| ND<0.1 U | ND<1.5 U2c | -1.4 | 0 | 14 |
| ND<0.1 U | ND<1.5 U2c | -1.4 | 0 | 15 |
| | | | | |
| ND<1.5 U | ND<1.5 U1c | 0 | 0 | 15 |
| ND<1.5 U | ND<1.5 U1c | 0 | 0 | 15 |
| 0.98 J | ND<1.5 U1c | -0.52 | 0 | 16 |
| 0.9 J | ND<1.5 U1c | -0.6 | 0 | 17 |
| ND<1.5 U | ND<1.5 U1c | 0 | 0 | 17 |
| ND<1 U | ND<1.5 U1c | -0.5 | 0 | 18 |
| ND<0.1 U | ND<1.5 U1c | -1.4 | 0 | 19 |
| ND<0.1 U | ND<1.5 U1c | -1.4 | 0 | 20 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 20 |
| 0.98 J | ND<1.5 U | -0.52 | 0 | 21 |
| 0.9 J | ND<1.5 U | -0.6 | 0 | 22 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 22 |
| ND<1 U | ND<1.5 U | -0.5 | 0 | 23 |

| | | | | |
|---|---|---|---|---|
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 24 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 25 |
| | | | | |
| 0.98 J | ND<1.5 U | -0.52 | 0 | 26 |
| 0.9 J | ND<1.5 U | -0.6 | 0 | 27 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 27 |
| ND<1 U | ND<1.5 U | -0.5 | 0 | 28 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 29 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 30 |
| | | | | |
| 0.9 J | 0.98 J | -0.08 | 0 | 31 |
| ND<1.5 U | 0.98 J | 0.52 | 1 | 31 |
| ND<1 U | 0.98 J | 0.02 | 2 | 31 |
| ND<0.1 U | 0.98 J | -0.88 | 2 | 32 |
| ND<0.1 U | 0.98 J | -0.88 | 2 | 33 |
| | | | | |
| ND<1.5 U | 0.9 J | 0.6 | 3 | 33 |
| ND<1 U | 0.9 J | 0.1 | 4 | 33 |
| ND<0.1 U | 0.9 J | -0.8 | 4 | 34 |
| ND<0.1 U | 0.9 J | -0.8 | 4 | 35 |
| | | | | |
| ND<1 U | ND<1.5 U | -0.5 | 4 | 36 |
| ND<0.1 U | ND<1.5 U | -1.4 | 4 | 37 |
| ND<0.1 U | ND<1.5 U | -1.4 | 4 | 38 |
| | | | | |
| ND<0.1 U | ND<1 U | -0.9 | 4 | 39 |
| ND<0.1 U | ND<1 U | -0.9 | 4 | 40 |
| | | | | |
| ND<0.1 U | ND<0.1 U | 0 | 4 | 40 |

S Statistic = 4 - 40 = -36

| Tied Group | Value | Members |
|---|---|---|
| 1 | 1.5 | 7 |
| 2 | 0.1 | 2 |

| Time Period | Observations |
|---|---|
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 9/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 3/1/2022 | 1 |
| 3/1/2023 | 1 |
| 3/1/2024 | 1 |

There are 1 time periods with multiple data

A = 816
B = 18
C = 210
D = 0
E = 44
F = 2

a = 3828
b = 11880
c = 264
Group Variance = 166.667
Z-Score = -2.71109
Comparison Level at 95% confidence level = 1.65463 (upward trend)
-2.71109 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RW07-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 1.7 J | 1.8 J | -0.1 | 0 | 1 |
| 1.4 J | 1.8 J | -0.4 | 0 | 2 |
| 1.9 J | 1.8 J | 0.1 | 1 | 2 |
| 2.3 J | 1.8 J | 0.5 | 2 | 2 |
| 2.8 J | 1.8 J | 1 | 3 | 2 |
| 3.1 | 1.8 J | 1.3 | 4 | 2 |
| 3.6 | 1.8 J | 1.8 | 5 | 2 |
| 3.2 | 1.8 J | 1.4 | 6 | 2 |
| 5.8 | 1.8 J | 4 | 7 | 2 |
| 6 | 1.8 J | 4.2 | 8 | 2 |
| 4.8 | 1.8 J | 3 | 9 | 2 |
| 4.6 | 1.8 J | 2.8 | 10 | 2 |
| 4.8 | 1.8 J | 3 | 11 | 2 |
| 4.7 | 1.8 J | 2.9 | 12 | 2 |
| 2.8 J | 1.8 J | 1 | 13 | 2 |
| 2.7 J | 1.8 J | 0.9 | 14 | 2 |
| 2.9 J | 1.8 J | 1.1 | 15 | 2 |
| 3 B | 1.8 J | 1.2 | 16 | 2 |
| 3.4 | 1.8 J | 1.6 | 17 | 2 |
| 3 J | 1.8 J | 1.2 | 18 | 2 |
| 2.5 J | 1.8 J | 0.7 | 19 | 2 |
| 4.5 | 1.8 J | 2.7 | 20 | 2 |
| 1.7 | 1.8 J | -0.1 | 20 | 3 |
| 16.6 | 1.8 J | 14.8 | 21 | 3 |
| 2.544 | 1.8 J | 0.744 | 22 | 3 |
| 4.38 | 1.8 J | 2.58 | 23 | 3 |
| | | | | |
| 1.4 J | 1.7 J | -0.3 | 23 | 4 |
| 1.9 J | 1.7 J | 0.2 | 24 | 4 |
| 2.3 J | 1.7 J | 0.6 | 25 | 4 |
| 2.8 J | 1.7 J | 1.1 | 26 | 4 |
| 3.1 | 1.7 J | 1.4 | 27 | 4 |
| 3.6 | 1.7 J | 1.9 | 28 | 4 |
| 3.2 | 1.7 J | 1.5 | 29 | 4 |
| 5.8 | 1.7 J | 4.1 | 30 | 4 |
| 6 | 1.7 J | 4.3 | 31 | 4 |
| 4.8 | 1.7 J | 3.1 | 32 | 4 |
| 4.6 | 1.7 J | 2.9 | 33 | 4 |
| 4.8 | 1.7 J | 3.1 | 34 | 4 |
| 4.7 | 1.7 J | 3 | 35 | 4 |
| 2.8 J | 1.7 J | 1.1 | 36 | 4 |
| 2.7 J | 1.7 J | 1 | 37 | 4 |
| 2.9 J | 1.7 J | 1.2 | 38 | 4 |
| 3 B | 1.7 J | 1.3 | 39 | 4 |
| 3.4 | 1.7 J | 1.7 | 40 | 4 |
| 3 J | 1.7 J | 1.3 | 41 | 4 |
| 2.5 J | 1.7 J | 0.8 | 42 | 4 |

| | | | | |
|---|---|---|---|---|
| 4.5 | 1.7 J | 2.8 | 43 | 4 |
| 1.7 | 1.7 J | 0 | 43 | 4 |
| 16.6 | 1.7 J | 14.9 | 44 | 4 |
| 2.544 | 1.7 J | 0.844 | 45 | 4 |
| 4.38 | 1.7 J | 2.68 | 46 | 4 |
| | | | | |
| 1.9 J | 1.4 J | 0.5 | 47 | 4 |
| 2.3 J | 1.4 J | 0.9 | 48 | 4 |
| 2.8 J | 1.4 J | 1.4 | 49 | 4 |
| 3.1 | 1.4 J | 1.7 | 50 | 4 |
| 3.6 | 1.4 J | 2.2 | 51 | 4 |
| 3.2 | 1.4 J | 1.8 | 52 | 4 |
| 5.8 | 1.4 J | 4.4 | 53 | 4 |
| 6 | 1.4 J | 4.6 | 54 | 4 |
| 4.8 | 1.4 J | 3.4 | 55 | 4 |
| 4.6 | 1.4 J | 3.2 | 56 | 4 |
| 4.8 | 1.4 J | 3.4 | 57 | 4 |
| 4.7 | 1.4 J | 3.3 | 58 | 4 |
| 2.8 J | 1.4 J | 1.4 | 59 | 4 |
| 2.7 J | 1.4 J | 1.3 | 60 | 4 |
| 2.9 J | 1.4 J | 1.5 | 61 | 4 |
| 3 B | 1.4 J | 1.6 | 62 | 4 |
| 3.4 | 1.4 J | 2 | 63 | 4 |
| 3 J | 1.4 J | 1.6 | 64 | 4 |
| 2.5 J | 1.4 J | 1.1 | 65 | 4 |
| 4.5 | 1.4 J | 3.1 | 66 | 4 |
| 1.7 | 1.4 J | 0.3 | 67 | 4 |
| 16.6 | 1.4 J | 15.2 | 68 | 4 |
| 2.544 | 1.4 J | 1.144 | 69 | 4 |
| 4.38 | 1.4 J | 2.98 | 70 | 4 |
| | | | | |
| 2.3 J | 1.9 J | 0.4 | 71 | 4 |
| 2.8 J | 1.9 J | 0.9 | 72 | 4 |
| 3.1 | 1.9 J | 1.2 | 73 | 4 |
| 3.6 | 1.9 J | 1.7 | 74 | 4 |
| 3.2 | 1.9 J | 1.3 | 75 | 4 |
| 5.8 | 1.9 J | 3.9 | 76 | 4 |
| 6 | 1.9 J | 4.1 | 77 | 4 |
| 4.8 | 1.9 J | 2.9 | 78 | 4 |
| 4.6 | 1.9 J | 2.7 | 79 | 4 |
| 4.8 | 1.9 J | 2.9 | 80 | 4 |
| 4.7 | 1.9 J | 2.8 | 81 | 4 |
| 2.8 J | 1.9 J | 0.9 | 82 | 4 |
| 2.7 J | 1.9 J | 0.8 | 83 | 4 |
| 2.9 J | 1.9 J | 1 | 84 | 4 |
| 3 B | 1.9 J | 1.1 | 85 | 4 |
| 3.4 | 1.9 J | 1.5 | 86 | 4 |
| 3 J | 1.9 J | 1.1 | 87 | 4 |
| 2.5 J | 1.9 J | 0.6 | 88 | 4 |
| 4.5 | 1.9 J | 2.6 | 89 | 4 |
| 1.7 | 1.9 J | -0.2 | 89 | 5 |
| 16.6 | 1.9 J | 14.7 | 90 | 5 |
| 2.544 | 1.9 J | 0.644 | 91 | 5 |
| 4.38 | 1.9 J | 2.48 | 92 | 5 |
| | | | | |
| 2.8 J | 2.3 J | 0.5 | 93 | 5 |
| 3.1 | 2.3 J | 0.8 | 94 | 5 |

| | | | | |
|---|---|---|---|---|
| 3.6 | 2.3 J | 1.3 | 95 | 5 |
| 3.2 | 2.3 J | 0.9 | 96 | 5 |
| 5.8 | 2.3 J | 3.5 | 97 | 5 |
| 6 | 2.3 J | 3.7 | 98 | 5 |
| 4.8 | 2.3 J | 2.5 | 99 | 5 |
| 4.6 | 2.3 J | 2.3 | 100 | 5 |
| 4.8 | 2.3 J | 2.5 | 101 | 5 |
| 4.7 | 2.3 J | 2.4 | 102 | 5 |
| 2.8 J | 2.3 J | 0.5 | 103 | 5 |
| 2.7 J | 2.3 J | 0.4 | 104 | 5 |
| 2.9 J | 2.3 J | 0.6 | 105 | 5 |
| 3 B | 2.3 J | 0.7 | 106 | 5 |
| 3.4 | 2.3 J | 1.1 | 107 | 5 |
| 3 J | 2.3 J | 0.7 | 108 | 5 |
| 2.5 J | 2.3 J | 0.2 | 109 | 5 |
| 4.5 | 2.3 J | 2.2 | 110 | 5 |
| 1.7 | 2.3 J | -0.6 | 110 | 6 |
| 16.6 | 2.3 J | 14.3 | 111 | 6 |
| 2.544 | 2.3 J | 0.244 | 112 | 6 |
| 4.38 | 2.3 J | 2.08 | 113 | 6 |
| | | | | |
| 3.1 | 2.8 J | 0.3 | 114 | 6 |
| 3.6 | 2.8 J | 0.8 | 115 | 6 |
| 3.2 | 2.8 J | 0.4 | 116 | 6 |
| 5.8 | 2.8 J | 3 | 117 | 6 |
| 6 | 2.8 J | 3.2 | 118 | 6 |
| 4.8 | 2.8 J | 2 | 119 | 6 |
| 4.6 | 2.8 J | 1.8 | 120 | 6 |
| 4.8 | 2.8 J | 2 | 121 | 6 |
| 4.7 | 2.8 J | 1.9 | 122 | 6 |
| 2.8 J | 2.8 J | 0 | 122 | 6 |
| 2.7 J | 2.8 J | -0.1 | 122 | 7 |
| 2.9 J | 2.8 J | 0.1 | 123 | 7 |
| 3 B | 2.8 J | 0.2 | 124 | 7 |
| 3.4 | 2.8 J | 0.6 | 125 | 7 |
| 3 J | 2.8 J | 0.2 | 126 | 7 |
| 2.5 J | 2.8 J | -0.3 | 126 | 8 |
| 4.5 | 2.8 J | 1.7 | 127 | 8 |
| 1.7 | 2.8 J | -1.1 | 127 | 9 |
| 16.6 | 2.8 J | 13.8 | 128 | 9 |
| 2.544 | 2.8 J | -0.256 | 128 | 10 |
| 4.38 | 2.8 J | 1.58 | 129 | 10 |
| | | | | |
| 3.6 | 3.1 | 0.5 | 130 | 10 |
| 3.2 | 3.1 | 0.1 | 131 | 10 |
| 5.8 | 3.1 | 2.7 | 132 | 10 |
| 6 | 3.1 | 2.9 | 133 | 10 |
| 4.8 | 3.1 | 1.7 | 134 | 10 |
| 4.6 | 3.1 | 1.5 | 135 | 10 |
| 4.8 | 3.1 | 1.7 | 136 | 10 |
| 4.7 | 3.1 | 1.6 | 137 | 10 |
| 2.8 J | 3.1 | -0.3 | 137 | 11 |
| 2.7 J | 3.1 | -0.4 | 137 | 12 |
| 2.9 J | 3.1 | -0.2 | 137 | 13 |
| 3 B | 3.1 | -0.1 | 137 | 14 |
| 3.4 | 3.1 | 0.3 | 138 | 14 |
| 3 J | 3.1 | -0.1 | 138 | 15 |

| | | | | |
|---|---|---|---|---|
| 2.5 J | 3.1 | -0.6 | 138 | 16 |
| 4.5 | 3.1 | 1.4 | 139 | 16 |
| 1.7 | 3.1 | -1.4 | 139 | 17 |
| 16.6 | 3.1 | 13.5 | 140 | 17 |
| 2.544 | 3.1 | -0.556 | 140 | 18 |
| 4.38 | 3.1 | 1.28 | 141 | 18 |
| | | | | |
| 3.2 | 3.6 | -0.4 | 141 | 19 |
| 5.8 | 3.6 | 2.2 | 142 | 19 |
| 6 | 3.6 | 2.4 | 143 | 19 |
| 4.8 | 3.6 | 1.2 | 144 | 19 |
| 4.6 | 3.6 | 1 | 145 | 19 |
| 4.8 | 3.6 | 1.2 | 146 | 19 |
| 4.7 | 3.6 | 1.1 | 147 | 19 |
| 2.8 J | 3.6 | -0.8 | 147 | 20 |
| 2.7 J | 3.6 | -0.9 | 147 | 21 |
| 2.9 J | 3.6 | -0.7 | 147 | 22 |
| 3 B | 3.6 | -0.6 | 147 | 23 |
| 3.4 | 3.6 | -0.2 | 147 | 24 |
| 3 J | 3.6 | -0.6 | 147 | 25 |
| 2.5 J | 3.6 | -1.1 | 147 | 26 |
| 4.5 | 3.6 | 0.9 | 148 | 26 |
| 1.7 | 3.6 | -1.9 | 148 | 27 |
| 16.6 | 3.6 | 13 | 149 | 27 |
| 2.544 | 3.6 | -1.056 | 149 | 28 |
| 4.38 | 3.6 | 0.78 | 150 | 28 |
| | | | | |
| 5.8 | 3.2 | 2.6 | 151 | 28 |
| 6 | 3.2 | 2.8 | 152 | 28 |
| 4.8 | 3.2 | 1.6 | 153 | 28 |
| 4.6 | 3.2 | 1.4 | 154 | 28 |
| 4.8 | 3.2 | 1.6 | 155 | 28 |
| 4.7 | 3.2 | 1.5 | 156 | 28 |
| 2.8 J | 3.2 | -0.4 | 156 | 29 |
| 2.7 J | 3.2 | -0.5 | 156 | 30 |
| 2.9 J | 3.2 | -0.3 | 156 | 31 |
| 3 B | 3.2 | -0.2 | 156 | 32 |
| 3.4 | 3.2 | 0.2 | 157 | 32 |
| 3 J | 3.2 | -0.2 | 157 | 33 |
| 2.5 J | 3.2 | -0.7 | 157 | 34 |
| 4.5 | 3.2 | 1.3 | 158 | 34 |
| 1.7 | 3.2 | -1.5 | 158 | 35 |
| 16.6 | 3.2 | 13.4 | 159 | 35 |
| 2.544 | 3.2 | -0.656 | 159 | 36 |
| 4.38 | 3.2 | 1.18 | 160 | 36 |
| | | | | |
| 6 | 5.8 | 0.2 | 161 | 36 |
| 4.8 | 5.8 | -1 | 161 | 37 |
| 4.6 | 5.8 | -1.2 | 161 | 38 |
| 4.8 | 5.8 | -1 | 161 | 39 |
| 4.7 | 5.8 | -1.1 | 161 | 40 |
| 2.8 J | 5.8 | -3 | 161 | 41 |
| 2.7 J | 5.8 | -3.1 | 161 | 42 |
| 2.9 J | 5.8 | -2.9 | 161 | 43 |
| 3 B | 5.8 | -2.8 | 161 | 44 |
| 3.4 | 5.8 | -2.4 | 161 | 45 |
| 3 J | 5.8 | -2.8 | 161 | 46 |

| | | | | |
|---|---|---|---|---|
| 2.5 J | 5.8 | -3.3 | 161 | 47 |
| 4.5 | 5.8 | -1.3 | 161 | 48 |
| 1.7 | 5.8 | -4.1 | 161 | 49 |
| 16.6 | 5.8 | 10.8 | 162 | 49 |
| 2.544 | 5.8 | -3.256 | 162 | 50 |
| 4.38 | 5.8 | -1.42 | 162 | 51 |
| | | | | |
| 4.8 | 6 | -1.2 | 162 | 52 |
| 4.6 | 6 | -1.4 | 162 | 53 |
| 4.8 | 6 | -1.2 | 162 | 54 |
| 4.7 | 6 | -1.3 | 162 | 55 |
| 2.8 J | 6 | -3.2 | 162 | 56 |
| 2.7 J | 6 | -3.3 | 162 | 57 |
| 2.9 J | 6 | -3.1 | 162 | 58 |
| 3 B | 6 | -3 | 162 | 59 |
| 3.4 | 6 | -2.6 | 162 | 60 |
| 3 J | 6 | -3 | 162 | 61 |
| 2.5 J | 6 | -3.5 | 162 | 62 |
| 4.5 | 6 | -1.5 | 162 | 63 |
| 1.7 | 6 | -4.3 | 162 | 64 |
| 16.6 | 6 | 10.6 | 163 | 64 |
| 2.544 | 6 | -3.456 | 163 | 65 |
| 4.38 | 6 | -1.62 | 163 | 66 |
| | | | | |
| 4.6 | 4.8 | -0.2 | 163 | 67 |
| 4.8 | 4.8 | 0 | 163 | 67 |
| 4.7 | 4.8 | -0.1 | 163 | 68 |
| 2.8 J | 4.8 | -2 | 163 | 69 |
| 2.7 J | 4.8 | -2.1 | 163 | 70 |
| 2.9 J | 4.8 | -1.9 | 163 | 71 |
| 3 B | 4.8 | -1.8 | 163 | 72 |
| 3.4 | 4.8 | -1.4 | 163 | 73 |
| 3 J | 4.8 | -1.8 | 163 | 74 |
| 2.5 J | 4.8 | -2.3 | 163 | 75 |
| 4.5 | 4.8 | -0.3 | 163 | 76 |
| 1.7 | 4.8 | -3.1 | 163 | 77 |
| 16.6 | 4.8 | 11.8 | 164 | 77 |
| 2.544 | 4.8 | -2.256 | 164 | 78 |
| 4.38 | 4.8 | -0.42 | 164 | 79 |
| | | | | |
| 4.8 | 4.6 | 0.2 | 165 | 79 |
| 4.7 | 4.6 | 0.1 | 166 | 79 |
| 2.8 J | 4.6 | -1.8 | 166 | 80 |
| 2.7 J | 4.6 | -1.9 | 166 | 81 |
| 2.9 J | 4.6 | -1.7 | 166 | 82 |
| 3 B | 4.6 | -1.6 | 166 | 83 |
| 3.4 | 4.6 | -1.2 | 166 | 84 |
| 3 J | 4.6 | -1.6 | 166 | 85 |
| 2.5 J | 4.6 | -2.1 | 166 | 86 |
| 4.5 | 4.6 | -0.1 | 166 | 87 |
| 1.7 | 4.6 | -2.9 | 166 | 88 |
| 16.6 | 4.6 | 12 | 167 | 88 |
| 2.544 | 4.6 | -2.056 | 167 | 89 |
| 4.38 | 4.6 | -0.22 | 167 | 90 |
| | | | | |
| 4.7 | 4.8 | -0.1 | 167 | 91 |
| 2.8 J | 4.8 | -2 | 167 | 92 |

| | | | | |
|---|---|---|---|---|
| 2.7 J | 4.8 | -2.1 | 167 | 93 |
| 2.9 J | 4.8 | -1.9 | 167 | 94 |
| 3 B | 4.8 | -1.8 | 167 | 95 |
| 3.4 | 4.8 | -1.4 | 167 | 96 |
| 3 J | 4.8 | -1.8 | 167 | 97 |
| 2.5 J | 4.8 | -2.3 | 167 | 98 |
| 4.5 | 4.8 | -0.3 | 167 | 99 |
| 1.7 | 4.8 | -3.1 | 167 | 100 |
| 16.6 | 4.8 | 11.8 | 168 | 100 |
| 2.544 | 4.8 | -2.256 | 168 | 101 |
| 4.38 | 4.8 | -0.42 | 168 | 102 |
| | | | | |
| 2.8 J | 4.7 | -1.9 | 168 | 103 |
| 2.7 J | 4.7 | -2 | 168 | 104 |
| 2.9 J | 4.7 | -1.8 | 168 | 105 |
| 3 B | 4.7 | -1.7 | 168 | 106 |
| 3.4 | 4.7 | -1.3 | 168 | 107 |
| 3 J | 4.7 | -1.7 | 168 | 108 |
| 2.5 J | 4.7 | -2.2 | 168 | 109 |
| 4.5 | 4.7 | -0.2 | 168 | 110 |
| 1.7 | 4.7 | -3 | 168 | 111 |
| 16.6 | 4.7 | 11.9 | 169 | 111 |
| 2.544 | 4.7 | -2.156 | 169 | 112 |
| 4.38 | 4.7 | -0.32 | 169 | 113 |
| | | | | |
| 2.7 J | 2.8 J | Same Date | 169 | 113 |
| 2.9 J | 2.8 J | 0.1 | 170 | 113 |
| 3 B | 2.8 J | 0.2 | 171 | 113 |
| 3.4 | 2.8 J | 0.6 | 172 | 113 |
| 3 J | 2.8 J | 0.2 | 173 | 113 |
| 2.5 J | 2.8 J | -0.3 | 173 | 114 |
| 4.5 | 2.8 J | 1.7 | 174 | 114 |
| 1.7 | 2.8 J | -1.1 | 174 | 115 |
| 16.6 | 2.8 J | 13.8 | 175 | 115 |
| 2.544 | 2.8 J | -0.256 | 175 | 116 |
| 4.38 | 2.8 J | 1.58 | 176 | 116 |
| | | | | |
| 2.9 J | 2.7 J | 0.2 | 177 | 116 |
| 3 B | 2.7 J | 0.3 | 178 | 116 |
| 3.4 | 2.7 J | 0.7 | 179 | 116 |
| 3 J | 2.7 J | 0.3 | 180 | 116 |
| 2.5 J | 2.7 J | -0.2 | 180 | 117 |
| 4.5 | 2.7 J | 1.8 | 181 | 117 |
| 1.7 | 2.7 J | -1 | 181 | 118 |
| 16.6 | 2.7 J | 13.9 | 182 | 118 |
| 2.544 | 2.7 J | -0.156 | 182 | 119 |
| 4.38 | 2.7 J | 1.68 | 183 | 119 |
| | | | | |
| 3 B | 2.9 J | Same Date | 183 | 119 |
| 3.4 | 2.9 J | 0.5 | 184 | 119 |
| 3 J | 2.9 J | 0.1 | 185 | 119 |
| 2.5 J | 2.9 J | -0.4 | 185 | 120 |
| 4.5 | 2.9 J | 1.6 | 186 | 120 |
| 1.7 | 2.9 J | -1.2 | 186 | 121 |
| 16.6 | 2.9 J | 13.7 | 187 | 121 |
| 2.544 | 2.9 J | -0.356 | 187 | 122 |
| 4.38 | 2.9 J | 1.48 | 188 | 122 |

| | | | | |
|---|---|---|---|---|
| 3.4 | 3 B | 0.4 | 189 | 122 |
| 3 J | 3 B | 0 | 189 | 122 |
| 2.5 J | 3 B | -0.5 | 189 | 123 |
| 4.5 | 3 B | 1.5 | 190 | 123 |
| 1.7 | 3 B | -1.3 | 190 | 124 |
| 16.6 | 3 B | 13.6 | 191 | 124 |
| 2.544 | 3 B | -0.456 | 191 | 125 |
| 4.38 | 3 B | 1.38 | 192 | 125 |
| | | | | |
| 3 J | 3.4 | -0.4 | 192 | 126 |
| 2.5 J | 3.4 | -0.9 | 192 | 127 |
| 4.5 | 3.4 | 1.1 | 193 | 127 |
| 1.7 | 3.4 | -1.7 | 193 | 128 |
| 16.6 | 3.4 | 13.2 | 194 | 128 |
| 2.544 | 3.4 | -0.856 | 194 | 129 |
| 4.38 | 3.4 | 0.98 | 195 | 129 |
| | | | | |
| 2.5 J | 3 J | -0.5 | 195 | 130 |
| 4.5 | 3 J | 1.5 | 196 | 130 |
| 1.7 | 3 J | -1.3 | 196 | 131 |
| 16.6 | 3 J | 13.6 | 197 | 131 |
| 2.544 | 3 J | -0.456 | 197 | 132 |
| 4.38 | 3 J | 1.38 | 198 | 132 |
| | | | | |
| 4.5 | 2.5 J | 2 | 199 | 132 |
| 1.7 | 2.5 J | -0.8 | 199 | 133 |
| 16.6 | 2.5 J | 14.1 | 200 | 133 |
| 2.544 | 2.5 J | 0.044 | 201 | 133 |
| 4.38 | 2.5 J | 1.88 | 202 | 133 |
| | | | | |
| 1.7 | 4.5 | -2.8 | 202 | 134 |
| 16.6 | 4.5 | 12.1 | 203 | 134 |
| 2.544 | 4.5 | -1.956 | 203 | 135 |
| 4.38 | 4.5 | -0.12 | 203 | 136 |
| | | | | |
| 16.6 | 1.7 | 14.9 | 204 | 136 |
| 2.544 | 1.7 | 0.844 | 205 | 136 |
| 4.38 | 1.7 | 2.68 | 206 | 136 |
| | | | | |
| 2.544 | 16.6 | -14.056 | 206 | 137 |
| 4.38 | 16.6 | -12.22 | 206 | 138 |
| | | | | |
| 4.38 | 2.544 | 1.836 | 207 | 138 |

S Statistic = 207 - 138 = 69

| Tied Group | Value | Members |
|---|---|---|
| 1 | 1.7 | 2 |
| 2 | 2.8 | 2 |
| 3 | 4.8 | 2 |
| 4 | 3 | 2 |

| Time Period | Observations |
|---|---|
| 2/1/2017 | 1 |
| 3/1/2017 | 1 |

| | |
|---|---|
| 4/1/2017 | 1 |
| 5/1/2017 | 1 |
| 6/1/2017 | 1 |
| 7/1/2017 | 1 |
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 11/1/2021 | 1 |
| 3/1/2022 | 1 |
| 3/1/2023 | 1 |
| 3/1/2024 | 1 |

There are 2 time periods with multiple data

---

A = 72
B = 36
C = 0
D = 0
E = 8
F = 4
a = 41418
b = 157950
c = 1404
Group Variance = 2295.02
Z-Score = 1.41943
Comparison Level at 95% confidence level = 1.65463 (upward trend)
1.41943 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RW08-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 11 | 3.8 | 7.2 | 1 | 0 |
| 7.8 | 3.8 | 4 | 2 | 0 |
| 3.2 | 3.8 | -0.6 | 2 | 1 |
| 1.7 J | 3.8 | -2.1 | 2 | 2 |
| 0.74 J | 3.8 | -3.06 | 2 | 3 |
| 2.7 J | 3.8 | -1.1 | 2 | 4 |
| 2.5 J | 3.8 | -1.3 | 2 | 5 |
| 0.96 J | 3.8 | -2.84 | 2 | 6 |
| ND<1.5 U | 3.8 | -2.3 | 2 | 7 |
| ND<1.5 U | 3.8 | -2.3 | 2 | 8 |
| ND<1.5 U | 3.8 | -2.3 | 2 | 9 |
| 2.2 J | 3.8 | -1.6 | 2 | 10 |
| ND<1.5 U | 3.8 | -2.3 | 2 | 11 |
| ND<1.5 U | 3.8 | -2.3 | 2 | 12 |
| 2.7 J1c | 3.8 | -1.1 | 2 | 13 |
| 2 J2c | 3.8 | -1.8 | 2 | 14 |
| 0.86 J | 3.8 | -2.94 | 2 | 15 |
| 1.2 JB | 3.8 | -2.6 | 2 | 16 |
| 0.39 J | 3.8 | -3.41 | 2 | 17 |
| ND<1.5 U | 3.8 | -2.3 | 2 | 18 |
| 2.7 J | 3.8 | -1.1 | 2 | 19 |
| 0.67 J | 3.8 | -3.13 | 2 | 20 |
| ND<1.5 U | 3.8 | -2.3 | 2 | 21 |
| 0.37 J | 3.8 | -3.43 | 2 | 22 |
| | | | | |
| 7.8 | 11 | -3.2 | 2 | 23 |
| 3.2 | 11 | -7.8 | 2 | 24 |
| 1.7 J | 11 | -9.3 | 2 | 25 |
| 0.74 J | 11 | -10.26 | 2 | 26 |
| 2.7 J | 11 | -8.3 | 2 | 27 |
| 2.5 J | 11 | -8.5 | 2 | 28 |
| 0.96 J | 11 | -10.04 | 2 | 29 |
| ND<1.5 U | 11 | -9.5 | 2 | 30 |
| ND<1.5 U | 11 | -9.5 | 2 | 31 |
| ND<1.5 U | 11 | -9.5 | 2 | 32 |
| 2.2 J | 11 | -8.8 | 2 | 33 |
| ND<1.5 U | 11 | -9.5 | 2 | 34 |
| ND<1.5 U | 11 | -9.5 | 2 | 35 |
| 2.7 J1c | 11 | -8.3 | 2 | 36 |
| 2 J2c | 11 | -9 | 2 | 37 |
| 0.86 J | 11 | -10.14 | 2 | 38 |
| 1.2 JB | 11 | -9.8 | 2 | 39 |
| 0.39 J | 11 | -10.61 | 2 | 40 |
| ND<1.5 U | 11 | -9.5 | 2 | 41 |
| 2.7 J | 11 | -8.3 | 2 | 42 |
| 0.67 J | 11 | -10.33 | 2 | 43 |
| ND<1.5 U | 11 | -9.5 | 2 | 44 |

| | | | | |
|---|---|---|---|---|
| 0.37 J | 11 | -10.63 | 2 | 45 |
| | | | | |
| 3.2 | 7.8 | -4.6 | 2 | 46 |
| 1.7 J | 7.8 | -6.1 | 2 | 47 |
| 0.74 J | 7.8 | -7.06 | 2 | 48 |
| 2.7 J | 7.8 | -5.1 | 2 | 49 |
| 2.5 J | 7.8 | -5.3 | 2 | 50 |
| 0.96 J | 7.8 | -6.84 | 2 | 51 |
| ND<1.5 U | 7.8 | -6.3 | 2 | 52 |
| ND<1.5 U | 7.8 | -6.3 | 2 | 53 |
| ND<1.5 U | 7.8 | -6.3 | 2 | 54 |
| 2.2 J | 7.8 | -5.6 | 2 | 55 |
| ND<1.5 U | 7.8 | -6.3 | 2 | 56 |
| ND<1.5 U | 7.8 | -6.3 | 2 | 57 |
| 2.7 J1c | 7.8 | -5.1 | 2 | 58 |
| 2 J2c | 7.8 | -5.8 | 2 | 59 |
| 0.86 J | 7.8 | -6.94 | 2 | 60 |
| 1.2 JB | 7.8 | -6.6 | 2 | 61 |
| 0.39 J | 7.8 | -7.41 | 2 | 62 |
| ND<1.5 U | 7.8 | -6.3 | 2 | 63 |
| 2.7 J | 7.8 | -5.1 | 2 | 64 |
| 0.67 J | 7.8 | -7.13 | 2 | 65 |
| ND<1.5 U | 7.8 | -6.3 | 2 | 66 |
| 0.37 J | 7.8 | -7.43 | 2 | 67 |
| | | | | |
| 1.7 J | 3.2 | -1.5 | 2 | 68 |
| 0.74 J | 3.2 | -2.46 | 2 | 69 |
| 2.7 J | 3.2 | -0.5 | 2 | 70 |
| 2.5 J | 3.2 | -0.7 | 2 | 71 |
| 0.96 J | 3.2 | -2.24 | 2 | 72 |
| ND<1.5 U | 3.2 | -1.7 | 2 | 73 |
| ND<1.5 U | 3.2 | -1.7 | 2 | 74 |
| ND<1.5 U | 3.2 | -1.7 | 2 | 75 |
| 2.2 J | 3.2 | -1 | 2 | 76 |
| ND<1.5 U | 3.2 | -1.7 | 2 | 77 |
| ND<1.5 U | 3.2 | -1.7 | 2 | 78 |
| 2.7 J1c | 3.2 | -0.5 | 2 | 79 |
| 2 J2c | 3.2 | -1.2 | 2 | 80 |
| 0.86 J | 3.2 | -2.34 | 2 | 81 |
| 1.2 JB | 3.2 | -2 | 2 | 82 |
| 0.39 J | 3.2 | -2.81 | 2 | 83 |
| ND<1.5 U | 3.2 | -1.7 | 2 | 84 |
| 2.7 J | 3.2 | -0.5 | 2 | 85 |
| 0.67 J | 3.2 | -2.53 | 2 | 86 |
| ND<1.5 U | 3.2 | -1.7 | 2 | 87 |
| 0.37 J | 3.2 | -2.83 | 2 | 88 |
| | | | | |
| 0.74 J | 1.7 J | -0.96 | 2 | 89 |
| 2.7 J | 1.7 J | 1 | 3 | 89 |
| 2.5 J | 1.7 J | 0.8 | 4 | 89 |
| 0.96 J | 1.7 J | -0.74 | 4 | 90 |
| ND<1.5 U | 1.7 J | -0.2 | 4 | 91 |
| ND<1.5 U | 1.7 J | -0.2 | 4 | 92 |
| ND<1.5 U | 1.7 J | -0.2 | 4 | 93 |
| 2.2 J | 1.7 J | 0.5 | 5 | 93 |
| ND<1.5 U | 1.7 J | -0.2 | 5 | 94 |
| ND<1.5 U | 1.7 J | -0.2 | 5 | 95 |

| | | | | |
|---|---|---|---|---|
| 2.7 J1c | 1.7 J | 1 | 6 | 95 |
| 2 J2c | 1.7 J | 0.3 | 7 | 95 |
| 0.86 J | 1.7 J | -0.84 | 7 | 96 |
| 1.2 JB | 1.7 J | -0.5 | 7 | 97 |
| 0.39 J | 1.7 J | -1.31 | 7 | 98 |
| ND<1.5 U | 1.7 J | -0.2 | 7 | 99 |
| 2.7 J | 1.7 J | 1 | 8 | 99 |
| 0.67 J | 1.7 J | -1.03 | 8 | 100 |
| ND<1.5 U | 1.7 J | -0.2 | 8 | 101 |
| 0.37 J | 1.7 J | -1.33 | 8 | 102 |
| | | | | |
| 2.7 J | 0.74 J | 1.96 | 9 | 102 |
| 2.5 J | 0.74 J | 1.76 | 10 | 102 |
| 0.96 J | 0.74 J | 0.22 | 11 | 102 |
| ND<1.5 U | 0.74 J | 0.76 | 12 | 102 |
| ND<1.5 U | 0.74 J | 0.76 | 13 | 102 |
| ND<1.5 U | 0.74 J | 0.76 | 14 | 102 |
| 2.2 J | 0.74 J | 1.46 | 15 | 102 |
| ND<1.5 U | 0.74 J | 0.76 | 16 | 102 |
| ND<1.5 U | 0.74 J | 0.76 | 17 | 102 |
| 2.7 J1c | 0.74 J | 1.96 | 18 | 102 |
| 2 J2c | 0.74 J | 1.26 | 19 | 102 |
| 0.86 J | 0.74 J | 0.12 | 20 | 102 |
| 1.2 JB | 0.74 J | 0.46 | 21 | 102 |
| 0.39 J | 0.74 J | -0.35 | 21 | 103 |
| ND<1.5 U | 0.74 J | 0.76 | 22 | 103 |
| 2.7 J | 0.74 J | 1.96 | 23 | 103 |
| 0.67 J | 0.74 J | -0.07 | 23 | 104 |
| ND<1.5 U | 0.74 J | 0.76 | 24 | 104 |
| 0.37 J | 0.74 J | -0.37 | 24 | 105 |
| | | | | |
| 2.5 J | 2.7 J | -0.2 | 24 | 106 |
| 0.96 J | 2.7 J | -1.74 | 24 | 107 |
| ND<1.5 U | 2.7 J | -1.2 | 24 | 108 |
| ND<1.5 U | 2.7 J | -1.2 | 24 | 109 |
| ND<1.5 U | 2.7 J | -1.2 | 24 | 110 |
| 2.2 J | 2.7 J | -0.5 | 24 | 111 |
| ND<1.5 U | 2.7 J | -1.2 | 24 | 112 |
| ND<1.5 U | 2.7 J | -1.2 | 24 | 113 |
| 2.7 J1c | 2.7 J | 0 | 24 | 113 |
| 2 J2c | 2.7 J | -0.7 | 24 | 114 |
| 0.86 J | 2.7 J | -1.84 | 24 | 115 |
| 1.2 JB | 2.7 J | -1.5 | 24 | 116 |
| 0.39 J | 2.7 J | -2.31 | 24 | 117 |
| ND<1.5 U | 2.7 J | -1.2 | 24 | 118 |
| 2.7 J | 2.7 J | 0 | 24 | 118 |
| 0.67 J | 2.7 J | -2.03 | 24 | 119 |
| ND<1.5 U | 2.7 J | -1.2 | 24 | 120 |
| 0.37 J | 2.7 J | -2.33 | 24 | 121 |
| | | | | |
| 0.96 J | 2.5 J | -1.54 | 24 | 122 |
| ND<1.5 U | 2.5 J | -1 | 24 | 123 |
| ND<1.5 U | 2.5 J | -1 | 24 | 124 |
| ND<1.5 U | 2.5 J | -1 | 24 | 125 |
| 2.2 J | 2.5 J | -0.3 | 24 | 126 |
| ND<1.5 U | 2.5 J | -1 | 24 | 127 |
| ND<1.5 U | 2.5 J | -1 | 24 | 128 |

| | | | | |
|---|---|---|---|---|
| 2.7 J1c | 2.5 J | 0.2 | 25 | 128 |
| 2 J2c | 2.5 J | -0.5 | 25 | 129 |
| 0.86 J | 2.5 J | -1.64 | 25 | 130 |
| 1.2 JB | 2.5 J | -1.3 | 25 | 131 |
| 0.39 J | 2.5 J | -2.11 | 25 | 132 |
| ND<1.5 U | 2.5 J | -1 | 25 | 133 |
| 2.7 J | 2.5 J | 0.2 | 26 | 133 |
| 0.67 J | 2.5 J | -1.83 | 26 | 134 |
| ND<1.5 U | 2.5 J | -1 | 26 | 135 |
| 0.37 J | 2.5 J | -2.13 | 26 | 136 |
| | | | | |
| ND<1.5 U | 0.96 J | 0.54 | 27 | 136 |
| ND<1.5 U | 0.96 J | 0.54 | 28 | 136 |
| ND<1.5 U | 0.96 J | 0.54 | 29 | 136 |
| 2.2 J | 0.96 J | 1.24 | 30 | 136 |
| ND<1.5 U | 0.96 J | 0.54 | 31 | 136 |
| ND<1.5 U | 0.96 J | 0.54 | 32 | 136 |
| 2.7 J1c | 0.96 J | 1.74 | 33 | 136 |
| 2 J2c | 0.96 J | 1.04 | 34 | 136 |
| 0.86 J | 0.96 J | -0.1 | 34 | 137 |
| 1.2 JB | 0.96 J | 0.24 | 35 | 137 |
| 0.39 J | 0.96 J | -0.57 | 35 | 138 |
| ND<1.5 U | 0.96 J | 0.54 | 36 | 138 |
| 2.7 J | 0.96 J | 1.74 | 37 | 138 |
| 0.67 J | 0.96 J | -0.29 | 37 | 139 |
| ND<1.5 U | 0.96 J | 0.54 | 38 | 139 |
| 0.37 J | 0.96 J | -0.59 | 38 | 140 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 38 | 140 |
| ND<1.5 U | ND<1.5 U | 0 | 38 | 140 |
| 2.2 J | ND<1.5 U | 0.7 | 39 | 140 |
| ND<1.5 U | ND<1.5 U | 0 | 39 | 140 |
| ND<1.5 U | ND<1.5 U | 0 | 39 | 140 |
| 2.7 J1c | ND<1.5 U | 1.2 | 40 | 140 |
| 2 J2c | ND<1.5 U | 0.5 | 41 | 140 |
| 0.86 J | ND<1.5 U | -0.64 | 41 | 141 |
| 1.2 JB | ND<1.5 U | -0.3 | 41 | 142 |
| 0.39 J | ND<1.5 U | -1.11 | 41 | 143 |
| ND<1.5 U | ND<1.5 U | 0 | 41 | 143 |
| 2.7 J | ND<1.5 U | 1.2 | 42 | 143 |
| 0.67 J | ND<1.5 U | -0.83 | 42 | 144 |
| ND<1.5 U | ND<1.5 U | 0 | 42 | 144 |
| 0.37 J | ND<1.5 U | -1.13 | 42 | 145 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 42 | 145 |
| 2.2 J | ND<1.5 U | 0.7 | 43 | 145 |
| ND<1.5 U | ND<1.5 U | 0 | 43 | 145 |
| ND<1.5 U | ND<1.5 U | 0 | 43 | 145 |
| 2.7 J1c | ND<1.5 U | 1.2 | 44 | 145 |
| 2 J2c | ND<1.5 U | 0.5 | 45 | 145 |
| 0.86 J | ND<1.5 U | -0.64 | 45 | 146 |
| 1.2 JB | ND<1.5 U | -0.3 | 45 | 147 |
| 0.39 J | ND<1.5 U | -1.11 | 45 | 148 |
| ND<1.5 U | ND<1.5 U | 0 | 45 | 148 |
| 2.7 J | ND<1.5 U | 1.2 | 46 | 148 |
| 0.67 J | ND<1.5 U | -0.83 | 46 | 149 |
| ND<1.5 U | ND<1.5 U | 0 | 46 | 149 |

| | | | | |
|---|---|---|---|---|
| 0.37 J | ND<1.5 U | -1.13 | 46 | 150 |
| | | | | |
| 2.2 J | ND<1.5 U | 0.7 | 47 | 150 |
| ND<1.5 U | ND<1.5 U | 0 | 47 | 150 |
| ND<1.5 U | ND<1.5 U | 0 | 47 | 150 |
| 2.7 J1c | ND<1.5 U | 1.2 | 48 | 150 |
| 2 J2c | ND<1.5 U | 0.5 | 49 | 150 |
| 0.86 J | ND<1.5 U | -0.64 | 49 | 151 |
| 1.2 JB | ND<1.5 U | -0.3 | 49 | 152 |
| 0.39 J | ND<1.5 U | -1.11 | 49 | 153 |
| ND<1.5 U | ND<1.5 U | 0 | 49 | 153 |
| 2.7 J | ND<1.5 U | 1.2 | 50 | 153 |
| 0.67 J | ND<1.5 U | -0.83 | 50 | 154 |
| ND<1.5 U | ND<1.5 U | 0 | 50 | 154 |
| 0.37 J | ND<1.5 U | -1.13 | 50 | 155 |
| | | | | |
| ND<1.5 U | 2.2 J | -0.7 | 50 | 156 |
| ND<1.5 U | 2.2 J | -0.7 | 50 | 157 |
| 2.7 J1c | 2.2 J | 0.5 | 51 | 157 |
| 2 J2c | 2.2 J | -0.2 | 51 | 158 |
| 0.86 J | 2.2 J | -1.34 | 51 | 159 |
| 1.2 JB | 2.2 J | -1 | 51 | 160 |
| 0.39 J | 2.2 J | -1.81 | 51 | 161 |
| ND<1.5 U | 2.2 J | -0.7 | 51 | 162 |
| 2.7 J | 2.2 J | 0.5 | 52 | 162 |
| 0.67 J | 2.2 J | -1.53 | 52 | 163 |
| ND<1.5 U | 2.2 J | -0.7 | 52 | 164 |
| 0.37 J | 2.2 J | -1.83 | 52 | 165 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 52 | 165 |
| 2.7 J1c | ND<1.5 U | 1.2 | 53 | 165 |
| 2 J2c | ND<1.5 U | 0.5 | 54 | 165 |
| 0.86 J | ND<1.5 U | -0.64 | 54 | 166 |
| 1.2 JB | ND<1.5 U | -0.3 | 54 | 167 |
| 0.39 J | ND<1.5 U | -1.11 | 54 | 168 |
| ND<1.5 U | ND<1.5 U | 0 | 54 | 168 |
| 2.7 J | ND<1.5 U | 1.2 | 55 | 168 |
| 0.67 J | ND<1.5 U | -0.83 | 55 | 169 |
| ND<1.5 U | ND<1.5 U | 0 | 55 | 169 |
| 0.37 J | ND<1.5 U | -1.13 | 55 | 170 |
| | | | | |
| 2.7 J1c | ND<1.5 U | 1.2 | 56 | 170 |
| 2 J2c | ND<1.5 U | 0.5 | 57 | 170 |
| 0.86 J | ND<1.5 U | -0.64 | 57 | 171 |
| 1.2 JB | ND<1.5 U | -0.3 | 57 | 172 |
| 0.39 J | ND<1.5 U | -1.11 | 57 | 173 |
| ND<1.5 U | ND<1.5 U | 0 | 57 | 173 |
| 2.7 J | ND<1.5 U | 1.2 | 58 | 173 |
| 0.67 J | ND<1.5 U | -0.83 | 58 | 174 |
| ND<1.5 U | ND<1.5 U | 0 | 58 | 174 |
| 0.37 J | ND<1.5 U | -1.13 | 58 | 175 |
| | | | | |
| 2 J2c | 2.7 J1c | Same Date | 58 | 175 |
| 0.86 J | 2.7 J1c | -1.84 | 58 | 176 |
| 1.2 JB | 2.7 J1c | -1.5 | 58 | 177 |
| 0.39 J | 2.7 J1c | -2.31 | 58 | 178 |
| ND<1.5 U | 2.7 J1c | -1.2 | 58 | 179 |

| | | | | |
|---|---|---|---|---|
| 2.7 J | 2.7 J1c | 0 | 58 | 179 |
| 0.67 J | 2.7 J1c | -2.03 | 58 | 180 |
| ND<1.5 U | 2.7 J1c | -1.2 | 58 | 181 |
| 0.37 J | 2.7 J1c | -2.33 | 58 | 182 |
| | | | | |
| 0.86 J | 2 J2c | -1.14 | 58 | 183 |
| 1.2 JB | 2 J2c | -0.8 | 58 | 184 |
| 0.39 J | 2 J2c | -1.61 | 58 | 185 |
| ND<1.5 U | 2 J2c | -0.5 | 58 | 186 |
| 2.7 J | 2 J2c | 0.7 | 59 | 186 |
| 0.67 J | 2 J2c | -1.33 | 59 | 187 |
| ND<1.5 U | 2 J2c | -0.5 | 59 | 188 |
| 0.37 J | 2 J2c | -1.63 | 59 | 189 |
| | | | | |
| 1.2 JB | 0.86 J | Same Date | 59 | 189 |
| 0.39 J | 0.86 J | -0.47 | 59 | 190 |
| ND<1.5 U | 0.86 J | 0.64 | 60 | 190 |
| 2.7 J | 0.86 J | 1.84 | 61 | 190 |
| 0.67 J | 0.86 J | -0.19 | 61 | 191 |
| ND<1.5 U | 0.86 J | 0.64 | 62 | 191 |
| 0.37 J | 0.86 J | -0.49 | 62 | 192 |
| | | | | |
| 0.39 J | 1.2 JB | -0.81 | 62 | 193 |
| ND<1.5 U | 1.2 JB | 0.3 | 63 | 193 |
| 2.7 J | 1.2 JB | 1.5 | 64 | 193 |
| 0.67 J | 1.2 JB | -0.53 | 64 | 194 |
| ND<1.5 U | 1.2 JB | 0.3 | 65 | 194 |
| 0.37 J | 1.2 JB | -0.83 | 65 | 195 |
| | | | | |
| ND<1.5 U | 0.39 J | 1.11 | 66 | 195 |
| 2.7 J | 0.39 J | 2.31 | 67 | 195 |
| 0.67 J | 0.39 J | 0.28 | 68 | 195 |
| ND<1.5 U | 0.39 J | 1.11 | 69 | 195 |
| 0.37 J | 0.39 J | -0.02 | 69 | 196 |
| | | | | |
| 2.7 J | ND<1.5 U | 1.2 | 70 | 196 |
| 0.67 J | ND<1.5 U | -0.83 | 70 | 197 |
| ND<1.5 U | ND<1.5 U | 0 | 70 | 197 |
| 0.37 J | ND<1.5 U | -1.13 | 70 | 198 |
| | | | | |
| 0.67 J | 2.7 J | -2.03 | 70 | 199 |
| ND<1.5 U | 2.7 J | -1.2 | 70 | 200 |
| 0.37 J | 2.7 J | -2.33 | 70 | 201 |
| | | | | |
| ND<1.5 U | 0.67 J | 0.83 | 71 | 201 |
| 0.37 J | 0.67 J | -0.3 | 71 | 202 |
| | | | | |
| 0.37 J | ND<1.5 U | -1.13 | 71 | 203 |

S Statistic = 71 - 203 = -132

| Tied Group | Value | Members |
|---|---|---|
| 1 | 2.7 | 3 |
| 2 | 1.5 | 7 |

| Time Period | Observations |
|---|---|

| | |
|---|---|
| 2/1/2017 | 1 |
| 3/1/2017 | 1 |
| 4/1/2017 | 1 |
| 5/1/2017 | 1 |
| 6/1/2017 | 1 |
| 7/1/2017 | 1 |
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |

There are 2 time periods with multiple data

---

A = 864
B = 36
C = 216
D = 0
E = 48
F = 4
a = 33000
b = 124200
c = 1200
Group Variance = 1783.49
Z-Score = -3.10196
Comparison Level at 95% confidence level = 1.65463 (upward trend)
-3.10196 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RW09-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 17.5 | 22.3 | -4.8 | 0 | 1 |
| 16.6 | 22.3 | -5.7 | 0 | 2 |
| 14.9 | 22.3 | -7.4 | 0 | 3 |
| 13.9 | 22.3 | -8.4 | 0 | 4 |
| 13.4 | 22.3 | -8.9 | 0 | 5 |
| 12.5 | 22.3 | -9.8 | 0 | 6 |
| 12.3 | 22.3 | -10 | 0 | 7 |
| 10.6 | 22.3 | -11.7 | 0 | 8 |
| 10.5 | 22.3 | -11.8 | 0 | 9 |
| 9.2 | 22.3 | -13.1 | 0 | 10 |
| 9.9 | 22.3 | -12.4 | 0 | 11 |
| 9.8 | 22.3 | -12.5 | 0 | 12 |
| 13.1 | 22.3 | -9.2 | 0 | 13 |
| 22.3 | 22.3 | 0 | 0 | 13 |
| 10.2 2c | 22.3 | -12.1 | 0 | 14 |
| 11.2 1c | 22.3 | -11.1 | 0 | 15 |
| 13.2 | 22.3 | -9.1 | 0 | 16 |
| 12 | 22.3 | -10.3 | 0 | 17 |
| 16.7 1c | 22.3 | -5.6 | 0 | 18 |
| 14.3 | 22.3 | -8 | 0 | 19 |
| 16.9 | 22.3 | -5.4 | 0 | 20 |
| 15.2 | 22.3 | -7.1 | 0 | 21 |
| 17 | 22.3 | -5.3 | 0 | 22 |
| 16 | 22.3 | -6.3 | 0 | 23 |
| | | | | |
| 16.6 | 17.5 | -0.9 | 0 | 24 |
| 14.9 | 17.5 | -2.6 | 0 | 25 |
| 13.9 | 17.5 | -3.6 | 0 | 26 |
| 13.4 | 17.5 | -4.1 | 0 | 27 |
| 12.5 | 17.5 | -5 | 0 | 28 |
| 12.3 | 17.5 | -5.2 | 0 | 29 |
| 10.6 | 17.5 | -6.9 | 0 | 30 |
| 10.5 | 17.5 | -7 | 0 | 31 |
| 9.2 | 17.5 | -8.3 | 0 | 32 |
| 9.9 | 17.5 | -7.6 | 0 | 33 |
| 9.8 | 17.5 | -7.7 | 0 | 34 |
| 13.1 | 17.5 | -4.4 | 0 | 35 |
| 22.3 | 17.5 | 4.8 | 1 | 35 |
| 10.2 2c | 17.5 | -7.3 | 1 | 36 |
| 11.2 1c | 17.5 | -6.3 | 1 | 37 |
| 13.2 | 17.5 | -4.3 | 1 | 38 |
| 12 | 17.5 | -5.5 | 1 | 39 |
| 16.7 1c | 17.5 | -0.8 | 1 | 40 |
| 14.3 | 17.5 | -3.2 | 1 | 41 |
| 16.9 | 17.5 | -0.6 | 1 | 42 |
| 15.2 | 17.5 | -2.3 | 1 | 43 |
| 17 | 17.5 | -0.5 | 1 | 44 |

| | | | | |
|---|---|---|---|---|
| 16 | 17.5 | -1.5 | 1 | 45 |
| | | | | |
| 14.9 | 16.6 | -1.7 | 1 | 46 |
| 13.9 | 16.6 | -2.7 | 1 | 47 |
| 13.4 | 16.6 | -3.2 | 1 | 48 |
| 12.5 | 16.6 | -4.1 | 1 | 49 |
| 12.3 | 16.6 | -4.3 | 1 | 50 |
| 10.6 | 16.6 | -6 | 1 | 51 |
| 10.5 | 16.6 | -6.1 | 1 | 52 |
| 9.2 | 16.6 | -7.4 | 1 | 53 |
| 9.9 | 16.6 | -6.7 | 1 | 54 |
| 9.8 | 16.6 | -6.8 | 1 | 55 |
| 13.1 | 16.6 | -3.5 | 1 | 56 |
| 22.3 | 16.6 | 5.7 | 2 | 56 |
| 10.2 2c | 16.6 | -6.4 | 2 | 57 |
| 11.2 1c | 16.6 | -5.4 | 2 | 58 |
| 13.2 | 16.6 | -3.4 | 2 | 59 |
| 12 | 16.6 | -4.6 | 2 | 60 |
| 16.7 1c | 16.6 | 0.1 | 3 | 60 |
| 14.3 | 16.6 | -2.3 | 3 | 61 |
| 16.9 | 16.6 | 0.3 | 4 | 61 |
| 15.2 | 16.6 | -1.4 | 4 | 62 |
| 17 | 16.6 | 0.4 | 5 | 62 |
| 16 | 16.6 | -0.6 | 5 | 63 |
| | | | | |
| 13.9 | 14.9 | -1 | 5 | 64 |
| 13.4 | 14.9 | -1.5 | 5 | 65 |
| 12.5 | 14.9 | -2.4 | 5 | 66 |
| 12.3 | 14.9 | -2.6 | 5 | 67 |
| 10.6 | 14.9 | -4.3 | 5 | 68 |
| 10.5 | 14.9 | -4.4 | 5 | 69 |
| 9.2 | 14.9 | -5.7 | 5 | 70 |
| 9.9 | 14.9 | -5 | 5 | 71 |
| 9.8 | 14.9 | -5.1 | 5 | 72 |
| 13.1 | 14.9 | -1.8 | 5 | 73 |
| 22.3 | 14.9 | 7.4 | 6 | 73 |
| 10.2 2c | 14.9 | -4.7 | 6 | 74 |
| 11.2 1c | 14.9 | -3.7 | 6 | 75 |
| 13.2 | 14.9 | -1.7 | 6 | 76 |
| 12 | 14.9 | -2.9 | 6 | 77 |
| 16.7 1c | 14.9 | 1.8 | 7 | 77 |
| 14.3 | 14.9 | -0.6 | 7 | 78 |
| 16.9 | 14.9 | 2 | 8 | 78 |
| 15.2 | 14.9 | 0.3 | 9 | 78 |
| 17 | 14.9 | 2.1 | 10 | 78 |
| 16 | 14.9 | 1.1 | 11 | 78 |
| | | | | |
| 13.4 | 13.9 | -0.5 | 11 | 79 |
| 12.5 | 13.9 | -1.4 | 11 | 80 |
| 12.3 | 13.9 | -1.6 | 11 | 81 |
| 10.6 | 13.9 | -3.3 | 11 | 82 |
| 10.5 | 13.9 | -3.4 | 11 | 83 |
| 9.2 | 13.9 | -4.7 | 11 | 84 |
| 9.9 | 13.9 | -4 | 11 | 85 |
| 9.8 | 13.9 | -4.1 | 11 | 86 |
| 13.1 | 13.9 | -0.8 | 11 | 87 |
| 22.3 | 13.9 | 8.4 | 12 | 87 |

| | | | | |
|---|---|---|---|---|
| 10.2 2c | 13.9 | -3.7 | 12 | 88 |
| 11.2 1c | 13.9 | -2.7 | 12 | 89 |
| 13.2 | 13.9 | -0.7 | 12 | 90 |
| 12 | 13.9 | -1.9 | 12 | 91 |
| 16.7 1c | 13.9 | 2.8 | 13 | 91 |
| 14.3 | 13.9 | 0.4 | 14 | 91 |
| 16.9 | 13.9 | 3 | 15 | 91 |
| 15.2 | 13.9 | 1.3 | 16 | 91 |
| 17 | 13.9 | 3.1 | 17 | 91 |
| 16 | 13.9 | 2.1 | 18 | 91 |
| | | | | |
| 12.5 | 13.4 | -0.9 | 18 | 92 |
| 12.3 | 13.4 | -1.1 | 18 | 93 |
| 10.6 | 13.4 | -2.8 | 18 | 94 |
| 10.5 | 13.4 | -2.9 | 18 | 95 |
| 9.2 | 13.4 | -4.2 | 18 | 96 |
| 9.9 | 13.4 | -3.5 | 18 | 97 |
| 9.8 | 13.4 | -3.6 | 18 | 98 |
| 13.1 | 13.4 | -0.3 | 18 | 99 |
| 22.3 | 13.4 | 8.9 | 19 | 99 |
| 10.2 2c | 13.4 | -3.2 | 19 | 100 |
| 11.2 1c | 13.4 | -2.2 | 19 | 101 |
| 13.2 | 13.4 | -0.2 | 19 | 102 |
| 12 | 13.4 | -1.4 | 19 | 103 |
| 16.7 1c | 13.4 | 3.3 | 20 | 103 |
| 14.3 | 13.4 | 0.9 | 21 | 103 |
| 16.9 | 13.4 | 3.5 | 22 | 103 |
| 15.2 | 13.4 | 1.8 | 23 | 103 |
| 17 | 13.4 | 3.6 | 24 | 103 |
| 16 | 13.4 | 2.6 | 25 | 103 |
| | | | | |
| 12.3 | 12.5 | -0.2 | 25 | 104 |
| 10.6 | 12.5 | -1.9 | 25 | 105 |
| 10.5 | 12.5 | -2 | 25 | 106 |
| 9.2 | 12.5 | -3.3 | 25 | 107 |
| 9.9 | 12.5 | -2.6 | 25 | 108 |
| 9.8 | 12.5 | -2.7 | 25 | 109 |
| 13.1 | 12.5 | 0.6 | 26 | 109 |
| 22.3 | 12.5 | 9.8 | 27 | 109 |
| 10.2 2c | 12.5 | -2.3 | 27 | 110 |
| 11.2 1c | 12.5 | -1.3 | 27 | 111 |
| 13.2 | 12.5 | 0.7 | 28 | 111 |
| 12 | 12.5 | -0.5 | 28 | 112 |
| 16.7 1c | 12.5 | 4.2 | 29 | 112 |
| 14.3 | 12.5 | 1.8 | 30 | 112 |
| 16.9 | 12.5 | 4.4 | 31 | 112 |
| 15.2 | 12.5 | 2.7 | 32 | 112 |
| 17 | 12.5 | 4.5 | 33 | 112 |
| 16 | 12.5 | 3.5 | 34 | 112 |
| | | | | |
| 10.6 | 12.3 | -1.7 | 34 | 113 |
| 10.5 | 12.3 | -1.8 | 34 | 114 |
| 9.2 | 12.3 | -3.1 | 34 | 115 |
| 9.9 | 12.3 | -2.4 | 34 | 116 |
| 9.8 | 12.3 | -2.5 | 34 | 117 |
| 13.1 | 12.3 | 0.8 | 35 | 117 |
| 22.3 | 12.3 | 10 | 36 | 117 |

| | | | | |
|---|---|---|---|---|
| 10.2 2c | 12.3 | -2.1 | 36 | 118 |
| 11.2 1c | 12.3 | -1.1 | 36 | 119 |
| 13.2 | 12.3 | 0.9 | 37 | 119 |
| 12 | 12.3 | -0.3 | 37 | 120 |
| 16.7 1c | 12.3 | 4.4 | 38 | 120 |
| 14.3 | 12.3 | 2 | 39 | 120 |
| 16.9 | 12.3 | 4.6 | 40 | 120 |
| 15.2 | 12.3 | 2.9 | 41 | 120 |
| 17 | 12.3 | 4.7 | 42 | 120 |
| 16 | 12.3 | 3.7 | 43 | 120 |
| | | | | |
| 10.5 | 10.6 | -0.1 | 43 | 121 |
| 9.2 | 10.6 | -1.4 | 43 | 122 |
| 9.9 | 10.6 | -0.7 | 43 | 123 |
| 9.8 | 10.6 | -0.8 | 43 | 124 |
| 13.1 | 10.6 | 2.5 | 44 | 124 |
| 22.3 | 10.6 | 11.7 | 45 | 124 |
| 10.2 2c | 10.6 | -0.4 | 45 | 125 |
| 11.2 1c | 10.6 | 0.6 | 46 | 125 |
| 13.2 | 10.6 | 2.6 | 47 | 125 |
| 12 | 10.6 | 1.4 | 48 | 125 |
| 16.7 1c | 10.6 | 6.1 | 49 | 125 |
| 14.3 | 10.6 | 3.7 | 50 | 125 |
| 16.9 | 10.6 | 6.3 | 51 | 125 |
| 15.2 | 10.6 | 4.6 | 52 | 125 |
| 17 | 10.6 | 6.4 | 53 | 125 |
| 16 | 10.6 | 5.4 | 54 | 125 |
| | | | | |
| 9.2 | 10.5 | -1.3 | 54 | 126 |
| 9.9 | 10.5 | -0.6 | 54 | 127 |
| 9.8 | 10.5 | -0.7 | 54 | 128 |
| 13.1 | 10.5 | 2.6 | 55 | 128 |
| 22.3 | 10.5 | 11.8 | 56 | 128 |
| 10.2 2c | 10.5 | -0.3 | 56 | 129 |
| 11.2 1c | 10.5 | 0.7 | 57 | 129 |
| 13.2 | 10.5 | 2.7 | 58 | 129 |
| 12 | 10.5 | 1.5 | 59 | 129 |
| 16.7 1c | 10.5 | 6.2 | 60 | 129 |
| 14.3 | 10.5 | 3.8 | 61 | 129 |
| 16.9 | 10.5 | 6.4 | 62 | 129 |
| 15.2 | 10.5 | 4.7 | 63 | 129 |
| 17 | 10.5 | 6.5 | 64 | 129 |
| 16 | 10.5 | 5.5 | 65 | 129 |
| | | | | |
| 9.9 | 9.2 | 0.7 | 66 | 129 |
| 9.8 | 9.2 | 0.6 | 67 | 129 |
| 13.1 | 9.2 | 3.9 | 68 | 129 |
| 22.3 | 9.2 | 13.1 | 69 | 129 |
| 10.2 2c | 9.2 | 1 | 70 | 129 |
| 11.2 1c | 9.2 | 2 | 71 | 129 |
| 13.2 | 9.2 | 4 | 72 | 129 |
| 12 | 9.2 | 2.8 | 73 | 129 |
| 16.7 1c | 9.2 | 7.5 | 74 | 129 |
| 14.3 | 9.2 | 5.1 | 75 | 129 |
| 16.9 | 9.2 | 7.7 | 76 | 129 |
| 15.2 | 9.2 | 6 | 77 | 129 |
| 17 | 9.2 | 7.8 | 78 | 129 |

| | | | | |
|---|---|---|---|---|
| 16 | 9.2 | 6.8 | 79 | 129 |
| | | | | |
| 9.8 | 9.9 | -0.1 | 79 | 130 |
| 13.1 | 9.9 | 3.2 | 80 | 130 |
| 22.3 | 9.9 | 12.4 | 81 | 130 |
| 10.2 2c | 9.9 | 0.3 | 82 | 130 |
| 11.2 1c | 9.9 | 1.3 | 83 | 130 |
| 13.2 | 9.9 | 3.3 | 84 | 130 |
| 12 | 9.9 | 2.1 | 85 | 130 |
| 16.7 1c | 9.9 | 6.8 | 86 | 130 |
| 14.3 | 9.9 | 4.4 | 87 | 130 |
| 16.9 | 9.9 | 7 | 88 | 130 |
| 15.2 | 9.9 | 5.3 | 89 | 130 |
| 17 | 9.9 | 7.1 | 90 | 130 |
| 16 | 9.9 | 6.1 | 91 | 130 |
| | | | | |
| 13.1 | 9.8 | 3.3 | 92 | 130 |
| 22.3 | 9.8 | 12.5 | 93 | 130 |
| 10.2 2c | 9.8 | 0.4 | 94 | 130 |
| 11.2 1c | 9.8 | 1.4 | 95 | 130 |
| 13.2 | 9.8 | 3.4 | 96 | 130 |
| 12 | 9.8 | 2.2 | 97 | 130 |
| 16.7 1c | 9.8 | 6.9 | 98 | 130 |
| 14.3 | 9.8 | 4.5 | 99 | 130 |
| 16.9 | 9.8 | 7.1 | 100 | 130 |
| 15.2 | 9.8 | 5.4 | 101 | 130 |
| 17 | 9.8 | 7.2 | 102 | 130 |
| 16 | 9.8 | 6.2 | 103 | 130 |
| | | | | |
| 22.3 | 13.1 | 9.2 | 104 | 130 |
| 10.2 2c | 13.1 | -2.9 | 104 | 131 |
| 11.2 1c | 13.1 | -1.9 | 104 | 132 |
| 13.2 | 13.1 | 0.1 | 105 | 132 |
| 12 | 13.1 | -1.1 | 105 | 133 |
| 16.7 1c | 13.1 | 3.6 | 106 | 133 |
| 14.3 | 13.1 | 1.2 | 107 | 133 |
| 16.9 | 13.1 | 3.8 | 108 | 133 |
| 15.2 | 13.1 | 2.1 | 109 | 133 |
| 17 | 13.1 | 3.9 | 110 | 133 |
| 16 | 13.1 | 2.9 | 111 | 133 |
| | | | | |
| 10.2 2c | 22.3 | -12.1 | 111 | 134 |
| 11.2 1c | 22.3 | -11.1 | 111 | 135 |
| 13.2 | 22.3 | -9.1 | 111 | 136 |
| 12 | 22.3 | -10.3 | 111 | 137 |
| 16.7 1c | 22.3 | -5.6 | 111 | 138 |
| 14.3 | 22.3 | -8 | 111 | 139 |
| 16.9 | 22.3 | -5.4 | 111 | 140 |
| 15.2 | 22.3 | -7.1 | 111 | 141 |
| 17 | 22.3 | -5.3 | 111 | 142 |
| 16 | 22.3 | -6.3 | 111 | 143 |
| | | | | |
| 11.2 1c | 10.2 2c | Same Date | 111 | 143 |
| 13.2 | 10.2 2c | 3 | 112 | 143 |
| 12 | 10.2 2c | 1.8 | 113 | 143 |
| 16.7 1c | 10.2 2c | 6.5 | 114 | 143 |
| 14.3 | 10.2 2c | 4.1 | 115 | 143 |

| | | | | |
|---|---|---|---|---|
| 16.9 | 10.2 2c | 6.7 | 116 | 143 |
| 15.2 | 10.2 2c | 5 | 117 | 143 |
| 17 | 10.2 2c | 6.8 | 118 | 143 |
| 16 | 10.2 2c | 5.8 | 119 | 143 |
| | | | | |
| 13.2 | 11.2 1c | 2 | 120 | 143 |
| 12 | 11.2 1c | 0.8 | 121 | 143 |
| 16.7 1c | 11.2 1c | 5.5 | 122 | 143 |
| 14.3 | 11.2 1c | 3.1 | 123 | 143 |
| 16.9 | 11.2 1c | 5.7 | 124 | 143 |
| 15.2 | 11.2 1c | 4 | 125 | 143 |
| 17 | 11.2 1c | 5.8 | 126 | 143 |
| 16 | 11.2 1c | 4.8 | 127 | 143 |
| | | | | |
| 12 | 13.2 | Same Date | 127 | 143 |
| 16.7 1c | 13.2 | 3.5 | 128 | 143 |
| 14.3 | 13.2 | 1.1 | 129 | 143 |
| 16.9 | 13.2 | 3.7 | 130 | 143 |
| 15.2 | 13.2 | 2 | 131 | 143 |
| 17 | 13.2 | 3.8 | 132 | 143 |
| 16 | 13.2 | 2.8 | 133 | 143 |
| | | | | |
| 16.7 1c | 12 | 4.7 | 134 | 143 |
| 14.3 | 12 | 2.3 | 135 | 143 |
| 16.9 | 12 | 4.9 | 136 | 143 |
| 15.2 | 12 | 3.2 | 137 | 143 |
| 17 | 12 | 5 | 138 | 143 |
| 16 | 12 | 4 | 139 | 143 |
| | | | | |
| 14.3 | 16.7 1c | -2.4 | 139 | 144 |
| 16.9 | 16.7 1c | 0.2 | 140 | 144 |
| 15.2 | 16.7 1c | -1.5 | 140 | 145 |
| 17 | 16.7 1c | 0.3 | 141 | 145 |
| 16 | 16.7 1c | -0.7 | 141 | 146 |
| | | | | |
| 16.9 | 14.3 | 2.6 | 142 | 146 |
| 15.2 | 14.3 | 0.9 | 143 | 146 |
| 17 | 14.3 | 2.7 | 144 | 146 |
| 16 | 14.3 | 1.7 | 145 | 146 |
| | | | | |
| 15.2 | 16.9 | -1.7 | 145 | 147 |
| 17 | 16.9 | 0.1 | 146 | 147 |
| 16 | 16.9 | -0.9 | 146 | 148 |
| | | | | |
| 17 | 15.2 | 1.8 | 147 | 148 |
| 16 | 15.2 | 0.8 | 148 | 148 |
| | | | | |
| 16 | 17 | -1 | 148 | 149 |

S Statistic = 148 - 149 = -1

| Tied Group | Value | Members |
|---|---|---|
| 1 | 22.3 | 2 |

| Time Period | Observations |
|---|---|
| 2/1/2017 | 1 |

| | |
|---|---|
| 3/1/2017 | 1 |
| 4/1/2017 | 1 |
| 5/1/2017 | 1 |
| 6/1/2017 | 1 |
| 7/1/2017 | 1 |
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |

There are 2 time periods with multiple data

---

A = 18
B = 36
C = 0
D = 0
E = 2
F = 4
a = 33000
b = 124200
c = 1200
Group Variance = 1830.34
Z-Score = 0
Comparison Level at 95% confidence level = 1.65463 (upward trend)
0 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RW11-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 1.8 J | 0.78 J | 1.02 | 1 | 0 |
| 5.3 | 0.78 J | 4.52 | 2 | 0 |
| 1.8 J | 0.78 J | 1.02 | 3 | 0 |
| 0.94 J | 0.78 J | 0.16 | 4 | 0 |
| 0.84 J | 0.78 J | 0.06 | 5 | 0 |
| 1.3 J | 0.78 J | 0.52 | 6 | 0 |
| 0.81 J | 0.78 J | 0.03 | 7 | 0 |
| ND<1.5 U | 0.78 J | 0.72 | 8 | 0 |
| 2.1 J | 0.78 J | 1.32 | 9 | 0 |
| 2.9 J | 0.78 J | 2.12 | 10 | 0 |
| 2.2 J | 0.78 J | 1.42 | 11 | 0 |
| 4.1 | 0.78 J | 3.32 | 12 | 0 |
| 66.3 | 0.78 J | 65.52 | 13 | 0 |
| 1.2 J | 0.78 J | 0.42 | 14 | 0 |
| 2.2 J2c | 0.78 J | 1.42 | 15 | 0 |
| 2.1 J1c | 0.78 J | 1.32 | 16 | 0 |
| 1 J | 0.78 J | 0.22 | 17 | 0 |
| 1.1 JB | 0.78 J | 0.32 | 18 | 0 |
| ND<1.5 U | 0.78 J | 0.72 | 19 | 0 |
| 1.9 J | 0.78 J | 1.12 | 20 | 0 |
| 2 J | 0.78 J | 1.22 | 21 | 0 |
| 2.5 J | 0.78 J | 1.72 | 22 | 0 |
| 2.2 J | 0.78 J | 1.42 | 23 | 0 |
| 2 J | 0.78 J | 1.22 | 24 | 0 |
| 3.4 | 0.78 J | 2.62 | 25 | 0 |
| ND<1 U | 0.78 J | 0.22 | 26 | 0 |
| 3.835 | 0.78 J | 3.055 | 27 | 0 |
| 0.0883 J | 0.78 J | -0.6917 | 27 | 1 |
| | | | | |
| 5.3 | 1.8 J | 3.5 | 28 | 1 |
| 1.8 J | 1.8 J | 0 | 28 | 1 |
| 0.94 J | 1.8 J | -0.86 | 28 | 2 |
| 0.84 J | 1.8 J | -0.96 | 28 | 3 |
| 1.3 J | 1.8 J | -0.5 | 28 | 4 |
| 0.81 J | 1.8 J | -0.99 | 28 | 5 |
| ND<1.5 U | 1.8 J | -0.3 | 28 | 6 |
| 2.1 J | 1.8 J | 0.3 | 29 | 6 |
| 2.9 J | 1.8 J | 1.1 | 30 | 6 |
| 2.2 J | 1.8 J | 0.4 | 31 | 6 |
| 4.1 | 1.8 J | 2.3 | 32 | 6 |
| 66.3 | 1.8 J | 64.5 | 33 | 6 |
| 1.2 J | 1.8 J | -0.6 | 33 | 7 |
| 2.2 J2c | 1.8 J | 0.4 | 34 | 7 |
| 2.1 J1c | 1.8 J | 0.3 | 35 | 7 |
| 1 J | 1.8 J | -0.8 | 35 | 8 |
| 1.1 JB | 1.8 J | -0.7 | 35 | 9 |
| ND<1.5 U | 1.8 J | -0.3 | 35 | 10 |

| | | | | |
|---|---|---|---|---|
| 1.9 J | 1.8 J | 0.1 | 36 | 10 |
| 2 J | 1.8 J | 0.2 | 37 | 10 |
| 2.5 J | 1.8 J | 0.7 | 38 | 10 |
| 2.2 J | 1.8 J | 0.4 | 39 | 10 |
| 2 J | 1.8 J | 0.2 | 40 | 10 |
| 3.4 | 1.8 J | 1.6 | 41 | 10 |
| ND<1 U | 1.8 J | -0.8 | 41 | 11 |
| 3.835 | 1.8 J | 2.035 | 42 | 11 |
| 0.0883 J | 1.8 J | -1.7117 | 42 | 12 |
| | | | | |
| 1.8 J | 5.3 | -3.5 | 42 | 13 |
| 0.94 J | 5.3 | -4.36 | 42 | 14 |
| 0.84 J | 5.3 | -4.46 | 42 | 15 |
| 1.3 J | 5.3 | -4 | 42 | 16 |
| 0.81 J | 5.3 | -4.49 | 42 | 17 |
| ND<1.5 U | 5.3 | -3.8 | 42 | 18 |
| 2.1 J | 5.3 | -3.2 | 42 | 19 |
| 2.9 J | 5.3 | -2.4 | 42 | 20 |
| 2.2 J | 5.3 | -3.1 | 42 | 21 |
| 4.1 | 5.3 | -1.2 | 42 | 22 |
| 66.3 | 5.3 | 61 | 43 | 22 |
| 1.2 J | 5.3 | -4.1 | 43 | 23 |
| 2.2 J2c | 5.3 | -3.1 | 43 | 24 |
| 2.1 J1c | 5.3 | -3.2 | 43 | 25 |
| 1 J | 5.3 | -4.3 | 43 | 26 |
| 1.1 JB | 5.3 | -4.2 | 43 | 27 |
| ND<1.5 U | 5.3 | -3.8 | 43 | 28 |
| 1.9 J | 5.3 | -3.4 | 43 | 29 |
| 2 J | 5.3 | -3.3 | 43 | 30 |
| 2.5 J | 5.3 | -2.8 | 43 | 31 |
| 2.2 J | 5.3 | -3.1 | 43 | 32 |
| 2 J | 5.3 | -3.3 | 43 | 33 |
| 3.4 | 5.3 | -1.9 | 43 | 34 |
| ND<1 U | 5.3 | -4.3 | 43 | 35 |
| 3.835 | 5.3 | -1.465 | 43 | 36 |
| 0.0883 J | 5.3 | -5.2117 | 43 | 37 |
| | | | | |
| 0.94 J | 1.8 J | -0.86 | 43 | 38 |
| 0.84 J | 1.8 J | -0.96 | 43 | 39 |
| 1.3 J | 1.8 J | -0.5 | 43 | 40 |
| 0.81 J | 1.8 J | -0.99 | 43 | 41 |
| ND<1.5 U | 1.8 J | -0.3 | 43 | 42 |
| 2.1 J | 1.8 J | 0.3 | 44 | 42 |
| 2.9 J | 1.8 J | 1.1 | 45 | 42 |
| 2.2 J | 1.8 J | 0.4 | 46 | 42 |
| 4.1 | 1.8 J | 2.3 | 47 | 42 |
| 66.3 | 1.8 J | 64.5 | 48 | 42 |
| 1.2 J | 1.8 J | -0.6 | 48 | 43 |
| 2.2 J2c | 1.8 J | 0.4 | 49 | 43 |
| 2.1 J1c | 1.8 J | 0.3 | 50 | 43 |
| 1 J | 1.8 J | -0.8 | 50 | 44 |
| 1.1 JB | 1.8 J | -0.7 | 50 | 45 |
| ND<1.5 U | 1.8 J | -0.3 | 50 | 46 |
| 1.9 J | 1.8 J | 0.1 | 51 | 46 |
| 2 J | 1.8 J | 0.2 | 52 | 46 |
| 2.5 J | 1.8 J | 0.7 | 53 | 46 |
| 2.2 J | 1.8 J | 0.4 | 54 | 46 |

| | | | | |
|---|---|---|---|---|
| 2 J | 1.8 J | 0.2 | 55 | 46 |
| 3.4 | 1.8 J | 1.6 | 56 | 46 |
| ND<1 U | 1.8 J | -0.8 | 56 | 47 |
| 3.835 | 1.8 J | 2.035 | 57 | 47 |
| 0.0883 J | 1.8 J | -1.7117 | 57 | 48 |
| | | | | |
| 0.84 J | 0.94 J | -0.1 | 57 | 49 |
| 1.3 J | 0.94 J | 0.36 | 58 | 49 |
| 0.81 J | 0.94 J | -0.13 | 58 | 50 |
| ND<1.5 U | 0.94 J | 0.56 | 59 | 50 |
| 2.1 J | 0.94 J | 1.16 | 60 | 50 |
| 2.9 J | 0.94 J | 1.96 | 61 | 50 |
| 2.2 J | 0.94 J | 1.26 | 62 | 50 |
| 4.1 | 0.94 J | 3.16 | 63 | 50 |
| 66.3 | 0.94 J | 65.36 | 64 | 50 |
| 1.2 J | 0.94 J | 0.26 | 65 | 50 |
| 2.2 J2c | 0.94 J | 1.26 | 66 | 50 |
| 2.1 J1c | 0.94 J | 1.16 | 67 | 50 |
| 1 J | 0.94 J | 0.06 | 68 | 50 |
| 1.1 JB | 0.94 J | 0.16 | 69 | 50 |
| ND<1.5 U | 0.94 J | 0.56 | 70 | 50 |
| 1.9 J | 0.94 J | 0.96 | 71 | 50 |
| 2 J | 0.94 J | 1.06 | 72 | 50 |
| 2.5 J | 0.94 J | 1.56 | 73 | 50 |
| 2.2 J | 0.94 J | 1.26 | 74 | 50 |
| 2 J | 0.94 J | 1.06 | 75 | 50 |
| 3.4 | 0.94 J | 2.46 | 76 | 50 |
| ND<1 U | 0.94 J | 0.06 | 77 | 50 |
| 3.835 | 0.94 J | 2.895 | 78 | 50 |
| 0.0883 J | 0.94 J | -0.8517 | 78 | 51 |
| | | | | |
| 1.3 J | 0.84 J | 0.46 | 79 | 51 |
| 0.81 J | 0.84 J | -0.03 | 79 | 52 |
| ND<1.5 U | 0.84 J | 0.66 | 80 | 52 |
| 2.1 J | 0.84 J | 1.26 | 81 | 52 |
| 2.9 J | 0.84 J | 2.06 | 82 | 52 |
| 2.2 J | 0.84 J | 1.36 | 83 | 52 |
| 4.1 | 0.84 J | 3.26 | 84 | 52 |
| 66.3 | 0.84 J | 65.46 | 85 | 52 |
| 1.2 J | 0.84 J | 0.36 | 86 | 52 |
| 2.2 J2c | 0.84 J | 1.36 | 87 | 52 |
| 2.1 J1c | 0.84 J | 1.26 | 88 | 52 |
| 1 J | 0.84 J | 0.16 | 89 | 52 |
| 1.1 JB | 0.84 J | 0.26 | 90 | 52 |
| ND<1.5 U | 0.84 J | 0.66 | 91 | 52 |
| 1.9 J | 0.84 J | 1.06 | 92 | 52 |
| 2 J | 0.84 J | 1.16 | 93 | 52 |
| 2.5 J | 0.84 J | 1.66 | 94 | 52 |
| 2.2 J | 0.84 J | 1.36 | 95 | 52 |
| 2 J | 0.84 J | 1.16 | 96 | 52 |
| 3.4 | 0.84 J | 2.56 | 97 | 52 |
| ND<1 U | 0.84 J | 0.16 | 98 | 52 |
| 3.835 | 0.84 J | 2.995 | 99 | 52 |
| 0.0883 J | 0.84 J | -0.7517 | 99 | 53 |
| | | | | |
| 0.81 J | 1.3 J | -0.49 | 99 | 54 |
| ND<1.5 U | 1.3 J | 0.2 | 100 | 54 |

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|---|---|---|---|---|
| 2.1 J | 1.3 J | 0.8 | 101 | 54 |
| 2.9 J | 1.3 J | 1.6 | 102 | 54 |
| 2.2 J | 1.3 J | 0.9 | 103 | 54 |
| 4.1 | 1.3 J | 2.8 | 104 | 54 |
| 66.3 | 1.3 J | 65 | 105 | 54 |
| 1.2 J | 1.3 J | -0.1 | 105 | 55 |
| 2.2 J2c | 1.3 J | 0.9 | 106 | 55 |
| 2.1 J1c | 1.3 J | 0.8 | 107 | 55 |
| 1 J | 1.3 J | -0.3 | 107 | 56 |
| 1.1 JB | 1.3 J | -0.2 | 107 | 57 |
| ND<1.5 U | 1.3 J | 0.2 | 108 | 57 |
| 1.9 J | 1.3 J | 0.6 | 109 | 57 |
| 2 J | 1.3 J | 0.7 | 110 | 57 |
| 2.5 J | 1.3 J | 1.2 | 111 | 57 |
| 2.2 J | 1.3 J | 0.9 | 112 | 57 |
| 2 J | 1.3 J | 0.7 | 113 | 57 |
| 3.4 | 1.3 J | 2.1 | 114 | 57 |
| ND<1 U | 1.3 J | -0.3 | 114 | 58 |
| 3.835 | 1.3 J | 2.535 | 115 | 58 |
| 0.0883 J | 1.3 J | -1.2117 | 115 | 59 |
| | | | | |
| ND<1.5 U | 0.81 J | 0.69 | 116 | 59 |
| 2.1 J | 0.81 J | 1.29 | 117 | 59 |
| 2.9 J | 0.81 J | 2.09 | 118 | 59 |
| 2.2 J | 0.81 J | 1.39 | 119 | 59 |
| 4.1 | 0.81 J | 3.29 | 120 | 59 |
| 66.3 | 0.81 J | 65.49 | 121 | 59 |
| 1.2 J | 0.81 J | 0.39 | 122 | 59 |
| 2.2 J2c | 0.81 J | 1.39 | 123 | 59 |
| 2.1 J1c | 0.81 J | 1.29 | 124 | 59 |
| 1 J | 0.81 J | 0.19 | 125 | 59 |
| 1.1 JB | 0.81 J | 0.29 | 126 | 59 |
| ND<1.5 U | 0.81 J | 0.69 | 127 | 59 |
| 1.9 J | 0.81 J | 1.09 | 128 | 59 |
| 2 J | 0.81 J | 1.19 | 129 | 59 |
| 2.5 J | 0.81 J | 1.69 | 130 | 59 |
| 2.2 J | 0.81 J | 1.39 | 131 | 59 |
| 2 J | 0.81 J | 1.19 | 132 | 59 |
| 3.4 | 0.81 J | 2.59 | 133 | 59 |
| ND<1 U | 0.81 J | 0.19 | 134 | 59 |
| 3.835 | 0.81 J | 3.025 | 135 | 59 |
| 0.0883 J | 0.81 J | -0.7217 | 135 | 60 |
| | | | | |
| 2.1 J | ND<1.5 U | 0.6 | 136 | 60 |
| 2.9 J | ND<1.5 U | 1.4 | 137 | 60 |
| 2.2 J | ND<1.5 U | 0.7 | 138 | 60 |
| 4.1 | ND<1.5 U | 2.6 | 139 | 60 |
| 66.3 | ND<1.5 U | 64.8 | 140 | 60 |
| 1.2 J | ND<1.5 U | -0.3 | 140 | 61 |
| 2.2 J2c | ND<1.5 U | 0.7 | 141 | 61 |
| 2.1 J1c | ND<1.5 U | 0.6 | 142 | 61 |
| 1 J | ND<1.5 U | -0.5 | 142 | 62 |
| 1.1 JB | ND<1.5 U | -0.4 | 142 | 63 |
| ND<1.5 U | ND<1.5 U | 0 | 142 | 63 |
| 1.9 J | ND<1.5 U | 0.4 | 143 | 63 |
| 2 J | ND<1.5 U | 0.5 | 144 | 63 |
| 2.5 J | ND<1.5 U | 1 | 145 | 63 |

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|---|---|---|---|---|
| 2.2 J | ND<1.5 U | 0.7 | 146 | 63 |
| 2 J | ND<1.5 U | 0.5 | 147 | 63 |
| 3.4 | ND<1.5 U | 1.9 | 148 | 63 |
| ND<1 U | ND<1.5 U | -0.5 | 148 | 64 |
| 3.835 | ND<1.5 U | 2.335 | 149 | 64 |
| 0.0883 J | ND<1.5 U | -1.4117 | 149 | 65 |
| | | | | |
| 2.9 J | 2.1 J | 0.8 | 150 | 65 |
| 2.2 J | 2.1 J | 0.1 | 151 | 65 |
| 4.1 | 2.1 J | 2 | 152 | 65 |
| 66.3 | 2.1 J | 64.2 | 153 | 65 |
| 1.2 J | 2.1 J | -0.9 | 153 | 66 |
| 2.2 J2c | 2.1 J | 0.1 | 154 | 66 |
| 2.1 J1c | 2.1 J | 0 | 154 | 66 |
| 1 J | 2.1 J | -1.1 | 154 | 67 |
| 1.1 JB | 2.1 J | -1 | 154 | 68 |
| ND<1.5 U | 2.1 J | -0.6 | 154 | 69 |
| 1.9 J | 2.1 J | -0.2 | 154 | 70 |
| 2 J | 2.1 J | -0.1 | 154 | 71 |
| 2.5 J | 2.1 J | 0.4 | 155 | 71 |
| 2.2 J | 2.1 J | 0.1 | 156 | 71 |
| 2 J | 2.1 J | -0.1 | 156 | 72 |
| 3.4 | 2.1 J | 1.3 | 157 | 72 |
| ND<1 U | 2.1 J | -1.1 | 157 | 73 |
| 3.835 | 2.1 J | 1.735 | 158 | 73 |
| 0.0883 J | 2.1 J | -2.0117 | 158 | 74 |
| | | | | |
| 2.2 J | 2.9 J | -0.7 | 158 | 75 |
| 4.1 | 2.9 J | 1.2 | 159 | 75 |
| 66.3 | 2.9 J | 63.4 | 160 | 75 |
| 1.2 J | 2.9 J | -1.7 | 160 | 76 |
| 2.2 J2c | 2.9 J | -0.7 | 160 | 77 |
| 2.1 J1c | 2.9 J | -0.8 | 160 | 78 |
| 1 J | 2.9 J | -1.9 | 160 | 79 |
| 1.1 JB | 2.9 J | -1.8 | 160 | 80 |
| ND<1.5 U | 2.9 J | -1.4 | 160 | 81 |
| 1.9 J | 2.9 J | -1 | 160 | 82 |
| 2 J | 2.9 J | -0.9 | 160 | 83 |
| 2.5 J | 2.9 J | -0.4 | 160 | 84 |
| 2.2 J | 2.9 J | -0.7 | 160 | 85 |
| 2 J | 2.9 J | -0.9 | 160 | 86 |
| 3.4 | 2.9 J | 0.5 | 161 | 86 |
| ND<1 U | 2.9 J | -1.9 | 161 | 87 |
| 3.835 | 2.9 J | 0.935 | 162 | 87 |
| 0.0883 J | 2.9 J | -2.8117 | 162 | 88 |
| | | | | |
| 4.1 | 2.2 J | 1.9 | 163 | 88 |
| 66.3 | 2.2 J | 64.1 | 164 | 88 |
| 1.2 J | 2.2 J | -1 | 164 | 89 |
| 2.2 J2c | 2.2 J | 0 | 164 | 89 |
| 2.1 J1c | 2.2 J | -0.1 | 164 | 90 |
| 1 J | 2.2 J | -1.2 | 164 | 91 |
| 1.1 JB | 2.2 J | -1.1 | 164 | 92 |
| ND<1.5 U | 2.2 J | -0.7 | 164 | 93 |
| 1.9 J | 2.2 J | -0.3 | 164 | 94 |
| 2 J | 2.2 J | -0.2 | 164 | 95 |
| 2.5 J | 2.2 J | 0.3 | 165 | 95 |

| | | | | |
|---|---|---|---|---|
| 2.2 J | 2.2 J | 0 | 165 | 95 |
| 2 J | 2.2 J | -0.2 | 165 | 96 |
| 3.4 | 2.2 J | 1.2 | 166 | 96 |
| ND<1 U | 2.2 J | -1.2 | 166 | 97 |
| 3.835 | 2.2 J | 1.635 | 167 | 97 |
| 0.0883 J | 2.2 J | -2.1117 | 167 | 98 |
| | | | | |
| 66.3 | 4.1 | 62.2 | 168 | 98 |
| 1.2 J | 4.1 | -2.9 | 168 | 99 |
| 2.2 J2c | 4.1 | -1.9 | 168 | 100 |
| 2.1 J1c | 4.1 | -2 | 168 | 101 |
| 1 J | 4.1 | -3.1 | 168 | 102 |
| 1.1 JB | 4.1 | -3 | 168 | 103 |
| ND<1.5 U | 4.1 | -2.6 | 168 | 104 |
| 1.9 J | 4.1 | -2.2 | 168 | 105 |
| 2 J | 4.1 | -2.1 | 168 | 106 |
| 2.5 J | 4.1 | -1.6 | 168 | 107 |
| 2.2 J | 4.1 | -1.9 | 168 | 108 |
| 2 J | 4.1 | -2.1 | 168 | 109 |
| 3.4 | 4.1 | -0.7 | 168 | 110 |
| ND<1 U | 4.1 | -3.1 | 168 | 111 |
| 3.835 | 4.1 | -0.265 | 168 | 112 |
| 0.0883 J | 4.1 | -4.0117 | 168 | 113 |
| | | | | |
| 1.2 J | 66.3 | -65.1 | 168 | 114 |
| 2.2 J2c | 66.3 | -64.1 | 168 | 115 |
| 2.1 J1c | 66.3 | -64.2 | 168 | 116 |
| 1 J | 66.3 | -65.3 | 168 | 117 |
| 1.1 JB | 66.3 | -65.2 | 168 | 118 |
| ND<1.5 U | 66.3 | -64.8 | 168 | 119 |
| 1.9 J | 66.3 | -64.4 | 168 | 120 |
| 2 J | 66.3 | -64.3 | 168 | 121 |
| 2.5 J | 66.3 | -63.8 | 168 | 122 |
| 2.2 J | 66.3 | -64.1 | 168 | 123 |
| 2 J | 66.3 | -64.3 | 168 | 124 |
| 3.4 | 66.3 | -62.9 | 168 | 125 |
| ND<1 U | 66.3 | -65.3 | 168 | 126 |
| 3.835 | 66.3 | -62.465 | 168 | 127 |
| 0.0883 J | 66.3 | -66.2117 | 168 | 128 |
| | | | | |
| 2.2 J2c | 1.2 J | 1 | 169 | 128 |
| 2.1 J1c | 1.2 J | 0.9 | 170 | 128 |
| 1 J | 1.2 J | -0.2 | 170 | 129 |
| 1.1 JB | 1.2 J | -0.1 | 170 | 130 |
| ND<1.5 U | 1.2 J | 0.3 | 171 | 130 |
| 1.9 J | 1.2 J | 0.7 | 172 | 130 |
| 2 J | 1.2 J | 0.8 | 173 | 130 |
| 2.5 J | 1.2 J | 1.3 | 174 | 130 |
| 2.2 J | 1.2 J | 1 | 175 | 130 |
| 2 J | 1.2 J | 0.8 | 176 | 130 |
| 3.4 | 1.2 J | 2.2 | 177 | 130 |
| ND<1 U | 1.2 J | -0.2 | 177 | 131 |
| 3.835 | 1.2 J | 2.635 | 178 | 131 |
| 0.0883 J | 1.2 J | -1.1117 | 178 | 132 |
| | | | | |
| 2.1 J1c | 2.2 J2c | Same Date | 178 | 132 |
| 1 J | 2.2 J2c | -1.2 | 178 | 133 |

| | | | | |
|---|---|---|---|---|
| 1.1 JB | 2.2 J2c | -1.1 | 178 | 134 |
| ND<1.5 U | 2.2 J2c | -0.7 | 178 | 135 |
| 1.9 J | 2.2 J2c | -0.3 | 178 | 136 |
| 2 J | 2.2 J2c | -0.2 | 178 | 137 |
| 2.5 J | 2.2 J2c | 0.3 | 179 | 137 |
| 2.2 J | 2.2 J2c | 0 | 179 | 137 |
| 2 J | 2.2 J2c | -0.2 | 179 | 138 |
| 3.4 | 2.2 J2c | 1.2 | 180 | 138 |
| ND<1 U | 2.2 J2c | -1.2 | 180 | 139 |
| 3.835 | 2.2 J2c | 1.635 | 181 | 139 |
| 0.0883 J | 2.2 J2c | -2.1117 | 181 | 140 |
| | | | | |
| 1 J | 2.1 J1c | -1.1 | 181 | 141 |
| 1.1 JB | 2.1 J1c | -1 | 181 | 142 |
| ND<1.5 U | 2.1 J1c | -0.6 | 181 | 143 |
| 1.9 J | 2.1 J1c | -0.2 | 181 | 144 |
| 2 J | 2.1 J1c | -0.1 | 181 | 145 |
| 2.5 J | 2.1 J1c | 0.4 | 182 | 145 |
| 2.2 J | 2.1 J1c | 0.1 | 183 | 145 |
| 2 J | 2.1 J1c | -0.1 | 183 | 146 |
| 3.4 | 2.1 J1c | 1.3 | 184 | 146 |
| ND<1 U | 2.1 J1c | -1.1 | 184 | 147 |
| 3.835 | 2.1 J1c | 1.735 | 185 | 147 |
| 0.0883 J | 2.1 J1c | -2.0117 | 185 | 148 |
| | | | | |
| 1.1 JB | 1 J | Same Date | 185 | 148 |
| ND<1.5 U | 1 J | 0.5 | 186 | 148 |
| 1.9 J | 1 J | 0.9 | 187 | 148 |
| 2 J | 1 J | 1 | 188 | 148 |
| 2.5 J | 1 J | 1.5 | 189 | 148 |
| 2.2 J | 1 J | 1.2 | 190 | 148 |
| 2 J | 1 J | 1 | 191 | 148 |
| 3.4 | 1 J | 2.4 | 192 | 148 |
| ND<1 U | 1 J | 0 | 192 | 148 |
| 3.835 | 1 J | 2.835 | 193 | 148 |
| 0.0883 J | 1 J | -0.9117 | 193 | 149 |
| | | | | |
| ND<1.5 U | 1.1 JB | 0.4 | 194 | 149 |
| 1.9 J | 1.1 JB | 0.8 | 195 | 149 |
| 2 J | 1.1 JB | 0.9 | 196 | 149 |
| 2.5 J | 1.1 JB | 1.4 | 197 | 149 |
| 2.2 J | 1.1 JB | 1.1 | 198 | 149 |
| 2 J | 1.1 JB | 0.9 | 199 | 149 |
| 3.4 | 1.1 JB | 2.3 | 200 | 149 |
| ND<1 U | 1.1 JB | -0.1 | 200 | 150 |
| 3.835 | 1.1 JB | 2.735 | 201 | 150 |
| 0.0883 J | 1.1 JB | -1.0117 | 201 | 151 |
| | | | | |
| 1.9 J | ND<1.5 U | 0.4 | 202 | 151 |
| 2 J | ND<1.5 U | 0.5 | 203 | 151 |
| 2.5 J | ND<1.5 U | 1 | 204 | 151 |
| 2.2 J | ND<1.5 U | 0.7 | 205 | 151 |
| 2 J | ND<1.5 U | 0.5 | 206 | 151 |
| 3.4 | ND<1.5 U | 1.9 | 207 | 151 |
| ND<1 U | ND<1.5 U | -0.5 | 207 | 152 |
| 3.835 | ND<1.5 U | 2.335 | 208 | 152 |
| 0.0883 J | ND<1.5 U | -1.4117 | 208 | 153 |

| | | | | |
|---|---|---|---|---|
| 2 J | 1.9 J | 0.1 | 209 | 153 |
| 2.5 J | 1.9 J | 0.6 | 210 | 153 |
| 2.2 J | 1.9 J | 0.3 | 211 | 153 |
| 2 J | 1.9 J | 0.1 | 212 | 153 |
| 3.4 | 1.9 J | 1.5 | 213 | 153 |
| ND<1 U | 1.9 J | -0.9 | 213 | 154 |
| 3.835 | 1.9 J | 1.935 | 214 | 154 |
| 0.0883 J | 1.9 J | -1.8117 | 214 | 155 |
| 2.5 J | 2 J | 0.5 | 215 | 155 |
| 2.2 J | 2 J | 0.2 | 216 | 155 |
| 2 J | 2 J | 0 | 216 | 155 |
| 3.4 | 2 J | 1.4 | 217 | 155 |
| ND<1 U | 2 J | -1 | 217 | 156 |
| 3.835 | 2 J | 1.835 | 218 | 156 |
| 0.0883 J | 2 J | -1.9117 | 218 | 157 |
| 2.2 J | 2.5 J | -0.3 | 218 | 158 |
| 2 J | 2.5 J | -0.5 | 218 | 159 |
| 3.4 | 2.5 J | 0.9 | 219 | 159 |
| ND<1 U | 2.5 J | -1.5 | 219 | 160 |
| 3.835 | 2.5 J | 1.335 | 220 | 160 |
| 0.0883 J | 2.5 J | -2.4117 | 220 | 161 |
| 2 J | 2.2 J | -0.2 | 220 | 162 |
| 3.4 | 2.2 J | 1.2 | 221 | 162 |
| ND<1 U | 2.2 J | -1.2 | 221 | 163 |
| 3.835 | 2.2 J | 1.635 | 222 | 163 |
| 0.0883 J | 2.2 J | -2.1117 | 222 | 164 |
| 3.4 | 2 J | 1.4 | 223 | 164 |
| ND<1 U | 2 J | -1 | 223 | 165 |
| 3.835 | 2 J | 1.835 | 224 | 165 |
| 0.0883 J | 2 J | -1.9117 | 224 | 166 |
| ND<1 U | 3.4 | -2.4 | 224 | 167 |
| 3.835 | 3.4 | 0.435 | 225 | 167 |
| 0.0883 J | 3.4 | -3.3117 | 225 | 168 |
| 3.835 | ND<1 U | 2.835 | 226 | 168 |
| 0.0883 J | ND<1 U | -0.9117 | 226 | 169 |
| 0.0883 J | 3.835 | -3.7467 | 226 | 170 |

S Statistic = 226 - 170 = 56

| Tied Group | Value | Members |
|---|---|---|
| 1 | 1.8 | 2 |
| 2 | 1.5 | 2 |
| 3 | 2.1 | 2 |
| 4 | 2.2 | 3 |
| 5 | 1 | 2 |
| 6 | 2 | 2 |

| Time Period | Observations |
|---|---|

| | |
|---|---|
| 2/1/2017 | 1 |
| 3/1/2017 | 1 |
| 4/1/2017 | 1 |
| 5/1/2017 | 1 |
| 6/1/2017 | 1 |
| 7/1/2017 | 1 |
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 3/1/2022 | 1 |
| 3/1/2023 | 1 |
| 3/1/2024 | 1 |

There are 2 time periods with multiple data

---

A = 156
B = 36
C = 6
D = 0
E = 16
F = 4
a = 51156
b = 197316
c = 1624
Group Variance = 2831.37
Z-Score = 1.03363
Comparison Level at 95% confidence level = 1.65463 (upward trend)
1.03363 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RW12-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 12.6 | 29.7 | -17.1 | 0 | 1 |
| 7 | 29.7 | -22.7 | 0 | 2 |
| 5.1 | 29.7 | -24.6 | 0 | 3 |
| 11.3 | 29.7 | -18.4 | 0 | 4 |
| 193 | 29.7 | 163.3 | 1 | 4 |
| 4.2 | 29.7 | -25.5 | 1 | 5 |
| 11.7 | 29.7 | -18 | 1 | 6 |
| 11 | 29.7 | -18.7 | 1 | 7 |
| 5.2 | 29.7 | -24.5 | 1 | 8 |
| 2.3 J | 29.7 | -27.4 | 1 | 9 |
| 6.6 | 29.7 | -23.1 | 1 | 10 |
| 7.3 | 29.7 | -22.4 | 1 | 11 |
| 4.4 | 29.7 | -25.3 | 1 | 12 |
| 2.1 J | 29.7 | -27.6 | 1 | 13 |
| 3.2 | 29.7 | -26.5 | 1 | 14 |
| 2.5 J | 29.7 | -27.2 | 1 | 15 |
| 5.2 | 29.7 | -24.5 | 1 | 16 |
| ND<0.5 U | 29.7 | -29.2 | 1 | 17 |
| ND<1 UR1M1 | 29.7 | -28.7 | 1 | 18 |
| 3.048 | 29.7 | -26.652 | 1 | 19 |
| 10.99 | 29.7 | -18.71 | 1 | 20 |
| 8.661 | 29.7 | -21.039 | 1 | 21 |
| 5.974 | 29.7 | -23.726 | 1 | 22 |
| 2.8 | 29.7 | -26.9 | 1 | 23 |
| | | | | |
| 7 | 12.6 | -5.6 | 1 | 24 |
| 5.1 | 12.6 | -7.5 | 1 | 25 |
| 11.3 | 12.6 | -1.3 | 1 | 26 |
| 193 | 12.6 | 180.4 | 2 | 26 |
| 4.2 | 12.6 | -8.4 | 2 | 27 |
| 11.7 | 12.6 | -0.9 | 2 | 28 |
| 11 | 12.6 | -1.6 | 2 | 29 |
| 5.2 | 12.6 | -7.4 | 2 | 30 |
| 2.3 J | 12.6 | -10.3 | 2 | 31 |
| 6.6 | 12.6 | -6 | 2 | 32 |
| 7.3 | 12.6 | -5.3 | 2 | 33 |
| 4.4 | 12.6 | -8.2 | 2 | 34 |
| 2.1 J | 12.6 | -10.5 | 2 | 35 |
| 3.2 | 12.6 | -9.4 | 2 | 36 |
| 2.5 J | 12.6 | -10.1 | 2 | 37 |
| 5.2 | 12.6 | -7.4 | 2 | 38 |
| ND<0.5 U | 12.6 | -12.1 | 2 | 39 |
| ND<1 UR1M1 | 12.6 | -11.6 | 2 | 40 |
| 3.048 | 12.6 | -9.552 | 2 | 41 |
| 10.99 | 12.6 | -1.61 | 2 | 42 |
| 8.661 | 12.6 | -3.939 | 2 | 43 |
| 5.974 | 12.6 | -6.626 | 2 | 44 |

| | | | | |
|---|---|---|---|---|
| 2.8 | 12.6 | -9.8 | 2 | 45 |
| | | | | |
| 5.1 | 7 | -1.9 | 2 | 46 |
| 11.3 | 7 | 4.3 | 3 | 46 |
| 193 | 7 | 186 | 4 | 46 |
| 4.2 | 7 | -2.8 | 4 | 47 |
| 11.7 | 7 | 4.7 | 5 | 47 |
| 11 | 7 | 4 | 6 | 47 |
| 5.2 | 7 | -1.8 | 6 | 48 |
| 2.3 J | 7 | -4.7 | 6 | 49 |
| 6.6 | 7 | -0.4 | 6 | 50 |
| 7.3 | 7 | 0.3 | 7 | 50 |
| 4.4 | 7 | -2.6 | 7 | 51 |
| 2.1 J | 7 | -4.9 | 7 | 52 |
| 3.2 | 7 | -3.8 | 7 | 53 |
| 2.5 J | 7 | -4.5 | 7 | 54 |
| 5.2 | 7 | -1.8 | 7 | 55 |
| ND<0.5 U | 7 | -6.5 | 7 | 56 |
| ND<1 UR1M1 | 7 | -6 | 7 | 57 |
| 3.048 | 7 | -3.952 | 7 | 58 |
| 10.99 | 7 | 3.99 | 8 | 58 |
| 8.661 | 7 | 1.661 | 9 | 58 |
| 5.974 | 7 | -1.026 | 9 | 59 |
| 2.8 | 7 | -4.2 | 9 | 60 |
| | | | | |
| 11.3 | 5.1 | 6.2 | 10 | 60 |
| 193 | 5.1 | 187.9 | 11 | 60 |
| 4.2 | 5.1 | -0.9 | 11 | 61 |
| 11.7 | 5.1 | 6.6 | 12 | 61 |
| 11 | 5.1 | 5.9 | 13 | 61 |
| 5.2 | 5.1 | 0.1 | 14 | 61 |
| 2.3 J | 5.1 | -2.8 | 14 | 62 |
| 6.6 | 5.1 | 1.5 | 15 | 62 |
| 7.3 | 5.1 | 2.2 | 16 | 62 |
| 4.4 | 5.1 | -0.7 | 16 | 63 |
| 2.1 J | 5.1 | -3 | 16 | 64 |
| 3.2 | 5.1 | -1.9 | 16 | 65 |
| 2.5 J | 5.1 | -2.6 | 16 | 66 |
| 5.2 | 5.1 | 0.1 | 17 | 66 |
| ND<0.5 U | 5.1 | -4.6 | 17 | 67 |
| ND<1 UR1M1 | 5.1 | -4.1 | 17 | 68 |
| 3.048 | 5.1 | -2.052 | 17 | 69 |
| 10.99 | 5.1 | 5.89 | 18 | 69 |
| 8.661 | 5.1 | 3.561 | 19 | 69 |
| 5.974 | 5.1 | 0.874 | 20 | 69 |
| 2.8 | 5.1 | -2.3 | 20 | 70 |
| | | | | |
| 193 | 11.3 | 181.7 | 21 | 70 |
| 4.2 | 11.3 | -7.1 | 21 | 71 |
| 11.7 | 11.3 | 0.4 | 22 | 71 |
| 11 | 11.3 | -0.3 | 22 | 72 |
| 5.2 | 11.3 | -6.1 | 22 | 73 |
| 2.3 J | 11.3 | -9 | 22 | 74 |
| 6.6 | 11.3 | -4.7 | 22 | 75 |
| 7.3 | 11.3 | -4 | 22 | 76 |
| 4.4 | 11.3 | -6.9 | 22 | 77 |
| 2.1 J | 11.3 | -9.2 | 22 | 78 |

| | | | | |
|---|---|---|---|---|
| 3.2 | 11.3 | -8.1 | 22 | 79 |
| 2.5 J | 11.3 | -8.8 | 22 | 80 |
| 5.2 | 11.3 | -6.1 | 22 | 81 |
| ND<0.5 U | 11.3 | -10.8 | 22 | 82 |
| ND<1 UR1M1 | 11.3 | -10.3 | 22 | 83 |
| 3.048 | 11.3 | -8.252 | 22 | 84 |
| 10.99 | 11.3 | -0.31 | 22 | 85 |
| 8.661 | 11.3 | -2.639 | 22 | 86 |
| 5.974 | 11.3 | -5.326 | 22 | 87 |
| 2.8 | 11.3 | -8.5 | 22 | 88 |
| | | | | |
| 4.2 | 193 | -188.8 | 22 | 89 |
| 11.7 | 193 | -181.3 | 22 | 90 |
| 11 | 193 | -182 | 22 | 91 |
| 5.2 | 193 | -187.8 | 22 | 92 |
| 2.3 J | 193 | -190.7 | 22 | 93 |
| 6.6 | 193 | -186.4 | 22 | 94 |
| 7.3 | 193 | -185.7 | 22 | 95 |
| 4.4 | 193 | -188.6 | 22 | 96 |
| 2.1 J | 193 | -190.9 | 22 | 97 |
| 3.2 | 193 | -189.8 | 22 | 98 |
| 2.5 J | 193 | -190.5 | 22 | 99 |
| 5.2 | 193 | -187.8 | 22 | 100 |
| ND<0.5 U | 193 | -192.5 | 22 | 101 |
| ND<1 UR1M1 | 193 | -192 | 22 | 102 |
| 3.048 | 193 | -189.952 | 22 | 103 |
| 10.99 | 193 | -182.01 | 22 | 104 |
| 8.661 | 193 | -184.339 | 22 | 105 |
| 5.974 | 193 | -187.026 | 22 | 106 |
| 2.8 | 193 | -190.2 | 22 | 107 |
| | | | | |
| 11.7 | 4.2 | 7.5 | 23 | 107 |
| 11 | 4.2 | 6.8 | 24 | 107 |
| 5.2 | 4.2 | 1 | 25 | 107 |
| 2.3 J | 4.2 | -1.9 | 25 | 108 |
| 6.6 | 4.2 | 2.4 | 26 | 108 |
| 7.3 | 4.2 | 3.1 | 27 | 108 |
| 4.4 | 4.2 | 0.2 | 28 | 108 |
| 2.1 J | 4.2 | -2.1 | 28 | 109 |
| 3.2 | 4.2 | -1 | 28 | 110 |
| 2.5 J | 4.2 | -1.7 | 28 | 111 |
| 5.2 | 4.2 | 1 | 29 | 111 |
| ND<0.5 U | 4.2 | -3.7 | 29 | 112 |
| ND<1 UR1M1 | 4.2 | -3.2 | 29 | 113 |
| 3.048 | 4.2 | -1.152 | 29 | 114 |
| 10.99 | 4.2 | 6.79 | 30 | 114 |
| 8.661 | 4.2 | 4.461 | 31 | 114 |
| 5.974 | 4.2 | 1.774 | 32 | 114 |
| 2.8 | 4.2 | -1.4 | 32 | 115 |
| | | | | |
| 11 | 11.7 | -0.7 | 32 | 116 |
| 5.2 | 11.7 | -6.5 | 32 | 117 |
| 2.3 J | 11.7 | -9.4 | 32 | 118 |
| 6.6 | 11.7 | -5.1 | 32 | 119 |
| 7.3 | 11.7 | -4.4 | 32 | 120 |
| 4.4 | 11.7 | -7.3 | 32 | 121 |
| 2.1 J | 11.7 | -9.6 | 32 | 122 |

| | | | | |
|---|---|---|---|---|
| 3.2 | 11.7 | -8.5 | 32 | 123 |
| 2.5 J | 11.7 | -9.2 | 32 | 124 |
| 5.2 | 11.7 | -6.5 | 32 | 125 |
| ND<0.5 U | 11.7 | -11.2 | 32 | 126 |
| ND<1 UR1M1 | 11.7 | -10.7 | 32 | 127 |
| 3.048 | 11.7 | -8.652 | 32 | 128 |
| 10.99 | 11.7 | -0.71 | 32 | 129 |
| 8.661 | 11.7 | -3.039 | 32 | 130 |
| 5.974 | 11.7 | -5.726 | 32 | 131 |
| 2.8 | 11.7 | -8.9 | 32 | 132 |
| | | | | |
| 5.2 | 11 | -5.8 | 32 | 133 |
| 2.3 J | 11 | -8.7 | 32 | 134 |
| 6.6 | 11 | -4.4 | 32 | 135 |
| 7.3 | 11 | -3.7 | 32 | 136 |
| 4.4 | 11 | -6.6 | 32 | 137 |
| 2.1 J | 11 | -8.9 | 32 | 138 |
| 3.2 | 11 | -7.8 | 32 | 139 |
| 2.5 J | 11 | -8.5 | 32 | 140 |
| 5.2 | 11 | -5.8 | 32 | 141 |
| ND<0.5 U | 11 | -10.5 | 32 | 142 |
| ND<1 UR1M1 | 11 | -10 | 32 | 143 |
| 3.048 | 11 | -7.952 | 32 | 144 |
| 10.99 | 11 | -0.01 | 32 | 145 |
| 8.661 | 11 | -2.339 | 32 | 146 |
| 5.974 | 11 | -5.026 | 32 | 147 |
| 2.8 | 11 | -8.2 | 32 | 148 |
| | | | | |
| 2.3 J | 5.2 | -2.9 | 32 | 149 |
| 6.6 | 5.2 | 1.4 | 33 | 149 |
| 7.3 | 5.2 | 2.1 | 34 | 149 |
| 4.4 | 5.2 | -0.8 | 34 | 150 |
| 2.1 J | 5.2 | -3.1 | 34 | 151 |
| 3.2 | 5.2 | -2 | 34 | 152 |
| 2.5 J | 5.2 | -2.7 | 34 | 153 |
| 5.2 | 5.2 | 0 | 34 | 153 |
| ND<0.5 U | 5.2 | -4.7 | 34 | 154 |
| ND<1 UR1M1 | 5.2 | -4.2 | 34 | 155 |
| 3.048 | 5.2 | -2.152 | 34 | 156 |
| 10.99 | 5.2 | 5.79 | 35 | 156 |
| 8.661 | 5.2 | 3.461 | 36 | 156 |
| 5.974 | 5.2 | 0.774 | 37 | 156 |
| 2.8 | 5.2 | -2.4 | 37 | 157 |
| | | | | |
| 6.6 | 2.3 J | 4.3 | 38 | 157 |
| 7.3 | 2.3 J | 5 | 39 | 157 |
| 4.4 | 2.3 J | 2.1 | 40 | 157 |
| 2.1 J | 2.3 J | -0.2 | 40 | 158 |
| 3.2 | 2.3 J | 0.9 | 41 | 158 |
| 2.5 J | 2.3 J | 0.2 | 42 | 158 |
| 5.2 | 2.3 J | 2.9 | 43 | 158 |
| ND<0.5 U | 2.3 J | -1.8 | 43 | 159 |
| ND<1 UR1M1 | 2.3 J | -1.3 | 43 | 160 |
| 3.048 | 2.3 J | 0.748 | 44 | 160 |
| 10.99 | 2.3 J | 8.69 | 45 | 160 |
| 8.661 | 2.3 J | 6.361 | 46 | 160 |
| 5.974 | 2.3 J | 3.674 | 47 | 160 |

| | | | | |
|---|---|---|---|---|
| 2.8 | 2.3 J | 0.5 | 48 | 160 |
| | | | | |
| 7.3 | 6.6 | Same Date | 48 | 160 |
| 4.4 | 6.6 | -2.2 | 48 | 161 |
| 2.1 J | 6.6 | -4.5 | 48 | 162 |
| 3.2 | 6.6 | -3.4 | 48 | 163 |
| 2.5 J | 6.6 | -4.1 | 48 | 164 |
| 5.2 | 6.6 | -1.4 | 48 | 165 |
| ND<0.5 U | 6.6 | -6.1 | 48 | 166 |
| ND<1 UR1M1 | 6.6 | -5.6 | 48 | 167 |
| 3.048 | 6.6 | -3.552 | 48 | 168 |
| 10.99 | 6.6 | 4.39 | 49 | 168 |
| 8.661 | 6.6 | 2.061 | 50 | 168 |
| 5.974 | 6.6 | -0.626 | 50 | 169 |
| 2.8 | 6.6 | -3.8 | 50 | 170 |
| | | | | |
| 4.4 | 7.3 | -2.9 | 50 | 171 |
| 2.1 J | 7.3 | -5.2 | 50 | 172 |
| 3.2 | 7.3 | -4.1 | 50 | 173 |
| 2.5 J | 7.3 | -4.8 | 50 | 174 |
| 5.2 | 7.3 | -2.1 | 50 | 175 |
| ND<0.5 U | 7.3 | -6.8 | 50 | 176 |
| ND<1 UR1M1 | 7.3 | -6.3 | 50 | 177 |
| 3.048 | 7.3 | -4.252 | 50 | 178 |
| 10.99 | 7.3 | 3.69 | 51 | 178 |
| 8.661 | 7.3 | 1.361 | 52 | 178 |
| 5.974 | 7.3 | -1.326 | 52 | 179 |
| 2.8 | 7.3 | -4.5 | 52 | 180 |
| | | | | |
| 2.1 J | 4.4 | Same Date | 52 | 180 |
| 3.2 | 4.4 | -1.2 | 52 | 181 |
| 2.5 J | 4.4 | -1.9 | 52 | 182 |
| 5.2 | 4.4 | 0.8 | 53 | 182 |
| ND<0.5 U | 4.4 | -3.9 | 53 | 183 |
| ND<1 UR1M1 | 4.4 | -3.4 | 53 | 184 |
| 3.048 | 4.4 | -1.352 | 53 | 185 |
| 10.99 | 4.4 | 6.59 | 54 | 185 |
| 8.661 | 4.4 | 4.261 | 55 | 185 |
| 5.974 | 4.4 | 1.574 | 56 | 185 |
| 2.8 | 4.4 | -1.6 | 56 | 186 |
| | | | | |
| 3.2 | 2.1 J | 1.1 | 57 | 186 |
| 2.5 J | 2.1 J | 0.4 | 58 | 186 |
| 5.2 | 2.1 J | 3.1 | 59 | 186 |
| ND<0.5 U | 2.1 J | -1.6 | 59 | 187 |
| ND<1 UR1M1 | 2.1 J | -1.1 | 59 | 188 |
| 3.048 | 2.1 J | 0.948 | 60 | 188 |
| 10.99 | 2.1 J | 8.89 | 61 | 188 |
| 8.661 | 2.1 J | 6.561 | 62 | 188 |
| 5.974 | 2.1 J | 3.874 | 63 | 188 |
| 2.8 | 2.1 J | 0.7 | 64 | 188 |
| | | | | |
| 2.5 J | 3.2 | -0.7 | 64 | 189 |
| 5.2 | 3.2 | 2 | 65 | 189 |
| ND<0.5 U | 3.2 | -2.7 | 65 | 190 |
| ND<1 UR1M1 | 3.2 | -2.2 | 65 | 191 |
| 3.048 | 3.2 | -0.152 | 65 | 192 |

| | | | | |
|---|---|---|---|---|
| 10.99 | 3.2 | 7.79 | 66 | 192 |
| 8.661 | 3.2 | 5.461 | 67 | 192 |
| 5.974 | 3.2 | 2.774 | 68 | 192 |
| 2.8 | 3.2 | -0.4 | 68 | 193 |
| | | | | |
| 5.2 | 2.5 J | 2.7 | 69 | 193 |
| ND<0.5 U | 2.5 J | -2 | 69 | 194 |
| ND<1 UR1M1 | 2.5 J | -1.5 | 69 | 195 |
| 3.048 | 2.5 J | 0.548 | 70 | 195 |
| 10.99 | 2.5 J | 8.49 | 71 | 195 |
| 8.661 | 2.5 J | 6.161 | 72 | 195 |
| 5.974 | 2.5 J | 3.474 | 73 | 195 |
| 2.8 | 2.5 J | 0.3 | 74 | 195 |
| | | | | |
| ND<0.5 U | 5.2 | -4.7 | 74 | 196 |
| ND<1 UR1M1 | 5.2 | -4.2 | 74 | 197 |
| 3.048 | 5.2 | -2.152 | 74 | 198 |
| 10.99 | 5.2 | 5.79 | 75 | 198 |
| 8.661 | 5.2 | 3.461 | 76 | 198 |
| 5.974 | 5.2 | 0.774 | 77 | 198 |
| 2.8 | 5.2 | -2.4 | 77 | 199 |
| | | | | |
| ND<1 UR1M1 | ND<0.5 U | 0.5 | 78 | 199 |
| 3.048 | ND<0.5 U | 2.548 | 79 | 199 |
| 10.99 | ND<0.5 U | 10.49 | 80 | 199 |
| 8.661 | ND<0.5 U | 8.161 | 81 | 199 |
| 5.974 | ND<0.5 U | 5.474 | 82 | 199 |
| 2.8 | ND<0.5 U | 2.3 | 83 | 199 |
| | | | | |
| 3.048 | ND<1 UR1M1 | 2.048 | 84 | 199 |
| 10.99 | ND<1 UR1M1 | 9.99 | 85 | 199 |
| 8.661 | ND<1 UR1M1 | 7.661 | 86 | 199 |
| 5.974 | ND<1 UR1M1 | 4.974 | 87 | 199 |
| 2.8 | ND<1 UR1M1 | 1.8 | 88 | 199 |
| | | | | |
| 10.99 | 3.048 | 7.942 | 89 | 199 |
| 8.661 | 3.048 | 5.613 | 90 | 199 |
| 5.974 | 3.048 | 2.926 | 91 | 199 |
| 2.8 | 3.048 | -0.248 | 91 | 200 |
| | | | | |
| 8.661 | 10.99 | -2.329 | 91 | 201 |
| 5.974 | 10.99 | -5.016 | 91 | 202 |
| 2.8 | 10.99 | -8.19 | 91 | 203 |
| | | | | |
| 5.974 | 8.661 | -2.687 | 91 | 204 |
| 2.8 | 8.661 | -5.861 | 91 | 205 |
| | | | | |
| 2.8 | 5.974 | -3.174 | 91 | 206 |

S Statistic = 91 - 206 = -115

| Tied Group | Value | Members |
|---|---|---|
| 1 | 5.2 | 2 |

| Time Period | Observations |
|---|---|
| 6/1/2017 | 1 |

| | |
|---|---|
| 7/1/2017 | 1 |
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 6/1/2020 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 2 time periods with multiple data

---

A = 18
B = 36
C = 0
D = 0
E = 2
F = 4
a = 33000
b = 124200
c = 1200
Group Variance = 1830.34
Z-Score = -2.66464
Comparison Level at 95% confidence level = 1.65463 (upward trend)
-2.66464 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RW14-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 1780 | 1520 | 260 | 1 | 0 |
| 1700 | 1520 | 180 | 2 | 0 |
| 1750 | 1520 | 230 | 3 | 0 |
| 2390 | 1520 | 870 | 4 | 0 |
| 2820 | 1520 | 1300 | 5 | 0 |
| 2800 | 1520 | 1280 | 6 | 0 |
| 3220 | 1520 | 1700 | 7 | 0 |
| 3630 | 1520 | 2110 | 8 | 0 |
| 3840 | 1520 | 2320 | 9 | 0 |
| 2960 | 1520 | 1440 | 10 | 0 |
| 2980 | 1520 | 1460 | 11 | 0 |
| 3000 | 1520 | 1480 | 12 | 0 |
| 3000 | 1520 | 1480 | 13 | 0 |
| 3450 | 1520 | 1930 | 14 | 0 |
| 3990 | 1520 | 2470 | 15 | 0 |
| 3020 | 1520 | 1500 | 16 | 0 |
| 3590 | 1520 | 2070 | 17 | 0 |
| 3240 | 1520 | 1720 | 18 | 0 |
| 3020 | 1520 | 1500 | 19 | 0 |
| | | | | |
| 1700 | 1780 | -80 | 19 | 1 |
| 1750 | 1780 | -30 | 19 | 2 |
| 2390 | 1780 | 610 | 20 | 2 |
| 2820 | 1780 | 1040 | 21 | 2 |
| 2800 | 1780 | 1020 | 22 | 2 |
| 3220 | 1780 | 1440 | 23 | 2 |
| 3630 | 1780 | 1850 | 24 | 2 |
| 3840 | 1780 | 2060 | 25 | 2 |
| 2960 | 1780 | 1180 | 26 | 2 |
| 2980 | 1780 | 1200 | 27 | 2 |
| 3000 | 1780 | 1220 | 28 | 2 |
| 3000 | 1780 | 1220 | 29 | 2 |
| 3450 | 1780 | 1670 | 30 | 2 |
| 3990 | 1780 | 2210 | 31 | 2 |
| 3020 | 1780 | 1240 | 32 | 2 |
| 3590 | 1780 | 1810 | 33 | 2 |
| 3240 | 1780 | 1460 | 34 | 2 |
| 3020 | 1780 | 1240 | 35 | 2 |
| | | | | |
| 1750 | 1700 | 50 | 36 | 2 |
| 2390 | 1700 | 690 | 37 | 2 |
| 2820 | 1700 | 1120 | 38 | 2 |
| 2800 | 1700 | 1100 | 39 | 2 |
| 3220 | 1700 | 1520 | 40 | 2 |
| 3630 | 1700 | 1930 | 41 | 2 |
| 3840 | 1700 | 2140 | 42 | 2 |
| 2960 | 1700 | 1260 | 43 | 2 |

| | | | | |
|---|---|---|---|---|
| 2980 | 1700 | 1280 | 44 | 2 |
| 3000 | 1700 | 1300 | 45 | 2 |
| 3000 | 1700 | 1300 | 46 | 2 |
| 3450 | 1700 | 1750 | 47 | 2 |
| 3990 | 1700 | 2290 | 48 | 2 |
| 3020 | 1700 | 1320 | 49 | 2 |
| 3590 | 1700 | 1890 | 50 | 2 |
| 3240 | 1700 | 1540 | 51 | 2 |
| 3020 | 1700 | 1320 | 52 | 2 |
| | | | | |
| 2390 | 1750 | 640 | 53 | 2 |
| 2820 | 1750 | 1070 | 54 | 2 |
| 2800 | 1750 | 1050 | 55 | 2 |
| 3220 | 1750 | 1470 | 56 | 2 |
| 3630 | 1750 | 1880 | 57 | 2 |
| 3840 | 1750 | 2090 | 58 | 2 |
| 2960 | 1750 | 1210 | 59 | 2 |
| 2980 | 1750 | 1230 | 60 | 2 |
| 3000 | 1750 | 1250 | 61 | 2 |
| 3000 | 1750 | 1250 | 62 | 2 |
| 3450 | 1750 | 1700 | 63 | 2 |
| 3990 | 1750 | 2240 | 64 | 2 |
| 3020 | 1750 | 1270 | 65 | 2 |
| 3590 | 1750 | 1840 | 66 | 2 |
| 3240 | 1750 | 1490 | 67 | 2 |
| 3020 | 1750 | 1270 | 68 | 2 |
| | | | | |
| 2820 | 2390 | 430 | 69 | 2 |
| 2800 | 2390 | 410 | 70 | 2 |
| 3220 | 2390 | 830 | 71 | 2 |
| 3630 | 2390 | 1240 | 72 | 2 |
| 3840 | 2390 | 1450 | 73 | 2 |
| 2960 | 2390 | 570 | 74 | 2 |
| 2980 | 2390 | 590 | 75 | 2 |
| 3000 | 2390 | 610 | 76 | 2 |
| 3000 | 2390 | 610 | 77 | 2 |
| 3450 | 2390 | 1060 | 78 | 2 |
| 3990 | 2390 | 1600 | 79 | 2 |
| 3020 | 2390 | 630 | 80 | 2 |
| 3590 | 2390 | 1200 | 81 | 2 |
| 3240 | 2390 | 850 | 82 | 2 |
| 3020 | 2390 | 630 | 83 | 2 |
| | | | | |
| 2800 | 2820 | -20 | 83 | 3 |
| 3220 | 2820 | 400 | 84 | 3 |
| 3630 | 2820 | 810 | 85 | 3 |
| 3840 | 2820 | 1020 | 86 | 3 |
| 2960 | 2820 | 140 | 87 | 3 |
| 2980 | 2820 | 160 | 88 | 3 |
| 3000 | 2820 | 180 | 89 | 3 |
| 3000 | 2820 | 180 | 90 | 3 |
| 3450 | 2820 | 630 | 91 | 3 |
| 3990 | 2820 | 1170 | 92 | 3 |
| 3020 | 2820 | 200 | 93 | 3 |
| 3590 | 2820 | 770 | 94 | 3 |
| 3240 | 2820 | 420 | 95 | 3 |
| 3020 | 2820 | 200 | 96 | 3 |

| | | | | |
|---|---|---|---|---|
| 3220 | 2800 | 420 | 97 | 3 |
| 3630 | 2800 | 830 | 98 | 3 |
| 3840 | 2800 | 1040 | 99 | 3 |
| 2960 | 2800 | 160 | 100 | 3 |
| 2980 | 2800 | 180 | 101 | 3 |
| 3000 | 2800 | 200 | 102 | 3 |
| 3000 | 2800 | 200 | 103 | 3 |
| 3450 | 2800 | 650 | 104 | 3 |
| 3990 | 2800 | 1190 | 105 | 3 |
| 3020 | 2800 | 220 | 106 | 3 |
| 3590 | 2800 | 790 | 107 | 3 |
| 3240 | 2800 | 440 | 108 | 3 |
| 3020 | 2800 | 220 | 109 | 3 |
| | | | | |
| 3630 | 3220 | 410 | 110 | 3 |
| 3840 | 3220 | 620 | 111 | 3 |
| 2960 | 3220 | -260 | 111 | 4 |
| 2980 | 3220 | -240 | 111 | 5 |
| 3000 | 3220 | -220 | 111 | 6 |
| 3000 | 3220 | -220 | 111 | 7 |
| 3450 | 3220 | 230 | 112 | 7 |
| 3990 | 3220 | 770 | 113 | 7 |
| 3020 | 3220 | -200 | 113 | 8 |
| 3590 | 3220 | 370 | 114 | 8 |
| 3240 | 3220 | 20 | 115 | 8 |
| 3020 | 3220 | -200 | 115 | 9 |
| | | | | |
| 3840 | 3630 | 210 | 116 | 9 |
| 2960 | 3630 | -670 | 116 | 10 |
| 2980 | 3630 | -650 | 116 | 11 |
| 3000 | 3630 | -630 | 116 | 12 |
| 3000 | 3630 | -630 | 116 | 13 |
| 3450 | 3630 | -180 | 116 | 14 |
| 3990 | 3630 | 360 | 117 | 14 |
| 3020 | 3630 | -610 | 117 | 15 |
| 3590 | 3630 | -40 | 117 | 16 |
| 3240 | 3630 | -390 | 117 | 17 |
| 3020 | 3630 | -610 | 117 | 18 |
| | | | | |
| 2960 | 3840 | -880 | 117 | 19 |
| 2980 | 3840 | -860 | 117 | 20 |
| 3000 | 3840 | -840 | 117 | 21 |
| 3000 | 3840 | -840 | 117 | 22 |
| 3450 | 3840 | -390 | 117 | 23 |
| 3990 | 3840 | 150 | 118 | 23 |
| 3020 | 3840 | -820 | 118 | 24 |
| 3590 | 3840 | -250 | 118 | 25 |
| 3240 | 3840 | -600 | 118 | 26 |
| 3020 | 3840 | -820 | 118 | 27 |
| | | | | |
| 2980 | 2960 | Same Date | 118 | 27 |
| 3000 | 2960 | 40 | 119 | 27 |
| 3000 | 2960 | 40 | 120 | 27 |
| 3450 | 2960 | 490 | 121 | 27 |
| 3990 | 2960 | 1030 | 122 | 27 |
| 3020 | 2960 | 60 | 123 | 27 |

| | | | | |
|---|---|---|---|---|
| 3590 | 2960 | 630 | 124 | 27 |
| 3240 | 2960 | 280 | 125 | 27 |
| 3020 | 2960 | 60 | 126 | 27 |
| | | | | |
| 3000 | 2980 | 20 | 127 | 27 |
| 3000 | 2980 | 20 | 128 | 27 |
| 3450 | 2980 | 470 | 129 | 27 |
| 3990 | 2980 | 1010 | 130 | 27 |
| 3020 | 2980 | 40 | 131 | 27 |
| 3590 | 2980 | 610 | 132 | 27 |
| 3240 | 2980 | 260 | 133 | 27 |
| 3020 | 2980 | 40 | 134 | 27 |
| | | | | |
| 3000 | 3000 | Same Date | 134 | 27 |
| 3450 | 3000 | 450 | 135 | 27 |
| 3990 | 3000 | 990 | 136 | 27 |
| 3020 | 3000 | 20 | 137 | 27 |
| 3590 | 3000 | 590 | 138 | 27 |
| 3240 | 3000 | 240 | 139 | 27 |
| 3020 | 3000 | 20 | 140 | 27 |
| | | | | |
| 3450 | 3000 | 450 | 141 | 27 |
| 3990 | 3000 | 990 | 142 | 27 |
| 3020 | 3000 | 20 | 143 | 27 |
| 3590 | 3000 | 590 | 144 | 27 |
| 3240 | 3000 | 240 | 145 | 27 |
| 3020 | 3000 | 20 | 146 | 27 |
| | | | | |
| 3990 | 3450 | 540 | 147 | 27 |
| 3020 | 3450 | -430 | 147 | 28 |
| 3590 | 3450 | 140 | 148 | 28 |
| 3240 | 3450 | -210 | 148 | 29 |
| 3020 | 3450 | -430 | 148 | 30 |
| | | | | |
| 3020 | 3990 | -970 | 148 | 31 |
| 3590 | 3990 | -400 | 148 | 32 |
| 3240 | 3990 | -750 | 148 | 33 |
| 3020 | 3990 | -970 | 148 | 34 |
| | | | | |
| 3590 | 3020 | 570 | 149 | 34 |
| 3240 | 3020 | 220 | 150 | 34 |
| 3020 | 3020 | 0 | 150 | 34 |
| | | | | |
| 3240 | 3590 | -350 | 150 | 35 |
| 3020 | 3590 | -570 | 150 | 36 |
| | | | | |
| 3020 | 3240 | -220 | 150 | 37 |

S Statistic = 150 - 37 = 113

| Tied Group | Value | Members |
|---|---|---|
| 1 | 3000 | 2 |
| 2 | 3020 | 2 |

| Time Period | Observations |
|---|---|
| 6/1/2017 | 1 |

| | |
|---|---|
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |

There are 2 time periods with multiple data

---

A = 36
B = 36
C = 0
D = 0
E = 4
F = 4
a = 17100
b = 61560
c = 760
Group Variance = 946.021
Z-Score = 3.64139
Comparison Level at 95% confidence level = 1.65463 (upward trend)
**3.64139 > 1.65463 indicating an upward trend**

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RW15-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 29.9 | 12.2 | 17.7 | 1 | 0 |
| 25.3 | 12.2 | 13.1 | 2 | 0 |
| 63 | 12.2 | 50.8 | 3 | 0 |
| 55 | 12.2 | 42.8 | 4 | 0 |
| 40.7 | 12.2 | 28.5 | 5 | 0 |
| 41.2 | 12.2 | 29 | 6 | 0 |
| 38.5 | 12.2 | 26.3 | 7 | 0 |
| 78.1 1c | 12.2 | 65.9 | 8 | 0 |
| 15.4 | 12.2 | 3.2 | 9 | 0 |
| 22.7 | 12.2 | 10.5 | 10 | 0 |
| 20.6 | 12.2 | 8.4 | 11 | 0 |
| 19.1 | 12.2 | 6.9 | 12 | 0 |
| 7.4 | 12.2 | -4.8 | 12 | 1 |
| 8.5 | 12.2 | -3.7 | 12 | 2 |
| 4.3 | 12.2 | -7.9 | 12 | 3 |
| ND<1.5 U | 12.2 | -10.7 | 12 | 4 |
| 0.51 J | 12.2 | -11.69 | 12 | 5 |
| ND<1.5 U | 12.2 | -10.7 | 12 | 6 |
| | | | | |
| 25.3 | 29.9 | -4.6 | 12 | 7 |
| 63 | 29.9 | 33.1 | 13 | 7 |
| 55 | 29.9 | 25.1 | 14 | 7 |
| 40.7 | 29.9 | 10.8 | 15 | 7 |
| 41.2 | 29.9 | 11.3 | 16 | 7 |
| 38.5 | 29.9 | 8.6 | 17 | 7 |
| 78.1 1c | 29.9 | 48.2 | 18 | 7 |
| 15.4 | 29.9 | -14.5 | 18 | 8 |
| 22.7 | 29.9 | -7.2 | 18 | 9 |
| 20.6 | 29.9 | -9.3 | 18 | 10 |
| 19.1 | 29.9 | -10.8 | 18 | 11 |
| 7.4 | 29.9 | -22.5 | 18 | 12 |
| 8.5 | 29.9 | -21.4 | 18 | 13 |
| 4.3 | 29.9 | -25.6 | 18 | 14 |
| ND<1.5 U | 29.9 | -28.4 | 18 | 15 |
| 0.51 J | 29.9 | -29.39 | 18 | 16 |
| ND<1.5 U | 29.9 | -28.4 | 18 | 17 |
| | | | | |
| 63 | 25.3 | 37.7 | 19 | 17 |
| 55 | 25.3 | 29.7 | 20 | 17 |
| 40.7 | 25.3 | 15.4 | 21 | 17 |
| 41.2 | 25.3 | 15.9 | 22 | 17 |
| 38.5 | 25.3 | 13.2 | 23 | 17 |
| 78.1 1c | 25.3 | 52.8 | 24 | 17 |
| 15.4 | 25.3 | -9.9 | 24 | 18 |
| 22.7 | 25.3 | -2.6 | 24 | 19 |
| 20.6 | 25.3 | -4.7 | 24 | 20 |
| 19.1 | 25.3 | -6.2 | 24 | 21 |

| | | | | |
|---|---|---|---|---|
| 7.4 | 25.3 | -17.9 | 24 | 22 |
| 8.5 | 25.3 | -16.8 | 24 | 23 |
| 4.3 | 25.3 | -21 | 24 | 24 |
| ND<1.5 U | 25.3 | -23.8 | 24 | 25 |
| 0.51 J | 25.3 | -24.79 | 24 | 26 |
| ND<1.5 U | 25.3 | -23.8 | 24 | 27 |
| | | | | |
| 55 | 63 | -8 | 24 | 28 |
| 40.7 | 63 | -22.3 | 24 | 29 |
| 41.2 | 63 | -21.8 | 24 | 30 |
| 38.5 | 63 | -24.5 | 24 | 31 |
| 78.1 1c | 63 | 15.1 | 25 | 31 |
| 15.4 | 63 | -47.6 | 25 | 32 |
| 22.7 | 63 | -40.3 | 25 | 33 |
| 20.6 | 63 | -42.4 | 25 | 34 |
| 19.1 | 63 | -43.9 | 25 | 35 |
| 7.4 | 63 | -55.6 | 25 | 36 |
| 8.5 | 63 | -54.5 | 25 | 37 |
| 4.3 | 63 | -58.7 | 25 | 38 |
| ND<1.5 U | 63 | -61.5 | 25 | 39 |
| 0.51 J | 63 | -62.49 | 25 | 40 |
| ND<1.5 U | 63 | -61.5 | 25 | 41 |
| | | | | |
| 40.7 | 55 | -14.3 | 25 | 42 |
| 41.2 | 55 | -13.8 | 25 | 43 |
| 38.5 | 55 | -16.5 | 25 | 44 |
| 78.1 1c | 55 | 23.1 | 26 | 44 |
| 15.4 | 55 | -39.6 | 26 | 45 |
| 22.7 | 55 | -32.3 | 26 | 46 |
| 20.6 | 55 | -34.4 | 26 | 47 |
| 19.1 | 55 | -35.9 | 26 | 48 |
| 7.4 | 55 | -47.6 | 26 | 49 |
| 8.5 | 55 | -46.5 | 26 | 50 |
| 4.3 | 55 | -50.7 | 26 | 51 |
| ND<1.5 U | 55 | -53.5 | 26 | 52 |
| 0.51 J | 55 | -54.49 | 26 | 53 |
| ND<1.5 U | 55 | -53.5 | 26 | 54 |
| | | | | |
| 41.2 | 40.7 | 0.5 | 27 | 54 |
| 38.5 | 40.7 | -2.2 | 27 | 55 |
| 78.1 1c | 40.7 | 37.4 | 28 | 55 |
| 15.4 | 40.7 | -25.3 | 28 | 56 |
| 22.7 | 40.7 | -18 | 28 | 57 |
| 20.6 | 40.7 | -20.1 | 28 | 58 |
| 19.1 | 40.7 | -21.6 | 28 | 59 |
| 7.4 | 40.7 | -33.3 | 28 | 60 |
| 8.5 | 40.7 | -32.2 | 28 | 61 |
| 4.3 | 40.7 | -36.4 | 28 | 62 |
| ND<1.5 U | 40.7 | -39.2 | 28 | 63 |
| 0.51 J | 40.7 | -40.19 | 28 | 64 |
| ND<1.5 U | 40.7 | -39.2 | 28 | 65 |
| | | | | |
| 38.5 | 41.2 | -2.7 | 28 | 66 |
| 78.1 1c | 41.2 | 36.9 | 29 | 66 |
| 15.4 | 41.2 | -25.8 | 29 | 67 |
| 22.7 | 41.2 | -18.5 | 29 | 68 |
| 20.6 | 41.2 | -20.6 | 29 | 69 |

| | | | | |
|---|---|---|---|---|
| 19.1 | 41.2 | -22.1 | 29 | 70 |
| 7.4 | 41.2 | -33.8 | 29 | 71 |
| 8.5 | 41.2 | -32.7 | 29 | 72 |
| 4.3 | 41.2 | -36.9 | 29 | 73 |
| ND<1.5 U | 41.2 | -39.7 | 29 | 74 |
| 0.51 J | 41.2 | -40.69 | 29 | 75 |
| ND<1.5 U | 41.2 | -39.7 | 29 | 76 |
| | | | | |
| 78.1 1c | 38.5 | 39.6 | 30 | 76 |
| 15.4 | 38.5 | -23.1 | 30 | 77 |
| 22.7 | 38.5 | -15.8 | 30 | 78 |
| 20.6 | 38.5 | -17.9 | 30 | 79 |
| 19.1 | 38.5 | -19.4 | 30 | 80 |
| 7.4 | 38.5 | -31.1 | 30 | 81 |
| 8.5 | 38.5 | -30 | 30 | 82 |
| 4.3 | 38.5 | -34.2 | 30 | 83 |
| ND<1.5 U | 38.5 | -37 | 30 | 84 |
| 0.51 J | 38.5 | -37.99 | 30 | 85 |
| ND<1.5 U | 38.5 | -37 | 30 | 86 |
| | | | | |
| 15.4 | 78.1 1c | -62.7 | 30 | 87 |
| 22.7 | 78.1 1c | -55.4 | 30 | 88 |
| 20.6 | 78.1 1c | -57.5 | 30 | 89 |
| 19.1 | 78.1 1c | -59 | 30 | 90 |
| 7.4 | 78.1 1c | -70.7 | 30 | 91 |
| 8.5 | 78.1 1c | -69.6 | 30 | 92 |
| 4.3 | 78.1 1c | -73.8 | 30 | 93 |
| ND<1.5 U | 78.1 1c | -76.6 | 30 | 94 |
| 0.51 J | 78.1 1c | -77.59 | 30 | 95 |
| ND<1.5 U | 78.1 1c | -76.6 | 30 | 96 |
| | | | | |
| 22.7 | 15.4 | Same Date | 30 | 96 |
| 20.6 | 15.4 | 5.2 | 31 | 96 |
| 19.1 | 15.4 | 3.7 | 32 | 96 |
| 7.4 | 15.4 | -8 | 32 | 97 |
| 8.5 | 15.4 | -6.9 | 32 | 98 |
| 4.3 | 15.4 | -11.1 | 32 | 99 |
| ND<1.5 U | 15.4 | -13.9 | 32 | 100 |
| 0.51 J | 15.4 | -14.89 | 32 | 101 |
| ND<1.5 U | 15.4 | -13.9 | 32 | 102 |
| | | | | |
| 20.6 | 22.7 | -2.1 | 32 | 103 |
| 19.1 | 22.7 | -3.6 | 32 | 104 |
| 7.4 | 22.7 | -15.3 | 32 | 105 |
| 8.5 | 22.7 | -14.2 | 32 | 106 |
| 4.3 | 22.7 | -18.4 | 32 | 107 |
| ND<1.5 U | 22.7 | -21.2 | 32 | 108 |
| 0.51 J | 22.7 | -22.19 | 32 | 109 |
| ND<1.5 U | 22.7 | -21.2 | 32 | 110 |
| | | | | |
| 19.1 | 20.6 | Same Date | 32 | 110 |
| 7.4 | 20.6 | -13.2 | 32 | 111 |
| 8.5 | 20.6 | -12.1 | 32 | 112 |
| 4.3 | 20.6 | -16.3 | 32 | 113 |
| ND<1.5 U | 20.6 | -19.1 | 32 | 114 |
| 0.51 J | 20.6 | -20.09 | 32 | 115 |
| ND<1.5 U | 20.6 | -19.1 | 32 | 116 |

| | | | | |
|---|---|---|---|---|
| 7.4 | 19.1 | -11.7 | 32 | 117 |
| 8.5 | 19.1 | -10.6 | 32 | 118 |
| 4.3 | 19.1 | -14.8 | 32 | 119 |
| ND<1.5 U | 19.1 | -17.6 | 32 | 120 |
| 0.51 J | 19.1 | -18.59 | 32 | 121 |
| ND<1.5 U | 19.1 | -17.6 | 32 | 122 |
| | | | | |
| 8.5 | 7.4 | 1.1 | 33 | 122 |
| 4.3 | 7.4 | -3.1 | 33 | 123 |
| ND<1.5 U | 7.4 | -5.9 | 33 | 124 |
| 0.51 J | 7.4 | -6.89 | 33 | 125 |
| ND<1.5 U | 7.4 | -5.9 | 33 | 126 |
| | | | | |
| 4.3 | 8.5 | -4.2 | 33 | 127 |
| ND<1.5 U | 8.5 | -7 | 33 | 128 |
| 0.51 J | 8.5 | -7.99 | 33 | 129 |
| ND<1.5 U | 8.5 | -7 | 33 | 130 |
| | | | | |
| ND<1.5 U | 4.3 | -2.8 | 33 | 131 |
| 0.51 J | 4.3 | -3.79 | 33 | 132 |
| ND<1.5 U | 4.3 | -2.8 | 33 | 133 |
| | | | | |
| 0.51 J | ND<1.5 U | -0.99 | 33 | 134 |
| ND<1.5 U | ND<1.5 U | 0 | 33 | 134 |
| | | | | |
| ND<1.5 U | 0.51 J | 0.99 | 34 | 134 |

S Statistic = 34 - 134 = -100

| Tied Group | Value | Members |
|---|---|---|
| 1 | 1.5 | 2 |

| Time Period | Observations |
|---|---|
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |

There are 2 time periods with multiple data

A = 18
B = 36
C = 0

D = 0
E = 2
F = 4
a = 14706
b = 52326
c = 684
Group Variance = 814.012
Z-Score = -3.46992
Comparison Level at 95% confidence level = 1.65463 (upward trend)
-3.46992 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RW16-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 13.5 | 22.9 | -9.4 | 0 | 1 |
| 11.9 | 22.9 | -11 | 0 | 2 |
| 64.1 | 22.9 | 41.2 | 1 | 2 |
| ND<1.5 U | 22.9 | -21.4 | 1 | 3 |
| ND<1.5 U | 22.9 | -21.4 | 1 | 4 |
| ND<1.5 U | 22.9 | -21.4 | 1 | 5 |
| ND<1.5 U | 22.9 | -21.4 | 1 | 6 |
| ND<1.5 U | 22.9 | -21.4 | 1 | 7 |
| ND<1.5 U | 22.9 | -21.4 | 1 | 8 |
| ND<1.5 U | 22.9 | -21.4 | 1 | 9 |
| ND<1.5 U | 22.9 | -21.4 | 1 | 10 |
| ND<1.5 U | 22.9 | -21.4 | 1 | 11 |
| ND<1.5 U | 22.9 | -21.4 | 1 | 12 |
| ND<1.5 U | 22.9 | -21.4 | 1 | 13 |
| ND<1.5 U | 22.9 | -21.4 | 1 | 14 |
| ND<1.5 U | 22.9 | -21.4 | 1 | 15 |
| 0.36 J | 22.9 | -22.54 | 1 | 16 |
| ND<1.5 U | 22.9 | -21.4 | 1 | 17 |
| ND<1.5 U | 22.9 | -21.4 | 1 | 18 |
| ND<1.5 U | 22.9 | -21.4 | 1 | 19 |
| ND<1.5 U | 22.9 | -21.4 | 1 | 20 |
| ND<1.5 U | 22.9 | -21.4 | 1 | 21 |
| ND<1 U | 22.9 | -21.9 | 1 | 22 |
| ND<0.1 U | 22.9 | -22.8 | 1 | 23 |
| 0.0662 J | 22.9 | -22.8338 | 1 | 24 |
| | | | | |
| 11.9 | 13.5 | -1.6 | 1 | 25 |
| 64.1 | 13.5 | 50.6 | 2 | 25 |
| ND<1.5 U | 13.5 | -12 | 2 | 26 |
| ND<1.5 U | 13.5 | -12 | 2 | 27 |
| ND<1.5 U | 13.5 | -12 | 2 | 28 |
| ND<1.5 U | 13.5 | -12 | 2 | 29 |
| ND<1.5 U | 13.5 | -12 | 2 | 30 |
| ND<1.5 U | 13.5 | -12 | 2 | 31 |
| ND<1.5 U | 13.5 | -12 | 2 | 32 |
| ND<1.5 U | 13.5 | -12 | 2 | 33 |
| ND<1.5 U | 13.5 | -12 | 2 | 34 |
| ND<1.5 U | 13.5 | -12 | 2 | 35 |
| ND<1.5 U | 13.5 | -12 | 2 | 36 |
| ND<1.5 U | 13.5 | -12 | 2 | 37 |
| ND<1.5 U | 13.5 | -12 | 2 | 38 |
| 0.36 J | 13.5 | -13.14 | 2 | 39 |
| ND<1.5 U | 13.5 | -12 | 2 | 40 |
| ND<1.5 U | 13.5 | -12 | 2 | 41 |
| ND<1.5 U | 13.5 | -12 | 2 | 42 |
| ND<1.5 U | 13.5 | -12 | 2 | 43 |
| ND<1.5 U | 13.5 | -12 | 2 | 44 |

| | | | | |
|---|---|---|---|---|
| ND<1 U | 13.5 | -12.5 | 2 | 45 |
| ND<0.1 U | 13.5 | -13.4 | 2 | 46 |
| 0.0662 J | 13.5 | -13.4338 | 2 | 47 |
| | | | | |
| 64.1 | 11.9 | 52.2 | 3 | 47 |
| ND<1.5 U | 11.9 | -10.4 | 3 | 48 |
| ND<1.5 U | 11.9 | -10.4 | 3 | 49 |
| ND<1.5 U | 11.9 | -10.4 | 3 | 50 |
| ND<1.5 U | 11.9 | -10.4 | 3 | 51 |
| ND<1.5 U | 11.9 | -10.4 | 3 | 52 |
| ND<1.5 U | 11.9 | -10.4 | 3 | 53 |
| ND<1.5 U | 11.9 | -10.4 | 3 | 54 |
| ND<1.5 U | 11.9 | -10.4 | 3 | 55 |
| ND<1.5 U | 11.9 | -10.4 | 3 | 56 |
| ND<1.5 U | 11.9 | -10.4 | 3 | 57 |
| ND<1.5 U | 11.9 | -10.4 | 3 | 58 |
| ND<1.5 U | 11.9 | -10.4 | 3 | 59 |
| ND<1.5 U | 11.9 | -10.4 | 3 | 60 |
| 0.36 J | 11.9 | -11.54 | 3 | 61 |
| ND<1.5 U | 11.9 | -10.4 | 3 | 62 |
| ND<1.5 U | 11.9 | -10.4 | 3 | 63 |
| ND<1.5 U | 11.9 | -10.4 | 3 | 64 |
| ND<1.5 U | 11.9 | -10.4 | 3 | 65 |
| ND<1.5 U | 11.9 | -10.4 | 3 | 66 |
| ND<1 U | 11.9 | -10.9 | 3 | 67 |
| ND<0.1 U | 11.9 | -11.8 | 3 | 68 |
| 0.0662 J | 11.9 | -11.8338 | 3 | 69 |
| | | | | |
| ND<1.5 U | 64.1 | -62.6 | 3 | 70 |
| ND<1.5 U | 64.1 | -62.6 | 3 | 71 |
| ND<1.5 U | 64.1 | -62.6 | 3 | 72 |
| ND<1.5 U | 64.1 | -62.6 | 3 | 73 |
| ND<1.5 U | 64.1 | -62.6 | 3 | 74 |
| ND<1.5 U | 64.1 | -62.6 | 3 | 75 |
| ND<1.5 U | 64.1 | -62.6 | 3 | 76 |
| ND<1.5 U | 64.1 | -62.6 | 3 | 77 |
| ND<1.5 U | 64.1 | -62.6 | 3 | 78 |
| ND<1.5 U | 64.1 | -62.6 | 3 | 79 |
| ND<1.5 U | 64.1 | -62.6 | 3 | 80 |
| ND<1.5 U | 64.1 | -62.6 | 3 | 81 |
| ND<1.5 U | 64.1 | -62.6 | 3 | 82 |
| 0.36 J | 64.1 | -63.74 | 3 | 83 |
| ND<1.5 U | 64.1 | -62.6 | 3 | 84 |
| ND<1.5 U | 64.1 | -62.6 | 3 | 85 |
| ND<1.5 U | 64.1 | -62.6 | 3 | 86 |
| ND<1.5 U | 64.1 | -62.6 | 3 | 87 |
| ND<1.5 U | 64.1 | -62.6 | 3 | 88 |
| ND<1 U | 64.1 | -63.1 | 3 | 89 |
| ND<0.1 U | 64.1 | -64 | 3 | 90 |
| 0.0662 J | 64.1 | -64.0338 | 3 | 91 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 91 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 91 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 91 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 91 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 91 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 91 |

| | | | | |
|---|---|---|---|---|
| ND<1.5 U | ND<1.5 U | 0 | 3 | 91 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 91 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 91 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 91 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 91 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 91 |
| 0.36 J | ND<1.5 U | -1.14 | 3 | 92 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 92 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 92 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 92 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 92 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 92 |
| ND<1 U | ND<1.5 U | -0.5 | 3 | 93 |
| ND<0.1 U | ND<1.5 U | -1.4 | 3 | 94 |
| 0.0662 J | ND<1.5 U | -1.4338 | 3 | 95 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 95 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 95 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 95 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 95 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 95 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 95 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 95 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 95 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 95 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 95 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 95 |
| 0.36 J | ND<1.5 U | -1.14 | 3 | 96 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 96 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 96 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 96 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 96 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 96 |
| ND<1 U | ND<1.5 U | -0.5 | 3 | 97 |
| ND<0.1 U | ND<1.5 U | -1.4 | 3 | 98 |
| 0.0662 J | ND<1.5 U | -1.4338 | 3 | 99 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 99 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 99 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 99 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 99 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 99 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 99 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 99 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 99 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 99 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 99 |
| 0.36 J | ND<1.5 U | -1.14 | 3 | 100 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 100 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 100 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 100 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 100 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 100 |
| ND<1 U | ND<1.5 U | -0.5 | 3 | 101 |
| ND<0.1 U | ND<1.5 U | -1.4 | 3 | 102 |
| 0.0662 J | ND<1.5 U | -1.4338 | 3 | 103 |

| | | | | |
|---|---|---|---|---|
| ND<1.5 U | ND<1.5 U | 0 | 3 | 103 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 103 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 103 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 103 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 103 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 103 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 103 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 103 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 103 |
| 0.36 J | ND<1.5 U | -1.14 | 3 | 104 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 104 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 104 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 104 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 104 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 104 |
| ND<1 U | ND<1.5 U | -0.5 | 3 | 105 |
| ND<0.1 U | ND<1.5 U | -1.4 | 3 | 106 |
| 0.0662 J | ND<1.5 U | -1.4338 | 3 | 107 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 107 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 107 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 107 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 107 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 107 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 107 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 107 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 107 |
| 0.36 J | ND<1.5 U | -1.14 | 3 | 108 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 108 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 108 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 108 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 108 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 108 |
| ND<1 U | ND<1.5 U | -0.5 | 3 | 109 |
| ND<0.1 U | ND<1.5 U | -1.4 | 3 | 110 |
| 0.0662 J | ND<1.5 U | -1.4338 | 3 | 111 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 111 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 111 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 111 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 111 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 111 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 111 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 111 |
| 0.36 J | ND<1.5 U | -1.14 | 3 | 112 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 112 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 112 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 112 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 112 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 112 |
| ND<1 U | ND<1.5 U | -0.5 | 3 | 113 |
| ND<0.1 U | ND<1.5 U | -1.4 | 3 | 114 |
| 0.0662 J | ND<1.5 U | -1.4338 | 3 | 115 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 115 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 115 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 115 |

| | | | | |
|---|---|---|---|---|
| ND<1.5 U | ND<1.5 U | 0 | 3 | 115 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 115 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 115 |
| 0.36 J | ND<1.5 U | -1.14 | 3 | 116 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 116 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 116 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 116 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 116 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 116 |
| ND<1 U | ND<1.5 U | -0.5 | 3 | 117 |
| ND<0.1 U | ND<1.5 U | -1.4 | 3 | 118 |
| 0.0662 J | ND<1.5 U | -1.4338 | 3 | 119 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 119 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 119 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 119 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 119 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 119 |
| 0.36 J | ND<1.5 U | -1.14 | 3 | 120 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 120 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 120 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 120 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 120 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 120 |
| ND<1 U | ND<1.5 U | -0.5 | 3 | 121 |
| ND<0.1 U | ND<1.5 U | -1.4 | 3 | 122 |
| 0.0662 J | ND<1.5 U | -1.4338 | 3 | 123 |
| | | | | |
| ND<1.5 U | ND<1.5 U | Same Date | 3 | 123 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 123 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 123 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 123 |
| 0.36 J | ND<1.5 U | -1.14 | 3 | 124 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 124 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 124 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 124 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 124 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 124 |
| ND<1 U | ND<1.5 U | -0.5 | 3 | 125 |
| ND<0.1 U | ND<1.5 U | -1.4 | 3 | 126 |
| 0.0662 J | ND<1.5 U | -1.4338 | 3 | 127 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 127 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 127 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 127 |
| 0.36 J | ND<1.5 U | -1.14 | 3 | 128 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 128 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 128 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 128 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 128 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 128 |
| ND<1 U | ND<1.5 U | -0.5 | 3 | 129 |
| ND<0.1 U | ND<1.5 U | -1.4 | 3 | 130 |
| 0.0662 J | ND<1.5 U | -1.4338 | 3 | 131 |
| | | | | |
| ND<1.5 U | ND<1.5 U | Same Date | 3 | 131 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 131 |

| | | | | |
|---|---|---|---|---|
| 0.36 J | ND<1.5 U | -1.14 | 3 | 132 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 132 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 132 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 132 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 132 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 132 |
| ND<1 U | ND<1.5 U | -0.5 | 3 | 133 |
| ND<0.1 U | ND<1.5 U | -1.4 | 3 | 134 |
| 0.0662 J | ND<1.5 U | -1.4338 | 3 | 135 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 135 |
| 0.36 J | ND<1.5 U | -1.14 | 3 | 136 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 136 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 136 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 136 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 136 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 136 |
| ND<1 U | ND<1.5 U | -0.5 | 3 | 137 |
| ND<0.1 U | ND<1.5 U | -1.4 | 3 | 138 |
| 0.0662 J | ND<1.5 U | -1.4338 | 3 | 139 |
| | | | | |
| 0.36 J | ND<1.5 U | -1.14 | 3 | 140 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 140 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 140 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 140 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 140 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 140 |
| ND<1 U | ND<1.5 U | -0.5 | 3 | 141 |
| ND<0.1 U | ND<1.5 U | -1.4 | 3 | 142 |
| 0.0662 J | ND<1.5 U | -1.4338 | 3 | 143 |
| | | | | |
| ND<1.5 U | 0.36 J | 1.14 | 4 | 143 |
| ND<1.5 U | 0.36 J | 1.14 | 5 | 143 |
| ND<1.5 U | 0.36 J | 1.14 | 6 | 143 |
| ND<1.5 U | 0.36 J | 1.14 | 7 | 143 |
| ND<1.5 U | 0.36 J | 1.14 | 8 | 143 |
| ND<1 U | 0.36 J | 0.64 | 9 | 143 |
| ND<0.1 U | 0.36 J | -0.26 | 9 | 144 |
| 0.0662 J | 0.36 J | -0.2938 | 9 | 145 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 9 | 145 |
| ND<1.5 U | ND<1.5 U | 0 | 9 | 145 |
| ND<1.5 U | ND<1.5 U | 0 | 9 | 145 |
| ND<1.5 U | ND<1.5 U | 0 | 9 | 145 |
| ND<1 U | ND<1.5 U | -0.5 | 9 | 146 |
| ND<0.1 U | ND<1.5 U | -1.4 | 9 | 147 |
| 0.0662 J | ND<1.5 U | -1.4338 | 9 | 148 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 9 | 148 |
| ND<1.5 U | ND<1.5 U | 0 | 9 | 148 |
| ND<1.5 U | ND<1.5 U | 0 | 9 | 148 |
| ND<1 U | ND<1.5 U | -0.5 | 9 | 149 |
| ND<0.1 U | ND<1.5 U | -1.4 | 9 | 150 |
| 0.0662 J | ND<1.5 U | -1.4338 | 9 | 151 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 9 | 151 |
| ND<1.5 U | ND<1.5 U | 0 | 9 | 151 |

| | | | | |
|---|---|---|---|---|
| ND<1 U | ND<1.5 U | -0.5 | 9 | 152 |
| ND<0.1 U | ND<1.5 U | -1.4 | 9 | 153 |
| 0.0662 J | ND<1.5 U | -1.4338 | 9 | 154 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 9 | 154 |
| ND<1 U | ND<1.5 U | -0.5 | 9 | 155 |
| ND<0.1 U | ND<1.5 U | -1.4 | 9 | 156 |
| 0.0662 J | ND<1.5 U | -1.4338 | 9 | 157 |
| | | | | |
| ND<1 U | ND<1.5 U | -0.5 | 9 | 158 |
| ND<0.1 U | ND<1.5 U | -1.4 | 9 | 159 |
| 0.0662 J | ND<1.5 U | -1.4338 | 9 | 160 |
| | | | | |
| ND<0.1 U | ND<1 U | -0.9 | 9 | 161 |
| 0.0662 J | ND<1 U | -0.9338 | 9 | 162 |
| | | | | |
| 0.0662 J | ND<0.1 U | -0.0338 | 9 | 163 |

S Statistic = 9 - 163 = -154

| Tied Group | Value | Members |
|---|---|---|
| 1 | 1.5 | 18 |

| Time Period | Observations |
|---|---|
| 2/1/2017 | 1 |
| 3/1/2017 | 1 |
| 4/1/2017 | 1 |
| 5/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 3/1/2022 | 1 |
| 3/1/2023 | 1 |
| 3/1/2024 | 1 |

There are 2 time periods with multiple data

A = 12546
B = 36
C = 4896
D = 0
E = 306
F = 4

a = 37050
b = 140400
c = 1300
Group Variance = 1360.27
Z-Score = -4.14838
Comparison Level at 95% confidence level = 1.65463 (upward trend)
-4.14838 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RW18-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 240 | 356 | -116 | 0 | 1 |
| 34.9 | 356 | -321.1 | 0 | 2 |
| 156 | 356 | -200 | 0 | 3 |
| 306 | 356 | -50 | 0 | 4 |
| 208 | 356 | -148 | 0 | 5 |
| 410 | 356 | 54 | 1 | 5 |
| 218 | 356 | -138 | 1 | 6 |
| 448 | 356 | 92 | 2 | 6 |
| 7.1 | 356 | -348.9 | 2 | 7 |
| 1.2 J | 356 | -354.8 | 2 | 8 |
| 0.69 J | 356 | -355.31 | 2 | 9 |
| ND<1.5 U | 356 | -354.5 | 2 | 10 |
| ND<1.5 U | 356 | -354.5 | 2 | 11 |
| ND<1.5 U | 356 | -354.5 | 2 | 12 |
| ND<1.5 U | 356 | -354.5 | 2 | 13 |
| 1.9 J | 356 | -354.1 | 2 | 14 |
| ND<1.5 U | 356 | -354.5 | 2 | 15 |
| ND<1.5 U | 356 | -354.5 | 2 | 16 |
| ND<1.5 U | 356 | -354.5 | 2 | 17 |
| ND<1.5 U | 356 | -354.5 | 2 | 18 |
| ND<1.5 U | 356 | -354.5 | 2 | 19 |
| ND<1 U | 356 | -355 | 2 | 20 |
| ND<0.1 U | 356 | -355.9 | 2 | 21 |
| 0.3824 | 356 | -355.618 | 2 | 22 |
| | | | | |
| 34.9 | 240 | -205.1 | 2 | 23 |
| 156 | 240 | -84 | 2 | 24 |
| 306 | 240 | 66 | 3 | 24 |
| 208 | 240 | -32 | 3 | 25 |
| 410 | 240 | 170 | 4 | 25 |
| 218 | 240 | -22 | 4 | 26 |
| 448 | 240 | 208 | 5 | 26 |
| 7.1 | 240 | -232.9 | 5 | 27 |
| 1.2 J | 240 | -238.8 | 5 | 28 |
| 0.69 J | 240 | -239.31 | 5 | 29 |
| ND<1.5 U | 240 | -238.5 | 5 | 30 |
| ND<1.5 U | 240 | -238.5 | 5 | 31 |
| ND<1.5 U | 240 | -238.5 | 5 | 32 |
| ND<1.5 U | 240 | -238.5 | 5 | 33 |
| 1.9 J | 240 | -238.1 | 5 | 34 |
| ND<1.5 U | 240 | -238.5 | 5 | 35 |
| ND<1.5 U | 240 | -238.5 | 5 | 36 |
| ND<1.5 U | 240 | -238.5 | 5 | 37 |
| ND<1.5 U | 240 | -238.5 | 5 | 38 |
| ND<1.5 U | 240 | -238.5 | 5 | 39 |
| ND<1 U | 240 | -239 | 5 | 40 |
| ND<0.1 U | 240 | -239.9 | 5 | 41 |

| | | | | |
|---|---|---|---|---|
| 0.3824 | 240 | -239.618 | 5 | 42 |
| | | | | |
| 156 | 34.9 | 121.1 | 6 | 42 |
| 306 | 34.9 | 271.1 | 7 | 42 |
| 208 | 34.9 | 173.1 | 8 | 42 |
| 410 | 34.9 | 375.1 | 9 | 42 |
| 218 | 34.9 | 183.1 | 10 | 42 |
| 448 | 34.9 | 413.1 | 11 | 42 |
| 7.1 | 34.9 | -27.8 | 11 | 43 |
| 1.2 J | 34.9 | -33.7 | 11 | 44 |
| 0.69 J | 34.9 | -34.21 | 11 | 45 |
| ND<1.5 U | 34.9 | -33.4 | 11 | 46 |
| ND<1.5 U | 34.9 | -33.4 | 11 | 47 |
| ND<1.5 U | 34.9 | -33.4 | 11 | 48 |
| ND<1.5 U | 34.9 | -33.4 | 11 | 49 |
| 1.9 J | 34.9 | -33 | 11 | 50 |
| ND<1.5 U | 34.9 | -33.4 | 11 | 51 |
| ND<1.5 U | 34.9 | -33.4 | 11 | 52 |
| ND<1.5 U | 34.9 | -33.4 | 11 | 53 |
| ND<1.5 U | 34.9 | -33.4 | 11 | 54 |
| ND<1.5 U | 34.9 | -33.4 | 11 | 55 |
| ND<1 U | 34.9 | -33.9 | 11 | 56 |
| ND<0.1 U | 34.9 | -34.8 | 11 | 57 |
| 0.3824 | 34.9 | -34.5176 | 11 | 58 |
| | | | | |
| 306 | 156 | 150 | 12 | 58 |
| 208 | 156 | 52 | 13 | 58 |
| 410 | 156 | 254 | 14 | 58 |
| 218 | 156 | 62 | 15 | 58 |
| 448 | 156 | 292 | 16 | 58 |
| 7.1 | 156 | -148.9 | 16 | 59 |
| 1.2 J | 156 | -154.8 | 16 | 60 |
| 0.69 J | 156 | -155.31 | 16 | 61 |
| ND<1.5 U | 156 | -154.5 | 16 | 62 |
| ND<1.5 U | 156 | -154.5 | 16 | 63 |
| ND<1.5 U | 156 | -154.5 | 16 | 64 |
| ND<1.5 U | 156 | -154.5 | 16 | 65 |
| 1.9 J | 156 | -154.1 | 16 | 66 |
| ND<1.5 U | 156 | -154.5 | 16 | 67 |
| ND<1.5 U | 156 | -154.5 | 16 | 68 |
| ND<1.5 U | 156 | -154.5 | 16 | 69 |
| ND<1.5 U | 156 | -154.5 | 16 | 70 |
| ND<1.5 U | 156 | -154.5 | 16 | 71 |
| ND<1 U | 156 | -155 | 16 | 72 |
| ND<0.1 U | 156 | -155.9 | 16 | 73 |
| 0.3824 | 156 | -155.618 | 16 | 74 |
| | | | | |
| 208 | 306 | -98 | 16 | 75 |
| 410 | 306 | 104 | 17 | 75 |
| 218 | 306 | -88 | 17 | 76 |
| 448 | 306 | 142 | 18 | 76 |
| 7.1 | 306 | -298.9 | 18 | 77 |
| 1.2 J | 306 | -304.8 | 18 | 78 |
| 0.69 J | 306 | -305.31 | 18 | 79 |
| ND<1.5 U | 306 | -304.5 | 18 | 80 |
| ND<1.5 U | 306 | -304.5 | 18 | 81 |
| ND<1.5 U | 306 | -304.5 | 18 | 82 |

| | | | | |
|---|---|---|---|---|
| ND<1.5 U | 306 | -304.5 | 18 | 83 |
| 1.9 J | 306 | -304.1 | 18 | 84 |
| ND<1.5 U | 306 | -304.5 | 18 | 85 |
| ND<1.5 U | 306 | -304.5 | 18 | 86 |
| ND<1.5 U | 306 | -304.5 | 18 | 87 |
| ND<1.5 U | 306 | -304.5 | 18 | 88 |
| ND<1.5 U | 306 | -304.5 | 18 | 89 |
| ND<1 U | 306 | -305 | 18 | 90 |
| ND<0.1 U | 306 | -305.9 | 18 | 91 |
| 0.3824 | 306 | -305.618 | 18 | 92 |
| | | | | |
| 410 | 208 | 202 | 19 | 92 |
| 218 | 208 | 10 | 20 | 92 |
| 448 | 208 | 240 | 21 | 92 |
| 7.1 | 208 | -200.9 | 21 | 93 |
| 1.2 J | 208 | -206.8 | 21 | 94 |
| 0.69 J | 208 | -207.31 | 21 | 95 |
| ND<1.5 U | 208 | -206.5 | 21 | 96 |
| ND<1.5 U | 208 | -206.5 | 21 | 97 |
| ND<1.5 U | 208 | -206.5 | 21 | 98 |
| ND<1.5 U | 208 | -206.5 | 21 | 99 |
| 1.9 J | 208 | -206.1 | 21 | 100 |
| ND<1.5 U | 208 | -206.5 | 21 | 101 |
| ND<1.5 U | 208 | -206.5 | 21 | 102 |
| ND<1.5 U | 208 | -206.5 | 21 | 103 |
| ND<1.5 U | 208 | -206.5 | 21 | 104 |
| ND<1.5 U | 208 | -206.5 | 21 | 105 |
| ND<1 U | 208 | -207 | 21 | 106 |
| ND<0.1 U | 208 | -207.9 | 21 | 107 |
| 0.3824 | 208 | -207.618 | 21 | 108 |
| | | | | |
| 218 | 410 | -192 | 21 | 109 |
| 448 | 410 | 38 | 22 | 109 |
| 7.1 | 410 | -402.9 | 22 | 110 |
| 1.2 J | 410 | -408.8 | 22 | 111 |
| 0.69 J | 410 | -409.31 | 22 | 112 |
| ND<1.5 U | 410 | -408.5 | 22 | 113 |
| ND<1.5 U | 410 | -408.5 | 22 | 114 |
| ND<1.5 U | 410 | -408.5 | 22 | 115 |
| ND<1.5 U | 410 | -408.5 | 22 | 116 |
| 1.9 J | 410 | -408.1 | 22 | 117 |
| ND<1.5 U | 410 | -408.5 | 22 | 118 |
| ND<1.5 U | 410 | -408.5 | 22 | 119 |
| ND<1.5 U | 410 | -408.5 | 22 | 120 |
| ND<1.5 U | 410 | -408.5 | 22 | 121 |
| ND<1.5 U | 410 | -408.5 | 22 | 122 |
| ND<1 U | 410 | -409 | 22 | 123 |
| ND<0.1 U | 410 | -409.9 | 22 | 124 |
| 0.3824 | 410 | -409.618 | 22 | 125 |
| | | | | |
| 448 | 218 | 230 | 23 | 125 |
| 7.1 | 218 | -210.9 | 23 | 126 |
| 1.2 J | 218 | -216.8 | 23 | 127 |
| 0.69 J | 218 | -217.31 | 23 | 128 |
| ND<1.5 U | 218 | -216.5 | 23 | 129 |
| ND<1.5 U | 218 | -216.5 | 23 | 130 |
| ND<1.5 U | 218 | -216.5 | 23 | 131 |

| | | | | |
|---|---|---|---|---|
| ND<1.5 U | 218 | -216.5 | 23 | 132 |
| 1.9 J | 218 | -216.1 | 23 | 133 |
| ND<1.5 U | 218 | -216.5 | 23 | 134 |
| ND<1.5 U | 218 | -216.5 | 23 | 135 |
| ND<1.5 U | 218 | -216.5 | 23 | 136 |
| ND<1.5 U | 218 | -216.5 | 23 | 137 |
| ND<1.5 U | 218 | -216.5 | 23 | 138 |
| ND<1 U | 218 | -217 | 23 | 139 |
| ND<0.1 U | 218 | -217.9 | 23 | 140 |
| 0.3824 | 218 | -217.618 | 23 | 141 |
| | | | | |
| 7.1 | 448 | -440.9 | 23 | 142 |
| 1.2 J | 448 | -446.8 | 23 | 143 |
| 0.69 J | 448 | -447.31 | 23 | 144 |
| ND<1.5 U | 448 | -446.5 | 23 | 145 |
| ND<1.5 U | 448 | -446.5 | 23 | 146 |
| ND<1.5 U | 448 | -446.5 | 23 | 147 |
| ND<1.5 U | 448 | -446.5 | 23 | 148 |
| 1.9 J | 448 | -446.1 | 23 | 149 |
| ND<1.5 U | 448 | -446.5 | 23 | 150 |
| ND<1.5 U | 448 | -446.5 | 23 | 151 |
| ND<1.5 U | 448 | -446.5 | 23 | 152 |
| ND<1.5 U | 448 | -446.5 | 23 | 153 |
| ND<1.5 U | 448 | -446.5 | 23 | 154 |
| ND<1 U | 448 | -447 | 23 | 155 |
| ND<0.1 U | 448 | -447.9 | 23 | 156 |
| 0.3824 | 448 | -447.618 | 23 | 157 |
| | | | | |
| 1.2 J | 7.1 | -5.9 | 23 | 158 |
| 0.69 J | 7.1 | -6.41 | 23 | 159 |
| ND<1.5 U | 7.1 | -5.6 | 23 | 160 |
| ND<1.5 U | 7.1 | -5.6 | 23 | 161 |
| ND<1.5 U | 7.1 | -5.6 | 23 | 162 |
| ND<1.5 U | 7.1 | -5.6 | 23 | 163 |
| 1.9 J | 7.1 | -5.2 | 23 | 164 |
| ND<1.5 U | 7.1 | -5.6 | 23 | 165 |
| ND<1.5 U | 7.1 | -5.6 | 23 | 166 |
| ND<1.5 U | 7.1 | -5.6 | 23 | 167 |
| ND<1.5 U | 7.1 | -5.6 | 23 | 168 |
| ND<1.5 U | 7.1 | -5.6 | 23 | 169 |
| ND<1 U | 7.1 | -6.1 | 23 | 170 |
| ND<0.1 U | 7.1 | -7 | 23 | 171 |
| 0.3824 | 7.1 | -6.7176 | 23 | 172 |
| | | | | |
| 0.69 J | 1.2 J | -0.51 | 23 | 173 |
| ND<1.5 U | 1.2 J | 0.3 | 24 | 173 |
| ND<1.5 U | 1.2 J | 0.3 | 25 | 173 |
| ND<1.5 U | 1.2 J | 0.3 | 26 | 173 |
| ND<1.5 U | 1.2 J | 0.3 | 27 | 173 |
| 1.9 J | 1.2 J | 0.7 | 28 | 173 |
| ND<1.5 U | 1.2 J | 0.3 | 29 | 173 |
| ND<1.5 U | 1.2 J | 0.3 | 30 | 173 |
| ND<1.5 U | 1.2 J | 0.3 | 31 | 173 |
| ND<1.5 U | 1.2 J | 0.3 | 32 | 173 |
| ND<1.5 U | 1.2 J | 0.3 | 33 | 173 |
| ND<1 U | 1.2 J | -0.2 | 33 | 174 |
| ND<0.1 U | 1.2 J | -1.1 | 33 | 175 |

| | | | | |
|---|---|---|---|---|
| 0.3824 | 1.2 J | -0.8176 | 33 | 176 |
| | | | | |
| ND<1.5 U | 0.69 J | Same Date | 33 | 176 |
| ND<1.5 U | 0.69 J | 0.81 | 34 | 176 |
| ND<1.5 U | 0.69 J | 0.81 | 35 | 176 |
| ND<1.5 U | 0.69 J | 0.81 | 36 | 176 |
| 1.9 J | 0.69 J | 1.21 | 37 | 176 |
| ND<1.5 U | 0.69 J | 0.81 | 38 | 176 |
| ND<1.5 U | 0.69 J | 0.81 | 39 | 176 |
| ND<1.5 U | 0.69 J | 0.81 | 40 | 176 |
| ND<1.5 U | 0.69 J | 0.81 | 41 | 176 |
| ND<1.5 U | 0.69 J | 0.81 | 42 | 176 |
| ND<1 U | 0.69 J | 0.31 | 43 | 176 |
| ND<0.1 U | 0.69 J | -0.59 | 43 | 177 |
| 0.3824 | 0.69 J | -0.3076 | 43 | 178 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 43 | 178 |
| ND<1.5 U | ND<1.5 U | 0 | 43 | 178 |
| ND<1.5 U | ND<1.5 U | 0 | 43 | 178 |
| 1.9 J | ND<1.5 U | 0.4 | 44 | 178 |
| ND<1.5 U | ND<1.5 U | 0 | 44 | 178 |
| ND<1.5 U | ND<1.5 U | 0 | 44 | 178 |
| ND<1.5 U | ND<1.5 U | 0 | 44 | 178 |
| ND<1.5 U | ND<1.5 U | 0 | 44 | 178 |
| ND<1.5 U | ND<1.5 U | 0 | 44 | 178 |
| ND<1 U | ND<1.5 U | -0.5 | 44 | 179 |
| ND<0.1 U | ND<1.5 U | -1.4 | 44 | 180 |
| 0.3824 | ND<1.5 U | -1.1176 | 44 | 181 |
| | | | | |
| ND<1.5 U | ND<1.5 U | Same Date | 44 | 181 |
| ND<1.5 U | ND<1.5 U | 0 | 44 | 181 |
| 1.9 J | ND<1.5 U | 0.4 | 45 | 181 |
| ND<1.5 U | ND<1.5 U | 0 | 45 | 181 |
| ND<1.5 U | ND<1.5 U | 0 | 45 | 181 |
| ND<1.5 U | ND<1.5 U | 0 | 45 | 181 |
| ND<1.5 U | ND<1.5 U | 0 | 45 | 181 |
| ND<1.5 U | ND<1.5 U | 0 | 45 | 181 |
| ND<1 U | ND<1.5 U | -0.5 | 45 | 182 |
| ND<0.1 U | ND<1.5 U | -1.4 | 45 | 183 |
| 0.3824 | ND<1.5 U | -1.1176 | 45 | 184 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 45 | 184 |
| 1.9 J | ND<1.5 U | 0.4 | 46 | 184 |
| ND<1.5 U | ND<1.5 U | 0 | 46 | 184 |
| ND<1.5 U | ND<1.5 U | 0 | 46 | 184 |
| ND<1.5 U | ND<1.5 U | 0 | 46 | 184 |
| ND<1.5 U | ND<1.5 U | 0 | 46 | 184 |
| ND<1.5 U | ND<1.5 U | 0 | 46 | 184 |
| ND<1 U | ND<1.5 U | -0.5 | 46 | 185 |
| ND<0.1 U | ND<1.5 U | -1.4 | 46 | 186 |
| 0.3824 | ND<1.5 U | -1.1176 | 46 | 187 |
| | | | | |
| 1.9 J | ND<1.5 U | 0.4 | 47 | 187 |
| ND<1.5 U | ND<1.5 U | 0 | 47 | 187 |
| ND<1.5 U | ND<1.5 U | 0 | 47 | 187 |
| ND<1.5 U | ND<1.5 U | 0 | 47 | 187 |
| ND<1.5 U | ND<1.5 U | 0 | 47 | 187 |

| | | | | |
|---|---|---|---|---|
| ND<1.5 U | ND<1.5 U | 0 | 47 | 187 |
| ND<1 U | ND<1.5 U | -0.5 | 47 | 188 |
| ND<0.1 U | ND<1.5 U | -1.4 | 47 | 189 |
| 0.3824 | ND<1.5 U | -1.1176 | 47 | 190 |
| | | | | |
| ND<1.5 U | 1.9 J | -0.4 | 47 | 191 |
| ND<1.5 U | 1.9 J | -0.4 | 47 | 192 |
| ND<1.5 U | 1.9 J | -0.4 | 47 | 193 |
| ND<1.5 U | 1.9 J | -0.4 | 47 | 194 |
| ND<1.5 U | 1.9 J | -0.4 | 47 | 195 |
| ND<1 U | 1.9 J | -0.9 | 47 | 196 |
| ND<0.1 U | 1.9 J | -1.8 | 47 | 197 |
| 0.3824 | 1.9 J | -1.5176 | 47 | 198 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 47 | 198 |
| ND<1.5 U | ND<1.5 U | 0 | 47 | 198 |
| ND<1.5 U | ND<1.5 U | 0 | 47 | 198 |
| ND<1.5 U | ND<1.5 U | 0 | 47 | 198 |
| ND<1 U | ND<1.5 U | -0.5 | 47 | 199 |
| ND<0.1 U | ND<1.5 U | -1.4 | 47 | 200 |
| 0.3824 | ND<1.5 U | -1.1176 | 47 | 201 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 47 | 201 |
| ND<1.5 U | ND<1.5 U | 0 | 47 | 201 |
| ND<1.5 U | ND<1.5 U | 0 | 47 | 201 |
| ND<1 U | ND<1.5 U | -0.5 | 47 | 202 |
| ND<0.1 U | ND<1.5 U | -1.4 | 47 | 203 |
| 0.3824 | ND<1.5 U | -1.1176 | 47 | 204 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 47 | 204 |
| ND<1.5 U | ND<1.5 U | 0 | 47 | 204 |
| ND<1 U | ND<1.5 U | -0.5 | 47 | 205 |
| ND<0.1 U | ND<1.5 U | -1.4 | 47 | 206 |
| 0.3824 | ND<1.5 U | -1.1176 | 47 | 207 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 47 | 207 |
| ND<1 U | ND<1.5 U | -0.5 | 47 | 208 |
| ND<0.1 U | ND<1.5 U | -1.4 | 47 | 209 |
| 0.3824 | ND<1.5 U | -1.1176 | 47 | 210 |
| | | | | |
| ND<1 U | ND<1.5 U | -0.5 | 47 | 211 |
| ND<0.1 U | ND<1.5 U | -1.4 | 47 | 212 |
| 0.3824 | ND<1.5 U | -1.1176 | 47 | 213 |
| | | | | |
| ND<0.1 U | ND<1 U | -0.9 | 47 | 214 |
| 0.3824 | ND<1 U | -0.6176 | 47 | 215 |
| | | | | |
| 0.3824 | ND<0.1 U | 0.2824 | 48 | 215 |

S Statistic = 48 - 215 = -167

| Tied Group | Value | Members |
|---|---|---|
| 1 | 1.5 | 9 |

| Time Period | Observations |
|---|---|
| 6/1/2017 | 1 |

| | |
|---|---|
| 7/1/2017 | 1 |
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 3/1/2022 | 1 |
| 3/1/2023 | 1 |
| 3/1/2024 | 1 |

There are 2 time periods with multiple data

---

A = 1656
B = 36
C = 504
D = 0
E = 72
F = 4
a = 33000
b = 124200
c = 1200
Group Variance = 1739.57
Z-Score = -3.98003
Comparison Level at 95% confidence level = 1.65463 (upward trend)
-3.98003 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RW19-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 6.9 | 14.8 | -7.9 | 0 | 1 |
| 8.5 | 14.8 | -6.3 | 0 | 2 |
| 3.6 | 14.8 | -11.2 | 0 | 3 |
| 2.4 J | 14.8 | -12.4 | 0 | 4 |
| 9.7 | 14.8 | -5.1 | 0 | 5 |
| 7.2 | 14.8 | -7.6 | 0 | 6 |
| 2.6 J | 14.8 | -12.2 | 0 | 7 |
| 5.2 | 14.8 | -9.6 | 0 | 8 |
| 4.4 | 14.8 | -10.4 | 0 | 9 |
| 4.6 | 14.8 | -10.2 | 0 | 10 |
| 4.8 | 14.8 | -10 | 0 | 11 |
| 6.6 | 14.8 | -8.2 | 0 | 12 |
| 1.2 J | 14.8 | -13.6 | 0 | 13 |
| 3.6 | 14.8 | -11.2 | 0 | 14 |
| ND<1.5 U | 14.8 | -13.3 | 0 | 15 |
| 3.7 | 14.8 | -11.1 | 0 | 16 |
| 0.69 J | 14.8 | -14.11 | 0 | 17 |
| ND<1.5 U | 14.8 | -13.3 | 0 | 18 |
| ND<1.5 U | 14.8 | -13.3 | 0 | 19 |
| 1.2 J | 14.8 | -13.6 | 0 | 20 |
| 0.66 J | 14.8 | -14.14 | 0 | 21 |
| 0.77 J | 14.8 | -14.03 | 0 | 22 |
| 4.3 | 14.8 | -10.5 | 0 | 23 |
| 1.3 J | 14.8 | -13.5 | 0 | 24 |
| | | | | |
| 8.5 | 6.9 | 1.6 | 1 | 24 |
| 3.6 | 6.9 | -3.3 | 1 | 25 |
| 2.4 J | 6.9 | -4.5 | 1 | 26 |
| 9.7 | 6.9 | 2.8 | 2 | 26 |
| 7.2 | 6.9 | 0.3 | 3 | 26 |
| 2.6 J | 6.9 | -4.3 | 3 | 27 |
| 5.2 | 6.9 | -1.7 | 3 | 28 |
| 4.4 | 6.9 | -2.5 | 3 | 29 |
| 4.6 | 6.9 | -2.3 | 3 | 30 |
| 4.8 | 6.9 | -2.1 | 3 | 31 |
| 6.6 | 6.9 | -0.3 | 3 | 32 |
| 1.2 J | 6.9 | -5.7 | 3 | 33 |
| 3.6 | 6.9 | -3.3 | 3 | 34 |
| ND<1.5 U | 6.9 | -5.4 | 3 | 35 |
| 3.7 | 6.9 | -3.2 | 3 | 36 |
| 0.69 J | 6.9 | -6.21 | 3 | 37 |
| ND<1.5 U | 6.9 | -5.4 | 3 | 38 |
| ND<1.5 U | 6.9 | -5.4 | 3 | 39 |
| 1.2 J | 6.9 | -5.7 | 3 | 40 |
| 0.66 J | 6.9 | -6.24 | 3 | 41 |
| 0.77 J | 6.9 | -6.13 | 3 | 42 |
| 4.3 | 6.9 | -2.6 | 3 | 43 |

| | | | | |
|---|---|---|---|---|
| 1.3 J | 6.9 | -5.6 | 3 | 44 |
| | | | | |
| 3.6 | 8.5 | -4.9 | 3 | 45 |
| 2.4 J | 8.5 | -6.1 | 3 | 46 |
| 9.7 | 8.5 | 1.2 | 4 | 46 |
| 7.2 | 8.5 | -1.3 | 4 | 47 |
| 2.6 J | 8.5 | -5.9 | 4 | 48 |
| 5.2 | 8.5 | -3.3 | 4 | 49 |
| 4.4 | 8.5 | -4.1 | 4 | 50 |
| 4.6 | 8.5 | -3.9 | 4 | 51 |
| 4.8 | 8.5 | -3.7 | 4 | 52 |
| 6.6 | 8.5 | -1.9 | 4 | 53 |
| 1.2 J | 8.5 | -7.3 | 4 | 54 |
| 3.6 | 8.5 | -4.9 | 4 | 55 |
| ND<1.5 U | 8.5 | -7 | 4 | 56 |
| 3.7 | 8.5 | -4.8 | 4 | 57 |
| 0.69 J | 8.5 | -7.81 | 4 | 58 |
| ND<1.5 U | 8.5 | -7 | 4 | 59 |
| ND<1.5 U | 8.5 | -7 | 4 | 60 |
| 1.2 J | 8.5 | -7.3 | 4 | 61 |
| 0.66 J | 8.5 | -7.84 | 4 | 62 |
| 0.77 J | 8.5 | -7.73 | 4 | 63 |
| 4.3 | 8.5 | -4.2 | 4 | 64 |
| 1.3 J | 8.5 | -7.2 | 4 | 65 |
| | | | | |
| 2.4 J | 3.6 | -1.2 | 4 | 66 |
| 9.7 | 3.6 | 6.1 | 5 | 66 |
| 7.2 | 3.6 | 3.6 | 6 | 66 |
| 2.6 J | 3.6 | -1 | 6 | 67 |
| 5.2 | 3.6 | 1.6 | 7 | 67 |
| 4.4 | 3.6 | 0.8 | 8 | 67 |
| 4.6 | 3.6 | 1 | 9 | 67 |
| 4.8 | 3.6 | 1.2 | 10 | 67 |
| 6.6 | 3.6 | 3 | 11 | 67 |
| 1.2 J | 3.6 | -2.4 | 11 | 68 |
| 3.6 | 3.6 | 0 | 11 | 68 |
| ND<1.5 U | 3.6 | -2.1 | 11 | 69 |
| 3.7 | 3.6 | 0.1 | 12 | 69 |
| 0.69 J | 3.6 | -2.91 | 12 | 70 |
| ND<1.5 U | 3.6 | -2.1 | 12 | 71 |
| ND<1.5 U | 3.6 | -2.1 | 12 | 72 |
| 1.2 J | 3.6 | -2.4 | 12 | 73 |
| 0.66 J | 3.6 | -2.94 | 12 | 74 |
| 0.77 J | 3.6 | -2.83 | 12 | 75 |
| 4.3 | 3.6 | 0.7 | 13 | 75 |
| 1.3 J | 3.6 | -2.3 | 13 | 76 |
| | | | | |
| 9.7 | 2.4 J | 7.3 | 14 | 76 |
| 7.2 | 2.4 J | 4.8 | 15 | 76 |
| 2.6 J | 2.4 J | 0.2 | 16 | 76 |
| 5.2 | 2.4 J | 2.8 | 17 | 76 |
| 4.4 | 2.4 J | 2 | 18 | 76 |
| 4.6 | 2.4 J | 2.2 | 19 | 76 |
| 4.8 | 2.4 J | 2.4 | 20 | 76 |
| 6.6 | 2.4 J | 4.2 | 21 | 76 |
| 1.2 J | 2.4 J | -1.2 | 21 | 77 |
| 3.6 | 2.4 J | 1.2 | 22 | 77 |

| | | | | |
|---|---|---|---|---|
| ND<1.5 U | 2.4 J | -0.9 | 22 | 78 |
| 3.7 | 2.4 J | 1.3 | 23 | 78 |
| 0.69 J | 2.4 J | -1.71 | 23 | 79 |
| ND<1.5 U | 2.4 J | -0.9 | 23 | 80 |
| ND<1.5 U | 2.4 J | -0.9 | 23 | 81 |
| 1.2 J | 2.4 J | -1.2 | 23 | 82 |
| 0.66 J | 2.4 J | -1.74 | 23 | 83 |
| 0.77 J | 2.4 J | -1.63 | 23 | 84 |
| 4.3 | 2.4 J | 1.9 | 24 | 84 |
| 1.3 J | 2.4 J | -1.1 | 24 | 85 |
| | | | | |
| 7.2 | 9.7 | -2.5 | 24 | 86 |
| 2.6 J | 9.7 | -7.1 | 24 | 87 |
| 5.2 | 9.7 | -4.5 | 24 | 88 |
| 4.4 | 9.7 | -5.3 | 24 | 89 |
| 4.6 | 9.7 | -5.1 | 24 | 90 |
| 4.8 | 9.7 | -4.9 | 24 | 91 |
| 6.6 | 9.7 | -3.1 | 24 | 92 |
| 1.2 J | 9.7 | -8.5 | 24 | 93 |
| 3.6 | 9.7 | -6.1 | 24 | 94 |
| ND<1.5 U | 9.7 | -8.2 | 24 | 95 |
| 3.7 | 9.7 | -6 | 24 | 96 |
| 0.69 J | 9.7 | -9.01 | 24 | 97 |
| ND<1.5 U | 9.7 | -8.2 | 24 | 98 |
| ND<1.5 U | 9.7 | -8.2 | 24 | 99 |
| 1.2 J | 9.7 | -8.5 | 24 | 100 |
| 0.66 J | 9.7 | -9.04 | 24 | 101 |
| 0.77 J | 9.7 | -8.93 | 24 | 102 |
| 4.3 | 9.7 | -5.4 | 24 | 103 |
| 1.3 J | 9.7 | -8.4 | 24 | 104 |
| | | | | |
| 2.6 J | 7.2 | -4.6 | 24 | 105 |
| 5.2 | 7.2 | -2 | 24 | 106 |
| 4.4 | 7.2 | -2.8 | 24 | 107 |
| 4.6 | 7.2 | -2.6 | 24 | 108 |
| 4.8 | 7.2 | -2.4 | 24 | 109 |
| 6.6 | 7.2 | -0.6 | 24 | 110 |
| 1.2 J | 7.2 | -6 | 24 | 111 |
| 3.6 | 7.2 | -3.6 | 24 | 112 |
| ND<1.5 U | 7.2 | -5.7 | 24 | 113 |
| 3.7 | 7.2 | -3.5 | 24 | 114 |
| 0.69 J | 7.2 | -6.51 | 24 | 115 |
| ND<1.5 U | 7.2 | -5.7 | 24 | 116 |
| ND<1.5 U | 7.2 | -5.7 | 24 | 117 |
| 1.2 J | 7.2 | -6 | 24 | 118 |
| 0.66 J | 7.2 | -6.54 | 24 | 119 |
| 0.77 J | 7.2 | -6.43 | 24 | 120 |
| 4.3 | 7.2 | -2.9 | 24 | 121 |
| 1.3 J | 7.2 | -5.9 | 24 | 122 |
| | | | | |
| 5.2 | 2.6 J | 2.6 | 25 | 122 |
| 4.4 | 2.6 J | 1.8 | 26 | 122 |
| 4.6 | 2.6 J | 2 | 27 | 122 |
| 4.8 | 2.6 J | 2.2 | 28 | 122 |
| 6.6 | 2.6 J | 4 | 29 | 122 |
| 1.2 J | 2.6 J | -1.4 | 29 | 123 |
| 3.6 | 2.6 J | 1 | 30 | 123 |

| | | | | |
|---|---|---|---|---|
| ND<1.5 U | 2.6 J | -1.1 | 30 | 124 |
| 3.7 | 2.6 J | 1.1 | 31 | 124 |
| 0.69 J | 2.6 J | -1.91 | 31 | 125 |
| ND<1.5 U | 2.6 J | -1.1 | 31 | 126 |
| ND<1.5 U | 2.6 J | -1.1 | 31 | 127 |
| 1.2 J | 2.6 J | -1.4 | 31 | 128 |
| 0.66 J | 2.6 J | -1.94 | 31 | 129 |
| 0.77 J | 2.6 J | -1.83 | 31 | 130 |
| 4.3 | 2.6 J | 1.7 | 32 | 130 |
| 1.3 J | 2.6 J | -1.3 | 32 | 131 |
| | | | | |
| 4.4 | 5.2 | -0.8 | 32 | 132 |
| 4.6 | 5.2 | -0.6 | 32 | 133 |
| 4.8 | 5.2 | -0.4 | 32 | 134 |
| 6.6 | 5.2 | 1.4 | 33 | 134 |
| 1.2 J | 5.2 | -4 | 33 | 135 |
| 3.6 | 5.2 | -1.6 | 33 | 136 |
| ND<1.5 U | 5.2 | -3.7 | 33 | 137 |
| 3.7 | 5.2 | -1.5 | 33 | 138 |
| 0.69 J | 5.2 | -4.51 | 33 | 139 |
| ND<1.5 U | 5.2 | -3.7 | 33 | 140 |
| ND<1.5 U | 5.2 | -3.7 | 33 | 141 |
| 1.2 J | 5.2 | -4 | 33 | 142 |
| 0.66 J | 5.2 | -4.54 | 33 | 143 |
| 0.77 J | 5.2 | -4.43 | 33 | 144 |
| 4.3 | 5.2 | -0.9 | 33 | 145 |
| 1.3 J | 5.2 | -3.9 | 33 | 146 |
| | | | | |
| 4.6 | 4.4 | 0.2 | 34 | 146 |
| 4.8 | 4.4 | 0.4 | 35 | 146 |
| 6.6 | 4.4 | 2.2 | 36 | 146 |
| 1.2 J | 4.4 | -3.2 | 36 | 147 |
| 3.6 | 4.4 | -0.8 | 36 | 148 |
| ND<1.5 U | 4.4 | -2.9 | 36 | 149 |
| 3.7 | 4.4 | -0.7 | 36 | 150 |
| 0.69 J | 4.4 | -3.71 | 36 | 151 |
| ND<1.5 U | 4.4 | -2.9 | 36 | 152 |
| ND<1.5 U | 4.4 | -2.9 | 36 | 153 |
| 1.2 J | 4.4 | -3.2 | 36 | 154 |
| 0.66 J | 4.4 | -3.74 | 36 | 155 |
| 0.77 J | 4.4 | -3.63 | 36 | 156 |
| 4.3 | 4.4 | -0.1 | 36 | 157 |
| 1.3 J | 4.4 | -3.1 | 36 | 158 |
| | | | | |
| 4.8 | 4.6 | 0.2 | 37 | 158 |
| 6.6 | 4.6 | 2 | 38 | 158 |
| 1.2 J | 4.6 | -3.4 | 38 | 159 |
| 3.6 | 4.6 | -1 | 38 | 160 |
| ND<1.5 U | 4.6 | -3.1 | 38 | 161 |
| 3.7 | 4.6 | -0.9 | 38 | 162 |
| 0.69 J | 4.6 | -3.91 | 38 | 163 |
| ND<1.5 U | 4.6 | -3.1 | 38 | 164 |
| ND<1.5 U | 4.6 | -3.1 | 38 | 165 |
| 1.2 J | 4.6 | -3.4 | 38 | 166 |
| 0.66 J | 4.6 | -3.94 | 38 | 167 |
| 0.77 J | 4.6 | -3.83 | 38 | 168 |
| 4.3 | 4.6 | -0.3 | 38 | 169 |

| | | | | |
|---|---|---|---|---|
| 1.3 J | 4.6 | -3.3 | 38 | 170 |
| | | | | |
| 6.6 | 4.8 | 1.8 | 39 | 170 |
| 1.2 J | 4.8 | -3.6 | 39 | 171 |
| 3.6 | 4.8 | -1.2 | 39 | 172 |
| ND<1.5 U | 4.8 | -3.3 | 39 | 173 |
| 3.7 | 4.8 | -1.1 | 39 | 174 |
| 0.69 J | 4.8 | -4.11 | 39 | 175 |
| ND<1.5 U | 4.8 | -3.3 | 39 | 176 |
| ND<1.5 U | 4.8 | -3.3 | 39 | 177 |
| 1.2 J | 4.8 | -3.6 | 39 | 178 |
| 0.66 J | 4.8 | -4.14 | 39 | 179 |
| 0.77 J | 4.8 | -4.03 | 39 | 180 |
| 4.3 | 4.8 | -0.5 | 39 | 181 |
| 1.3 J | 4.8 | -3.5 | 39 | 182 |
| | | | | |
| 1.2 J | 6.6 | -5.4 | 39 | 183 |
| 3.6 | 6.6 | -3 | 39 | 184 |
| ND<1.5 U | 6.6 | -5.1 | 39 | 185 |
| 3.7 | 6.6 | -2.9 | 39 | 186 |
| 0.69 J | 6.6 | -5.91 | 39 | 187 |
| ND<1.5 U | 6.6 | -5.1 | 39 | 188 |
| ND<1.5 U | 6.6 | -5.1 | 39 | 189 |
| 1.2 J | 6.6 | -5.4 | 39 | 190 |
| 0.66 J | 6.6 | -5.94 | 39 | 191 |
| 0.77 J | 6.6 | -5.83 | 39 | 192 |
| 4.3 | 6.6 | -2.3 | 39 | 193 |
| 1.3 J | 6.6 | -5.3 | 39 | 194 |
| | | | | |
| 3.6 | 1.2 J | 2.4 | 40 | 194 |
| ND<1.5 U | 1.2 J | 0.3 | 41 | 194 |
| 3.7 | 1.2 J | 2.5 | 42 | 194 |
| 0.69 J | 1.2 J | -0.51 | 42 | 195 |
| ND<1.5 U | 1.2 J | 0.3 | 43 | 195 |
| ND<1.5 U | 1.2 J | 0.3 | 44 | 195 |
| 1.2 J | 1.2 J | 0 | 44 | 195 |
| 0.66 J | 1.2 J | -0.54 | 44 | 196 |
| 0.77 J | 1.2 J | -0.43 | 44 | 197 |
| 4.3 | 1.2 J | 3.1 | 45 | 197 |
| 1.3 J | 1.2 J | 0.1 | 46 | 197 |
| | | | | |
| ND<1.5 U | 3.6 | -2.1 | 46 | 198 |
| 3.7 | 3.6 | 0.1 | 47 | 198 |
| 0.69 J | 3.6 | -2.91 | 47 | 199 |
| ND<1.5 U | 3.6 | -2.1 | 47 | 200 |
| ND<1.5 U | 3.6 | -2.1 | 47 | 201 |
| 1.2 J | 3.6 | -2.4 | 47 | 202 |
| 0.66 J | 3.6 | -2.94 | 47 | 203 |
| 0.77 J | 3.6 | -2.83 | 47 | 204 |
| 4.3 | 3.6 | 0.7 | 48 | 204 |
| 1.3 J | 3.6 | -2.3 | 48 | 205 |
| | | | | |
| 3.7 | ND<1.5 U | Same Date | 48 | 205 |
| 0.69 J | ND<1.5 U | -0.81 | 48 | 206 |
| ND<1.5 U | ND<1.5 U | 0 | 48 | 206 |
| ND<1.5 U | ND<1.5 U | 0 | 48 | 206 |
| 1.2 J | ND<1.5 U | -0.3 | 48 | 207 |

| | | | | |
|---|---|---|---|---|
| 0.66 J | ND<1.5 U | -0.84 | 48 | 208 |
| 0.77 J | ND<1.5 U | -0.73 | 48 | 209 |
| 4.3 | ND<1.5 U | 2.8 | 49 | 209 |
| 1.3 J | ND<1.5 U | -0.2 | 49 | 210 |
| | | | | |
| 0.69 J | 3.7 | -3.01 | 49 | 211 |
| ND<1.5 U | 3.7 | -2.2 | 49 | 212 |
| ND<1.5 U | 3.7 | -2.2 | 49 | 213 |
| 1.2 J | 3.7 | -2.5 | 49 | 214 |
| 0.66 J | 3.7 | -3.04 | 49 | 215 |
| 0.77 J | 3.7 | -2.93 | 49 | 216 |
| 4.3 | 3.7 | 0.6 | 50 | 216 |
| 1.3 J | 3.7 | -2.4 | 50 | 217 |
| | | | | |
| ND<1.5 U | 0.69 J | Same Date | 50 | 217 |
| ND<1.5 U | 0.69 J | 0.81 | 51 | 217 |
| 1.2 J | 0.69 J | 0.51 | 52 | 217 |
| 0.66 J | 0.69 J | -0.03 | 52 | 218 |
| 0.77 J | 0.69 J | 0.08 | 53 | 218 |
| 4.3 | 0.69 J | 3.61 | 54 | 218 |
| 1.3 J | 0.69 J | 0.61 | 55 | 218 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 55 | 218 |
| 1.2 J | ND<1.5 U | -0.3 | 55 | 219 |
| 0.66 J | ND<1.5 U | -0.84 | 55 | 220 |
| 0.77 J | ND<1.5 U | -0.73 | 55 | 221 |
| 4.3 | ND<1.5 U | 2.8 | 56 | 221 |
| 1.3 J | ND<1.5 U | -0.2 | 56 | 222 |
| | | | | |
| 1.2 J | ND<1.5 U | -0.3 | 56 | 223 |
| 0.66 J | ND<1.5 U | -0.84 | 56 | 224 |
| 0.77 J | ND<1.5 U | -0.73 | 56 | 225 |
| 4.3 | ND<1.5 U | 2.8 | 57 | 225 |
| 1.3 J | ND<1.5 U | -0.2 | 57 | 226 |
| | | | | |
| 0.66 J | 1.2 J | -0.54 | 57 | 227 |
| 0.77 J | 1.2 J | -0.43 | 57 | 228 |
| 4.3 | 1.2 J | 3.1 | 58 | 228 |
| 1.3 J | 1.2 J | 0.1 | 59 | 228 |
| | | | | |
| 0.77 J | 0.66 J | 0.11 | 60 | 228 |
| 4.3 | 0.66 J | 3.64 | 61 | 228 |
| 1.3 J | 0.66 J | 0.64 | 62 | 228 |
| | | | | |
| 4.3 | 0.77 J | 3.53 | 63 | 228 |
| 1.3 J | 0.77 J | 0.53 | 64 | 228 |
| | | | | |
| 1.3 J | 4.3 | -3 | 64 | 229 |

S Statistic = 64 - 229 = -165

| Tied Group | Value | Members |
|---|---|---|
| 1 | 3.6 | 2 |
| 2 | 1.2 | 2 |
| 3 | 1.5 | 3 |

| Time Period | Observations |
|---|---|
| 2/1/2017 | 1 |
| 3/1/2017 | 1 |
| 4/1/2017 | 1 |
| 5/1/2017 | 1 |
| 6/1/2017 | 1 |
| 7/1/2017 | 1 |
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |

There are 2 time periods with multiple data

---

A = 102
B = 36
C = 6
D = 0
E = 10
F = 4
a = 33000
b = 124200
c = 1200
Group Variance = 1825.7
Z-Score = -3.83821
Comparison Level at 95% confidence level = 1.65463 (upward trend)
-3.83821 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RW21-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 483 1c | 483 1c | Same Date | 0 | 0 |
| 486 1c | 483 1c | Same Date | 0 | 0 |
| 486 1c | 483 1c | Same Date | 0 | 0 |
| 354 1c | 483 1c | -129 | 0 | 1 |
| 433 | 483 1c | -50 | 0 | 2 |
| 378 | 483 1c | -105 | 0 | 3 |
| 322 | 483 1c | -161 | 0 | 4 |
| 294 1c | 483 1c | -189 | 0 | 5 |
| 30.7 | 483 1c | -452.3 | 0 | 6 |
| 367 | 483 1c | -116 | 0 | 7 |
| | | | | |
| 486 1c | 483 1c | Same Date | 0 | 7 |
| 486 1c | 483 1c | Same Date | 0 | 7 |
| 354 1c | 483 1c | -129 | 0 | 8 |
| 433 | 483 1c | -50 | 0 | 9 |
| 378 | 483 1c | -105 | 0 | 10 |
| 322 | 483 1c | -161 | 0 | 11 |
| 294 1c | 483 1c | -189 | 0 | 12 |
| 30.7 | 483 1c | -452.3 | 0 | 13 |
| 367 | 483 1c | -116 | 0 | 14 |
| | | | | |
| 486 1c | 486 1c | Same Date | 0 | 14 |
| 354 1c | 486 1c | -132 | 0 | 15 |
| 433 | 486 1c | -53 | 0 | 16 |
| 378 | 486 1c | -108 | 0 | 17 |
| 322 | 486 1c | -164 | 0 | 18 |
| 294 1c | 486 1c | -192 | 0 | 19 |
| 30.7 | 486 1c | -455.3 | 0 | 20 |
| 367 | 486 1c | -119 | 0 | 21 |
| | | | | |
| 354 1c | 486 1c | -132 | 0 | 22 |
| 433 | 486 1c | -53 | 0 | 23 |
| 378 | 486 1c | -108 | 0 | 24 |
| 322 | 486 1c | -164 | 0 | 25 |
| 294 1c | 486 1c | -192 | 0 | 26 |
| 30.7 | 486 1c | -455.3 | 0 | 27 |
| 367 | 486 1c | -119 | 0 | 28 |
| | | | | |
| 433 | 354 1c | 79 | 1 | 28 |
| 378 | 354 1c | 24 | 2 | 28 |
| 322 | 354 1c | -32 | 2 | 29 |
| 294 1c | 354 1c | -60 | 2 | 30 |
| 30.7 | 354 1c | -323.3 | 2 | 31 |
| 367 | 354 1c | 13 | 3 | 31 |
| | | | | |
| 378 | 433 | -55 | 3 | 32 |
| 322 | 433 | -111 | 3 | 33 |

| | | | | |
|---|---|---|---|---|
| 294 1c | 433 | -139 | 3 | 34 |
| 30.7 | 433 | -402.3 | 3 | 35 |
| 367 | 433 | -66 | 3 | 36 |
| | | | | |
| 322 | 378 | -56 | 3 | 37 |
| 294 1c | 378 | -84 | 3 | 38 |
| 30.7 | 378 | -347.3 | 3 | 39 |
| 367 | 378 | -11 | 3 | 40 |
| | | | | |
| 294 1c | 322 | -28 | 3 | 41 |
| 30.7 | 322 | -291.3 | 3 | 42 |
| 367 | 322 | 45 | 4 | 42 |
| | | | | |
| 30.7 | 294 1c | -263.3 | 4 | 43 |
| 367 | 294 1c | 73 | 5 | 43 |
| | | | | |
| 367 | 30.7 | Same Date | 5 | 43 |

S Statistic = 5 - 43 = -38

| Tied Group | Value | Members |
|---|---|---|
| 1 | 483 | 2 |
| 2 | 486 | 2 |

| Time Period | Observations |
|---|---|
| 6/1/2019 | 4 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 2 |

There are 2 time periods with multiple data

A = 36
B = 174
C = 0
D = 24
E = 4
F = 14
a = 2970
b = 8910
c = 220
Group Variance = 153.588
Z-Score = -2.98554
Comparison Level at 95% confidence level = 1.65463 (upward trend)
-2.98554 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RW22R-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 168 1c2c | 157 | Same Date | 0 | 0 |
| 153 | 157 | Same Date | 0 | 0 |
| 153 | 157 | Same Date | 0 | 0 |
| 151 | 157 | Same Date | 0 | 0 |
| 151 | 157 | Same Date | 0 | 0 |
| 151 | 157 | Same Date | 0 | 0 |
| 151 | 157 | Same Date | 0 | 0 |
| 153 | 157 | Same Date | 0 | 0 |
| 153 | 157 | Same Date | 0 | 0 |
| 105 | 157 | -52 | 0 | 1 |
| 70.4 | 157 | -86.6 | 0 | 2 |
| 62.9 | 157 | -94.1 | 0 | 3 |
| 51.4 | 157 | -105.6 | 0 | 4 |
| 52.1 | 157 | -104.9 | 0 | 5 |
| 78.5 | 157 | -78.5 | 0 | 6 |
| 117 | 157 | -40 | 0 | 7 |
| 29.4 | 157 | -127.6 | 0 | 8 |
| 56.91 | 157 | -100.09 | 0 | 9 |
| 56.91 | 157 | -100.09 | 0 | 10 |
| 21.95 | 157 | -135.05 | 0 | 11 |
| 24.13 | 157 | -132.87 | 0 | 12 |
| 28.1 | 157 | -128.9 | 0 | 13 |
| 26.72 | 157 | -130.28 | 0 | 14 |
| | | | | |
| 153 | 168 1c2c | Same Date | 0 | 14 |
| 153 | 168 1c2c | Same Date | 0 | 14 |
| 151 | 168 1c2c | Same Date | 0 | 14 |
| 151 | 168 1c2c | Same Date | 0 | 14 |
| 151 | 168 1c2c | Same Date | 0 | 14 |
| 151 | 168 1c2c | Same Date | 0 | 14 |
| 153 | 168 1c2c | Same Date | 0 | 14 |
| 153 | 168 1c2c | Same Date | 0 | 14 |
| 105 | 168 1c2c | -63 | 0 | 15 |
| 70.4 | 168 1c2c | -97.6 | 0 | 16 |
| 62.9 | 168 1c2c | -105.1 | 0 | 17 |
| 51.4 | 168 1c2c | -116.6 | 0 | 18 |
| 52.1 | 168 1c2c | -115.9 | 0 | 19 |
| 78.5 | 168 1c2c | -89.5 | 0 | 20 |
| 117 | 168 1c2c | -51 | 0 | 21 |
| 29.4 | 168 1c2c | -138.6 | 0 | 22 |
| 56.91 | 168 1c2c | -111.09 | 0 | 23 |
| 56.91 | 168 1c2c | -111.09 | 0 | 24 |
| 21.95 | 168 1c2c | -146.05 | 0 | 25 |
| 24.13 | 168 1c2c | -143.87 | 0 | 26 |
| 28.1 | 168 1c2c | -139.9 | 0 | 27 |
| 26.72 | 168 1c2c | -141.28 | 0 | 28 |

| | | | | |
|---|---|---|---|---|
| 153 | 153 | Same Date | 0 | 28 |
| 151 | 153 | Same Date | 0 | 28 |
| 151 | 153 | Same Date | 0 | 28 |
| 151 | 153 | Same Date | 0 | 28 |
| 151 | 153 | Same Date | 0 | 28 |
| 153 | 153 | Same Date | 0 | 28 |
| 153 | 153 | Same Date | 0 | 28 |
| 105 | 153 | -48 | 0 | 29 |
| 70.4 | 153 | -82.6 | 0 | 30 |
| 62.9 | 153 | -90.1 | 0 | 31 |
| 51.4 | 153 | -101.6 | 0 | 32 |
| 52.1 | 153 | -100.9 | 0 | 33 |
| 78.5 | 153 | -74.5 | 0 | 34 |
| 117 | 153 | -36 | 0 | 35 |
| 29.4 | 153 | -123.6 | 0 | 36 |
| 56.91 | 153 | -96.09 | 0 | 37 |
| 56.91 | 153 | -96.09 | 0 | 38 |
| 21.95 | 153 | -131.05 | 0 | 39 |
| 24.13 | 153 | -128.87 | 0 | 40 |
| 28.1 | 153 | -124.9 | 0 | 41 |
| 26.72 | 153 | -126.28 | 0 | 42 |
| | | | | |
| 151 | 153 | Same Date | 0 | 42 |
| 151 | 153 | Same Date | 0 | 42 |
| 151 | 153 | Same Date | 0 | 42 |
| 151 | 153 | Same Date | 0 | 42 |
| 153 | 153 | Same Date | 0 | 42 |
| 153 | 153 | Same Date | 0 | 42 |
| 105 | 153 | -48 | 0 | 43 |
| 70.4 | 153 | -82.6 | 0 | 44 |
| 62.9 | 153 | -90.1 | 0 | 45 |
| 51.4 | 153 | -101.6 | 0 | 46 |
| 52.1 | 153 | -100.9 | 0 | 47 |
| 78.5 | 153 | -74.5 | 0 | 48 |
| 117 | 153 | -36 | 0 | 49 |
| 29.4 | 153 | -123.6 | 0 | 50 |
| 56.91 | 153 | -96.09 | 0 | 51 |
| 56.91 | 153 | -96.09 | 0 | 52 |
| 21.95 | 153 | -131.05 | 0 | 53 |
| 24.13 | 153 | -128.87 | 0 | 54 |
| 28.1 | 153 | -124.9 | 0 | 55 |
| 26.72 | 153 | -126.28 | 0 | 56 |
| | | | | |
| 151 | 151 | Same Date | 0 | 56 |
| 151 | 151 | Same Date | 0 | 56 |
| 151 | 151 | Same Date | 0 | 56 |
| 153 | 151 | Same Date | 0 | 56 |
| 153 | 151 | Same Date | 0 | 56 |
| 105 | 151 | -46 | 0 | 57 |
| 70.4 | 151 | -80.6 | 0 | 58 |
| 62.9 | 151 | -88.1 | 0 | 59 |
| 51.4 | 151 | -99.6 | 0 | 60 |
| 52.1 | 151 | -98.9 | 0 | 61 |
| 78.5 | 151 | -72.5 | 0 | 62 |
| 117 | 151 | -34 | 0 | 63 |
| 29.4 | 151 | -121.6 | 0 | 64 |
| 56.91 | 151 | -94.09 | 0 | 65 |

| | | | | |
|---|---|---|---|---|
| 56.91 | 151 | -94.09 | 0 | 66 |
| 21.95 | 151 | -129.05 | 0 | 67 |
| 24.13 | 151 | -126.87 | 0 | 68 |
| 28.1 | 151 | -122.9 | 0 | 69 |
| 26.72 | 151 | -124.28 | 0 | 70 |
| | | | | |
| 151 | 151 | Same Date | 0 | 70 |
| 151 | 151 | Same Date | 0 | 70 |
| 153 | 151 | Same Date | 0 | 70 |
| 153 | 151 | Same Date | 0 | 70 |
| 105 | 151 | -46 | 0 | 71 |
| 70.4 | 151 | -80.6 | 0 | 72 |
| 62.9 | 151 | -88.1 | 0 | 73 |
| 51.4 | 151 | -99.6 | 0 | 74 |
| 52.1 | 151 | -98.9 | 0 | 75 |
| 78.5 | 151 | -72.5 | 0 | 76 |
| 117 | 151 | -34 | 0 | 77 |
| 29.4 | 151 | -121.6 | 0 | 78 |
| 56.91 | 151 | -94.09 | 0 | 79 |
| 56.91 | 151 | -94.09 | 0 | 80 |
| 21.95 | 151 | -129.05 | 0 | 81 |
| 24.13 | 151 | -126.87 | 0 | 82 |
| 28.1 | 151 | -122.9 | 0 | 83 |
| 26.72 | 151 | -124.28 | 0 | 84 |
| | | | | |
| 151 | 151 | Same Date | 0 | 84 |
| 153 | 151 | Same Date | 0 | 84 |
| 153 | 151 | Same Date | 0 | 84 |
| 105 | 151 | -46 | 0 | 85 |
| 70.4 | 151 | -80.6 | 0 | 86 |
| 62.9 | 151 | -88.1 | 0 | 87 |
| 51.4 | 151 | -99.6 | 0 | 88 |
| 52.1 | 151 | -98.9 | 0 | 89 |
| 78.5 | 151 | -72.5 | 0 | 90 |
| 117 | 151 | -34 | 0 | 91 |
| 29.4 | 151 | -121.6 | 0 | 92 |
| 56.91 | 151 | -94.09 | 0 | 93 |
| 56.91 | 151 | -94.09 | 0 | 94 |
| 21.95 | 151 | -129.05 | 0 | 95 |
| 24.13 | 151 | -126.87 | 0 | 96 |
| 28.1 | 151 | -122.9 | 0 | 97 |
| 26.72 | 151 | -124.28 | 0 | 98 |
| | | | | |
| 153 | 151 | Same Date | 0 | 98 |
| 153 | 151 | Same Date | 0 | 98 |
| 105 | 151 | -46 | 0 | 99 |
| 70.4 | 151 | -80.6 | 0 | 100 |
| 62.9 | 151 | -88.1 | 0 | 101 |
| 51.4 | 151 | -99.6 | 0 | 102 |
| 52.1 | 151 | -98.9 | 0 | 103 |
| 78.5 | 151 | -72.5 | 0 | 104 |
| 117 | 151 | -34 | 0 | 105 |
| 29.4 | 151 | -121.6 | 0 | 106 |
| 56.91 | 151 | -94.09 | 0 | 107 |
| 56.91 | 151 | -94.09 | 0 | 108 |
| 21.95 | 151 | -129.05 | 0 | 109 |
| 24.13 | 151 | -126.87 | 0 | 110 |

| | | | | |
|---|---|---|---|---|
| 28.1 | 151 | -122.9 | 0 | 111 |
| 26.72 | 151 | -124.28 | 0 | 112 |
| | | | | |
| 153 | 153 | Same Date | 0 | 112 |
| 105 | 153 | -48 | 0 | 113 |
| 70.4 | 153 | -82.6 | 0 | 114 |
| 62.9 | 153 | -90.1 | 0 | 115 |
| 51.4 | 153 | -101.6 | 0 | 116 |
| 52.1 | 153 | -100.9 | 0 | 117 |
| 78.5 | 153 | -74.5 | 0 | 118 |
| 117 | 153 | -36 | 0 | 119 |
| 29.4 | 153 | -123.6 | 0 | 120 |
| 56.91 | 153 | -96.09 | 0 | 121 |
| 56.91 | 153 | -96.09 | 0 | 122 |
| 21.95 | 153 | -131.05 | 0 | 123 |
| 24.13 | 153 | -128.87 | 0 | 124 |
| 28.1 | 153 | -124.9 | 0 | 125 |
| 26.72 | 153 | -126.28 | 0 | 126 |
| | | | | |
| 105 | 153 | -48 | 0 | 127 |
| 70.4 | 153 | -82.6 | 0 | 128 |
| 62.9 | 153 | -90.1 | 0 | 129 |
| 51.4 | 153 | -101.6 | 0 | 130 |
| 52.1 | 153 | -100.9 | 0 | 131 |
| 78.5 | 153 | -74.5 | 0 | 132 |
| 117 | 153 | -36 | 0 | 133 |
| 29.4 | 153 | -123.6 | 0 | 134 |
| 56.91 | 153 | -96.09 | 0 | 135 |
| 56.91 | 153 | -96.09 | 0 | 136 |
| 21.95 | 153 | -131.05 | 0 | 137 |
| 24.13 | 153 | -128.87 | 0 | 138 |
| 28.1 | 153 | -124.9 | 0 | 139 |
| 26.72 | 153 | -126.28 | 0 | 140 |
| | | | | |
| 70.4 | 105 | -34.6 | 0 | 141 |
| 62.9 | 105 | -42.1 | 0 | 142 |
| 51.4 | 105 | -53.6 | 0 | 143 |
| 52.1 | 105 | -52.9 | 0 | 144 |
| 78.5 | 105 | -26.5 | 0 | 145 |
| 117 | 105 | 12 | 1 | 145 |
| 29.4 | 105 | -75.6 | 1 | 146 |
| 56.91 | 105 | -48.09 | 1 | 147 |
| 56.91 | 105 | -48.09 | 1 | 148 |
| 21.95 | 105 | -83.05 | 1 | 149 |
| 24.13 | 105 | -80.87 | 1 | 150 |
| 28.1 | 105 | -76.9 | 1 | 151 |
| 26.72 | 105 | -78.28 | 1 | 152 |
| | | | | |
| 62.9 | 70.4 | -7.5 | 1 | 153 |
| 51.4 | 70.4 | -19 | 1 | 154 |
| 52.1 | 70.4 | -18.3 | 1 | 155 |
| 78.5 | 70.4 | 8.1 | 2 | 155 |
| 117 | 70.4 | 46.6 | 3 | 155 |
| 29.4 | 70.4 | -41 | 3 | 156 |
| 56.91 | 70.4 | -13.49 | 3 | 157 |
| 56.91 | 70.4 | -13.49 | 3 | 158 |
| 21.95 | 70.4 | -48.45 | 3 | 159 |

| | | | | |
|---|---|---|---|---|
| 24.13 | 70.4 | -46.27 | 3 | 160 |
| 28.1 | 70.4 | -42.3 | 3 | 161 |
| 26.72 | 70.4 | -43.68 | 3 | 162 |
| | | | | |
| 51.4 | 62.9 | -11.5 | 3 | 163 |
| 52.1 | 62.9 | -10.8 | 3 | 164 |
| 78.5 | 62.9 | 15.6 | 4 | 164 |
| 117 | 62.9 | 54.1 | 5 | 164 |
| 29.4 | 62.9 | -33.5 | 5 | 165 |
| 56.91 | 62.9 | -5.99 | 5 | 166 |
| 56.91 | 62.9 | -5.99 | 5 | 167 |
| 21.95 | 62.9 | -40.95 | 5 | 168 |
| 24.13 | 62.9 | -38.77 | 5 | 169 |
| 28.1 | 62.9 | -34.8 | 5 | 170 |
| 26.72 | 62.9 | -36.18 | 5 | 171 |
| | | | | |
| 52.1 | 51.4 | 0.7 | 6 | 171 |
| 78.5 | 51.4 | 27.1 | 7 | 171 |
| 117 | 51.4 | 65.6 | 8 | 171 |
| 29.4 | 51.4 | -22 | 8 | 172 |
| 56.91 | 51.4 | 5.51 | 9 | 172 |
| 56.91 | 51.4 | 5.51 | 10 | 172 |
| 21.95 | 51.4 | -29.45 | 10 | 173 |
| 24.13 | 51.4 | -27.27 | 10 | 174 |
| 28.1 | 51.4 | -23.3 | 10 | 175 |
| 26.72 | 51.4 | -24.68 | 10 | 176 |
| | | | | |
| 78.5 | 52.1 | 26.4 | 11 | 176 |
| 117 | 52.1 | 64.9 | 12 | 176 |
| 29.4 | 52.1 | -22.7 | 12 | 177 |
| 56.91 | 52.1 | 4.81 | 13 | 177 |
| 56.91 | 52.1 | 4.81 | 14 | 177 |
| 21.95 | 52.1 | -30.15 | 14 | 178 |
| 24.13 | 52.1 | -27.97 | 14 | 179 |
| 28.1 | 52.1 | -24 | 14 | 180 |
| 26.72 | 52.1 | -25.38 | 14 | 181 |
| | | | | |
| 117 | 78.5 | 38.5 | 15 | 181 |
| 29.4 | 78.5 | -49.1 | 15 | 182 |
| 56.91 | 78.5 | -21.59 | 15 | 183 |
| 56.91 | 78.5 | -21.59 | 15 | 184 |
| 21.95 | 78.5 | -56.55 | 15 | 185 |
| 24.13 | 78.5 | -54.37 | 15 | 186 |
| 28.1 | 78.5 | -50.4 | 15 | 187 |
| 26.72 | 78.5 | -51.78 | 15 | 188 |
| | | | | |
| 29.4 | 117 | -87.6 | 15 | 189 |
| 56.91 | 117 | -60.09 | 15 | 190 |
| 56.91 | 117 | -60.09 | 15 | 191 |
| 21.95 | 117 | -95.05 | 15 | 192 |
| 24.13 | 117 | -92.87 | 15 | 193 |
| 28.1 | 117 | -88.9 | 15 | 194 |
| 26.72 | 117 | -90.28 | 15 | 195 |
| | | | | |
| 56.91 | 29.4 | 27.51 | 16 | 195 |
| 56.91 | 29.4 | 27.51 | 17 | 195 |
| 21.95 | 29.4 | -7.45 | 17 | 196 |

| | | | | |
|---|---|---|---|---|
| 24.13 | 29.4 | -5.27 | 17 | 197 |
| 28.1 | 29.4 | -1.3 | 17 | 198 |
| 26.72 | 29.4 | -2.68 | 17 | 199 |
| | | | | |
| 56.91 | 56.91 | Same Date | 17 | 199 |
| 21.95 | 56.91 | -34.96 | 17 | 200 |
| 24.13 | 56.91 | -32.78 | 17 | 201 |
| 28.1 | 56.91 | -28.81 | 17 | 202 |
| 26.72 | 56.91 | -30.19 | 17 | 203 |
| | | | | |
| 21.95 | 56.91 | -34.96 | 17 | 204 |
| 24.13 | 56.91 | -32.78 | 17 | 205 |
| 28.1 | 56.91 | -28.81 | 17 | 206 |
| 26.72 | 56.91 | -30.19 | 17 | 207 |
| | | | | |
| 24.13 | 21.95 | 2.18 | 18 | 207 |
| 28.1 | 21.95 | 6.15 | 19 | 207 |
| 26.72 | 21.95 | 4.77 | 20 | 207 |
| | | | | |
| 28.1 | 24.13 | 3.97 | 21 | 207 |
| 26.72 | 24.13 | 2.59 | 22 | 207 |
| | | | | |
| 26.72 | 28.1 | -1.38 | 22 | 208 |

S Statistic = 22 - 208 = -186

| Tied Group | Value | Members |
|---|---|---|
| 1 | 153 | 4 |
| 2 | 151 | 4 |
| 3 | 56.91 | 2 |

| Time Period | Observations |
|---|---|
| 5/1/2019 | 10 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 2 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 2 time periods with multiple data

A = 330
B = 2268
C = 48
D = 720
E = 26
F = 92
a = 29256
b = 109296

c = 1104
Group Variance = 1483.48
Z-Score = -4.8032
Comparison Level at 95% confidence level = 1.65463 (upward trend)
-4.8032 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RW23-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| ND<1.5 U | ND<1.5 U | Same Date | 0 | 0 |
| 0.88 J | ND<1.5 U | -0.62 | 0 | 1 |
| 1.3 J | ND<1.5 U | -0.2 | 0 | 2 |
| 0.52 J | ND<1.5 U | -0.98 | 0 | 3 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 3 |
| ND<1.5 U1c | ND<1.5 U | 0 | 0 | 3 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 3 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 3 |
| ND<0.5 U | ND<1.5 U | -1 | 0 | 4 |
| ND<1 U | ND<1.5 U | -0.5 | 0 | 5 |
| 0.1371 J | ND<1.5 U | -1.3629 | 0 | 6 |
| 0.0966 J | ND<1.5 U | -1.4034 | 0 | 7 |
| 0.1232 J | ND<1.5 U | -1.3768 | 0 | 8 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 9 |
| 8.464 | ND<1.5 U | 6.964 | 1 | 9 |
| | | | | |
| 0.88 J | ND<1.5 U | -0.62 | 1 | 10 |
| 1.3 J | ND<1.5 U | -0.2 | 1 | 11 |
| 0.52 J | ND<1.5 U | -0.98 | 1 | 12 |
| ND<1.5 U | ND<1.5 U | 0 | 1 | 12 |
| ND<1.5 U1c | ND<1.5 U | 0 | 1 | 12 |
| ND<1.5 U | ND<1.5 U | 0 | 1 | 12 |
| ND<1.5 U | ND<1.5 U | 0 | 1 | 12 |
| ND<0.5 U | ND<1.5 U | -1 | 1 | 13 |
| ND<1 U | ND<1.5 U | -0.5 | 1 | 14 |
| 0.1371 J | ND<1.5 U | -1.3629 | 1 | 15 |
| 0.0966 J | ND<1.5 U | -1.4034 | 1 | 16 |
| 0.1232 J | ND<1.5 U | -1.3768 | 1 | 17 |
| ND<0.1 U | ND<1.5 U | -1.4 | 1 | 18 |
| 8.464 | ND<1.5 U | 6.964 | 2 | 18 |
| | | | | |
| 1.3 J | 0.88 J | 0.42 | 3 | 18 |
| 0.52 J | 0.88 J | -0.36 | 3 | 19 |
| ND<1.5 U | 0.88 J | 0.62 | 4 | 19 |
| ND<1.5 U1c | 0.88 J | 0.62 | 5 | 19 |
| ND<1.5 U | 0.88 J | 0.62 | 6 | 19 |
| ND<1.5 U | 0.88 J | 0.62 | 7 | 19 |
| ND<0.5 U | 0.88 J | -0.38 | 7 | 20 |
| ND<1 U | 0.88 J | 0.12 | 8 | 20 |
| 0.1371 J | 0.88 J | -0.7429 | 8 | 21 |
| 0.0966 J | 0.88 J | -0.7834 | 8 | 22 |
| 0.1232 J | 0.88 J | -0.7568 | 8 | 23 |
| ND<0.1 U | 0.88 J | -0.78 | 8 | 24 |
| 8.464 | 0.88 J | 7.584 | 9 | 24 |
| | | | | |
| 0.52 J | 1.3 J | -0.78 | 9 | 25 |
| ND<1.5 U | 1.3 J | 0.2 | 10 | 25 |

| | | | | |
|---|---|---|---|---|
| ND<1.5 U1c | 1.3 J | 0.2 | 11 | 25 |
| ND<1.5 U | 1.3 J | 0.2 | 12 | 25 |
| ND<1.5 U | 1.3 J | 0.2 | 13 | 25 |
| ND<0.5 U | 1.3 J | -0.8 | 13 | 26 |
| ND<1 U | 1.3 J | -0.3 | 13 | 27 |
| 0.1371 J | 1.3 J | -1.1629 | 13 | 28 |
| 0.0966 J | 1.3 J | -1.2034 | 13 | 29 |
| 0.1232 J | 1.3 J | -1.1768 | 13 | 30 |
| ND<0.1 U | 1.3 J | -1.2 | 13 | 31 |
| 8.464 | 1.3 J | 7.164 | 14 | 31 |
| | | | | |
| ND<1.5 U | 0.52 J | 0.98 | 15 | 31 |
| ND<1.5 U1c | 0.52 J | 0.98 | 16 | 31 |
| ND<1.5 U | 0.52 J | 0.98 | 17 | 31 |
| ND<1.5 U | 0.52 J | 0.98 | 18 | 31 |
| ND<0.5 U | 0.52 J | -0.02 | 18 | 32 |
| ND<1 U | 0.52 J | 0.48 | 19 | 32 |
| 0.1371 J | 0.52 J | -0.3829 | 19 | 33 |
| 0.0966 J | 0.52 J | -0.4234 | 19 | 34 |
| 0.1232 J | 0.52 J | -0.3968 | 19 | 35 |
| ND<0.1 U | 0.52 J | -0.42 | 19 | 36 |
| 8.464 | 0.52 J | 7.944 | 20 | 36 |
| | | | | |
| ND<1.5 U1c | ND<1.5 U | 0 | 20 | 36 |
| ND<1.5 U | ND<1.5 U | 0 | 20 | 36 |
| ND<1.5 U | ND<1.5 U | 0 | 20 | 36 |
| ND<0.5 U | ND<1.5 U | -1 | 20 | 37 |
| ND<1 U | ND<1.5 U | -0.5 | 20 | 38 |
| 0.1371 J | ND<1.5 U | -1.3629 | 20 | 39 |
| 0.0966 J | ND<1.5 U | -1.4034 | 20 | 40 |
| 0.1232 J | ND<1.5 U | -1.3768 | 20 | 41 |
| ND<0.1 U | ND<1.5 U | -1.4 | 20 | 42 |
| 8.464 | ND<1.5 U | 6.964 | 21 | 42 |
| | | | | |
| ND<1.5 U | ND<1.5 U1c | 0 | 21 | 42 |
| ND<1.5 U | ND<1.5 U1c | 0 | 21 | 42 |
| ND<0.5 U | ND<1.5 U1c | -1 | 21 | 43 |
| ND<1 U | ND<1.5 U1c | -0.5 | 21 | 44 |
| 0.1371 J | ND<1.5 U1c | -1.3629 | 21 | 45 |
| 0.0966 J | ND<1.5 U1c | -1.4034 | 21 | 46 |
| 0.1232 J | ND<1.5 U1c | -1.3768 | 21 | 47 |
| ND<0.1 U | ND<1.5 U1c | -1.4 | 21 | 48 |
| 8.464 | ND<1.5 U1c | 6.964 | 22 | 48 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 22 | 48 |
| ND<0.5 U | ND<1.5 U | -1 | 22 | 49 |
| ND<1 U | ND<1.5 U | -0.5 | 22 | 50 |
| 0.1371 J | ND<1.5 U | -1.3629 | 22 | 51 |
| 0.0966 J | ND<1.5 U | -1.4034 | 22 | 52 |
| 0.1232 J | ND<1.5 U | -1.3768 | 22 | 53 |
| ND<0.1 U | ND<1.5 U | -1.4 | 22 | 54 |
| 8.464 | ND<1.5 U | 6.964 | 23 | 54 |
| | | | | |
| ND<0.5 U | ND<1.5 U | -1 | 23 | 55 |
| ND<1 U | ND<1.5 U | -0.5 | 23 | 56 |
| 0.1371 J | ND<1.5 U | -1.3629 | 23 | 57 |
| 0.0966 J | ND<1.5 U | -1.4034 | 23 | 58 |

| | | | | |
|---|---|---|---|---|
| 0.1232 J | ND<1.5 U | -1.3768 | 23 | 59 |
| ND<0.1 U | ND<1.5 U | -1.4 | 23 | 60 |
| 8.464 | ND<1.5 U | 6.964 | 24 | 60 |
| | | | | |
| ND<1 U | ND<0.5 U | 0.5 | 25 | 60 |
| 0.1371 J | ND<0.5 U | -0.3629 | 25 | 61 |
| 0.0966 J | ND<0.5 U | -0.4034 | 25 | 62 |
| 0.1232 J | ND<0.5 U | -0.3768 | 25 | 63 |
| ND<0.1 U | ND<0.5 U | -0.4 | 25 | 64 |
| 8.464 | ND<0.5 U | 7.964 | 26 | 64 |
| | | | | |
| 0.1371 J | ND<1 U | -0.8629 | 26 | 65 |
| 0.0966 J | ND<1 U | -0.9034 | 26 | 66 |
| 0.1232 J | ND<1 U | -0.8768 | 26 | 67 |
| ND<0.1 U | ND<1 U | -0.9 | 26 | 68 |
| 8.464 | ND<1 U | 7.464 | 27 | 68 |
| | | | | |
| 0.0966 J | 0.1371 J | -0.0405 | 27 | 69 |
| 0.1232 J | 0.1371 J | -0.0139 | 27 | 70 |
| ND<0.1 U | 0.1371 J | -0.0371 | 27 | 71 |
| 8.464 | 0.1371 J | 8.3269 | 28 | 71 |
| | | | | |
| 0.1232 J | 0.0966 J | 0.0266 | 29 | 71 |
| ND<0.1 U | 0.0966 J | 0.0034 | 30 | 71 |
| 8.464 | 0.0966 J | 8.3674 | 31 | 71 |
| | | | | |
| ND<0.1 U | 0.1232 J | -0.0232 | 31 | 72 |
| 8.464 | 0.1232 J | 8.3408 | 32 | 72 |
| | | | | |
| 8.464 | ND<0.1 U | 8.364 | 33 | 72 |

S Statistic = 33 - 72 = -39

| Tied Group | Value | Members |
|---|---|---|
| 1 | 1.5 | 6 |

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 510
B = 18

C = 120
D = 0
E = 30
F = 2
a = 8880
b = 30240
c = 480
Group Variance = 464.125
Z-Score = -1.76387
Comparison Level at 95% confidence level = 1.65463 (upward trend)
-1.76387 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RW24-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 0.91 J | ND<1.5 U | Same Date | 0 | 0 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 0 |
| 0.43 J | ND<1.5 U | -1.07 | 0 | 1 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 1 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 1 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 1 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 1 |
| | | | | |
| ND<1.5 U | 0.91 J | 0.59 | 1 | 1 |
| 0.43 J | 0.91 J | -0.48 | 1 | 2 |
| ND<1.5 U | 0.91 J | 0.59 | 2 | 2 |
| ND<1.5 U | 0.91 J | 0.59 | 3 | 2 |
| ND<1.5 U | 0.91 J | 0.59 | 4 | 2 |
| ND<1.5 U | 0.91 J | 0.59 | 5 | 2 |
| | | | | |
| 0.43 J | ND<1.5 U | -1.07 | 5 | 3 |
| ND<1.5 U | ND<1.5 U | 0 | 5 | 3 |
| ND<1.5 U | ND<1.5 U | 0 | 5 | 3 |
| ND<1.5 U | ND<1.5 U | 0 | 5 | 3 |
| ND<1.5 U | ND<1.5 U | 0 | 5 | 3 |
| | | | | |
| ND<1.5 U | 0.43 J | 1.07 | 6 | 3 |
| ND<1.5 U | 0.43 J | 1.07 | 7 | 3 |
| ND<1.5 U | 0.43 J | 1.07 | 8 | 3 |
| ND<1.5 U | 0.43 J | 1.07 | 9 | 3 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 9 | 3 |
| ND<1.5 U | ND<1.5 U | 0 | 9 | 3 |
| ND<1.5 U | ND<1.5 U | 0 | 9 | 3 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 9 | 3 |
| ND<1.5 U | ND<1.5 U | 0 | 9 | 3 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 9 | 3 |

S Statistic = 9 - 3 = 6

| Tied Group | Value | Members |
|---|---|---|
| 1 | 1.5 | 6 |

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |

| | |
|---|---|
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |

There are 1 time periods with multiple data

---

A = 510
B = 18
C = 120
D = 0
E = 30
F = 2
a = 1176
b = 3024
c = 112
Group Variance = 36.5357
Z-Score = 0.827201
Comparison Level at 95% confidence level = 1.65463 (upward trend)
0.827201 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RW25-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 491 | 495 | Same Date | 0 | 0 |
| 599 | 495 | 104 | 1 | 0 |
| 9.9 | 495 | -485.1 | 1 | 1 |
| 2.7 J | 495 | -492.3 | 1 | 2 |
| 4.6 | 495 | -490.4 | 1 | 3 |
| 7 | 495 | -488 | 1 | 4 |
| 8.6 | 495 | -486.4 | 1 | 5 |
| | | | | |
| 599 | 491 | 108 | 2 | 5 |
| 9.9 | 491 | -481.1 | 2 | 6 |
| 2.7 J | 491 | -488.3 | 2 | 7 |
| 4.6 | 491 | -486.4 | 2 | 8 |
| 7 | 491 | -484 | 2 | 9 |
| 8.6 | 491 | -482.4 | 2 | 10 |
| | | | | |
| 9.9 | 599 | -589.1 | 2 | 11 |
| 2.7 J | 599 | -596.3 | 2 | 12 |
| 4.6 | 599 | -594.4 | 2 | 13 |
| 7 | 599 | -592 | 2 | 14 |
| 8.6 | 599 | -590.4 | 2 | 15 |
| | | | | |
| 2.7 J | 9.9 | -7.2 | 2 | 16 |
| 4.6 | 9.9 | -5.3 | 2 | 17 |
| 7 | 9.9 | -2.9 | 2 | 18 |
| 8.6 | 9.9 | -1.3 | 2 | 19 |
| | | | | |
| 4.6 | 2.7 J | 1.9 | 3 | 19 |
| 7 | 2.7 J | 4.3 | 4 | 19 |
| 8.6 | 2.7 J | 5.9 | 5 | 19 |
| | | | | |
| 7 | 4.6 | 2.4 | 6 | 19 |
| 8.6 | 4.6 | 4 | 7 | 19 |
| | | | | |
| 8.6 | 7 | 1.6 | 8 | 19 |

S Statistic = 8 - 19 = -11

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |

9/1/2020 1
11/1/2020 1
There are 1 time periods with multiple data

---

A = 0
B = 18
C = 0
D = 0
E = 0
F = 2
a = 1176
b = 3024
c = 112
Group Variance = 64.3333
Z-Score = -1.24676
Comparison Level at 95% confidence level = 1.65463 (upward trend)
-1.24676 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RWA-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 6.2 1c2c | 2.3 J | Same Date | 0 | 0 |
| 0.42 J | 2.3 J | Same Date | 0 | 0 |
| 0.42 J | 2.3 J | Same Date | 0 | 0 |
| 1.8 J | 2.3 J | Same Date | 0 | 0 |
| 1.8 J | 2.3 J | Same Date | 0 | 0 |
| 1.8 J | 2.3 J | Same Date | 0 | 0 |
| 1.8 J | 2.3 J | Same Date | 0 | 0 |
| 0.42 J | 2.3 J | Same Date | 0 | 0 |
| 0.42 J | 2.3 J | Same Date | 0 | 0 |
| 24 | 2.3 J | 21.7 | 1 | 0 |
| 4.4 | 2.3 J | 2.1 | 2 | 0 |
| 0.6 J | 2.3 J | -1.7 | 2 | 1 |
| 0.88 J | 2.3 J | -1.42 | 2 | 2 |
| 2.9 J | 2.3 J | 0.6 | 3 | 2 |
| 1.5 J | 2.3 J | -0.8 | 3 | 3 |
| 0.48 J | 2.3 J | -1.82 | 3 | 4 |
| ND<0.5 U | 2.3 J | -1.8 | 3 | 5 |
| ND<1 U | 2.3 J | -1.3 | 3 | 6 |
| 3.942 | 2.3 J | 1.642 | 4 | 6 |
| 5.859 | 2.3 J | 3.559 | 5 | 6 |
| 4.392 | 2.3 J | 2.092 | 6 | 6 |
| 1.784 | 2.3 J | -0.516 | 6 | 7 |
| 2.186 | 2.3 J | -0.114 | 6 | 8 |
| | | | | |
| 0.42 J | 6.2 1c2c | Same Date | 6 | 8 |
| 0.42 J | 6.2 1c2c | Same Date | 6 | 8 |
| 1.8 J | 6.2 1c2c | Same Date | 6 | 8 |
| 1.8 J | 6.2 1c2c | Same Date | 6 | 8 |
| 1.8 J | 6.2 1c2c | Same Date | 6 | 8 |
| 1.8 J | 6.2 1c2c | Same Date | 6 | 8 |
| 0.42 J | 6.2 1c2c | Same Date | 6 | 8 |
| 0.42 J | 6.2 1c2c | Same Date | 6 | 8 |
| 24 | 6.2 1c2c | 17.8 | 7 | 8 |
| 4.4 | 6.2 1c2c | -1.8 | 7 | 9 |
| 0.6 J | 6.2 1c2c | -5.6 | 7 | 10 |
| 0.88 J | 6.2 1c2c | -5.32 | 7 | 11 |
| 2.9 J | 6.2 1c2c | -3.3 | 7 | 12 |
| 1.5 J | 6.2 1c2c | -4.7 | 7 | 13 |
| 0.48 J | 6.2 1c2c | -5.72 | 7 | 14 |
| ND<0.5 U | 6.2 1c2c | -5.7 | 7 | 15 |
| ND<1 U | 6.2 1c2c | -5.2 | 7 | 16 |
| 3.942 | 6.2 1c2c | -2.258 | 7 | 17 |
| 5.859 | 6.2 1c2c | -0.341 | 7 | 18 |
| 4.392 | 6.2 1c2c | -1.808 | 7 | 19 |
| 1.784 | 6.2 1c2c | -4.416 | 7 | 20 |
| 2.186 | 6.2 1c2c | -4.014 | 7 | 21 |

| | | | | |
|---|---|---|---|---|
| 0.42 J | 0.42 J | Same Date | 7 | 21 |
| 1.8 J | 0.42 J | Same Date | 7 | 21 |
| 1.8 J | 0.42 J | Same Date | 7 | 21 |
| 1.8 J | 0.42 J | Same Date | 7 | 21 |
| 1.8 J | 0.42 J | Same Date | 7 | 21 |
| 0.42 J | 0.42 J | Same Date | 7 | 21 |
| 0.42 J | 0.42 J | Same Date | 7 | 21 |
| 24 | 0.42 J | 23.58 | 8 | 21 |
| 4.4 | 0.42 J | 3.98 | 9 | 21 |
| 0.6 J | 0.42 J | 0.18 | 10 | 21 |
| 0.88 J | 0.42 J | 0.46 | 11 | 21 |
| 2.9 J | 0.42 J | 2.48 | 12 | 21 |
| 1.5 J | 0.42 J | 1.08 | 13 | 21 |
| 0.48 J | 0.42 J | 0.06 | 14 | 21 |
| ND<0.5 U | 0.42 J | 0.08 | 15 | 21 |
| ND<1 U | 0.42 J | 0.58 | 16 | 21 |
| 3.942 | 0.42 J | 3.522 | 17 | 21 |
| 5.859 | 0.42 J | 5.439 | 18 | 21 |
| 4.392 | 0.42 J | 3.972 | 19 | 21 |
| 1.784 | 0.42 J | 1.364 | 20 | 21 |
| 2.186 | 0.42 J | 1.766 | 21 | 21 |
| | | | | |
| 1.8 J | 0.42 J | Same Date | 21 | 21 |
| 1.8 J | 0.42 J | Same Date | 21 | 21 |
| 1.8 J | 0.42 J | Same Date | 21 | 21 |
| 1.8 J | 0.42 J | Same Date | 21 | 21 |
| 0.42 J | 0.42 J | Same Date | 21 | 21 |
| 0.42 J | 0.42 J | Same Date | 21 | 21 |
| 24 | 0.42 J | 23.58 | 22 | 21 |
| 4.4 | 0.42 J | 3.98 | 23 | 21 |
| 0.6 J | 0.42 J | 0.18 | 24 | 21 |
| 0.88 J | 0.42 J | 0.46 | 25 | 21 |
| 2.9 J | 0.42 J | 2.48 | 26 | 21 |
| 1.5 J | 0.42 J | 1.08 | 27 | 21 |
| 0.48 J | 0.42 J | 0.06 | 28 | 21 |
| ND<0.5 U | 0.42 J | 0.08 | 29 | 21 |
| ND<1 U | 0.42 J | 0.58 | 30 | 21 |
| 3.942 | 0.42 J | 3.522 | 31 | 21 |
| 5.859 | 0.42 J | 5.439 | 32 | 21 |
| 4.392 | 0.42 J | 3.972 | 33 | 21 |
| 1.784 | 0.42 J | 1.364 | 34 | 21 |
| 2.186 | 0.42 J | 1.766 | 35 | 21 |
| | | | | |
| 1.8 J | 1.8 J | Same Date | 35 | 21 |
| 1.8 J | 1.8 J | Same Date | 35 | 21 |
| 1.8 J | 1.8 J | Same Date | 35 | 21 |
| 0.42 J | 1.8 J | Same Date | 35 | 21 |
| 0.42 J | 1.8 J | Same Date | 35 | 21 |
| 24 | 1.8 J | 22.2 | 36 | 21 |
| 4.4 | 1.8 J | 2.6 | 37 | 21 |
| 0.6 J | 1.8 J | -1.2 | 37 | 22 |
| 0.88 J | 1.8 J | -0.92 | 37 | 23 |
| 2.9 J | 1.8 J | 1.1 | 38 | 23 |
| 1.5 J | 1.8 J | -0.3 | 38 | 24 |
| 0.48 J | 1.8 J | -1.32 | 38 | 25 |
| ND<0.5 U | 1.8 J | -1.3 | 38 | 26 |
| ND<1 U | 1.8 J | -0.8 | 38 | 27 |

| | | | | |
|---|---|---|---|---|
| 3.942 | 1.8 J | 2.142 | 39 | 27 |
| 5.859 | 1.8 J | 4.059 | 40 | 27 |
| 4.392 | 1.8 J | 2.592 | 41 | 27 |
| 1.784 | 1.8 J | -0.016 | 41 | 28 |
| 2.186 | 1.8 J | 0.386 | 42 | 28 |
| | | | | |
| 1.8 J | 1.8 J | Same Date | 42 | 28 |
| 1.8 J | 1.8 J | Same Date | 42 | 28 |
| 0.42 J | 1.8 J | Same Date | 42 | 28 |
| 0.42 J | 1.8 J | Same Date | 42 | 28 |
| 24 | 1.8 J | 22.2 | 43 | 28 |
| 4.4 | 1.8 J | 2.6 | 44 | 28 |
| 0.6 J | 1.8 J | -1.2 | 44 | 29 |
| 0.88 J | 1.8 J | -0.92 | 44 | 30 |
| 2.9 J | 1.8 J | 1.1 | 45 | 30 |
| 1.5 J | 1.8 J | -0.3 | 45 | 31 |
| 0.48 J | 1.8 J | -1.32 | 45 | 32 |
| ND<0.5 U | 1.8 J | -1.3 | 45 | 33 |
| ND<1 U | 1.8 J | -0.8 | 45 | 34 |
| 3.942 | 1.8 J | 2.142 | 46 | 34 |
| 5.859 | 1.8 J | 4.059 | 47 | 34 |
| 4.392 | 1.8 J | 2.592 | 48 | 34 |
| 1.784 | 1.8 J | -0.016 | 48 | 35 |
| 2.186 | 1.8 J | 0.386 | 49 | 35 |
| | | | | |
| 1.8 J | 1.8 J | Same Date | 49 | 35 |
| 0.42 J | 1.8 J | Same Date | 49 | 35 |
| 0.42 J | 1.8 J | Same Date | 49 | 35 |
| 24 | 1.8 J | 22.2 | 50 | 35 |
| 4.4 | 1.8 J | 2.6 | 51 | 35 |
| 0.6 J | 1.8 J | -1.2 | 51 | 36 |
| 0.88 J | 1.8 J | -0.92 | 51 | 37 |
| 2.9 J | 1.8 J | 1.1 | 52 | 37 |
| 1.5 J | 1.8 J | -0.3 | 52 | 38 |
| 0.48 J | 1.8 J | -1.32 | 52 | 39 |
| ND<0.5 U | 1.8 J | -1.3 | 52 | 40 |
| ND<1 U | 1.8 J | -0.8 | 52 | 41 |
| 3.942 | 1.8 J | 2.142 | 53 | 41 |
| 5.859 | 1.8 J | 4.059 | 54 | 41 |
| 4.392 | 1.8 J | 2.592 | 55 | 41 |
| 1.784 | 1.8 J | -0.016 | 55 | 42 |
| 2.186 | 1.8 J | 0.386 | 56 | 42 |
| | | | | |
| 0.42 J | 1.8 J | Same Date | 56 | 42 |
| 0.42 J | 1.8 J | Same Date | 56 | 42 |
| 24 | 1.8 J | 22.2 | 57 | 42 |
| 4.4 | 1.8 J | 2.6 | 58 | 42 |
| 0.6 J | 1.8 J | -1.2 | 58 | 43 |
| 0.88 J | 1.8 J | -0.92 | 58 | 44 |
| 2.9 J | 1.8 J | 1.1 | 59 | 44 |
| 1.5 J | 1.8 J | -0.3 | 59 | 45 |
| 0.48 J | 1.8 J | -1.32 | 59 | 46 |
| ND<0.5 U | 1.8 J | -1.3 | 59 | 47 |
| ND<1 U | 1.8 J | -0.8 | 59 | 48 |
| 3.942 | 1.8 J | 2.142 | 60 | 48 |
| 5.859 | 1.8 J | 4.059 | 61 | 48 |
| 4.392 | 1.8 J | 2.592 | 62 | 48 |

| | | | | |
|---|---|---|---|---|
| 1.784 | 1.8 J | -0.016 | 62 | 49 |
| 2.186 | 1.8 J | 0.386 | 63 | 49 |
| | | | | |
| 0.42 J | 0.42 J | Same Date | 63 | 49 |
| 24 | 0.42 J | 23.58 | 64 | 49 |
| 4.4 | 0.42 J | 3.98 | 65 | 49 |
| 0.6 J | 0.42 J | 0.18 | 66 | 49 |
| 0.88 J | 0.42 J | 0.46 | 67 | 49 |
| 2.9 J | 0.42 J | 2.48 | 68 | 49 |
| 1.5 J | 0.42 J | 1.08 | 69 | 49 |
| 0.48 J | 0.42 J | 0.06 | 70 | 49 |
| ND<0.5 U | 0.42 J | 0.08 | 71 | 49 |
| ND<1 U | 0.42 J | 0.58 | 72 | 49 |
| 3.942 | 0.42 J | 3.522 | 73 | 49 |
| 5.859 | 0.42 J | 5.439 | 74 | 49 |
| 4.392 | 0.42 J | 3.972 | 75 | 49 |
| 1.784 | 0.42 J | 1.364 | 76 | 49 |
| 2.186 | 0.42 J | 1.766 | 77 | 49 |
| | | | | |
| 24 | 0.42 J | 23.58 | 78 | 49 |
| 4.4 | 0.42 J | 3.98 | 79 | 49 |
| 0.6 J | 0.42 J | 0.18 | 80 | 49 |
| 0.88 J | 0.42 J | 0.46 | 81 | 49 |
| 2.9 J | 0.42 J | 2.48 | 82 | 49 |
| 1.5 J | 0.42 J | 1.08 | 83 | 49 |
| 0.48 J | 0.42 J | 0.06 | 84 | 49 |
| ND<0.5 U | 0.42 J | 0.08 | 85 | 49 |
| ND<1 U | 0.42 J | 0.58 | 86 | 49 |
| 3.942 | 0.42 J | 3.522 | 87 | 49 |
| 5.859 | 0.42 J | 5.439 | 88 | 49 |
| 4.392 | 0.42 J | 3.972 | 89 | 49 |
| 1.784 | 0.42 J | 1.364 | 90 | 49 |
| 2.186 | 0.42 J | 1.766 | 91 | 49 |
| | | | | |
| 4.4 | 24 | -19.6 | 91 | 50 |
| 0.6 J | 24 | -23.4 | 91 | 51 |
| 0.88 J | 24 | -23.12 | 91 | 52 |
| 2.9 J | 24 | -21.1 | 91 | 53 |
| 1.5 J | 24 | -22.5 | 91 | 54 |
| 0.48 J | 24 | -23.52 | 91 | 55 |
| ND<0.5 U | 24 | -23.5 | 91 | 56 |
| ND<1 U | 24 | -23 | 91 | 57 |
| 3.942 | 24 | -20.058 | 91 | 58 |
| 5.859 | 24 | -18.141 | 91 | 59 |
| 4.392 | 24 | -19.608 | 91 | 60 |
| 1.784 | 24 | -22.216 | 91 | 61 |
| 2.186 | 24 | -21.814 | 91 | 62 |
| | | | | |
| 0.6 J | 4.4 | -3.8 | 91 | 63 |
| 0.88 J | 4.4 | -3.52 | 91 | 64 |
| 2.9 J | 4.4 | -1.5 | 91 | 65 |
| 1.5 J | 4.4 | -2.9 | 91 | 66 |
| 0.48 J | 4.4 | -3.92 | 91 | 67 |
| ND<0.5 U | 4.4 | -3.9 | 91 | 68 |
| ND<1 U | 4.4 | -3.4 | 91 | 69 |
| 3.942 | 4.4 | -0.458 | 91 | 70 |
| 5.859 | 4.4 | 1.459 | 92 | 70 |

| | | | | |
|---|---|---|---|---|
| 4.392 | 4.4 | -0.008 | 92 | 71 |
| 1.784 | 4.4 | -2.616 | 92 | 72 |
| 2.186 | 4.4 | -2.214 | 92 | 73 |
| | | | | |
| 0.88 J | 0.6 J | 0.28 | 93 | 73 |
| 2.9 J | 0.6 J | 2.3 | 94 | 73 |
| 1.5 J | 0.6 J | 0.9 | 95 | 73 |
| 0.48 J | 0.6 J | -0.12 | 95 | 74 |
| ND<0.5 U | 0.6 J | -0.1 | 95 | 75 |
| ND<1 U | 0.6 J | 0.4 | 96 | 75 |
| 3.942 | 0.6 J | 3.342 | 97 | 75 |
| 5.859 | 0.6 J | 5.259 | 98 | 75 |
| 4.392 | 0.6 J | 3.792 | 99 | 75 |
| 1.784 | 0.6 J | 1.184 | 100 | 75 |
| 2.186 | 0.6 J | 1.586 | 101 | 75 |
| | | | | |
| 2.9 J | 0.88 J | 2.02 | 102 | 75 |
| 1.5 J | 0.88 J | 0.62 | 103 | 75 |
| 0.48 J | 0.88 J | -0.4 | 103 | 76 |
| ND<0.5 U | 0.88 J | -0.38 | 103 | 77 |
| ND<1 U | 0.88 J | 0.12 | 104 | 77 |
| 3.942 | 0.88 J | 3.062 | 105 | 77 |
| 5.859 | 0.88 J | 4.979 | 106 | 77 |
| 4.392 | 0.88 J | 3.512 | 107 | 77 |
| 1.784 | 0.88 J | 0.904 | 108 | 77 |
| 2.186 | 0.88 J | 1.306 | 109 | 77 |
| | | | | |
| 1.5 J | 2.9 J | -1.4 | 109 | 78 |
| 0.48 J | 2.9 J | -2.42 | 109 | 79 |
| ND<0.5 U | 2.9 J | -2.4 | 109 | 80 |
| ND<1 U | 2.9 J | -1.9 | 109 | 81 |
| 3.942 | 2.9 J | 1.042 | 110 | 81 |
| 5.859 | 2.9 J | 2.959 | 111 | 81 |
| 4.392 | 2.9 J | 1.492 | 112 | 81 |
| 1.784 | 2.9 J | -1.116 | 112 | 82 |
| 2.186 | 2.9 J | -0.714 | 112 | 83 |
| | | | | |
| 0.48 J | 1.5 J | -1.02 | 112 | 84 |
| ND<0.5 U | 1.5 J | -1 | 112 | 85 |
| ND<1 U | 1.5 J | -0.5 | 112 | 86 |
| 3.942 | 1.5 J | 2.442 | 113 | 86 |
| 5.859 | 1.5 J | 4.359 | 114 | 86 |
| 4.392 | 1.5 J | 2.892 | 115 | 86 |
| 1.784 | 1.5 J | 0.284 | 116 | 86 |
| 2.186 | 1.5 J | 0.686 | 117 | 86 |
| | | | | |
| ND<0.5 U | 0.48 J | 0.02 | 118 | 86 |
| ND<1 U | 0.48 J | 0.52 | 119 | 86 |
| 3.942 | 0.48 J | 3.462 | 120 | 86 |
| 5.859 | 0.48 J | 5.379 | 121 | 86 |
| 4.392 | 0.48 J | 3.912 | 122 | 86 |
| 1.784 | 0.48 J | 1.304 | 123 | 86 |
| 2.186 | 0.48 J | 1.706 | 124 | 86 |
| | | | | |
| ND<1 U | ND<0.5 U | 0.5 | 125 | 86 |
| 3.942 | ND<0.5 U | 3.442 | 126 | 86 |
| 5.859 | ND<0.5 U | 5.359 | 127 | 86 |

| | | | | |
|---|---|---|---|---|
| 4.392 | ND<0.5 U | 3.892 | 128 | 86 |
| 1.784 | ND<0.5 U | 1.284 | 129 | 86 |
| 2.186 | ND<0.5 U | 1.686 | 130 | 86 |
| | | | | |
| 3.942 | ND<1 U | 2.942 | 131 | 86 |
| 5.859 | ND<1 U | 4.859 | 132 | 86 |
| 4.392 | ND<1 U | 3.392 | 133 | 86 |
| 1.784 | ND<1 U | 0.784 | 134 | 86 |
| 2.186 | ND<1 U | 1.186 | 135 | 86 |
| | | | | |
| 5.859 | 3.942 | 1.917 | 136 | 86 |
| 4.392 | 3.942 | 0.45 | 137 | 86 |
| 1.784 | 3.942 | -2.158 | 137 | 87 |
| 2.186 | 3.942 | -1.756 | 137 | 88 |
| | | | | |
| 4.392 | 5.859 | -1.467 | 137 | 89 |
| 1.784 | 5.859 | -4.075 | 137 | 90 |
| 2.186 | 5.859 | -3.673 | 137 | 91 |
| | | | | |
| 1.784 | 4.392 | -2.608 | 137 | 92 |
| 2.186 | 4.392 | -2.206 | 137 | 93 |
| | | | | |
| 2.186 | 1.784 | 0.402 | 138 | 93 |

S Statistic = 138 - 93 = 45

| Tied Group | Value | Members |
|---|---|---|
| 1 | 0.42 | 4 |
| 2 | 1.8 | 4 |

| Time Period | Observations |
|---|---|
| 5/1/2019 | 10 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 312
B = 2250
C = 48
D = 720
E = 24
F = 90
a = 29256
b = 109296

c = 1104
Group Variance = 1485.27
Z-Score = 1.14169
Comparison Level at 95% confidence level = 1.65463 (upward trend)
1.14169 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RWB-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| ND<1.5 U | 0.6 J1c2c | Same Date | 0 | 0 |
| ND<1.5 U | 0.6 J1c2c | Same Date | 0 | 0 |
| 2.2 J | 0.6 J1c2c | Same Date | 0 | 0 |
| 2.2 J | 0.6 J1c2c | Same Date | 0 | 0 |
| 2.2 J | 0.6 J1c2c | Same Date | 0 | 0 |
| 2.2 J | 0.6 J1c2c | Same Date | 0 | 0 |
| ND<1.5 U | 0.6 J1c2c | Same Date | 0 | 0 |
| ND<1.5 U | 0.6 J1c2c | Same Date | 0 | 0 |
| ND<1.5 U | 0.6 J1c2c | Same Date | 0 | 0 |
| ND<1.5 U | 0.6 J1c2c | 0.9 | 1 | 0 |
| ND<1.5 U | 0.6 J1c2c | 0.9 | 2 | 0 |
| ND<1.5 U | 0.6 J1c2c | 0.9 | 3 | 0 |
| ND<1.5 U | 0.6 J1c2c | 0.9 | 4 | 0 |
| ND<1.5 U | 0.6 J1c2c | 0.9 | 5 | 0 |
| ND<1.5 U | 0.6 J1c2c | 0.9 | 6 | 0 |
| ND<1.5 U | 0.6 J1c2c | 0.9 | 7 | 0 |
| ND<0.5 U | 0.6 J1c2c | -0.1 | 7 | 1 |
| ND<1 U | 0.6 J1c2c | 0.4 | 8 | 1 |
| ND<0.1 U | 0.6 J1c2c | -0.5 | 8 | 2 |
| ND<0.1 U | 0.6 J1c2c | -0.5 | 8 | 3 |
| ND<0.1 U | 0.6 J1c2c | -0.5 | 8 | 4 |
| 0.4092 | 0.6 J1c2c | -0.1908 | 8 | 5 |
| ND<0.1 U | 0.6 J1c2c | -0.5 | 8 | 6 |
| | | | | |
| ND<1.5 U | ND<1.5 U | Same Date | 8 | 6 |
| 2.2 J | ND<1.5 U | Same Date | 8 | 6 |
| 2.2 J | ND<1.5 U | Same Date | 8 | 6 |
| 2.2 J | ND<1.5 U | Same Date | 8 | 6 |
| 2.2 J | ND<1.5 U | Same Date | 8 | 6 |
| ND<1.5 U | ND<1.5 U | Same Date | 8 | 6 |
| ND<1.5 U | ND<1.5 U | Same Date | 8 | 6 |
| ND<1.5 U | ND<1.5 U | Same Date | 8 | 6 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 6 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 6 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 6 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 6 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 6 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 6 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 6 |
| ND<0.5 U | ND<1.5 U | -1 | 8 | 7 |
| ND<1 U | ND<1.5 U | -0.5 | 8 | 8 |
| ND<0.1 U | ND<1.5 U | -1.4 | 8 | 9 |
| ND<0.1 U | ND<1.5 U | -1.4 | 8 | 10 |
| ND<0.1 U | ND<1.5 U | -1.4 | 8 | 11 |
| 0.4092 | ND<1.5 U | -1.0908 | 8 | 12 |
| ND<0.1 U | ND<1.5 U | -1.4 | 8 | 13 |

| | | | | |
|---|---|---|---|---|
| 2.2 J | ND<1.5 U | Same Date | 8 | 13 |
| 2.2 J | ND<1.5 U | Same Date | 8 | 13 |
| 2.2 J | ND<1.5 U | Same Date | 8 | 13 |
| 2.2 J | ND<1.5 U | Same Date | 8 | 13 |
| ND<1.5 U | ND<1.5 U | Same Date | 8 | 13 |
| ND<1.5 U | ND<1.5 U | Same Date | 8 | 13 |
| ND<1.5 U | ND<1.5 U | Same Date | 8 | 13 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 13 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 13 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 13 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 13 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 13 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 13 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 13 |
| ND<0.5 U | ND<1.5 U | -1 | 8 | 14 |
| ND<1 U | ND<1.5 U | -0.5 | 8 | 15 |
| ND<0.1 U | ND<1.5 U | -1.4 | 8 | 16 |
| ND<0.1 U | ND<1.5 U | -1.4 | 8 | 17 |
| ND<0.1 U | ND<1.5 U | -1.4 | 8 | 18 |
| 0.4092 | ND<1.5 U | -1.0908 | 8 | 19 |
| ND<0.1 U | ND<1.5 U | -1.4 | 8 | 20 |
| | | | | |
| 2.2 J | 2.2 J | Same Date | 8 | 20 |
| 2.2 J | 2.2 J | Same Date | 8 | 20 |
| 2.2 J | 2.2 J | Same Date | 8 | 20 |
| ND<1.5 U | 2.2 J | Same Date | 8 | 20 |
| ND<1.5 U | 2.2 J | Same Date | 8 | 20 |
| ND<1.5 U | 2.2 J | Same Date | 8 | 20 |
| ND<1.5 U | 2.2 J | -0.7 | 8 | 21 |
| ND<1.5 U | 2.2 J | -0.7 | 8 | 22 |
| ND<1.5 U | 2.2 J | -0.7 | 8 | 23 |
| ND<1.5 U | 2.2 J | -0.7 | 8 | 24 |
| ND<1.5 U | 2.2 J | -0.7 | 8 | 25 |
| ND<1.5 U | 2.2 J | -0.7 | 8 | 26 |
| ND<1.5 U | 2.2 J | -0.7 | 8 | 27 |
| ND<0.5 U | 2.2 J | -1.7 | 8 | 28 |
| ND<1 U | 2.2 J | -1.2 | 8 | 29 |
| ND<0.1 U | 2.2 J | -2.1 | 8 | 30 |
| ND<0.1 U | 2.2 J | -2.1 | 8 | 31 |
| ND<0.1 U | 2.2 J | -2.1 | 8 | 32 |
| 0.4092 | 2.2 J | -1.7908 | 8 | 33 |
| ND<0.1 U | 2.2 J | -2.1 | 8 | 34 |
| | | | | |
| 2.2 J | 2.2 J | Same Date | 8 | 34 |
| 2.2 J | 2.2 J | Same Date | 8 | 34 |
| ND<1.5 U | 2.2 J | Same Date | 8 | 34 |
| ND<1.5 U | 2.2 J | Same Date | 8 | 34 |
| ND<1.5 U | 2.2 J | Same Date | 8 | 34 |
| ND<1.5 U | 2.2 J | -0.7 | 8 | 35 |
| ND<1.5 U | 2.2 J | -0.7 | 8 | 36 |
| ND<1.5 U | 2.2 J | -0.7 | 8 | 37 |
| ND<1.5 U | 2.2 J | -0.7 | 8 | 38 |
| ND<1.5 U | 2.2 J | -0.7 | 8 | 39 |
| ND<1.5 U | 2.2 J | -0.7 | 8 | 40 |
| ND<1.5 U | 2.2 J | -0.7 | 8 | 41 |
| ND<0.5 U | 2.2 J | -1.7 | 8 | 42 |
| ND<1 U | 2.2 J | -1.2 | 8 | 43 |

| | | | | |
|---|---|---|---|---|
| ND<0.1 U | 2.2 J | -2.1 | 8 | 44 |
| ND<0.1 U | 2.2 J | -2.1 | 8 | 45 |
| ND<0.1 U | 2.2 J | -2.1 | 8 | 46 |
| 0.4092 | 2.2 J | -1.7908 | 8 | 47 |
| ND<0.1 U | 2.2 J | -2.1 | 8 | 48 |
| | | | | |
| 2.2 J | 2.2 J | Same Date | 8 | 48 |
| ND<1.5 U | 2.2 J | Same Date | 8 | 48 |
| ND<1.5 U | 2.2 J | Same Date | 8 | 48 |
| ND<1.5 U | 2.2 J | Same Date | 8 | 48 |
| ND<1.5 U | 2.2 J | -0.7 | 8 | 49 |
| ND<1.5 U | 2.2 J | -0.7 | 8 | 50 |
| ND<1.5 U | 2.2 J | -0.7 | 8 | 51 |
| ND<1.5 U | 2.2 J | -0.7 | 8 | 52 |
| ND<1.5 U | 2.2 J | -0.7 | 8 | 53 |
| ND<1.5 U | 2.2 J | -0.7 | 8 | 54 |
| ND<1.5 U | 2.2 J | -0.7 | 8 | 55 |
| ND<0.5 U | 2.2 J | -1.7 | 8 | 56 |
| ND<1 U | 2.2 J | -1.2 | 8 | 57 |
| ND<0.1 U | 2.2 J | -2.1 | 8 | 58 |
| ND<0.1 U | 2.2 J | -2.1 | 8 | 59 |
| ND<0.1 U | 2.2 J | -2.1 | 8 | 60 |
| 0.4092 | 2.2 J | -1.7908 | 8 | 61 |
| ND<0.1 U | 2.2 J | -2.1 | 8 | 62 |
| | | | | |
| ND<1.5 U | 2.2 J | Same Date | 8 | 62 |
| ND<1.5 U | 2.2 J | Same Date | 8 | 62 |
| ND<1.5 U | 2.2 J | Same Date | 8 | 62 |
| ND<1.5 U | 2.2 J | -0.7 | 8 | 63 |
| ND<1.5 U | 2.2 J | -0.7 | 8 | 64 |
| ND<1.5 U | 2.2 J | -0.7 | 8 | 65 |
| ND<1.5 U | 2.2 J | -0.7 | 8 | 66 |
| ND<1.5 U | 2.2 J | -0.7 | 8 | 67 |
| ND<1.5 U | 2.2 J | -0.7 | 8 | 68 |
| ND<1.5 U | 2.2 J | -0.7 | 8 | 69 |
| ND<0.5 U | 2.2 J | -1.7 | 8 | 70 |
| ND<1 U | 2.2 J | -1.2 | 8 | 71 |
| ND<0.1 U | 2.2 J | -2.1 | 8 | 72 |
| ND<0.1 U | 2.2 J | -2.1 | 8 | 73 |
| ND<0.1 U | 2.2 J | -2.1 | 8 | 74 |
| 0.4092 | 2.2 J | -1.7908 | 8 | 75 |
| ND<0.1 U | 2.2 J | -2.1 | 8 | 76 |
| | | | | |
| ND<1.5 U | ND<1.5 U | Same Date | 8 | 76 |
| ND<1.5 U | ND<1.5 U | Same Date | 8 | 76 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 76 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 76 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 76 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 76 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 76 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 76 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 76 |
| ND<0.5 U | ND<1.5 U | -1 | 8 | 77 |
| ND<1 U | ND<1.5 U | -0.5 | 8 | 78 |
| ND<0.1 U | ND<1.5 U | -1.4 | 8 | 79 |
| ND<0.1 U | ND<1.5 U | -1.4 | 8 | 80 |
| ND<0.1 U | ND<1.5 U | -1.4 | 8 | 81 |

| | | | | |
|---|---|---|---|---|
| 0.4092 | ND<1.5 U | -1.0908 | 8 | 82 |
| ND<0.1 U | ND<1.5 U | -1.4 | 8 | 83 |
| | | | | |
| ND<1.5 U | ND<1.5 U | Same Date | 8 | 83 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 83 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 83 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 83 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 83 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 83 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 83 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 83 |
| ND<0.5 U | ND<1.5 U | -1 | 8 | 84 |
| ND<1 U | ND<1.5 U | -0.5 | 8 | 85 |
| ND<0.1 U | ND<1.5 U | -1.4 | 8 | 86 |
| ND<0.1 U | ND<1.5 U | -1.4 | 8 | 87 |
| ND<0.1 U | ND<1.5 U | -1.4 | 8 | 88 |
| 0.4092 | ND<1.5 U | -1.0908 | 8 | 89 |
| ND<0.1 U | ND<1.5 U | -1.4 | 8 | 90 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 90 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 90 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 90 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 90 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 90 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 90 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 90 |
| ND<0.5 U | ND<1.5 U | -1 | 8 | 91 |
| ND<1 U | ND<1.5 U | -0.5 | 8 | 92 |
| ND<0.1 U | ND<1.5 U | -1.4 | 8 | 93 |
| ND<0.1 U | ND<1.5 U | -1.4 | 8 | 94 |
| ND<0.1 U | ND<1.5 U | -1.4 | 8 | 95 |
| 0.4092 | ND<1.5 U | -1.0908 | 8 | 96 |
| ND<0.1 U | ND<1.5 U | -1.4 | 8 | 97 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 97 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 97 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 97 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 97 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 97 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 97 |
| ND<0.5 U | ND<1.5 U | -1 | 8 | 98 |
| ND<1 U | ND<1.5 U | -0.5 | 8 | 99 |
| ND<0.1 U | ND<1.5 U | -1.4 | 8 | 100 |
| ND<0.1 U | ND<1.5 U | -1.4 | 8 | 101 |
| ND<0.1 U | ND<1.5 U | -1.4 | 8 | 102 |
| 0.4092 | ND<1.5 U | -1.0908 | 8 | 103 |
| ND<0.1 U | ND<1.5 U | -1.4 | 8 | 104 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 104 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 104 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 104 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 104 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 104 |
| ND<0.5 U | ND<1.5 U | -1 | 8 | 105 |
| ND<1 U | ND<1.5 U | -0.5 | 8 | 106 |
| ND<0.1 U | ND<1.5 U | -1.4 | 8 | 107 |
| ND<0.1 U | ND<1.5 U | -1.4 | 8 | 108 |

| | | | | |
|---|---|---|---|---|
| ND<0.1 U | ND<1.5 U | -1.4 | 8 | 109 |
| 0.4092 | ND<1.5 U | -1.0908 | 8 | 110 |
| ND<0.1 U | ND<1.5 U | -1.4 | 8 | 111 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 111 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 111 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 111 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 111 |
| ND<0.5 U | ND<1.5 U | -1 | 8 | 112 |
| ND<1 U | ND<1.5 U | -0.5 | 8 | 113 |
| ND<0.1 U | ND<1.5 U | -1.4 | 8 | 114 |
| ND<0.1 U | ND<1.5 U | -1.4 | 8 | 115 |
| ND<0.1 U | ND<1.5 U | -1.4 | 8 | 116 |
| 0.4092 | ND<1.5 U | -1.0908 | 8 | 117 |
| ND<0.1 U | ND<1.5 U | -1.4 | 8 | 118 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 118 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 118 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 118 |
| ND<0.5 U | ND<1.5 U | -1 | 8 | 119 |
| ND<1 U | ND<1.5 U | -0.5 | 8 | 120 |
| ND<0.1 U | ND<1.5 U | -1.4 | 8 | 121 |
| ND<0.1 U | ND<1.5 U | -1.4 | 8 | 122 |
| ND<0.1 U | ND<1.5 U | -1.4 | 8 | 123 |
| 0.4092 | ND<1.5 U | -1.0908 | 8 | 124 |
| ND<0.1 U | ND<1.5 U | -1.4 | 8 | 125 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 125 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 125 |
| ND<0.5 U | ND<1.5 U | -1 | 8 | 126 |
| ND<1 U | ND<1.5 U | -0.5 | 8 | 127 |
| ND<0.1 U | ND<1.5 U | -1.4 | 8 | 128 |
| ND<0.1 U | ND<1.5 U | -1.4 | 8 | 129 |
| ND<0.1 U | ND<1.5 U | -1.4 | 8 | 130 |
| 0.4092 | ND<1.5 U | -1.0908 | 8 | 131 |
| ND<0.1 U | ND<1.5 U | -1.4 | 8 | 132 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 132 |
| ND<0.5 U | ND<1.5 U | -1 | 8 | 133 |
| ND<1 U | ND<1.5 U | -0.5 | 8 | 134 |
| ND<0.1 U | ND<1.5 U | -1.4 | 8 | 135 |
| ND<0.1 U | ND<1.5 U | -1.4 | 8 | 136 |
| ND<0.1 U | ND<1.5 U | -1.4 | 8 | 137 |
| 0.4092 | ND<1.5 U | -1.0908 | 8 | 138 |
| ND<0.1 U | ND<1.5 U | -1.4 | 8 | 139 |
| | | | | |
| ND<0.5 U | ND<1.5 U | -1 | 8 | 140 |
| ND<1 U | ND<1.5 U | -0.5 | 8 | 141 |
| ND<0.1 U | ND<1.5 U | -1.4 | 8 | 142 |
| ND<0.1 U | ND<1.5 U | -1.4 | 8 | 143 |
| ND<0.1 U | ND<1.5 U | -1.4 | 8 | 144 |
| 0.4092 | ND<1.5 U | -1.0908 | 8 | 145 |
| ND<0.1 U | ND<1.5 U | -1.4 | 8 | 146 |
| | | | | |
| ND<1 U | ND<0.5 U | 0.5 | 9 | 146 |
| ND<0.1 U | ND<0.5 U | -0.4 | 9 | 147 |
| ND<0.1 U | ND<0.5 U | -0.4 | 9 | 148 |

| | | | | |
|---|---|---|---|---|
| ND<0.1 U | ND<0.5 U | -0.4 | 9 | 149 |
| 0.4092 | ND<0.5 U | -0.0908 | 9 | 150 |
| ND<0.1 U | ND<0.5 U | -0.4 | 9 | 151 |
| | | | | |
| ND<0.1 U | ND<1 U | -0.9 | 9 | 152 |
| ND<0.1 U | ND<1 U | -0.9 | 9 | 153 |
| ND<0.1 U | ND<1 U | -0.9 | 9 | 154 |
| 0.4092 | ND<1 U | -0.5908 | 9 | 155 |
| ND<0.1 U | ND<1 U | -0.9 | 9 | 156 |
| | | | | |
| ND<0.1 U | ND<0.1 U | 0 | 9 | 156 |
| ND<0.1 U | ND<0.1 U | 0 | 9 | 156 |
| 0.4092 | ND<0.1 U | 0.3092 | 10 | 156 |
| ND<0.1 U | ND<0.1 U | 0 | 10 | 156 |
| | | | | |
| ND<0.1 U | ND<0.1 U | 0 | 10 | 156 |
| 0.4092 | ND<0.1 U | 0.3092 | 11 | 156 |
| ND<0.1 U | ND<0.1 U | 0 | 11 | 156 |
| | | | | |
| 0.4092 | ND<0.1 U | 0.3092 | 12 | 156 |
| ND<0.1 U | ND<0.1 U | 0 | 12 | 156 |
| | | | | |
| ND<0.1 U | 0.4092 | -0.3092 | 12 | 157 |

S Statistic = 12 - 157 = -145

| Tied Group | Value | Members |
|---|---|---|
| 1 | 1.5 | 12 |
| 2 | 2.2 | 4 |
| 3 | 0.1 | 4 |

| Time Period | Observations |
|---|---|
| 5/1/2019 | 10 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 4140
B = 2250
C = 1368
D = 720
E = 156
F = 90
a = 29256

b = 109296
c = 1104
Group Variance = 1292.06
Z-Score = -4.00609
Comparison Level at 95% confidence level = 1.65463 (upward trend)
-4.00609 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis
### Parameter: Cadmium
### Location: RWD-MWS
**Original Data (Not Transformed)**
**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| ND<1.5 U2c | ND<1.5 U1c3c | Same Date | 0 | 0 |
| ND<1.5 U | ND<1.5 U1c3c | 0 | 0 | 0 |
| ND<1.5 U | ND<1.5 U1c3c | 0 | 0 | 0 |
| ND<1.5 U | ND<1.5 U1c3c | 0 | 0 | 0 |
| 0.46 J | ND<1.5 U1c3c | -1.04 | 0 | 1 |
| 0.46 J | ND<1.5 U1c3c | -1.04 | 0 | 2 |
| ND<1.5 U | ND<1.5 U1c3c | 0 | 0 | 2 |
| ND<1.5 U | ND<1.5 U1c3c | 0 | 0 | 2 |
| ND<0.5 U | ND<1.5 U1c3c | -1 | 0 | 3 |
| ND<1 U | ND<1.5 U1c3c | -0.5 | 0 | 4 |
| 0.8141 | ND<1.5 U1c3c | -0.6859 | 0 | 5 |
| ND<0.1 U | ND<1.5 U1c3c | -1.4 | 0 | 6 |
| ND<0.1 U | ND<1.5 U1c3c | -1.4 | 0 | 7 |
| ND<0.1 U | ND<1.5 U1c3c | -1.4 | 0 | 8 |
| ND<0.1 U | ND<1.5 U1c3c | -1.4 | 0 | 9 |
| | | | | |
| ND<1.5 U | ND<1.5 U2c | 0 | 0 | 9 |
| ND<1.5 U | ND<1.5 U2c | 0 | 0 | 9 |
| ND<1.5 U | ND<1.5 U2c | 0 | 0 | 9 |
| 0.46 J | ND<1.5 U2c | -1.04 | 0 | 10 |
| 0.46 J | ND<1.5 U2c | -1.04 | 0 | 11 |
| ND<1.5 U | ND<1.5 U2c | 0 | 0 | 11 |
| ND<1.5 U | ND<1.5 U2c | 0 | 0 | 11 |
| ND<0.5 U | ND<1.5 U2c | -1 | 0 | 12 |
| ND<1 U | ND<1.5 U2c | -0.5 | 0 | 13 |
| 0.8141 | ND<1.5 U2c | -0.6859 | 0 | 14 |
| ND<0.1 U | ND<1.5 U2c | -1.4 | 0 | 15 |
| ND<0.1 U | ND<1.5 U2c | -1.4 | 0 | 16 |
| ND<0.1 U | ND<1.5 U2c | -1.4 | 0 | 17 |
| ND<0.1 U | ND<1.5 U2c | -1.4 | 0 | 18 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 18 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 18 |
| 0.46 J | ND<1.5 U | -1.04 | 0 | 19 |
| 0.46 J | ND<1.5 U | -1.04 | 0 | 20 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 20 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 20 |
| ND<0.5 U | ND<1.5 U | -1 | 0 | 21 |
| ND<1 U | ND<1.5 U | -0.5 | 0 | 22 |
| 0.8141 | ND<1.5 U | -0.6859 | 0 | 23 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 24 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 25 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 26 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 27 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 27 |
| 0.46 J | ND<1.5 U | -1.04 | 0 | 28 |

| | | | | |
|---|---|---|---|---|
| 0.46 J | ND<1.5 U | -1.04 | 0 | 29 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 29 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 29 |
| ND<0.5 U | ND<1.5 U | -1 | 0 | 30 |
| ND<1 U | ND<1.5 U | -0.5 | 0 | 31 |
| 0.8141 | ND<1.5 U | -0.6859 | 0 | 32 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 33 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 34 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 35 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 36 |
| | | | | |
| 0.46 J | ND<1.5 U | -1.04 | 0 | 37 |
| 0.46 J | ND<1.5 U | -1.04 | 0 | 38 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 38 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 38 |
| ND<0.5 U | ND<1.5 U | -1 | 0 | 39 |
| ND<1 U | ND<1.5 U | -0.5 | 0 | 40 |
| 0.8141 | ND<1.5 U | -0.6859 | 0 | 41 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 42 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 43 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 44 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 45 |
| | | | | |
| 0.46 J | 0.46 J | 0 | 0 | 45 |
| ND<1.5 U | 0.46 J | 1.04 | 1 | 45 |
| ND<1.5 U | 0.46 J | 1.04 | 2 | 45 |
| ND<0.5 U | 0.46 J | 0.04 | 3 | 45 |
| ND<1 U | 0.46 J | 0.54 | 4 | 45 |
| 0.8141 | 0.46 J | 0.3541 | 5 | 45 |
| ND<0.1 U | 0.46 J | -0.36 | 5 | 46 |
| ND<0.1 U | 0.46 J | -0.36 | 5 | 47 |
| ND<0.1 U | 0.46 J | -0.36 | 5 | 48 |
| ND<0.1 U | 0.46 J | -0.36 | 5 | 49 |
| | | | | |
| ND<1.5 U | 0.46 J | 1.04 | 6 | 49 |
| ND<1.5 U | 0.46 J | 1.04 | 7 | 49 |
| ND<0.5 U | 0.46 J | 0.04 | 8 | 49 |
| ND<1 U | 0.46 J | 0.54 | 9 | 49 |
| 0.8141 | 0.46 J | 0.3541 | 10 | 49 |
| ND<0.1 U | 0.46 J | -0.36 | 10 | 50 |
| ND<0.1 U | 0.46 J | -0.36 | 10 | 51 |
| ND<0.1 U | 0.46 J | -0.36 | 10 | 52 |
| ND<0.1 U | 0.46 J | -0.36 | 10 | 53 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 10 | 53 |
| ND<0.5 U | ND<1.5 U | -1 | 10 | 54 |
| ND<1 U | ND<1.5 U | -0.5 | 10 | 55 |
| 0.8141 | ND<1.5 U | -0.6859 | 10 | 56 |
| ND<0.1 U | ND<1.5 U | -1.4 | 10 | 57 |
| ND<0.1 U | ND<1.5 U | -1.4 | 10 | 58 |
| ND<0.1 U | ND<1.5 U | -1.4 | 10 | 59 |
| ND<0.1 U | ND<1.5 U | -1.4 | 10 | 60 |
| | | | | |
| ND<0.5 U | ND<1.5 U | -1 | 10 | 61 |
| ND<1 U | ND<1.5 U | -0.5 | 10 | 62 |
| 0.8141 | ND<1.5 U | -0.6859 | 10 | 63 |
| ND<0.1 U | ND<1.5 U | -1.4 | 10 | 64 |

| | | | | |
|---|---|---|---|---|
| ND<0.1 U | ND<1.5 U | -1.4 | 10 | 65 |
| ND<0.1 U | ND<1.5 U | -1.4 | 10 | 66 |
| ND<0.1 U | ND<1.5 U | -1.4 | 10 | 67 |
| | | | | |
| ND<1 U | ND<0.5 U | 0.5 | 11 | 67 |
| 0.8141 | ND<0.5 U | 0.3141 | 12 | 67 |
| ND<0.1 U | ND<0.5 U | -0.4 | 12 | 68 |
| ND<0.1 U | ND<0.5 U | -0.4 | 12 | 69 |
| ND<0.1 U | ND<0.5 U | -0.4 | 12 | 70 |
| ND<0.1 U | ND<0.5 U | -0.4 | 12 | 71 |
| | | | | |
| 0.8141 | ND<1 U | -0.1859 | 12 | 72 |
| ND<0.1 U | ND<1 U | -0.9 | 12 | 73 |
| ND<0.1 U | ND<1 U | -0.9 | 12 | 74 |
| ND<0.1 U | ND<1 U | -0.9 | 12 | 75 |
| ND<0.1 U | ND<1 U | -0.9 | 12 | 76 |
| | | | | |
| ND<0.1 U | 0.8141 | -0.7141 | 12 | 77 |
| ND<0.1 U | 0.8141 | -0.7141 | 12 | 78 |
| ND<0.1 U | 0.8141 | -0.7141 | 12 | 79 |
| ND<0.1 U | 0.8141 | -0.7141 | 12 | 80 |
| | | | | |
| ND<0.1 U | ND<0.1 U | 0 | 12 | 80 |
| ND<0.1 U | ND<0.1 U | 0 | 12 | 80 |
| ND<0.1 U | ND<0.1 U | 0 | 12 | 80 |
| | | | | |
| ND<0.1 U | ND<0.1 U | 0 | 12 | 80 |
| ND<0.1 U | ND<0.1 U | 0 | 12 | 80 |
| | | | | |
| ND<0.1 U | ND<0.1 U | 0 | 12 | 80 |

S Statistic = 12 - 80 = -68

| Tied Group | Value | Members |
|---|---|---|
| 1 | 1.5 | 7 |
| 2 | 0.46 | 2 |
| 3 | 0.1 | 4 |

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 972
B = 18
C = 234
D = 0
E = 56
F = 2
a = 8880
b = 30240
c = 480
Group Variance = 438.567
Z-Score = -3.19931
Comparison Level at 95% confidence level = 1.65463 (upward trend)
-3.19931 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RWE-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 0.59 J1c3c | 0.57 J2c | Same Date | 0 | 0 |
| 0.64 J | 0.57 J2c | 0.07 | 1 | 0 |
| 2 J | 0.57 J2c | 1.43 | 2 | 0 |
| 0.91 J | 0.57 J2c | 0.34 | 3 | 0 |
| 1.4 J | 0.57 J2c | 0.83 | 4 | 0 |
| 8.7 | 0.57 J2c | 8.13 | 5 | 0 |
| 0.44 J | 0.57 J2c | -0.13 | 5 | 1 |
| 10.9 | 0.57 J2c | 10.33 | 6 | 1 |
| 0.55 J | 0.57 J2c | -0.02 | 6 | 2 |
| ND<1 U | 0.57 J2c | 0.43 | 7 | 2 |
| 3.584 | 0.57 J2c | 3.014 | 8 | 2 |
| 3.584 | 0.57 J2c | 3.014 | 9 | 2 |
| 2.846 | 0.57 J2c | 2.276 | 10 | 2 |
| 2.055 | 0.57 J2c | 1.485 | 11 | 2 |
| 5.255 | 0.57 J2c | 4.685 | 12 | 2 |
| 3.184 | 0.57 J2c | 2.614 | 13 | 2 |
| | | | | |
| 0.64 J | 0.59 J1c3c | 0.05 | 14 | 2 |
| 2 J | 0.59 J1c3c | 1.41 | 15 | 2 |
| 0.91 J | 0.59 J1c3c | 0.32 | 16 | 2 |
| 1.4 J | 0.59 J1c3c | 0.81 | 17 | 2 |
| 8.7 | 0.59 J1c3c | 8.11 | 18 | 2 |
| 0.44 J | 0.59 J1c3c | -0.15 | 18 | 3 |
| 10.9 | 0.59 J1c3c | 10.31 | 19 | 3 |
| 0.55 J | 0.59 J1c3c | -0.04 | 19 | 4 |
| ND<1 U | 0.59 J1c3c | 0.41 | 20 | 4 |
| 3.584 | 0.59 J1c3c | 2.994 | 21 | 4 |
| 3.584 | 0.59 J1c3c | 2.994 | 22 | 4 |
| 2.846 | 0.59 J1c3c | 2.256 | 23 | 4 |
| 2.055 | 0.59 J1c3c | 1.465 | 24 | 4 |
| 5.255 | 0.59 J1c3c | 4.665 | 25 | 4 |
| 3.184 | 0.59 J1c3c | 2.594 | 26 | 4 |
| | | | | |
| 2 J | 0.64 J | 1.36 | 27 | 4 |
| 0.91 J | 0.64 J | 0.27 | 28 | 4 |
| 1.4 J | 0.64 J | 0.76 | 29 | 4 |
| 8.7 | 0.64 J | 8.06 | 30 | 4 |
| 0.44 J | 0.64 J | -0.2 | 30 | 5 |
| 10.9 | 0.64 J | 10.26 | 31 | 5 |
| 0.55 J | 0.64 J | -0.09 | 31 | 6 |
| ND<1 U | 0.64 J | 0.36 | 32 | 6 |
| 3.584 | 0.64 J | 2.944 | 33 | 6 |
| 3.584 | 0.64 J | 2.944 | 34 | 6 |
| 2.846 | 0.64 J | 2.206 | 35 | 6 |
| 2.055 | 0.64 J | 1.415 | 36 | 6 |
| 5.255 | 0.64 J | 4.615 | 37 | 6 |
| 3.184 | 0.64 J | 2.544 | 38 | 6 |

| | | | | |
|---|---|---|---|---|
| 0.91 J | 2 J | -1.09 | 38 | 7 |
| 1.4 J | 2 J | -0.6 | 38 | 8 |
| 8.7 | 2 J | 6.7 | 39 | 8 |
| 0.44 J | 2 J | -1.56 | 39 | 9 |
| 10.9 | 2 J | 8.9 | 40 | 9 |
| 0.55 J | 2 J | -1.45 | 40 | 10 |
| ND<1 U | 2 J | -1 | 40 | 11 |
| 3.584 | 2 J | 1.584 | 41 | 11 |
| 3.584 | 2 J | 1.584 | 42 | 11 |
| 2.846 | 2 J | 0.846 | 43 | 11 |
| 2.055 | 2 J | 0.055 | 44 | 11 |
| 5.255 | 2 J | 3.255 | 45 | 11 |
| 3.184 | 2 J | 1.184 | 46 | 11 |
| | | | | |
| 1.4 J | 0.91 J | 0.49 | 47 | 11 |
| 8.7 | 0.91 J | 7.79 | 48 | 11 |
| 0.44 J | 0.91 J | -0.47 | 48 | 12 |
| 10.9 | 0.91 J | 9.99 | 49 | 12 |
| 0.55 J | 0.91 J | -0.36 | 49 | 13 |
| ND<1 U | 0.91 J | 0.09 | 50 | 13 |
| 3.584 | 0.91 J | 2.674 | 51 | 13 |
| 3.584 | 0.91 J | 2.674 | 52 | 13 |
| 2.846 | 0.91 J | 1.936 | 53 | 13 |
| 2.055 | 0.91 J | 1.145 | 54 | 13 |
| 5.255 | 0.91 J | 4.345 | 55 | 13 |
| 3.184 | 0.91 J | 2.274 | 56 | 13 |
| | | | | |
| 8.7 | 1.4 J | 7.3 | 57 | 13 |
| 0.44 J | 1.4 J | -0.96 | 57 | 14 |
| 10.9 | 1.4 J | 9.5 | 58 | 14 |
| 0.55 J | 1.4 J | -0.85 | 58 | 15 |
| ND<1 U | 1.4 J | -0.4 | 58 | 16 |
| 3.584 | 1.4 J | 2.184 | 59 | 16 |
| 3.584 | 1.4 J | 2.184 | 60 | 16 |
| 2.846 | 1.4 J | 1.446 | 61 | 16 |
| 2.055 | 1.4 J | 0.655 | 62 | 16 |
| 5.255 | 1.4 J | 3.855 | 63 | 16 |
| 3.184 | 1.4 J | 1.784 | 64 | 16 |
| | | | | |
| 0.44 J | 8.7 | -8.26 | 64 | 17 |
| 10.9 | 8.7 | 2.2 | 65 | 17 |
| 0.55 J | 8.7 | -8.15 | 65 | 18 |
| ND<1 U | 8.7 | -7.7 | 65 | 19 |
| 3.584 | 8.7 | -5.116 | 65 | 20 |
| 3.584 | 8.7 | -5.116 | 65 | 21 |
| 2.846 | 8.7 | -5.854 | 65 | 22 |
| 2.055 | 8.7 | -6.645 | 65 | 23 |
| 5.255 | 8.7 | -3.445 | 65 | 24 |
| 3.184 | 8.7 | -5.516 | 65 | 25 |
| | | | | |
| 10.9 | 0.44 J | 10.46 | 66 | 25 |
| 0.55 J | 0.44 J | 0.11 | 67 | 25 |
| ND<1 U | 0.44 J | 0.56 | 68 | 25 |
| 3.584 | 0.44 J | 3.144 | 69 | 25 |
| 3.584 | 0.44 J | 3.144 | 70 | 25 |
| 2.846 | 0.44 J | 2.406 | 71 | 25 |

| | | | | |
|---|---|---|---|---|
| 2.055 | 0.44 J | 1.615 | 72 | 25 |
| 5.255 | 0.44 J | 4.815 | 73 | 25 |
| 3.184 | 0.44 J | 2.744 | 74 | 25 |
| | | | | |
| 0.55 J | 10.9 | -10.35 | 74 | 26 |
| ND<1 U | 10.9 | -9.9 | 74 | 27 |
| 3.584 | 10.9 | -7.316 | 74 | 28 |
| 3.584 | 10.9 | -7.316 | 74 | 29 |
| 2.846 | 10.9 | -8.054 | 74 | 30 |
| 2.055 | 10.9 | -8.845 | 74 | 31 |
| 5.255 | 10.9 | -5.645 | 74 | 32 |
| 3.184 | 10.9 | -7.716 | 74 | 33 |
| | | | | |
| ND<1 U | 0.55 J | 0.45 | 75 | 33 |
| 3.584 | 0.55 J | 3.034 | 76 | 33 |
| 3.584 | 0.55 J | 3.034 | 77 | 33 |
| 2.846 | 0.55 J | 2.296 | 78 | 33 |
| 2.055 | 0.55 J | 1.505 | 79 | 33 |
| 5.255 | 0.55 J | 4.705 | 80 | 33 |
| 3.184 | 0.55 J | 2.634 | 81 | 33 |
| | | | | |
| 3.584 | ND<1 U | 2.584 | 82 | 33 |
| 3.584 | ND<1 U | 2.584 | 83 | 33 |
| 2.846 | ND<1 U | 1.846 | 84 | 33 |
| 2.055 | ND<1 U | 1.055 | 85 | 33 |
| 5.255 | ND<1 U | 4.255 | 86 | 33 |
| 3.184 | ND<1 U | 2.184 | 87 | 33 |
| | | | | |
| 3.584 | 3.584 | Same Date | 87 | 33 |
| 2.846 | 3.584 | -0.738 | 87 | 34 |
| 2.055 | 3.584 | -1.529 | 87 | 35 |
| 5.255 | 3.584 | 1.671 | 88 | 35 |
| 3.184 | 3.584 | -0.4 | 88 | 36 |
| | | | | |
| 2.846 | 3.584 | -0.738 | 88 | 37 |
| 2.055 | 3.584 | -1.529 | 88 | 38 |
| 5.255 | 3.584 | 1.671 | 89 | 38 |
| 3.184 | 3.584 | -0.4 | 89 | 39 |
| | | | | |
| 2.055 | 2.846 | -0.791 | 89 | 40 |
| 5.255 | 2.846 | 2.409 | 90 | 40 |
| 3.184 | 2.846 | 0.338 | 91 | 40 |
| | | | | |
| 5.255 | 2.055 | 3.2 | 92 | 40 |
| 3.184 | 2.055 | 1.129 | 93 | 40 |
| | | | | |
| 3.184 | 5.255 | -2.071 | 93 | 41 |

S Statistic = 93 - 41 = 52

| Tied Group | Value | Members |
|---|---|---|
| 1 | 3.584 | 2 |

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |

| | |
|---|---|
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 2 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 2 time periods with multiple data

---

A = 18
B = 36
C = 0
D = 0
E = 2
F = 4
a = 10608
b = 36720
c = 544
Group Variance = 586.348
Z-Score = 2.10617
Comparison Level at 95% confidence level = 1.65463 (upward trend)
**2.10617 > 1.65463 indicating an upward trend**

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RWF-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 4.2 | 5.7 | Same Date | 0 | 0 |
| 6.1 | 5.7 | 0.4 | 1 | 0 |
| 7.3 | 5.7 | 1.6 | 2 | 0 |
| 7.7 | 5.7 | 2 | 3 | 0 |
| 5.7 | 5.7 | 0 | 3 | 0 |
| 6 | 5.7 | 0.3 | 4 | 0 |
| 4.6 | 5.7 | -1.1 | 4 | 1 |
| 4 | 5.7 | -1.7 | 4 | 2 |
| 3.4 | 5.7 | -2.3 | 4 | 3 |
| 4.9 | 5.7 | -0.8 | 4 | 4 |
| 2.545 | 5.7 | -3.155 | 4 | 5 |
| 2.166 | 5.7 | -3.534 | 4 | 6 |
| 1.51 | 5.7 | -4.19 | 4 | 7 |
| 1.024 | 5.7 | -4.676 | 4 | 8 |
| 0.68 | 5.7 | -5.02 | 4 | 9 |
| | | | | |
| 6.1 | 4.2 | 1.9 | 5 | 9 |
| 7.3 | 4.2 | 3.1 | 6 | 9 |
| 7.7 | 4.2 | 3.5 | 7 | 9 |
| 5.7 | 4.2 | 1.5 | 8 | 9 |
| 6 | 4.2 | 1.8 | 9 | 9 |
| 4.6 | 4.2 | 0.4 | 10 | 9 |
| 4 | 4.2 | -0.2 | 10 | 10 |
| 3.4 | 4.2 | -0.8 | 10 | 11 |
| 4.9 | 4.2 | 0.7 | 11 | 11 |
| 2.545 | 4.2 | -1.655 | 11 | 12 |
| 2.166 | 4.2 | -2.034 | 11 | 13 |
| 1.51 | 4.2 | -2.69 | 11 | 14 |
| 1.024 | 4.2 | -3.176 | 11 | 15 |
| 0.68 | 4.2 | -3.52 | 11 | 16 |
| | | | | |
| 7.3 | 6.1 | 1.2 | 12 | 16 |
| 7.7 | 6.1 | 1.6 | 13 | 16 |
| 5.7 | 6.1 | -0.4 | 13 | 17 |
| 6 | 6.1 | -0.1 | 13 | 18 |
| 4.6 | 6.1 | -1.5 | 13 | 19 |
| 4 | 6.1 | -2.1 | 13 | 20 |
| 3.4 | 6.1 | -2.7 | 13 | 21 |
| 4.9 | 6.1 | -1.2 | 13 | 22 |
| 2.545 | 6.1 | -3.555 | 13 | 23 |
| 2.166 | 6.1 | -3.934 | 13 | 24 |
| 1.51 | 6.1 | -4.59 | 13 | 25 |
| 1.024 | 6.1 | -5.076 | 13 | 26 |
| 0.68 | 6.1 | -5.42 | 13 | 27 |
| | | | | |
| 7.7 | 7.3 | 0.4 | 14 | 27 |
| 5.7 | 7.3 | -1.6 | 14 | 28 |

| | | | | |
|---|---|---|---|---|
| 6 | 7.3 | -1.3 | 14 | 29 |
| 4.6 | 7.3 | -2.7 | 14 | 30 |
| 4 | 7.3 | -3.3 | 14 | 31 |
| 3.4 | 7.3 | -3.9 | 14 | 32 |
| 4.9 | 7.3 | -2.4 | 14 | 33 |
| 2.545 | 7.3 | -4.755 | 14 | 34 |
| 2.166 | 7.3 | -5.134 | 14 | 35 |
| 1.51 | 7.3 | -5.79 | 14 | 36 |
| 1.024 | 7.3 | -6.276 | 14 | 37 |
| 0.68 | 7.3 | -6.62 | 14 | 38 |
| | | | | |
| 5.7 | 7.7 | -2 | 14 | 39 |
| 6 | 7.7 | -1.7 | 14 | 40 |
| 4.6 | 7.7 | -3.1 | 14 | 41 |
| 4 | 7.7 | -3.7 | 14 | 42 |
| 3.4 | 7.7 | -4.3 | 14 | 43 |
| 4.9 | 7.7 | -2.8 | 14 | 44 |
| 2.545 | 7.7 | -5.155 | 14 | 45 |
| 2.166 | 7.7 | -5.534 | 14 | 46 |
| 1.51 | 7.7 | -6.19 | 14 | 47 |
| 1.024 | 7.7 | -6.676 | 14 | 48 |
| 0.68 | 7.7 | -7.02 | 14 | 49 |
| | | | | |
| 6 | 5.7 | 0.3 | 15 | 49 |
| 4.6 | 5.7 | -1.1 | 15 | 50 |
| 4 | 5.7 | -1.7 | 15 | 51 |
| 3.4 | 5.7 | -2.3 | 15 | 52 |
| 4.9 | 5.7 | -0.8 | 15 | 53 |
| 2.545 | 5.7 | -3.155 | 15 | 54 |
| 2.166 | 5.7 | -3.534 | 15 | 55 |
| 1.51 | 5.7 | -4.19 | 15 | 56 |
| 1.024 | 5.7 | -4.676 | 15 | 57 |
| 0.68 | 5.7 | -5.02 | 15 | 58 |
| | | | | |
| 4.6 | 6 | -1.4 | 15 | 59 |
| 4 | 6 | -2 | 15 | 60 |
| 3.4 | 6 | -2.6 | 15 | 61 |
| 4.9 | 6 | -1.1 | 15 | 62 |
| 2.545 | 6 | -3.455 | 15 | 63 |
| 2.166 | 6 | -3.834 | 15 | 64 |
| 1.51 | 6 | -4.49 | 15 | 65 |
| 1.024 | 6 | -4.976 | 15 | 66 |
| 0.68 | 6 | -5.32 | 15 | 67 |
| | | | | |
| 4 | 4.6 | -0.6 | 15 | 68 |
| 3.4 | 4.6 | -1.2 | 15 | 69 |
| 4.9 | 4.6 | 0.3 | 16 | 69 |
| 2.545 | 4.6 | -2.055 | 16 | 70 |
| 2.166 | 4.6 | -2.434 | 16 | 71 |
| 1.51 | 4.6 | -3.09 | 16 | 72 |
| 1.024 | 4.6 | -3.576 | 16 | 73 |
| 0.68 | 4.6 | -3.92 | 16 | 74 |
| | | | | |
| 3.4 | 4 | -0.6 | 16 | 75 |
| 4.9 | 4 | 0.9 | 17 | 75 |
| 2.545 | 4 | -1.455 | 17 | 76 |
| 2.166 | 4 | -1.834 | 17 | 77 |

| | | | | |
|---|---|---|---|---|
| 1.51 | 4 | -2.49 | 17 | 78 |
| 1.024 | 4 | -2.976 | 17 | 79 |
| 0.68 | 4 | -3.32 | 17 | 80 |
| | | | | |
| 4.9 | 3.4 | 1.5 | 18 | 80 |
| 2.545 | 3.4 | -0.855 | 18 | 81 |
| 2.166 | 3.4 | -1.234 | 18 | 82 |
| 1.51 | 3.4 | -1.89 | 18 | 83 |
| 1.024 | 3.4 | -2.376 | 18 | 84 |
| 0.68 | 3.4 | -2.72 | 18 | 85 |
| | | | | |
| 2.545 | 4.9 | -2.355 | 18 | 86 |
| 2.166 | 4.9 | -2.734 | 18 | 87 |
| 1.51 | 4.9 | -3.39 | 18 | 88 |
| 1.024 | 4.9 | -3.876 | 18 | 89 |
| 0.68 | 4.9 | -4.22 | 18 | 90 |
| | | | | |
| 2.166 | 2.545 | -0.379 | 18 | 91 |
| 1.51 | 2.545 | -1.035 | 18 | 92 |
| 1.024 | 2.545 | -1.521 | 18 | 93 |
| 0.68 | 2.545 | -1.865 | 18 | 94 |
| | | | | |
| 1.51 | 2.166 | -0.656 | 18 | 95 |
| 1.024 | 2.166 | -1.142 | 18 | 96 |
| 0.68 | 2.166 | -1.486 | 18 | 97 |
| | | | | |
| 1.024 | 1.51 | -0.486 | 18 | 98 |
| 0.68 | 1.51 | -0.83 | 18 | 99 |
| | | | | |
| 0.68 | 1.024 | -0.344 | 18 | 100 |

S Statistic = 18 - 100 = -82

| Tied Group | Value | Members |
|---|---|---|
| 1 | 5.7 | 2 |

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 18
B = 18

C = 0
D = 0
E = 2
F = 2
a = 8880
b = 30240
c = 480
Group Variance = 491.342
Z-Score = -3.65421
Comparison Level at 95% confidence level = 1.65463 (upward trend)
-3.65421 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RWG-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| ND<1.5 U1c3c | ND<1.5 U2c | Same Date | 0 | 0 |
| ND<1.5 U | ND<1.5 U2c | 0 | 0 | 0 |
| ND<1.5 U | ND<1.5 U2c | 0 | 0 | 0 |
| ND<1.5 U | ND<1.5 U2c | 0 | 0 | 0 |
| 0.63 J | ND<1.5 U2c | -0.87 | 0 | 1 |
| ND<1.5 U | ND<1.5 U2c | 0 | 0 | 1 |
| ND<1.5 U | ND<1.5 U2c | 0 | 0 | 1 |
| | | | | |
| ND<1.5 U | ND<1.5 U1c3c | 0 | 0 | 1 |
| ND<1.5 U | ND<1.5 U1c3c | 0 | 0 | 1 |
| ND<1.5 U | ND<1.5 U1c3c | 0 | 0 | 1 |
| 0.63 J | ND<1.5 U1c3c | -0.87 | 0 | 2 |
| ND<1.5 U | ND<1.5 U1c3c | 0 | 0 | 2 |
| ND<1.5 U | ND<1.5 U1c3c | 0 | 0 | 2 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 2 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 2 |
| 0.63 J | ND<1.5 U | -0.87 | 0 | 3 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 3 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 3 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 3 |
| 0.63 J | ND<1.5 U | -0.87 | 0 | 4 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 4 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 4 |
| | | | | |
| 0.63 J | ND<1.5 U | -0.87 | 0 | 5 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 5 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 5 |
| | | | | |
| ND<1.5 U | 0.63 J | 0.87 | 1 | 5 |
| ND<1.5 U | 0.63 J | 0.87 | 2 | 5 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 2 | 5 |

S Statistic = 2 - 5 = -3

| Tied Group | Value | Members |
|---|---|---|
| 1 | 1.5 | 7 |

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |

6/1/2020 1
9/1/2020 1
11/1/2020 1
There are 1 time periods with multiple data

---

A = 798
B = 18
C = 210
D = 0
E = 42
F = 2
a = 1176
b = 3024
c = 112
Group Variance = 20.75
Z-Score = -0.439057
Comparison Level at 95% confidence level = 1.65463 (upward trend)
-0.439057 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RWH-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 20 | 30.6 | Same Date | 0 | 0 |
| 856 1c | 30.6 | 825.4 | 1 | 0 |
| 19.9 | 30.6 | -10.7 | 1 | 1 |
| 163 | 30.6 | 132.4 | 2 | 1 |
| 0.97 J | 30.6 | -29.63 | 2 | 2 |
| 22.4 | 30.6 | -8.2 | 2 | 3 |
| 7 | 30.6 | -23.6 | 2 | 4 |
| 9.9 | 30.6 | -20.7 | 2 | 5 |
| 6.8 | 30.6 | -23.8 | 2 | 6 |
| 7 | 30.6 | -23.6 | 2 | 7 |
| 26.3 | 30.6 | -4.3 | 2 | 8 |
| 5.374 | 30.6 | -25.226 | 2 | 9 |
| 173.4 | 30.6 | 142.8 | 3 | 9 |
| 11.47 | 30.6 | -19.13 | 3 | 10 |
| 2316 | 30.6 | 2285.4 | 4 | 10 |
| | | | | |
| 856 1c | 20 | 836 | 5 | 10 |
| 19.9 | 20 | -0.1 | 5 | 11 |
| 163 | 20 | 143 | 6 | 11 |
| 0.97 J | 20 | -19.03 | 6 | 12 |
| 22.4 | 20 | 2.4 | 7 | 12 |
| 7 | 20 | -13 | 7 | 13 |
| 9.9 | 20 | -10.1 | 7 | 14 |
| 6.8 | 20 | -13.2 | 7 | 15 |
| 7 | 20 | -13 | 7 | 16 |
| 26.3 | 20 | 6.3 | 8 | 16 |
| 5.374 | 20 | -14.626 | 8 | 17 |
| 173.4 | 20 | 153.4 | 9 | 17 |
| 11.47 | 20 | -8.53 | 9 | 18 |
| 2316 | 20 | 2296 | 10 | 18 |
| | | | | |
| 19.9 | 856 1c | -836.1 | 10 | 19 |
| 163 | 856 1c | -693 | 10 | 20 |
| 0.97 J | 856 1c | -855.03 | 10 | 21 |
| 22.4 | 856 1c | -833.6 | 10 | 22 |
| 7 | 856 1c | -849 | 10 | 23 |
| 9.9 | 856 1c | -846.1 | 10 | 24 |
| 6.8 | 856 1c | -849.2 | 10 | 25 |
| 7 | 856 1c | -849 | 10 | 26 |
| 26.3 | 856 1c | -829.7 | 10 | 27 |
| 5.374 | 856 1c | -850.626 | 10 | 28 |
| 173.4 | 856 1c | -682.6 | 10 | 29 |
| 11.47 | 856 1c | -844.53 | 10 | 30 |
| 2316 | 856 1c | 1460 | 11 | 30 |
| | | | | |
| 163 | 19.9 | 143.1 | 12 | 30 |
| 0.97 J | 19.9 | -18.93 | 12 | 31 |

| | | | | |
|---|---|---|---|---|
| 22.4 | 19.9 | 2.5 | 13 | 31 |
| 7 | 19.9 | -12.9 | 13 | 32 |
| 9.9 | 19.9 | -10 | 13 | 33 |
| 6.8 | 19.9 | -13.1 | 13 | 34 |
| 7 | 19.9 | -12.9 | 13 | 35 |
| 26.3 | 19.9 | 6.4 | 14 | 35 |
| 5.374 | 19.9 | -14.526 | 14 | 36 |
| 173.4 | 19.9 | 153.5 | 15 | 36 |
| 11.47 | 19.9 | -8.43 | 15 | 37 |
| 2316 | 19.9 | 2296.1 | 16 | 37 |
| | | | | |
| 0.97 J | 163 | -162.03 | 16 | 38 |
| 22.4 | 163 | -140.6 | 16 | 39 |
| 7 | 163 | -156 | 16 | 40 |
| 9.9 | 163 | -153.1 | 16 | 41 |
| 6.8 | 163 | -156.2 | 16 | 42 |
| 7 | 163 | -156 | 16 | 43 |
| 26.3 | 163 | -136.7 | 16 | 44 |
| 5.374 | 163 | -157.626 | 16 | 45 |
| 173.4 | 163 | 10.4 | 17 | 45 |
| 11.47 | 163 | -151.53 | 17 | 46 |
| 2316 | 163 | 2153 | 18 | 46 |
| | | | | |
| 22.4 | 0.97 J | 21.43 | 19 | 46 |
| 7 | 0.97 J | 6.03 | 20 | 46 |
| 9.9 | 0.97 J | 8.93 | 21 | 46 |
| 6.8 | 0.97 J | 5.83 | 22 | 46 |
| 7 | 0.97 J | 6.03 | 23 | 46 |
| 26.3 | 0.97 J | 25.33 | 24 | 46 |
| 5.374 | 0.97 J | 4.404 | 25 | 46 |
| 173.4 | 0.97 J | 172.43 | 26 | 46 |
| 11.47 | 0.97 J | 10.5 | 27 | 46 |
| 2316 | 0.97 J | 2315.03 | 28 | 46 |
| | | | | |
| 7 | 22.4 | -15.4 | 28 | 47 |
| 9.9 | 22.4 | -12.5 | 28 | 48 |
| 6.8 | 22.4 | -15.6 | 28 | 49 |
| 7 | 22.4 | -15.4 | 28 | 50 |
| 26.3 | 22.4 | 3.9 | 29 | 50 |
| 5.374 | 22.4 | -17.026 | 29 | 51 |
| 173.4 | 22.4 | 151 | 30 | 51 |
| 11.47 | 22.4 | -10.93 | 30 | 52 |
| 2316 | 22.4 | 2293.6 | 31 | 52 |
| | | | | |
| 9.9 | 7 | 2.9 | 32 | 52 |
| 6.8 | 7 | -0.2 | 32 | 53 |
| 7 | 7 | 0 | 32 | 53 |
| 26.3 | 7 | 19.3 | 33 | 53 |
| 5.374 | 7 | -1.626 | 33 | 54 |
| 173.4 | 7 | 166.4 | 34 | 54 |
| 11.47 | 7 | 4.47 | 35 | 54 |
| 2316 | 7 | 2309 | 36 | 54 |
| | | | | |
| 6.8 | 9.9 | -3.1 | 36 | 55 |
| 7 | 9.9 | -2.9 | 36 | 56 |
| 26.3 | 9.9 | 16.4 | 37 | 56 |
| 5.374 | 9.9 | -4.526 | 37 | 57 |

| | | | | |
|---|---|---|---|---|
| 173.4 | 9.9 | 163.5 | 38 | 57 |
| 11.47 | 9.9 | 1.57 | 39 | 57 |
| 2316 | 9.9 | 2306.1 | 40 | 57 |
| | | | | |
| 7 | 6.8 | 0.2 | 41 | 57 |
| 26.3 | 6.8 | 19.5 | 42 | 57 |
| 5.374 | 6.8 | -1.426 | 42 | 58 |
| 173.4 | 6.8 | 166.6 | 43 | 58 |
| 11.47 | 6.8 | 4.67 | 44 | 58 |
| 2316 | 6.8 | 2309.2 | 45 | 58 |
| | | | | |
| 26.3 | 7 | 19.3 | 46 | 58 |
| 5.374 | 7 | -1.626 | 46 | 59 |
| 173.4 | 7 | 166.4 | 47 | 59 |
| 11.47 | 7 | 4.47 | 48 | 59 |
| 2316 | 7 | 2309 | 49 | 59 |
| | | | | |
| 5.374 | 26.3 | -20.926 | 49 | 60 |
| 173.4 | 26.3 | 147.1 | 50 | 60 |
| 11.47 | 26.3 | -14.83 | 50 | 61 |
| 2316 | 26.3 | 2289.7 | 51 | 61 |
| | | | | |
| 173.4 | 5.374 | 168.026 | 52 | 61 |
| 11.47 | 5.374 | 6.096 | 53 | 61 |
| 2316 | 5.374 | 2310.63 | 54 | 61 |
| | | | | |
| 11.47 | 173.4 | -161.93 | 54 | 62 |
| 2316 | 173.4 | 2142.6 | 55 | 62 |
| | | | | |
| 2316 | 11.47 | 2304.53 | 56 | 62 |

S Statistic = 56 - 62 = -6

| Tied Group | Value | Members |
|---|---|---|
| 1 | 7 | 2 |

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 18
B = 18

C = 0
D = 0
E = 2
F = 2
a = 8880
b = 30240
c = 480
Group Variance = 491.342
Z-Score = -0.225568
Comparison Level at 95% confidence level = 1.65463 (upward trend)
-0.225568 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RWI-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 714 | 743 | Same Date | 0 | 0 |
| 840 1c | 743 | 97 | 1 | 0 |
| 1080 | 743 | 337 | 2 | 0 |
| 125 | 743 | -618 | 2 | 1 |
| 17.5 | 743 | -725.5 | 2 | 2 |
| 0.76 J | 743 | -742.24 | 2 | 3 |
| 1010 | 743 | 267 | 3 | 3 |
| 596 | 743 | -147 | 3 | 4 |
| 8.828 | 743 | -734.172 | 3 | 5 |
| | | | | |
| 840 1c | 714 | 126 | 4 | 5 |
| 1080 | 714 | 366 | 5 | 5 |
| 125 | 714 | -589 | 5 | 6 |
| 17.5 | 714 | -696.5 | 5 | 7 |
| 0.76 J | 714 | -713.24 | 5 | 8 |
| 1010 | 714 | 296 | 6 | 8 |
| 596 | 714 | -118 | 6 | 9 |
| 8.828 | 714 | -705.172 | 6 | 10 |
| | | | | |
| 1080 | 840 1c | 240 | 7 | 10 |
| 125 | 840 1c | -715 | 7 | 11 |
| 17.5 | 840 1c | -822.5 | 7 | 12 |
| 0.76 J | 840 1c | -839.24 | 7 | 13 |
| 1010 | 840 1c | 170 | 8 | 13 |
| 596 | 840 1c | -244 | 8 | 14 |
| 8.828 | 840 1c | -831.172 | 8 | 15 |
| | | | | |
| 125 | 1080 | -955 | 8 | 16 |
| 17.5 | 1080 | -1062.5 | 8 | 17 |
| 0.76 J | 1080 | -1079.24 | 8 | 18 |
| 1010 | 1080 | -70 | 8 | 19 |
| 596 | 1080 | -484 | 8 | 20 |
| 8.828 | 1080 | -1071.17 | 8 | 21 |
| | | | | |
| 17.5 | 125 | -107.5 | 8 | 22 |
| 0.76 J | 125 | -124.24 | 8 | 23 |
| 1010 | 125 | 885 | 9 | 23 |
| 596 | 125 | 471 | 10 | 23 |
| 8.828 | 125 | -116.172 | 10 | 24 |
| | | | | |
| 0.76 J | 17.5 | -16.74 | 10 | 25 |
| 1010 | 17.5 | 992.5 | 11 | 25 |
| 596 | 17.5 | 578.5 | 12 | 25 |
| 8.828 | 17.5 | -8.672 | 12 | 26 |
| | | | | |
| 1010 | 0.76 J | 1009.24 | 13 | 26 |
| 596 | 0.76 J | 595.24 | 14 | 26 |

| | | | | |
|---|---|---|---|---|
| 8.828 | 0.76 J | 8.068 | 15 | 26 |
| 596 | 1010 | -414 | 15 | 27 |
| 8.828 | 1010 | -1001.17 | 15 | 28 |
| 8.828 | 596 | -587.172 | 15 | 29 |

S Statistic = 15 - 29 = -14

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 11/1/2021 | 1 |
| 3/1/2022 | 1 |
| 3/1/2023 | 1 |
| 3/1/2024 | 1 |

There are 1 time periods with multiple data

A = 0
B = 18
C = 0
D = 0
E = 0
F = 2
a = 2250
b = 6480
c = 180
Group Variance = 124
Z-Score = -1.16743
Comparison Level at 95% confidence level = 1.65463 (upward trend)
-1.16743 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis
### Parameter: Cadmium
### Location: RWJ-MWS
**Original Data (Not Transformed)**
**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| ND<1.5 U1c | ND<1.5 U | Same Date | 0 | 0 |
| ND<1.5 U1c | ND<1.5 U | 0 | 0 | 0 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 0 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 0 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 0 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 0 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 0 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 0 |
| 0.22 J | ND<1.5 U | -1.28 | 0 | 1 |
| ND<1 U | ND<1.5 U | -0.5 | 0 | 2 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 3 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 4 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 5 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 6 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 7 |
| | | | | |
| ND<1.5 U1c | ND<1.5 U1c | 0 | 0 | 7 |
| ND<1.5 U | ND<1.5 U1c | 0 | 0 | 7 |
| ND<1.5 U | ND<1.5 U1c | 0 | 0 | 7 |
| ND<1.5 U | ND<1.5 U1c | 0 | 0 | 7 |
| ND<1.5 U | ND<1.5 U1c | 0 | 0 | 7 |
| ND<1.5 U | ND<1.5 U1c | 0 | 0 | 7 |
| ND<1.5 U | ND<1.5 U1c | 0 | 0 | 7 |
| 0.22 J | ND<1.5 U1c | -1.28 | 0 | 8 |
| ND<1 U | ND<1.5 U1c | -0.5 | 0 | 9 |
| ND<0.1 U | ND<1.5 U1c | -1.4 | 0 | 10 |
| ND<0.1 U | ND<1.5 U1c | -1.4 | 0 | 11 |
| ND<0.1 U | ND<1.5 U1c | -1.4 | 0 | 12 |
| ND<0.1 U | ND<1.5 U1c | -1.4 | 0 | 13 |
| ND<0.1 U | ND<1.5 U1c | -1.4 | 0 | 14 |
| | | | | |
| ND<1.5 U | ND<1.5 U1c | 0 | 0 | 14 |
| ND<1.5 U | ND<1.5 U1c | 0 | 0 | 14 |
| ND<1.5 U | ND<1.5 U1c | 0 | 0 | 14 |
| ND<1.5 U | ND<1.5 U1c | 0 | 0 | 14 |
| ND<1.5 U | ND<1.5 U1c | 0 | 0 | 14 |
| ND<1.5 U | ND<1.5 U1c | 0 | 0 | 14 |
| 0.22 J | ND<1.5 U1c | -1.28 | 0 | 15 |
| ND<1 U | ND<1.5 U1c | -0.5 | 0 | 16 |
| ND<0.1 U | ND<1.5 U1c | -1.4 | 0 | 17 |
| ND<0.1 U | ND<1.5 U1c | -1.4 | 0 | 18 |
| ND<0.1 U | ND<1.5 U1c | -1.4 | 0 | 19 |
| ND<0.1 U | ND<1.5 U1c | -1.4 | 0 | 20 |
| ND<0.1 U | ND<1.5 U1c | -1.4 | 0 | 21 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 21 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 21 |

| | | | | |
|---|---|---|---|---|
| ND<1.5 U | ND<1.5 U | 0 | 0 | 21 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 21 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 21 |
| 0.22 J | ND<1.5 U | -1.28 | 0 | 22 |
| ND<1 U | ND<1.5 U | -0.5 | 0 | 23 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 24 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 25 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 26 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 27 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 28 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 28 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 28 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 28 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 28 |
| 0.22 J | ND<1.5 U | -1.28 | 0 | 29 |
| ND<1 U | ND<1.5 U | -0.5 | 0 | 30 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 31 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 32 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 33 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 34 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 35 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 35 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 35 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 35 |
| 0.22 J | ND<1.5 U | -1.28 | 0 | 36 |
| ND<1 U | ND<1.5 U | -0.5 | 0 | 37 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 38 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 39 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 40 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 41 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 42 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 42 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 42 |
| 0.22 J | ND<1.5 U | -1.28 | 0 | 43 |
| ND<1 U | ND<1.5 U | -0.5 | 0 | 44 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 45 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 46 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 47 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 48 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 49 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 49 |
| 0.22 J | ND<1.5 U | -1.28 | 0 | 50 |
| ND<1 U | ND<1.5 U | -0.5 | 0 | 51 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 52 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 53 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 54 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 55 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 56 |
| | | | | |
| 0.22 J | ND<1.5 U | -1.28 | 0 | 57 |
| ND<1 U | ND<1.5 U | -0.5 | 0 | 58 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 59 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 60 |

| | | | | |
|---|---|---|---|---|
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 61 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 62 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 63 |
| | | | | |
| ND<1 U | 0.22 J | 0.78 | 1 | 63 |
| ND<0.1 U | 0.22 J | -0.12 | 1 | 64 |
| ND<0.1 U | 0.22 J | -0.12 | 1 | 65 |
| ND<0.1 U | 0.22 J | -0.12 | 1 | 66 |
| ND<0.1 U | 0.22 J | -0.12 | 1 | 67 |
| ND<0.1 U | 0.22 J | -0.12 | 1 | 68 |
| | | | | |
| ND<0.1 U | ND<1 U | -0.9 | 1 | 69 |
| ND<0.1 U | ND<1 U | -0.9 | 1 | 70 |
| ND<0.1 U | ND<1 U | -0.9 | 1 | 71 |
| ND<0.1 U | ND<1 U | -0.9 | 1 | 72 |
| ND<0.1 U | ND<1 U | -0.9 | 1 | 73 |
| | | | | |
| ND<0.1 U | ND<0.1 U | 0 | 1 | 73 |
| ND<0.1 U | ND<0.1 U | 0 | 1 | 73 |
| ND<0.1 U | ND<0.1 U | 0 | 1 | 73 |
| ND<0.1 U | ND<0.1 U | 0 | 1 | 73 |
| | | | | |
| ND<0.1 U | ND<0.1 U | 0 | 1 | 73 |
| ND<0.1 U | ND<0.1 U | 0 | 1 | 73 |
| ND<0.1 U | ND<0.1 U | 0 | 1 | 73 |
| | | | | |
| ND<0.1 U | ND<0.1 U | 0 | 1 | 73 |
| ND<0.1 U | ND<0.1 U | 0 | 1 | 73 |
| | | | | |
| ND<0.1 U | ND<0.1 U | 0 | 1 | 73 |

S Statistic = 1 - 73 = -72

| Tied Group | Value | Members |
|---|---|---|
| 1 | 1.5 | 9 |
| 2 | 0.1 | 5 |

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 1956

B = 18
C = 564
D = 0
E = 92
F = 2
a = 8880
b = 30240
c = 480
Group Variance = 384.05
Z-Score = -3.62297
Comparison Level at 95% confidence level = 1.65463 (upward trend)
-3.62297 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis
### Parameter: Cadmium
### Location: RWK-MWS
**Original Data (Not Transformed)**
**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| ND<1.5 U | ND<1.5 U1c | Same Date | 0 | 0 |
| ND<1.5 U1c | ND<1.5 U1c | 0 | 0 | 0 |
| ND<1.5 U | ND<1.5 U1c | 0 | 0 | 0 |
| ND<1.5 U | ND<1.5 U1c | 0 | 0 | 0 |
| ND<1.5 U | ND<1.5 U1c | 0 | 0 | 0 |
| 0.51 J | ND<1.5 U1c | -0.99 | 0 | 1 |
| 0.37 J | ND<1.5 U1c | -1.13 | 0 | 2 |
| ND<1.5 U | ND<1.5 U1c | 0 | 0 | 2 |
| ND<0.5 U | ND<1.5 U1c | -1 | 0 | 3 |
| ND<1 U | ND<1.5 U1c | -0.5 | 0 | 4 |
| ND<0.1 U | ND<1.5 U1c | -1.4 | 0 | 5 |
| ND<0.1 U | ND<1.5 U1c | -1.4 | 0 | 6 |
| 0.1115 J | ND<1.5 U1c | -1.3885 | 0 | 7 |
| 0.2839 | ND<1.5 U1c | -1.2161 | 0 | 8 |
| 0.3063 | ND<1.5 U1c | -1.1937 | 0 | 9 |
| | | | | |
| ND<1.5 U1c | ND<1.5 U | 0 | 0 | 9 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 9 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 9 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 9 |
| 0.51 J | ND<1.5 U | -0.99 | 0 | 10 |
| 0.37 J | ND<1.5 U | -1.13 | 0 | 11 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 11 |
| ND<0.5 U | ND<1.5 U | -1 | 0 | 12 |
| ND<1 U | ND<1.5 U | -0.5 | 0 | 13 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 14 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 15 |
| 0.1115 J | ND<1.5 U | -1.3885 | 0 | 16 |
| 0.2839 | ND<1.5 U | -1.2161 | 0 | 17 |
| 0.3063 | ND<1.5 U | -1.1937 | 0 | 18 |
| | | | | |
| ND<1.5 U | ND<1.5 U1c | 0 | 0 | 18 |
| ND<1.5 U | ND<1.5 U1c | 0 | 0 | 18 |
| ND<1.5 U | ND<1.5 U1c | 0 | 0 | 18 |
| 0.51 J | ND<1.5 U1c | -0.99 | 0 | 19 |
| 0.37 J | ND<1.5 U1c | -1.13 | 0 | 20 |
| ND<1.5 U | ND<1.5 U1c | 0 | 0 | 20 |
| ND<0.5 U | ND<1.5 U1c | -1 | 0 | 21 |
| ND<1 U | ND<1.5 U1c | -0.5 | 0 | 22 |
| ND<0.1 U | ND<1.5 U1c | -1.4 | 0 | 23 |
| ND<0.1 U | ND<1.5 U1c | -1.4 | 0 | 24 |
| 0.1115 J | ND<1.5 U1c | -1.3885 | 0 | 25 |
| 0.2839 | ND<1.5 U1c | -1.2161 | 0 | 26 |
| 0.3063 | ND<1.5 U1c | -1.1937 | 0 | 27 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 27 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 27 |

| | | | | |
|---|---|---|---|---|
| 0.51 J | ND<1.5 U | -0.99 | 0 | 28 |
| 0.37 J | ND<1.5 U | -1.13 | 0 | 29 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 29 |
| ND<0.5 U | ND<1.5 U | -1 | 0 | 30 |
| ND<1 U | ND<1.5 U | -0.5 | 0 | 31 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 32 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 33 |
| 0.1115 J | ND<1.5 U | -1.3885 | 0 | 34 |
| 0.2839 | ND<1.5 U | -1.2161 | 0 | 35 |
| 0.3063 | ND<1.5 U | -1.1937 | 0 | 36 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 36 |
| 0.51 J | ND<1.5 U | -0.99 | 0 | 37 |
| 0.37 J | ND<1.5 U | -1.13 | 0 | 38 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 38 |
| ND<0.5 U | ND<1.5 U | -1 | 0 | 39 |
| ND<1 U | ND<1.5 U | -0.5 | 0 | 40 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 41 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 42 |
| 0.1115 J | ND<1.5 U | -1.3885 | 0 | 43 |
| 0.2839 | ND<1.5 U | -1.2161 | 0 | 44 |
| 0.3063 | ND<1.5 U | -1.1937 | 0 | 45 |
| | | | | |
| 0.51 J | ND<1.5 U | -0.99 | 0 | 46 |
| 0.37 J | ND<1.5 U | -1.13 | 0 | 47 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 47 |
| ND<0.5 U | ND<1.5 U | -1 | 0 | 48 |
| ND<1 U | ND<1.5 U | -0.5 | 0 | 49 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 50 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 51 |
| 0.1115 J | ND<1.5 U | -1.3885 | 0 | 52 |
| 0.2839 | ND<1.5 U | -1.2161 | 0 | 53 |
| 0.3063 | ND<1.5 U | -1.1937 | 0 | 54 |
| | | | | |
| 0.37 J | 0.51 J | -0.14 | 0 | 55 |
| ND<1.5 U | 0.51 J | 0.99 | 1 | 55 |
| ND<0.5 U | 0.51 J | -0.01 | 1 | 56 |
| ND<1 U | 0.51 J | 0.49 | 2 | 56 |
| ND<0.1 U | 0.51 J | -0.41 | 2 | 57 |
| ND<0.1 U | 0.51 J | -0.41 | 2 | 58 |
| 0.1115 J | 0.51 J | -0.3985 | 2 | 59 |
| 0.2839 | 0.51 J | -0.2261 | 2 | 60 |
| 0.3063 | 0.51 J | -0.2037 | 2 | 61 |
| | | | | |
| ND<1.5 U | 0.37 J | 1.13 | 3 | 61 |
| ND<0.5 U | 0.37 J | 0.13 | 4 | 61 |
| ND<1 U | 0.37 J | 0.63 | 5 | 61 |
| ND<0.1 U | 0.37 J | -0.27 | 5 | 62 |
| ND<0.1 U | 0.37 J | -0.27 | 5 | 63 |
| 0.1115 J | 0.37 J | -0.2585 | 5 | 64 |
| 0.2839 | 0.37 J | -0.0861 | 5 | 65 |
| 0.3063 | 0.37 J | -0.0637 | 5 | 66 |
| | | | | |
| ND<0.5 U | ND<1.5 U | -1 | 5 | 67 |
| ND<1 U | ND<1.5 U | -0.5 | 5 | 68 |
| ND<0.1 U | ND<1.5 U | -1.4 | 5 | 69 |
| ND<0.1 U | ND<1.5 U | -1.4 | 5 | 70 |

| | | | | |
|---|---|---|---|---|
| 0.1115 J | ND<1.5 U | -1.3885 | 5 | 71 |
| 0.2839 | ND<1.5 U | -1.2161 | 5 | 72 |
| 0.3063 | ND<1.5 U | -1.1937 | 5 | 73 |
| | | | | |
| ND<1 U | ND<0.5 U | 0.5 | 6 | 73 |
| ND<0.1 U | ND<0.5 U | -0.4 | 6 | 74 |
| ND<0.1 U | ND<0.5 U | -0.4 | 6 | 75 |
| 0.1115 J | ND<0.5 U | -0.3885 | 6 | 76 |
| 0.2839 | ND<0.5 U | -0.2161 | 6 | 77 |
| 0.3063 | ND<0.5 U | -0.1937 | 6 | 78 |
| | | | | |
| ND<0.1 U | ND<1 U | -0.9 | 6 | 79 |
| ND<0.1 U | ND<1 U | -0.9 | 6 | 80 |
| 0.1115 J | ND<1 U | -0.8885 | 6 | 81 |
| 0.2839 | ND<1 U | -0.7161 | 6 | 82 |
| 0.3063 | ND<1 U | -0.6937 | 6 | 83 |
| | | | | |
| ND<0.1 U | ND<0.1 U | 0 | 6 | 83 |
| 0.1115 J | ND<0.1 U | 0.0115 | 7 | 83 |
| 0.2839 | ND<0.1 U | 0.1839 | 8 | 83 |
| 0.3063 | ND<0.1 U | 0.2063 | 9 | 83 |
| | | | | |
| 0.1115 J | ND<0.1 U | 0.0115 | 10 | 83 |
| 0.2839 | ND<0.1 U | 0.1839 | 11 | 83 |
| 0.3063 | ND<0.1 U | 0.2063 | 12 | 83 |
| | | | | |
| 0.2839 | 0.1115 J | 0.1724 | 13 | 83 |
| 0.3063 | 0.1115 J | 0.1948 | 14 | 83 |
| | | | | |
| 0.3063 | 0.2839 | 0.0224 | 15 | 83 |

S Statistic = 15 - 83 = -68

| Tied Group | Value | Members |
|---|---|---|
| 1 | 1.5 | 7 |
| 2 | 0.1 | 2 |

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 816

B = 18
C = 210
D = 0
E = 44
F = 2
a = 8880
b = 30240
c = 480
Group Variance = 447.183
Z-Score = -3.16834
Comparison Level at 95% confidence level = 1.65463 (upward trend)
-3.16834 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis
### Parameter: Cadmium
### Location: RWL-MWS
**Original Data (Not Transformed)**
**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| ND<1.5 U1c | ND<1.5 U | Same Date | 0 | 0 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 0 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 0 |
| 0.85 J | ND<1.5 U | -0.65 | 0 | 1 |
| 0.52 J | ND<1.5 U | -0.98 | 0 | 2 |
| 0.59 J | ND<1.5 U | -0.91 | 0 | 3 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 3 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 3 |
| 0.37 J | ND<1.5 U | -1.13 | 0 | 4 |
| ND<1 U | ND<1.5 U | -0.5 | 0 | 5 |
| 0.1408 J | ND<1.5 U | -1.3592 | 0 | 6 |
| 0.0722 J | ND<1.5 U | -1.4278 | 0 | 7 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 8 |
| 4.627 | ND<1.5 U | 3.127 | 1 | 8 |
| 1.45 | ND<1.5 U | -0.05 | 1 | 9 |
| | | | | |
| ND<1.5 U | ND<1.5 U1c | 0 | 1 | 9 |
| ND<1.5 U | ND<1.5 U1c | 0 | 1 | 9 |
| 0.85 J | ND<1.5 U1c | -0.65 | 1 | 10 |
| 0.52 J | ND<1.5 U1c | -0.98 | 1 | 11 |
| 0.59 J | ND<1.5 U1c | -0.91 | 1 | 12 |
| ND<1.5 U | ND<1.5 U1c | 0 | 1 | 12 |
| ND<1.5 U | ND<1.5 U1c | 0 | 1 | 12 |
| 0.37 J | ND<1.5 U1c | -1.13 | 1 | 13 |
| ND<1 U | ND<1.5 U1c | -0.5 | 1 | 14 |
| 0.1408 J | ND<1.5 U1c | -1.3592 | 1 | 15 |
| 0.0722 J | ND<1.5 U1c | -1.4278 | 1 | 16 |
| ND<0.1 U | ND<1.5 U1c | -1.4 | 1 | 17 |
| 4.627 | ND<1.5 U1c | 3.127 | 2 | 17 |
| 1.45 | ND<1.5 U1c | -0.05 | 2 | 18 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 2 | 18 |
| 0.85 J | ND<1.5 U | -0.65 | 2 | 19 |
| 0.52 J | ND<1.5 U | -0.98 | 2 | 20 |
| 0.59 J | ND<1.5 U | -0.91 | 2 | 21 |
| ND<1.5 U | ND<1.5 U | 0 | 2 | 21 |
| ND<1.5 U | ND<1.5 U | 0 | 2 | 21 |
| 0.37 J | ND<1.5 U | -1.13 | 2 | 22 |
| ND<1 U | ND<1.5 U | -0.5 | 2 | 23 |
| 0.1408 J | ND<1.5 U | -1.3592 | 2 | 24 |
| 0.0722 J | ND<1.5 U | -1.4278 | 2 | 25 |
| ND<0.1 U | ND<1.5 U | -1.4 | 2 | 26 |
| 4.627 | ND<1.5 U | 3.127 | 3 | 26 |
| 1.45 | ND<1.5 U | -0.05 | 3 | 27 |
| | | | | |
| 0.85 J | ND<1.5 U | -0.65 | 3 | 28 |
| 0.52 J | ND<1.5 U | -0.98 | 3 | 29 |

| | | | | |
|---|---|---|---|---|
| 0.59 J | ND<1.5 U | -0.91 | 3 | 30 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 30 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 30 |
| 0.37 J | ND<1.5 U | -1.13 | 3 | 31 |
| ND<1 U | ND<1.5 U | -0.5 | 3 | 32 |
| 0.1408 J | ND<1.5 U | -1.3592 | 3 | 33 |
| 0.0722 J | ND<1.5 U | -1.4278 | 3 | 34 |
| ND<0.1 U | ND<1.5 U | -1.4 | 3 | 35 |
| 4.627 | ND<1.5 U | 3.127 | 4 | 35 |
| 1.45 | ND<1.5 U | -0.05 | 4 | 36 |
| | | | | |
| 0.52 J | 0.85 J | -0.33 | 4 | 37 |
| 0.59 J | 0.85 J | -0.26 | 4 | 38 |
| ND<1.5 U | 0.85 J | 0.65 | 5 | 38 |
| ND<1.5 U | 0.85 J | 0.65 | 6 | 38 |
| 0.37 J | 0.85 J | -0.48 | 6 | 39 |
| ND<1 U | 0.85 J | 0.15 | 7 | 39 |
| 0.1408 J | 0.85 J | -0.7092 | 7 | 40 |
| 0.0722 J | 0.85 J | -0.7778 | 7 | 41 |
| ND<0.1 U | 0.85 J | -0.75 | 7 | 42 |
| 4.627 | 0.85 J | 3.777 | 8 | 42 |
| 1.45 | 0.85 J | 0.6 | 9 | 42 |
| | | | | |
| 0.59 J | 0.52 J | 0.07 | 10 | 42 |
| ND<1.5 U | 0.52 J | 0.98 | 11 | 42 |
| ND<1.5 U | 0.52 J | 0.98 | 12 | 42 |
| 0.37 J | 0.52 J | -0.15 | 12 | 43 |
| ND<1 U | 0.52 J | 0.48 | 13 | 43 |
| 0.1408 J | 0.52 J | -0.3792 | 13 | 44 |
| 0.0722 J | 0.52 J | -0.4478 | 13 | 45 |
| ND<0.1 U | 0.52 J | -0.42 | 13 | 46 |
| 4.627 | 0.52 J | 4.107 | 14 | 46 |
| 1.45 | 0.52 J | 0.93 | 15 | 46 |
| | | | | |
| ND<1.5 U | 0.59 J | 0.91 | 16 | 46 |
| ND<1.5 U | 0.59 J | 0.91 | 17 | 46 |
| 0.37 J | 0.59 J | -0.22 | 17 | 47 |
| ND<1 U | 0.59 J | 0.41 | 18 | 47 |
| 0.1408 J | 0.59 J | -0.4492 | 18 | 48 |
| 0.0722 J | 0.59 J | -0.5178 | 18 | 49 |
| ND<0.1 U | 0.59 J | -0.49 | 18 | 50 |
| 4.627 | 0.59 J | 4.037 | 19 | 50 |
| 1.45 | 0.59 J | 0.86 | 20 | 50 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 20 | 50 |
| 0.37 J | ND<1.5 U | -1.13 | 20 | 51 |
| ND<1 U | ND<1.5 U | -0.5 | 20 | 52 |
| 0.1408 J | ND<1.5 U | -1.3592 | 20 | 53 |
| 0.0722 J | ND<1.5 U | -1.4278 | 20 | 54 |
| ND<0.1 U | ND<1.5 U | -1.4 | 20 | 55 |
| 4.627 | ND<1.5 U | 3.127 | 21 | 55 |
| 1.45 | ND<1.5 U | -0.05 | 21 | 56 |
| | | | | |
| 0.37 J | ND<1.5 U | -1.13 | 21 | 57 |
| ND<1 U | ND<1.5 U | -0.5 | 21 | 58 |
| 0.1408 J | ND<1.5 U | -1.3592 | 21 | 59 |
| 0.0722 J | ND<1.5 U | -1.4278 | 21 | 60 |

| | | | | |
|---|---|---|---|---|
| ND<0.1 U | ND<1.5 U | -1.4 | 21 | 61 |
| 4.627 | ND<1.5 U | 3.127 | 22 | 61 |
| 1.45 | ND<1.5 U | -0.05 | 22 | 62 |
| | | | | |
| ND<1 U | 0.37 J | 0.63 | 23 | 62 |
| 0.1408 J | 0.37 J | -0.2292 | 23 | 63 |
| 0.0722 J | 0.37 J | -0.2978 | 23 | 64 |
| ND<0.1 U | 0.37 J | -0.27 | 23 | 65 |
| 4.627 | 0.37 J | 4.257 | 24 | 65 |
| 1.45 | 0.37 J | 1.08 | 25 | 65 |
| | | | | |
| 0.1408 J | ND<1 U | -0.8592 | 25 | 66 |
| 0.0722 J | ND<1 U | -0.9278 | 25 | 67 |
| ND<0.1 U | ND<1 U | -0.9 | 25 | 68 |
| 4.627 | ND<1 U | 3.627 | 26 | 68 |
| 1.45 | ND<1 U | 0.45 | 27 | 68 |
| | | | | |
| 0.0722 J | 0.1408 J | -0.0686 | 27 | 69 |
| ND<0.1 U | 0.1408 J | -0.0408 | 27 | 70 |
| 4.627 | 0.1408 J | 4.4862 | 28 | 70 |
| 1.45 | 0.1408 J | 1.3092 | 29 | 70 |
| | | | | |
| ND<0.1 U | 0.0722 J | 0.0278 | 30 | 70 |
| 4.627 | 0.0722 J | 4.5548 | 31 | 70 |
| 1.45 | 0.0722 J | 1.3778 | 32 | 70 |
| | | | | |
| 4.627 | ND<0.1 U | 4.527 | 33 | 70 |
| 1.45 | ND<0.1 U | 1.35 | 34 | 70 |
| | | | | |
| 1.45 | 4.627 | -3.177 | 34 | 71 |

S Statistic = 34 - 71 = -37

| Tied Group | Value | Members |
|---|---|---|
| 1 | 1.5 | 6 |

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 510
B = 18

C = 120
D = 0
E = 30
F = 2
a = 8880
b = 30240
c = 480
Group Variance = 464.125
Z-Score = -1.67103
Comparison Level at 95% confidence level = 1.65463 (upward trend)
-1.67103 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RWM-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| ND<1.5 U | ND<1.5 U | Same Date | 0 | 0 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 0 |
| 0.36 J | ND<1.5 U | -1.14 | 0 | 1 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 1 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 1 |
| ND<1.5 U1c | ND<1.5 U | 0 | 0 | 1 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 1 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 1 |
| 0.36 J | ND<1.5 U | -1.14 | 0 | 2 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 2 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 2 |
| ND<1.5 U1c | ND<1.5 U | 0 | 0 | 2 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 2 |
| | | | | |
| 0.36 J | ND<1.5 U | -1.14 | 0 | 3 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 3 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 3 |
| ND<1.5 U1c | ND<1.5 U | 0 | 0 | 3 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 3 |
| | | | | |
| ND<1.5 U | 0.36 J | 1.14 | 1 | 3 |
| ND<1.5 U | 0.36 J | 1.14 | 2 | 3 |
| ND<1.5 U1c | 0.36 J | 1.14 | 3 | 3 |
| ND<1.5 U | 0.36 J | 1.14 | 4 | 3 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 4 | 3 |
| ND<1.5 U1c | ND<1.5 U | 0 | 4 | 3 |
| ND<1.5 U | ND<1.5 U | 0 | 4 | 3 |
| | | | | |
| ND<1.5 U1c | ND<1.5 U | 0 | 4 | 3 |
| ND<1.5 U | ND<1.5 U | 0 | 4 | 3 |
| | | | | |
| ND<1.5 U | ND<1.5 U1c | 0 | 4 | 3 |

S Statistic = 4 - 3 = 1

| Tied Group | Value | Members |
|---|---|---|
| 1 | 1.5 | 7 |

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |

6/1/2020 1
9/1/2020 1
11/1/2020 1
There are 1 time periods with multiple data

---

A = 798
B = 18
C = 210
D = 0
E = 42
F = 2
a = 1176
b = 3024
c = 112
Group Variance = 20.75
Z-Score = 0
Comparison Level at 95% confidence level = 1.65463 (upward trend)
0 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RWN-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 13000 | 13000 | Same Date | 0 | 0 |
| 11100 | 13000 | -1900 | 0 | 1 |
| 11200 | 13000 | -1800 | 0 | 2 |
| 9420 MH | 13000 | -3580 | 0 | 3 |
| 6810 | 13000 | -6190 | 0 | 4 |
| 7350 | 13000 | -5650 | 0 | 5 |
| 6260 | 13000 | -6740 | 0 | 6 |
| 4850 | 13000 | -8150 | 0 | 7 |
| 2260 | 13000 | -10740 | 0 | 8 |
| 2517 | 13000 | -10483 | 0 | 9 |
| 2350 | 13000 | -10650 | 0 | 10 |
| | | | | |
| 11100 | 13000 | -1900 | 0 | 11 |
| 11200 | 13000 | -1800 | 0 | 12 |
| 9420 MH | 13000 | -3580 | 0 | 13 |
| 6810 | 13000 | -6190 | 0 | 14 |
| 7350 | 13000 | -5650 | 0 | 15 |
| 6260 | 13000 | -6740 | 0 | 16 |
| 4850 | 13000 | -8150 | 0 | 17 |
| 2260 | 13000 | -10740 | 0 | 18 |
| 2517 | 13000 | -10483 | 0 | 19 |
| 2350 | 13000 | -10650 | 0 | 20 |
| | | | | |
| 11200 | 11100 | 100 | 1 | 20 |
| 9420 MH | 11100 | -1680 | 1 | 21 |
| 6810 | 11100 | -4290 | 1 | 22 |
| 7350 | 11100 | -3750 | 1 | 23 |
| 6260 | 11100 | -4840 | 1 | 24 |
| 4850 | 11100 | -6250 | 1 | 25 |
| 2260 | 11100 | -8840 | 1 | 26 |
| 2517 | 11100 | -8583 | 1 | 27 |
| 2350 | 11100 | -8750 | 1 | 28 |
| | | | | |
| 9420 MH | 11200 | -1780 | 1 | 29 |
| 6810 | 11200 | -4390 | 1 | 30 |
| 7350 | 11200 | -3850 | 1 | 31 |
| 6260 | 11200 | -4940 | 1 | 32 |
| 4850 | 11200 | -6350 | 1 | 33 |
| 2260 | 11200 | -8940 | 1 | 34 |
| 2517 | 11200 | -8683 | 1 | 35 |
| 2350 | 11200 | -8850 | 1 | 36 |
| | | | | |
| 6810 | 9420 MH | -2610 | 1 | 37 |
| 7350 | 9420 MH | -2070 | 1 | 38 |
| 6260 | 9420 MH | -3160 | 1 | 39 |
| 4850 | 9420 MH | -4570 | 1 | 40 |
| 2260 | 9420 MH | -7160 | 1 | 41 |

| | | | | |
|---|---|---|---|---|
| 2517 | 9420 MH | -6903 | 1 | 42 |
| 2350 | 9420 MH | -7070 | 1 | 43 |
| | | | | |
| 7350 | 6810 | 540 | 2 | 43 |
| 6260 | 6810 | -550 | 2 | 44 |
| 4850 | 6810 | -1960 | 2 | 45 |
| 2260 | 6810 | -4550 | 2 | 46 |
| 2517 | 6810 | -4293 | 2 | 47 |
| 2350 | 6810 | -4460 | 2 | 48 |
| | | | | |
| 6260 | 7350 | -1090 | 2 | 49 |
| 4850 | 7350 | -2500 | 2 | 50 |
| 2260 | 7350 | -5090 | 2 | 51 |
| 2517 | 7350 | -4833 | 2 | 52 |
| 2350 | 7350 | -5000 | 2 | 53 |
| | | | | |
| 4850 | 6260 | -1410 | 2 | 54 |
| 2260 | 6260 | -4000 | 2 | 55 |
| 2517 | 6260 | -3743 | 2 | 56 |
| 2350 | 6260 | -3910 | 2 | 57 |
| | | | | |
| 2260 | 4850 | -2590 | 2 | 58 |
| 2517 | 4850 | -2333 | 2 | 59 |
| 2350 | 4850 | -2500 | 2 | 60 |
| | | | | |
| 2517 | 2260 | 257 | 3 | 60 |
| 2350 | 2260 | 90 | 4 | 60 |
| | | | | |
| 2350 | 2517 | -167 | 4 | 61 |

S Statistic = 4 - 61 = -57

| Tied Group | Value | Members |
|---|---|---|
| 1 | 13000 | 2 |

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 3/1/2022 | 1 |
| 3/1/2023 | 1 |
| 3/1/2024 | 1 |

There are 1 time periods with multiple data

A = 18
B = 18
C = 0
D = 0
E = 2
F = 2
a = 3828

b = 11880
c = 264
Group Variance = 210.682
Z-Score = -3.85811
Comparison Level at 95% confidence level = 1.65463 (upward trend)
-3.85811 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RWO-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 10 1c4c | 1.4 J2c | Same Date | 0 | 0 |
| 1.3 J1c | 1.4 J2c | -0.1 | 0 | 1 |
| 7.6 | 1.4 J2c | 6.2 | 1 | 1 |
| 0.65 J | 1.4 J2c | -0.75 | 1 | 2 |
| 0.46 J | 1.4 J2c | -0.94 | 1 | 3 |
| 4.1 1c | 1.4 J2c | 2.7 | 2 | 3 |
| 0.53 J | 1.4 J2c | -0.87 | 2 | 4 |
| 0.85 J | 1.4 J2c | -0.55 | 2 | 5 |
| ND<0.5 U | 1.4 J2c | -0.9 | 2 | 6 |
| ND<1 U | 1.4 J2c | -0.4 | 2 | 7 |
| 0.0752 J | 1.4 J2c | -1.3248 | 2 | 8 |
| ND<0.1 U | 1.4 J2c | -1.3 | 2 | 9 |
| ND<0.1 U | 1.4 J2c | -1.3 | 2 | 10 |
| ND<0.1 U | 1.4 J2c | -1.3 | 2 | 11 |
| ND<5 U | 1.4 J2c | 3.6 | 3 | 11 |
| | | | | |
| 1.3 J1c | 10 1c4c | -8.7 | 3 | 12 |
| 7.6 | 10 1c4c | -2.4 | 3 | 13 |
| 0.65 J | 10 1c4c | -9.35 | 3 | 14 |
| 0.46 J | 10 1c4c | -9.54 | 3 | 15 |
| 4.1 1c | 10 1c4c | -5.9 | 3 | 16 |
| 0.53 J | 10 1c4c | -9.47 | 3 | 17 |
| 0.85 J | 10 1c4c | -9.15 | 3 | 18 |
| ND<0.5 U | 10 1c4c | -9.5 | 3 | 19 |
| ND<1 U | 10 1c4c | -9 | 3 | 20 |
| 0.0752 J | 10 1c4c | -9.9248 | 3 | 21 |
| ND<0.1 U | 10 1c4c | -9.9 | 3 | 22 |
| ND<0.1 U | 10 1c4c | -9.9 | 3 | 23 |
| ND<0.1 U | 10 1c4c | -9.9 | 3 | 24 |
| ND<5 U | 10 1c4c | -5 | 3 | 25 |
| | | | | |
| 7.6 | 1.3 J1c | 6.3 | 4 | 25 |
| 0.65 J | 1.3 J1c | -0.65 | 4 | 26 |
| 0.46 J | 1.3 J1c | -0.84 | 4 | 27 |
| 4.1 1c | 1.3 J1c | 2.8 | 5 | 27 |
| 0.53 J | 1.3 J1c | -0.77 | 5 | 28 |
| 0.85 J | 1.3 J1c | -0.45 | 5 | 29 |
| ND<0.5 U | 1.3 J1c | -0.8 | 5 | 30 |
| ND<1 U | 1.3 J1c | -0.3 | 5 | 31 |
| 0.0752 J | 1.3 J1c | -1.2248 | 5 | 32 |
| ND<0.1 U | 1.3 J1c | -1.2 | 5 | 33 |
| ND<0.1 U | 1.3 J1c | -1.2 | 5 | 34 |
| ND<0.1 U | 1.3 J1c | -1.2 | 5 | 35 |
| ND<5 U | 1.3 J1c | 3.7 | 6 | 35 |
| | | | | |
| 0.65 J | 7.6 | -6.95 | 6 | 36 |
| 0.46 J | 7.6 | -7.14 | 6 | 37 |

| | | | | |
|---|---|---|---|---|
| 4.1 1c | 7.6 | -3.5 | 6 | 38 |
| 0.53 J | 7.6 | -7.07 | 6 | 39 |
| 0.85 J | 7.6 | -6.75 | 6 | 40 |
| ND<0.5 U | 7.6 | -7.1 | 6 | 41 |
| ND<1 U | 7.6 | -6.6 | 6 | 42 |
| 0.0752 J | 7.6 | -7.5248 | 6 | 43 |
| ND<0.1 U | 7.6 | -7.5 | 6 | 44 |
| ND<0.1 U | 7.6 | -7.5 | 6 | 45 |
| ND<0.1 U | 7.6 | -7.5 | 6 | 46 |
| ND<5 U | 7.6 | -2.6 | 6 | 47 |
| | | | | |
| 0.46 J | 0.65 J | -0.19 | 6 | 48 |
| 4.1 1c | 0.65 J | 3.45 | 7 | 48 |
| 0.53 J | 0.65 J | -0.12 | 7 | 49 |
| 0.85 J | 0.65 J | 0.2 | 8 | 49 |
| ND<0.5 U | 0.65 J | -0.15 | 8 | 50 |
| ND<1 U | 0.65 J | 0.35 | 9 | 50 |
| 0.0752 J | 0.65 J | -0.5748 | 9 | 51 |
| ND<0.1 U | 0.65 J | -0.55 | 9 | 52 |
| ND<0.1 U | 0.65 J | -0.55 | 9 | 53 |
| ND<0.1 U | 0.65 J | -0.55 | 9 | 54 |
| ND<5 U | 0.65 J | 4.35 | 10 | 54 |
| | | | | |
| 4.1 1c | 0.46 J | 3.64 | 11 | 54 |
| 0.53 J | 0.46 J | 0.07 | 12 | 54 |
| 0.85 J | 0.46 J | 0.39 | 13 | 54 |
| ND<0.5 U | 0.46 J | 0.04 | 14 | 54 |
| ND<1 U | 0.46 J | 0.54 | 15 | 54 |
| 0.0752 J | 0.46 J | -0.3848 | 15 | 55 |
| ND<0.1 U | 0.46 J | -0.36 | 15 | 56 |
| ND<0.1 U | 0.46 J | -0.36 | 15 | 57 |
| ND<0.1 U | 0.46 J | -0.36 | 15 | 58 |
| ND<5 U | 0.46 J | 4.54 | 16 | 58 |
| | | | | |
| 0.53 J | 4.1 1c | -3.57 | 16 | 59 |
| 0.85 J | 4.1 1c | -3.25 | 16 | 60 |
| ND<0.5 U | 4.1 1c | -3.6 | 16 | 61 |
| ND<1 U | 4.1 1c | -3.1 | 16 | 62 |
| 0.0752 J | 4.1 1c | -4.0248 | 16 | 63 |
| ND<0.1 U | 4.1 1c | -4 | 16 | 64 |
| ND<0.1 U | 4.1 1c | -4 | 16 | 65 |
| ND<0.1 U | 4.1 1c | -4 | 16 | 66 |
| ND<5 U | 4.1 1c | 0.9 | 17 | 66 |
| | | | | |
| 0.85 J | 0.53 J | 0.32 | 18 | 66 |
| ND<0.5 U | 0.53 J | -0.03 | 18 | 67 |
| ND<1 U | 0.53 J | 0.47 | 19 | 67 |
| 0.0752 J | 0.53 J | -0.4548 | 19 | 68 |
| ND<0.1 U | 0.53 J | -0.43 | 19 | 69 |
| ND<0.1 U | 0.53 J | -0.43 | 19 | 70 |
| ND<0.1 U | 0.53 J | -0.43 | 19 | 71 |
| ND<5 U | 0.53 J | 4.47 | 20 | 71 |
| | | | | |
| ND<0.5 U | 0.85 J | -0.35 | 20 | 72 |
| ND<1 U | 0.85 J | 0.15 | 21 | 72 |
| 0.0752 J | 0.85 J | -0.7748 | 21 | 73 |
| ND<0.1 U | 0.85 J | -0.75 | 21 | 74 |

| | | | | |
|---|---|---|---|---|
| ND<0.1 U | 0.85 J | -0.75 | 21 | 75 |
| ND<0.1 U | 0.85 J | -0.75 | 21 | 76 |
| ND<5 U | 0.85 J | 4.15 | 22 | 76 |
| | | | | |
| ND<1 U | ND<0.5 U | 0.5 | 23 | 76 |
| 0.0752 J | ND<0.5 U | -0.4248 | 23 | 77 |
| ND<0.1 U | ND<0.5 U | -0.4 | 23 | 78 |
| ND<0.1 U | ND<0.5 U | -0.4 | 23 | 79 |
| ND<0.1 U | ND<0.5 U | -0.4 | 23 | 80 |
| ND<5 U | ND<0.5 U | 4.5 | 24 | 80 |
| | | | | |
| 0.0752 J | ND<1 U | -0.9248 | 24 | 81 |
| ND<0.1 U | ND<1 U | -0.9 | 24 | 82 |
| ND<0.1 U | ND<1 U | -0.9 | 24 | 83 |
| ND<0.1 U | ND<1 U | -0.9 | 24 | 84 |
| ND<5 U | ND<1 U | 4 | 25 | 84 |
| | | | | |
| ND<0.1 U | 0.0752 J | 0.0248 | 26 | 84 |
| ND<0.1 U | 0.0752 J | 0.0248 | 27 | 84 |
| ND<0.1 U | 0.0752 J | 0.0248 | 28 | 84 |
| ND<5 U | 0.0752 J | 4.9248 | 29 | 84 |
| | | | | |
| ND<0.1 U | ND<0.1 U | 0 | 29 | 84 |
| ND<0.1 U | ND<0.1 U | 0 | 29 | 84 |
| ND<5 U | ND<0.1 U | 4.9 | 30 | 84 |
| | | | | |
| ND<0.1 U | ND<0.1 U | 0 | 30 | 84 |
| ND<5 U | ND<0.1 U | 4.9 | 31 | 84 |
| | | | | |
| ND<5 U | ND<0.1 U | 4.9 | 32 | 84 |

S Statistic = 32 - 84 = -52

| Tied Group | Value | Members |
|---|---|---|
| 1 | 0.1 | 3 |

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 66
B = 18

C = 6
D = 0
E = 6
F = 2
a = 8880
b = 30240
c = 480
Group Variance = 488.692
Z-Score = -2.30703
Comparison Level at 95% confidence level = 1.65463 (upward trend)
-2.30703 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RWQ-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 2.9 J | 2.6 J | Same Date | 0 | 0 |
| 2.6 J1c | 2.6 J | 0 | 0 | 0 |
| 4.4 | 2.6 J | 1.8 | 1 | 0 |
| 3.1 | 2.6 J | 0.5 | 2 | 0 |
| 2.9 J | 2.6 J | 0.3 | 3 | 0 |
| 3.3 1c | 2.6 J | 0.7 | 4 | 0 |
| 3.2 | 2.6 J | 0.6 | 5 | 0 |
| 3.4 | 2.6 J | 0.8 | 6 | 0 |
| 3.1 | 2.6 J | 0.5 | 7 | 0 |
| 3.3 | 2.6 J | 0.7 | 8 | 0 |
| 2.69 | 2.6 J | 0.09 | 9 | 0 |
| 10.47 | 2.6 J | 7.87 | 10 | 0 |
| 2.042 | 2.6 J | -0.558 | 10 | 1 |
| 2.623 | 2.6 J | 0.023 | 11 | 1 |
| 3.007 | 2.6 J | 0.407 | 12 | 1 |
| | | | | |
| 2.6 J1c | 2.9 J | -0.3 | 12 | 2 |
| 4.4 | 2.9 J | 1.5 | 13 | 2 |
| 3.1 | 2.9 J | 0.2 | 14 | 2 |
| 2.9 J | 2.9 J | 0 | 14 | 2 |
| 3.3 1c | 2.9 J | 0.4 | 15 | 2 |
| 3.2 | 2.9 J | 0.3 | 16 | 2 |
| 3.4 | 2.9 J | 0.5 | 17 | 2 |
| 3.1 | 2.9 J | 0.2 | 18 | 2 |
| 3.3 | 2.9 J | 0.4 | 19 | 2 |
| 2.69 | 2.9 J | -0.21 | 19 | 3 |
| 10.47 | 2.9 J | 7.57 | 20 | 3 |
| 2.042 | 2.9 J | -0.858 | 20 | 4 |
| 2.623 | 2.9 J | -0.277 | 20 | 5 |
| 3.007 | 2.9 J | 0.107 | 21 | 5 |
| | | | | |
| 4.4 | 2.6 J1c | 1.8 | 22 | 5 |
| 3.1 | 2.6 J1c | 0.5 | 23 | 5 |
| 2.9 J | 2.6 J1c | 0.3 | 24 | 5 |
| 3.3 1c | 2.6 J1c | 0.7 | 25 | 5 |
| 3.2 | 2.6 J1c | 0.6 | 26 | 5 |
| 3.4 | 2.6 J1c | 0.8 | 27 | 5 |
| 3.1 | 2.6 J1c | 0.5 | 28 | 5 |
| 3.3 | 2.6 J1c | 0.7 | 29 | 5 |
| 2.69 | 2.6 J1c | 0.09 | 30 | 5 |
| 10.47 | 2.6 J1c | 7.87 | 31 | 5 |
| 2.042 | 2.6 J1c | -0.558 | 31 | 6 |
| 2.623 | 2.6 J1c | 0.023 | 32 | 6 |
| 3.007 | 2.6 J1c | 0.407 | 33 | 6 |
| | | | | |
| 3.1 | 4.4 | -1.3 | 33 | 7 |
| 2.9 J | 4.4 | -1.5 | 33 | 8 |

| | | | | |
|---|---|---|---|---|
| 3.3 1c | 4.4 | -1.1 | 33 | 9 |
| 3.2 | 4.4 | -1.2 | 33 | 10 |
| 3.4 | 4.4 | -1 | 33 | 11 |
| 3.1 | 4.4 | -1.3 | 33 | 12 |
| 3.3 | 4.4 | -1.1 | 33 | 13 |
| 2.69 | 4.4 | -1.71 | 33 | 14 |
| 10.47 | 4.4 | 6.07 | 34 | 14 |
| 2.042 | 4.4 | -2.358 | 34 | 15 |
| 2.623 | 4.4 | -1.777 | 34 | 16 |
| 3.007 | 4.4 | -1.393 | 34 | 17 |
| | | | | |
| 2.9 J | 3.1 | -0.2 | 34 | 18 |
| 3.3 1c | 3.1 | 0.2 | 35 | 18 |
| 3.2 | 3.1 | 0.1 | 36 | 18 |
| 3.4 | 3.1 | 0.3 | 37 | 18 |
| 3.1 | 3.1 | 0 | 37 | 18 |
| 3.3 | 3.1 | 0.2 | 38 | 18 |
| 2.69 | 3.1 | -0.41 | 38 | 19 |
| 10.47 | 3.1 | 7.37 | 39 | 19 |
| 2.042 | 3.1 | -1.058 | 39 | 20 |
| 2.623 | 3.1 | -0.477 | 39 | 21 |
| 3.007 | 3.1 | -0.093 | 39 | 22 |
| | | | | |
| 3.3 1c | 2.9 J | 0.4 | 40 | 22 |
| 3.2 | 2.9 J | 0.3 | 41 | 22 |
| 3.4 | 2.9 J | 0.5 | 42 | 22 |
| 3.1 | 2.9 J | 0.2 | 43 | 22 |
| 3.3 | 2.9 J | 0.4 | 44 | 22 |
| 2.69 | 2.9 J | -0.21 | 44 | 23 |
| 10.47 | 2.9 J | 7.57 | 45 | 23 |
| 2.042 | 2.9 J | -0.858 | 45 | 24 |
| 2.623 | 2.9 J | -0.277 | 45 | 25 |
| 3.007 | 2.9 J | 0.107 | 46 | 25 |
| | | | | |
| 3.2 | 3.3 1c | -0.1 | 46 | 26 |
| 3.4 | 3.3 1c | 0.1 | 47 | 26 |
| 3.1 | 3.3 1c | -0.2 | 47 | 27 |
| 3.3 | 3.3 1c | 0 | 47 | 27 |
| 2.69 | 3.3 1c | -0.61 | 47 | 28 |
| 10.47 | 3.3 1c | 7.17 | 48 | 28 |
| 2.042 | 3.3 1c | -1.258 | 48 | 29 |
| 2.623 | 3.3 1c | -0.677 | 48 | 30 |
| 3.007 | 3.3 1c | -0.293 | 48 | 31 |
| | | | | |
| 3.4 | 3.2 | 0.2 | 49 | 31 |
| 3.1 | 3.2 | -0.1 | 49 | 32 |
| 3.3 | 3.2 | 0.1 | 50 | 32 |
| 2.69 | 3.2 | -0.51 | 50 | 33 |
| 10.47 | 3.2 | 7.27 | 51 | 33 |
| 2.042 | 3.2 | -1.158 | 51 | 34 |
| 2.623 | 3.2 | -0.577 | 51 | 35 |
| 3.007 | 3.2 | -0.193 | 51 | 36 |
| | | | | |
| 3.1 | 3.4 | -0.3 | 51 | 37 |
| 3.3 | 3.4 | -0.1 | 51 | 38 |
| 2.69 | 3.4 | -0.71 | 51 | 39 |
| 10.47 | 3.4 | 7.07 | 52 | 39 |

| | | | | |
|---|---|---|---|---|
| 2.042 | 3.4 | -1.358 | 52 | 40 |
| 2.623 | 3.4 | -0.777 | 52 | 41 |
| 3.007 | 3.4 | -0.393 | 52 | 42 |
| | | | | |
| 3.3 | 3.1 | 0.2 | 53 | 42 |
| 2.69 | 3.1 | -0.41 | 53 | 43 |
| 10.47 | 3.1 | 7.37 | 54 | 43 |
| 2.042 | 3.1 | -1.058 | 54 | 44 |
| 2.623 | 3.1 | -0.477 | 54 | 45 |
| 3.007 | 3.1 | -0.093 | 54 | 46 |
| | | | | |
| 2.69 | 3.3 | -0.61 | 54 | 47 |
| 10.47 | 3.3 | 7.17 | 55 | 47 |
| 2.042 | 3.3 | -1.258 | 55 | 48 |
| 2.623 | 3.3 | -0.677 | 55 | 49 |
| 3.007 | 3.3 | -0.293 | 55 | 50 |
| | | | | |
| 10.47 | 2.69 | 7.78 | 56 | 50 |
| 2.042 | 2.69 | -0.648 | 56 | 51 |
| 2.623 | 2.69 | -0.067 | 56 | 52 |
| 3.007 | 2.69 | 0.317 | 57 | 52 |
| | | | | |
| 2.042 | 10.47 | -8.428 | 57 | 53 |
| 2.623 | 10.47 | -7.847 | 57 | 54 |
| 3.007 | 10.47 | -7.463 | 57 | 55 |
| | | | | |
| 2.623 | 2.042 | 0.581 | 58 | 55 |
| 3.007 | 2.042 | 0.965 | 59 | 55 |
| | | | | |
| 3.007 | 2.623 | 0.384 | 60 | 55 |

S Statistic = 60 - 55 = 5

| Tied Group | Value | Members |
|---|---|---|
| 1 | 2.6 | 2 |
| 2 | 2.9 | 2 |
| 3 | 3.1 | 2 |
| 4 | 3.3 | 2 |

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 72
B = 18
C = 0
D = 0
E = 8
F = 2
a = 8880
b = 30240
c = 480
Group Variance = 488.367
Z-Score = 0.181004
Comparison Level at 95% confidence level = 1.65463 (upward trend)
0.181004 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RWR-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 50 2c | 51.8 1c4c | Same Date | 0 | 0 |
| 41 1c | 51.8 1c4c | -10.8 | 0 | 1 |
| 42.3 | 51.8 1c4c | -9.5 | 0 | 2 |
| 38.8 | 51.8 1c4c | -13 | 0 | 3 |
| 35.5 | 51.8 1c4c | -16.3 | 0 | 4 |
| 34.3 | 51.8 1c4c | -17.5 | 0 | 5 |
| 33.8 | 51.8 1c4c | -18 | 0 | 6 |
| 35.1 | 51.8 1c4c | -16.7 | 0 | 7 |
| 39.3 | 51.8 1c4c | -12.5 | 0 | 8 |
| 28.8 | 51.8 1c4c | -23 | 0 | 9 |
| 23.54 | 51.8 1c4c | -28.26 | 0 | 10 |
| 19.3 | 51.8 1c4c | -32.5 | 0 | 11 |
| 20.34 | 51.8 1c4c | -31.46 | 0 | 12 |
| 15.34 | 51.8 1c4c | -36.46 | 0 | 13 |
| 36.18 | 51.8 1c4c | -15.62 | 0 | 14 |
| | | | | |
| 41 1c | 50 2c | -9 | 0 | 15 |
| 42.3 | 50 2c | -7.7 | 0 | 16 |
| 38.8 | 50 2c | -11.2 | 0 | 17 |
| 35.5 | 50 2c | -14.5 | 0 | 18 |
| 34.3 | 50 2c | -15.7 | 0 | 19 |
| 33.8 | 50 2c | -16.2 | 0 | 20 |
| 35.1 | 50 2c | -14.9 | 0 | 21 |
| 39.3 | 50 2c | -10.7 | 0 | 22 |
| 28.8 | 50 2c | -21.2 | 0 | 23 |
| 23.54 | 50 2c | -26.46 | 0 | 24 |
| 19.3 | 50 2c | -30.7 | 0 | 25 |
| 20.34 | 50 2c | -29.66 | 0 | 26 |
| 15.34 | 50 2c | -34.66 | 0 | 27 |
| 36.18 | 50 2c | -13.82 | 0 | 28 |
| | | | | |
| 42.3 | 41 1c | 1.3 | 1 | 28 |
| 38.8 | 41 1c | -2.2 | 1 | 29 |
| 35.5 | 41 1c | -5.5 | 1 | 30 |
| 34.3 | 41 1c | -6.7 | 1 | 31 |
| 33.8 | 41 1c | -7.2 | 1 | 32 |
| 35.1 | 41 1c | -5.9 | 1 | 33 |
| 39.3 | 41 1c | -1.7 | 1 | 34 |
| 28.8 | 41 1c | -12.2 | 1 | 35 |
| 23.54 | 41 1c | -17.46 | 1 | 36 |
| 19.3 | 41 1c | -21.7 | 1 | 37 |
| 20.34 | 41 1c | -20.66 | 1 | 38 |
| 15.34 | 41 1c | -25.66 | 1 | 39 |
| 36.18 | 41 1c | -4.82 | 1 | 40 |
| | | | | |
| 38.8 | 42.3 | -3.5 | 1 | 41 |
| 35.5 | 42.3 | -6.8 | 1 | 42 |

| | | | | |
|---|---|---|---|---|
| 34.3 | 42.3 | -8 | 1 | 43 |
| 33.8 | 42.3 | -8.5 | 1 | 44 |
| 35.1 | 42.3 | -7.2 | 1 | 45 |
| 39.3 | 42.3 | -3 | 1 | 46 |
| 28.8 | 42.3 | -13.5 | 1 | 47 |
| 23.54 | 42.3 | -18.76 | 1 | 48 |
| 19.3 | 42.3 | -23 | 1 | 49 |
| 20.34 | 42.3 | -21.96 | 1 | 50 |
| 15.34 | 42.3 | -26.96 | 1 | 51 |
| 36.18 | 42.3 | -6.12 | 1 | 52 |
| | | | | |
| 35.5 | 38.8 | -3.3 | 1 | 53 |
| 34.3 | 38.8 | -4.5 | 1 | 54 |
| 33.8 | 38.8 | -5 | 1 | 55 |
| 35.1 | 38.8 | -3.7 | 1 | 56 |
| 39.3 | 38.8 | 0.5 | 2 | 56 |
| 28.8 | 38.8 | -10 | 2 | 57 |
| 23.54 | 38.8 | -15.26 | 2 | 58 |
| 19.3 | 38.8 | -19.5 | 2 | 59 |
| 20.34 | 38.8 | -18.46 | 2 | 60 |
| 15.34 | 38.8 | -23.46 | 2 | 61 |
| 36.18 | 38.8 | -2.62 | 2 | 62 |
| | | | | |
| 34.3 | 35.5 | -1.2 | 2 | 63 |
| 33.8 | 35.5 | -1.7 | 2 | 64 |
| 35.1 | 35.5 | -0.4 | 2 | 65 |
| 39.3 | 35.5 | 3.8 | 3 | 65 |
| 28.8 | 35.5 | -6.7 | 3 | 66 |
| 23.54 | 35.5 | -11.96 | 3 | 67 |
| 19.3 | 35.5 | -16.2 | 3 | 68 |
| 20.34 | 35.5 | -15.16 | 3 | 69 |
| 15.34 | 35.5 | -20.16 | 3 | 70 |
| 36.18 | 35.5 | 0.68 | 4 | 70 |
| | | | | |
| 33.8 | 34.3 | -0.5 | 4 | 71 |
| 35.1 | 34.3 | 0.8 | 5 | 71 |
| 39.3 | 34.3 | 5 | 6 | 71 |
| 28.8 | 34.3 | -5.5 | 6 | 72 |
| 23.54 | 34.3 | -10.76 | 6 | 73 |
| 19.3 | 34.3 | -15 | 6 | 74 |
| 20.34 | 34.3 | -13.96 | 6 | 75 |
| 15.34 | 34.3 | -18.96 | 6 | 76 |
| 36.18 | 34.3 | 1.88 | 7 | 76 |
| | | | | |
| 35.1 | 33.8 | 1.3 | 8 | 76 |
| 39.3 | 33.8 | 5.5 | 9 | 76 |
| 28.8 | 33.8 | -5 | 9 | 77 |
| 23.54 | 33.8 | -10.26 | 9 | 78 |
| 19.3 | 33.8 | -14.5 | 9 | 79 |
| 20.34 | 33.8 | -13.46 | 9 | 80 |
| 15.34 | 33.8 | -18.46 | 9 | 81 |
| 36.18 | 33.8 | 2.38 | 10 | 81 |
| | | | | |
| 39.3 | 35.1 | 4.2 | 11 | 81 |
| 28.8 | 35.1 | -6.3 | 11 | 82 |
| 23.54 | 35.1 | -11.56 | 11 | 83 |
| 19.3 | 35.1 | -15.8 | 11 | 84 |

| | | | | |
|---|---|---|---|---|
| 20.34 | 35.1 | -14.76 | 11 | 85 |
| 15.34 | 35.1 | -19.76 | 11 | 86 |
| 36.18 | 35.1 | 1.08 | 12 | 86 |
| | | | | |
| 28.8 | 39.3 | -10.5 | 12 | 87 |
| 23.54 | 39.3 | -15.76 | 12 | 88 |
| 19.3 | 39.3 | -20 | 12 | 89 |
| 20.34 | 39.3 | -18.96 | 12 | 90 |
| 15.34 | 39.3 | -23.96 | 12 | 91 |
| 36.18 | 39.3 | -3.12 | 12 | 92 |
| | | | | |
| 23.54 | 28.8 | -5.26 | 12 | 93 |
| 19.3 | 28.8 | -9.5 | 12 | 94 |
| 20.34 | 28.8 | -8.46 | 12 | 95 |
| 15.34 | 28.8 | -13.46 | 12 | 96 |
| 36.18 | 28.8 | 7.38 | 13 | 96 |
| | | | | |
| 19.3 | 23.54 | -4.24 | 13 | 97 |
| 20.34 | 23.54 | -3.2 | 13 | 98 |
| 15.34 | 23.54 | -8.2 | 13 | 99 |
| 36.18 | 23.54 | 12.64 | 14 | 99 |
| | | | | |
| 20.34 | 19.3 | 1.04 | 15 | 99 |
| 15.34 | 19.3 | -3.96 | 15 | 100 |
| 36.18 | 19.3 | 16.88 | 16 | 100 |
| | | | | |
| 15.34 | 20.34 | -5 | 16 | 101 |
| 36.18 | 20.34 | 15.84 | 17 | 101 |
| | | | | |
| 36.18 | 15.34 | 20.84 | 18 | 101 |

S Statistic = 18 - 101 = -83

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 0
B = 18
C = 0

D = 0
E = 0
F = 2
a = 8880
b = 30240
c = 480
Group Variance = 492.333
Z-Score = -3.69559
Comparison Level at 95% confidence level = 1.65463 (upward trend)
-3.69559 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis
### Parameter: Cadmium
### Location: RWS-MWS
**Original Data (Not Transformed)**
**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| ND<1.5 U | ND<1.5 U | Same Date | 0 | 0 |
| ND<1.5 U1c | ND<1.5 U | 0 | 0 | 0 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 0 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 0 |
| 1.9 J | ND<1.5 U | 0.4 | 1 | 0 |
| 0.42 J | ND<1.5 U | -1.08 | 1 | 1 |
| 0.39 J | ND<1.5 U | -1.11 | 1 | 2 |
| ND<1.5 U | ND<1.5 U | 0 | 1 | 2 |
| ND<5 U | ND<1.5 U | 3.5 | 2 | 2 |
| ND<1 U | ND<1.5 U | -0.5 | 2 | 3 |
| 0.2304 | ND<1.5 U | -1.2696 | 2 | 4 |
| 0.6824 | ND<1.5 U | -0.8176 | 2 | 5 |
| 0.166 J | ND<1.5 U | -1.334 | 2 | 6 |
| 1.028 | ND<1.5 U | -0.472 | 2 | 7 |
| 1.43 | ND<1.5 U | -0.07 | 2 | 8 |
| | | | | |
| ND<1.5 U1c | ND<1.5 U | 0 | 2 | 8 |
| ND<1.5 U | ND<1.5 U | 0 | 2 | 8 |
| ND<1.5 U | ND<1.5 U | 0 | 2 | 8 |
| 1.9 J | ND<1.5 U | 0.4 | 3 | 8 |
| 0.42 J | ND<1.5 U | -1.08 | 3 | 9 |
| 0.39 J | ND<1.5 U | -1.11 | 3 | 10 |
| ND<1.5 U | ND<1.5 U | 0 | 3 | 10 |
| ND<5 U | ND<1.5 U | 3.5 | 4 | 10 |
| ND<1 U | ND<1.5 U | -0.5 | 4 | 11 |
| 0.2304 | ND<1.5 U | -1.2696 | 4 | 12 |
| 0.6824 | ND<1.5 U | -0.8176 | 4 | 13 |
| 0.166 J | ND<1.5 U | -1.334 | 4 | 14 |
| 1.028 | ND<1.5 U | -0.472 | 4 | 15 |
| 1.43 | ND<1.5 U | -0.07 | 4 | 16 |
| | | | | |
| ND<1.5 U | ND<1.5 U1c | 0 | 4 | 16 |
| ND<1.5 U | ND<1.5 U1c | 0 | 4 | 16 |
| 1.9 J | ND<1.5 U1c | 0.4 | 5 | 16 |
| 0.42 J | ND<1.5 U1c | -1.08 | 5 | 17 |
| 0.39 J | ND<1.5 U1c | -1.11 | 5 | 18 |
| ND<1.5 U | ND<1.5 U1c | 0 | 5 | 18 |
| ND<5 U | ND<1.5 U1c | 3.5 | 6 | 18 |
| ND<1 U | ND<1.5 U1c | -0.5 | 6 | 19 |
| 0.2304 | ND<1.5 U1c | -1.2696 | 6 | 20 |
| 0.6824 | ND<1.5 U1c | -0.8176 | 6 | 21 |
| 0.166 J | ND<1.5 U1c | -1.334 | 6 | 22 |
| 1.028 | ND<1.5 U1c | -0.472 | 6 | 23 |
| 1.43 | ND<1.5 U1c | -0.07 | 6 | 24 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 6 | 24 |
| 1.9 J | ND<1.5 U | 0.4 | 7 | 24 |

| | | | | |
|---|---|---|---|---|
| 0.42 J | ND<1.5 U | -1.08 | 7 | 25 |
| 0.39 J | ND<1.5 U | -1.11 | 7 | 26 |
| ND<1.5 U | ND<1.5 U | 0 | 7 | 26 |
| ND<5 U | ND<1.5 U | 3.5 | 8 | 26 |
| ND<1 U | ND<1.5 U | -0.5 | 8 | 27 |
| 0.2304 | ND<1.5 U | -1.2696 | 8 | 28 |
| 0.6824 | ND<1.5 U | -0.8176 | 8 | 29 |
| 0.166 J | ND<1.5 U | -1.334 | 8 | 30 |
| 1.028 | ND<1.5 U | -0.472 | 8 | 31 |
| 1.43 | ND<1.5 U | -0.07 | 8 | 32 |
| | | | | |
| 1.9 J | ND<1.5 U | 0.4 | 9 | 32 |
| 0.42 J | ND<1.5 U | -1.08 | 9 | 33 |
| 0.39 J | ND<1.5 U | -1.11 | 9 | 34 |
| ND<1.5 U | ND<1.5 U | 0 | 9 | 34 |
| ND<5 U | ND<1.5 U | 3.5 | 10 | 34 |
| ND<1 U | ND<1.5 U | -0.5 | 10 | 35 |
| 0.2304 | ND<1.5 U | -1.2696 | 10 | 36 |
| 0.6824 | ND<1.5 U | -0.8176 | 10 | 37 |
| 0.166 J | ND<1.5 U | -1.334 | 10 | 38 |
| 1.028 | ND<1.5 U | -0.472 | 10 | 39 |
| 1.43 | ND<1.5 U | -0.07 | 10 | 40 |
| | | | | |
| 0.42 J | 1.9 J | -1.48 | 10 | 41 |
| 0.39 J | 1.9 J | -1.51 | 10 | 42 |
| ND<1.5 U | 1.9 J | -0.4 | 10 | 43 |
| ND<5 U | 1.9 J | 3.1 | 11 | 43 |
| ND<1 U | 1.9 J | -0.9 | 11 | 44 |
| 0.2304 | 1.9 J | -1.6696 | 11 | 45 |
| 0.6824 | 1.9 J | -1.2176 | 11 | 46 |
| 0.166 J | 1.9 J | -1.734 | 11 | 47 |
| 1.028 | 1.9 J | -0.872 | 11 | 48 |
| 1.43 | 1.9 J | -0.47 | 11 | 49 |
| | | | | |
| 0.39 J | 0.42 J | -0.03 | 11 | 50 |
| ND<1.5 U | 0.42 J | 1.08 | 12 | 50 |
| ND<5 U | 0.42 J | 4.58 | 13 | 50 |
| ND<1 U | 0.42 J | 0.58 | 14 | 50 |
| 0.2304 | 0.42 J | -0.1896 | 14 | 51 |
| 0.6824 | 0.42 J | 0.2624 | 15 | 51 |
| 0.166 J | 0.42 J | -0.254 | 15 | 52 |
| 1.028 | 0.42 J | 0.608 | 16 | 52 |
| 1.43 | 0.42 J | 1.01 | 17 | 52 |
| | | | | |
| ND<1.5 U | 0.39 J | 1.11 | 18 | 52 |
| ND<5 U | 0.39 J | 4.61 | 19 | 52 |
| ND<1 U | 0.39 J | 0.61 | 20 | 52 |
| 0.2304 | 0.39 J | -0.1596 | 20 | 53 |
| 0.6824 | 0.39 J | 0.2924 | 21 | 53 |
| 0.166 J | 0.39 J | -0.224 | 21 | 54 |
| 1.028 | 0.39 J | 0.638 | 22 | 54 |
| 1.43 | 0.39 J | 1.04 | 23 | 54 |
| | | | | |
| ND<5 U | ND<1.5 U | 3.5 | 24 | 54 |
| ND<1 U | ND<1.5 U | -0.5 | 24 | 55 |
| 0.2304 | ND<1.5 U | -1.2696 | 24 | 56 |
| 0.6824 | ND<1.5 U | -0.8176 | 24 | 57 |

| | | | | |
|---|---|---|---|---|
| 0.166 J | ND<1.5 U | -1.334 | 24 | 58 |
| 1.028 | ND<1.5 U | -0.472 | 24 | 59 |
| 1.43 | ND<1.5 U | -0.07 | 24 | 60 |
| | | | | |
| ND<1 U | ND<5 U | -4 | 24 | 61 |
| 0.2304 | ND<5 U | -4.7696 | 24 | 62 |
| 0.6824 | ND<5 U | -4.3176 | 24 | 63 |
| 0.166 J | ND<5 U | -4.834 | 24 | 64 |
| 1.028 | ND<5 U | -3.972 | 24 | 65 |
| 1.43 | ND<5 U | -3.57 | 24 | 66 |
| | | | | |
| 0.2304 | ND<1 U | -0.7696 | 24 | 67 |
| 0.6824 | ND<1 U | -0.3176 | 24 | 68 |
| 0.166 J | ND<1 U | -0.834 | 24 | 69 |
| 1.028 | ND<1 U | 0.028 | 25 | 69 |
| 1.43 | ND<1 U | 0.43 | 26 | 69 |
| | | | | |
| 0.6824 | 0.2304 | 0.452 | 27 | 69 |
| 0.166 J | 0.2304 | -0.0644 | 27 | 70 |
| 1.028 | 0.2304 | 0.7976 | 28 | 70 |
| 1.43 | 0.2304 | 1.1996 | 29 | 70 |
| | | | | |
| 0.166 J | 0.6824 | -0.5164 | 29 | 71 |
| 1.028 | 0.6824 | 0.3456 | 30 | 71 |
| 1.43 | 0.6824 | 0.7476 | 31 | 71 |
| | | | | |
| 1.028 | 0.166 J | 0.862 | 32 | 71 |
| 1.43 | 0.166 J | 1.264 | 33 | 71 |
| | | | | |
| 1.43 | 1.028 | 0.402 | 34 | 71 |

S Statistic = 34 - 71 = -37

| Tied Group | Value | Members |
|---|---|---|
| 1 | 1.5 | 6 |

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 510
B = 18

C = 120
D = 0
E = 30
F = 2
a = 8880
b = 30240
c = 480
Group Variance = 464.125
Z-Score = -1.67103
Comparison Level at 95% confidence level = 1.65463 (upward trend)
-1.67103 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RW01-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 5730 | 12200 MH | -6470 | 0 | 1 |
| 7730 | 12200 MH | -4470 | 0 | 2 |
| 25200 | 12200 MH | 13000 | 1 | 2 |
| 7300 | 12200 MH | -4900 | 1 | 3 |
| 35200 | 12200 MH | 23000 | 2 | 3 |
| 52000 | 12200 MH | 39800 | 3 | 3 |
| 24100 | 12200 MH | 11900 | 4 | 3 |
| 37000 | 12200 MH | 24800 | 5 | 3 |
| 16500 MH | 12200 MH | 4300 | 6 | 3 |
| 17200 ML | 12200 MH | 5000 | 7 | 3 |
| 16100 | 12200 MH | 3900 | 8 | 3 |
| 16300 | 12200 MH | 4100 | 9 | 3 |
| 16300 2c | 12200 MH | 4100 | 10 | 3 |
| 10400 | 12200 MH | -1800 | 10 | 4 |
| 9810 | 12200 MH | -2390 | 10 | 5 |
| 6200 ML | 12200 MH | -6000 | 10 | 6 |
| 7050 | 12200 MH | -5150 | 10 | 7 |
| 4140 | 12200 MH | -8060 | 10 | 8 |
| 3620 | 12200 MH | -8580 | 10 | 9 |
| 5560 | 12200 MH | -6640 | 10 | 10 |
| 11300 | 12200 MH | -900 | 10 | 11 |
| 6406 | 12200 MH | -5794 | 10 | 12 |
| 10390 | 12200 MH | -1810 | 10 | 13 |
| | | | | |
| 7730 | 5730 | 2000 | 11 | 13 |
| 25200 | 5730 | 19470 | 12 | 13 |
| 7300 | 5730 | 1570 | 13 | 13 |
| 35200 | 5730 | 29470 | 14 | 13 |
| 52000 | 5730 | 46270 | 15 | 13 |
| 24100 | 5730 | 18370 | 16 | 13 |
| 37000 | 5730 | 31270 | 17 | 13 |
| 16500 MH | 5730 | 10770 | 18 | 13 |
| 17200 ML | 5730 | 11470 | 19 | 13 |
| 16100 | 5730 | 10370 | 20 | 13 |
| 16300 | 5730 | 10570 | 21 | 13 |
| 16300 2c | 5730 | 10570 | 22 | 13 |
| 10400 | 5730 | 4670 | 23 | 13 |
| 9810 | 5730 | 4080 | 24 | 13 |
| 6200 ML | 5730 | 470 | 25 | 13 |
| 7050 | 5730 | 1320 | 26 | 13 |
| 4140 | 5730 | -1590 | 26 | 14 |
| 3620 | 5730 | -2110 | 26 | 15 |
| 5560 | 5730 | -170 | 26 | 16 |
| 11300 | 5730 | 5570 | 27 | 16 |
| 6406 | 5730 | 676 | 28 | 16 |
| 10390 | 5730 | 4660 | 29 | 16 |

| | | | | |
|---|---|---|---|---|
| 25200 | 7730 | 17470 | 30 | 16 |
| 7300 | 7730 | -430 | 30 | 17 |
| 35200 | 7730 | 27470 | 31 | 17 |
| 52000 | 7730 | 44270 | 32 | 17 |
| 24100 | 7730 | 16370 | 33 | 17 |
| 37000 | 7730 | 29270 | 34 | 17 |
| 16500 MH | 7730 | 8770 | 35 | 17 |
| 17200 ML | 7730 | 9470 | 36 | 17 |
| 16100 | 7730 | 8370 | 37 | 17 |
| 16300 | 7730 | 8570 | 38 | 17 |
| 16300 2c | 7730 | 8570 | 39 | 17 |
| 10400 | 7730 | 2670 | 40 | 17 |
| 9810 | 7730 | 2080 | 41 | 17 |
| 6200 ML | 7730 | -1530 | 41 | 18 |
| 7050 | 7730 | -680 | 41 | 19 |
| 4140 | 7730 | -3590 | 41 | 20 |
| 3620 | 7730 | -4110 | 41 | 21 |
| 5560 | 7730 | -2170 | 41 | 22 |
| 11300 | 7730 | 3570 | 42 | 22 |
| 6406 | 7730 | -1324 | 42 | 23 |
| 10390 | 7730 | 2660 | 43 | 23 |
| | | | | |
| 7300 | 25200 | -17900 | 43 | 24 |
| 35200 | 25200 | 10000 | 44 | 24 |
| 52000 | 25200 | 26800 | 45 | 24 |
| 24100 | 25200 | -1100 | 45 | 25 |
| 37000 | 25200 | 11800 | 46 | 25 |
| 16500 MH | 25200 | -8700 | 46 | 26 |
| 17200 ML | 25200 | -8000 | 46 | 27 |
| 16100 | 25200 | -9100 | 46 | 28 |
| 16300 | 25200 | -8900 | 46 | 29 |
| 16300 2c | 25200 | -8900 | 46 | 30 |
| 10400 | 25200 | -14800 | 46 | 31 |
| 9810 | 25200 | -15390 | 46 | 32 |
| 6200 ML | 25200 | -19000 | 46 | 33 |
| 7050 | 25200 | -18150 | 46 | 34 |
| 4140 | 25200 | -21060 | 46 | 35 |
| 3620 | 25200 | -21580 | 46 | 36 |
| 5560 | 25200 | -19640 | 46 | 37 |
| 11300 | 25200 | -13900 | 46 | 38 |
| 6406 | 25200 | -18794 | 46 | 39 |
| 10390 | 25200 | -14810 | 46 | 40 |
| | | | | |
| 35200 | 7300 | 27900 | 47 | 40 |
| 52000 | 7300 | 44700 | 48 | 40 |
| 24100 | 7300 | 16800 | 49 | 40 |
| 37000 | 7300 | 29700 | 50 | 40 |
| 16500 MH | 7300 | 9200 | 51 | 40 |
| 17200 ML | 7300 | 9900 | 52 | 40 |
| 16100 | 7300 | 8800 | 53 | 40 |
| 16300 | 7300 | 9000 | 54 | 40 |
| 16300 2c | 7300 | 9000 | 55 | 40 |
| 10400 | 7300 | 3100 | 56 | 40 |
| 9810 | 7300 | 2510 | 57 | 40 |
| 6200 ML | 7300 | -1100 | 57 | 41 |
| 7050 | 7300 | -250 | 57 | 42 |
| 4140 | 7300 | -3160 | 57 | 43 |

| | | | | |
|---|---|---|---|---|
| 3620 | 7300 | -3680 | 57 | 44 |
| 5560 | 7300 | -1740 | 57 | 45 |
| 11300 | 7300 | 4000 | 58 | 45 |
| 6406 | 7300 | -894 | 58 | 46 |
| 10390 | 7300 | 3090 | 59 | 46 |
| | | | | |
| 52000 | 35200 | 16800 | 60 | 46 |
| 24100 | 35200 | -11100 | 60 | 47 |
| 37000 | 35200 | 1800 | 61 | 47 |
| 16500 MH | 35200 | -18700 | 61 | 48 |
| 17200 ML | 35200 | -18000 | 61 | 49 |
| 16100 | 35200 | -19100 | 61 | 50 |
| 16300 | 35200 | -18900 | 61 | 51 |
| 16300 2c | 35200 | -18900 | 61 | 52 |
| 10400 | 35200 | -24800 | 61 | 53 |
| 9810 | 35200 | -25390 | 61 | 54 |
| 6200 ML | 35200 | -29000 | 61 | 55 |
| 7050 | 35200 | -28150 | 61 | 56 |
| 4140 | 35200 | -31060 | 61 | 57 |
| 3620 | 35200 | -31580 | 61 | 58 |
| 5560 | 35200 | -29640 | 61 | 59 |
| 11300 | 35200 | -23900 | 61 | 60 |
| 6406 | 35200 | -28794 | 61 | 61 |
| 10390 | 35200 | -24810 | 61 | 62 |
| | | | | |
| 24100 | 52000 | -27900 | 61 | 63 |
| 37000 | 52000 | -15000 | 61 | 64 |
| 16500 MH | 52000 | -35500 | 61 | 65 |
| 17200 ML | 52000 | -34800 | 61 | 66 |
| 16100 | 52000 | -35900 | 61 | 67 |
| 16300 | 52000 | -35700 | 61 | 68 |
| 16300 2c | 52000 | -35700 | 61 | 69 |
| 10400 | 52000 | -41600 | 61 | 70 |
| 9810 | 52000 | -42190 | 61 | 71 |
| 6200 ML | 52000 | -45800 | 61 | 72 |
| 7050 | 52000 | -44950 | 61 | 73 |
| 4140 | 52000 | -47860 | 61 | 74 |
| 3620 | 52000 | -48380 | 61 | 75 |
| 5560 | 52000 | -46440 | 61 | 76 |
| 11300 | 52000 | -40700 | 61 | 77 |
| 6406 | 52000 | -45594 | 61 | 78 |
| 10390 | 52000 | -41610 | 61 | 79 |
| | | | | |
| 37000 | 24100 | 12900 | 62 | 79 |
| 16500 MH | 24100 | -7600 | 62 | 80 |
| 17200 ML | 24100 | -6900 | 62 | 81 |
| 16100 | 24100 | -8000 | 62 | 82 |
| 16300 | 24100 | -7800 | 62 | 83 |
| 16300 2c | 24100 | -7800 | 62 | 84 |
| 10400 | 24100 | -13700 | 62 | 85 |
| 9810 | 24100 | -14290 | 62 | 86 |
| 6200 ML | 24100 | -17900 | 62 | 87 |
| 7050 | 24100 | -17050 | 62 | 88 |
| 4140 | 24100 | -19960 | 62 | 89 |
| 3620 | 24100 | -20480 | 62 | 90 |
| 5560 | 24100 | -18540 | 62 | 91 |
| 11300 | 24100 | -12800 | 62 | 92 |

| | | | | |
|---|---|---|---|---|
| 6406 | 24100 | -17694 | 62 | 93 |
| 10390 | 24100 | -13710 | 62 | 94 |
| | | | | |
| 16500 MH | 37000 | -20500 | 62 | 95 |
| 17200 ML | 37000 | -19800 | 62 | 96 |
| 16100 | 37000 | -20900 | 62 | 97 |
| 16300 | 37000 | -20700 | 62 | 98 |
| 16300 2c | 37000 | -20700 | 62 | 99 |
| 10400 | 37000 | -26600 | 62 | 100 |
| 9810 | 37000 | -27190 | 62 | 101 |
| 6200 ML | 37000 | -30800 | 62 | 102 |
| 7050 | 37000 | -29950 | 62 | 103 |
| 4140 | 37000 | -32860 | 62 | 104 |
| 3620 | 37000 | -33380 | 62 | 105 |
| 5560 | 37000 | -31440 | 62 | 106 |
| 11300 | 37000 | -25700 | 62 | 107 |
| 6406 | 37000 | -30594 | 62 | 108 |
| 10390 | 37000 | -26610 | 62 | 109 |
| | | | | |
| 17200 ML | 16500 MH | Same Date | 62 | 109 |
| 16100 | 16500 MH | -400 | 62 | 110 |
| 16300 | 16500 MH | -200 | 62 | 111 |
| 16300 2c | 16500 MH | -200 | 62 | 112 |
| 10400 | 16500 MH | -6100 | 62 | 113 |
| 9810 | 16500 MH | -6690 | 62 | 114 |
| 6200 ML | 16500 MH | -10300 | 62 | 115 |
| 7050 | 16500 MH | -9450 | 62 | 116 |
| 4140 | 16500 MH | -12360 | 62 | 117 |
| 3620 | 16500 MH | -12880 | 62 | 118 |
| 5560 | 16500 MH | -10940 | 62 | 119 |
| 11300 | 16500 MH | -5200 | 62 | 120 |
| 6406 | 16500 MH | -10094 | 62 | 121 |
| 10390 | 16500 MH | -6110 | 62 | 122 |
| | | | | |
| 16100 | 17200 ML | -1100 | 62 | 123 |
| 16300 | 17200 ML | -900 | 62 | 124 |
| 16300 2c | 17200 ML | -900 | 62 | 125 |
| 10400 | 17200 ML | -6800 | 62 | 126 |
| 9810 | 17200 ML | -7390 | 62 | 127 |
| 6200 ML | 17200 ML | -11000 | 62 | 128 |
| 7050 | 17200 ML | -10150 | 62 | 129 |
| 4140 | 17200 ML | -13060 | 62 | 130 |
| 3620 | 17200 ML | -13580 | 62 | 131 |
| 5560 | 17200 ML | -11640 | 62 | 132 |
| 11300 | 17200 ML | -5900 | 62 | 133 |
| 6406 | 17200 ML | -10794 | 62 | 134 |
| 10390 | 17200 ML | -6810 | 62 | 135 |
| | | | | |
| 16300 | 16100 | Same Date | 62 | 135 |
| 16300 2c | 16100 | 200 | 63 | 135 |
| 10400 | 16100 | -5700 | 63 | 136 |
| 9810 | 16100 | -6290 | 63 | 137 |
| 6200 ML | 16100 | -9900 | 63 | 138 |
| 7050 | 16100 | -9050 | 63 | 139 |
| 4140 | 16100 | -11960 | 63 | 140 |
| 3620 | 16100 | -12480 | 63 | 141 |
| 5560 | 16100 | -10540 | 63 | 142 |

| | | | | |
|---|---|---|---|---|
| 11300 | 16100 | -4800 | 63 | 143 |
| 6406 | 16100 | -9694 | 63 | 144 |
| 10390 | 16100 | -5710 | 63 | 145 |
| | | | | |
| 16300 2c | 16300 | 0 | 63 | 145 |
| 10400 | 16300 | -5900 | 63 | 146 |
| 9810 | 16300 | -6490 | 63 | 147 |
| 6200 ML | 16300 | -10100 | 63 | 148 |
| 7050 | 16300 | -9250 | 63 | 149 |
| 4140 | 16300 | -12160 | 63 | 150 |
| 3620 | 16300 | -12680 | 63 | 151 |
| 5560 | 16300 | -10740 | 63 | 152 |
| 11300 | 16300 | -5000 | 63 | 153 |
| 6406 | 16300 | -9894 | 63 | 154 |
| 10390 | 16300 | -5910 | 63 | 155 |
| | | | | |
| 10400 | 16300 2c | -5900 | 63 | 156 |
| 9810 | 16300 2c | -6490 | 63 | 157 |
| 6200 ML | 16300 2c | -10100 | 63 | 158 |
| 7050 | 16300 2c | -9250 | 63 | 159 |
| 4140 | 16300 2c | -12160 | 63 | 160 |
| 3620 | 16300 2c | -12680 | 63 | 161 |
| 5560 | 16300 2c | -10740 | 63 | 162 |
| 11300 | 16300 2c | -5000 | 63 | 163 |
| 6406 | 16300 2c | -9894 | 63 | 164 |
| 10390 | 16300 2c | -5910 | 63 | 165 |
| | | | | |
| 9810 | 10400 | -590 | 63 | 166 |
| 6200 ML | 10400 | -4200 | 63 | 167 |
| 7050 | 10400 | -3350 | 63 | 168 |
| 4140 | 10400 | -6260 | 63 | 169 |
| 3620 | 10400 | -6780 | 63 | 170 |
| 5560 | 10400 | -4840 | 63 | 171 |
| 11300 | 10400 | 900 | 64 | 171 |
| 6406 | 10400 | -3994 | 64 | 172 |
| 10390 | 10400 | -10 | 64 | 173 |
| | | | | |
| 6200 ML | 9810 | -3610 | 64 | 174 |
| 7050 | 9810 | -2760 | 64 | 175 |
| 4140 | 9810 | -5670 | 64 | 176 |
| 3620 | 9810 | -6190 | 64 | 177 |
| 5560 | 9810 | -4250 | 64 | 178 |
| 11300 | 9810 | 1490 | 65 | 178 |
| 6406 | 9810 | -3404 | 65 | 179 |
| 10390 | 9810 | 580 | 66 | 179 |
| | | | | |
| 7050 | 6200 ML | 850 | 67 | 179 |
| 4140 | 6200 ML | -2060 | 67 | 180 |
| 3620 | 6200 ML | -2580 | 67 | 181 |
| 5560 | 6200 ML | -640 | 67 | 182 |
| 11300 | 6200 ML | 5100 | 68 | 182 |
| 6406 | 6200 ML | 206 | 69 | 182 |
| 10390 | 6200 ML | 4190 | 70 | 182 |
| | | | | |
| 4140 | 7050 | -2910 | 70 | 183 |
| 3620 | 7050 | -3430 | 70 | 184 |
| 5560 | 7050 | -1490 | 70 | 185 |

| | | | | |
|---|---|---|---|---|
| 11300 | 7050 | 4250 | 71 | 185 |
| 6406 | 7050 | -644 | 71 | 186 |
| 10390 | 7050 | 3340 | 72 | 186 |
| | | | | |
| 3620 | 4140 | -520 | 72 | 187 |
| 5560 | 4140 | 1420 | 73 | 187 |
| 11300 | 4140 | 7160 | 74 | 187 |
| 6406 | 4140 | 2266 | 75 | 187 |
| 10390 | 4140 | 6250 | 76 | 187 |
| | | | | |
| 5560 | 3620 | 1940 | 77 | 187 |
| 11300 | 3620 | 7680 | 78 | 187 |
| 6406 | 3620 | 2786 | 79 | 187 |
| 10390 | 3620 | 6770 | 80 | 187 |
| | | | | |
| 11300 | 5560 | 5740 | 81 | 187 |
| 6406 | 5560 | 846 | 82 | 187 |
| 10390 | 5560 | 4830 | 83 | 187 |
| | | | | |
| 6406 | 11300 | -4894 | 83 | 188 |
| 10390 | 11300 | -910 | 83 | 189 |
| | | | | |
| 10390 | 6406 | 3984 | 84 | 189 |

S Statistic = 84 - 189 = -105

| Tied Group | Value | Members |
|---|---|---|
| 1 | 16300 | 2 |

| Time Period | Observations |
|---|---|
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |

There are 2 time periods with multiple data

A = 18
B = 36

C = 0
D = 0
E = 2
F = 4
a = 29256
b = 109296
c = 1104
Group Variance = 1622.34
Z-Score = -2.58204
Comparison Level at 95% confidence level = 1.65463 (upward trend)
-2.58204 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RW02-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 3220 | 6290 | -3070 | 0 | 1 |
| 5490 | 6290 | -800 | 0 | 2 |
| 1460 | 6290 | -4830 | 0 | 3 |
| 79.3 | 6290 | -6210.7 | 0 | 4 |
| 2210 | 6290 | -4080 | 0 | 5 |
| 5320 | 6290 | -970 | 0 | 6 |
| 5470 | 6290 | -820 | 0 | 7 |
| 5930 | 6290 | -360 | 0 | 8 |
| 14200 | 6290 | 7910 | 1 | 8 |
| 13100 | 6290 | 6810 | 2 | 8 |
| 22400 | 6290 | 16110 | 3 | 8 |
| 21900 | 6290 | 15610 | 4 | 8 |
| 27400 2c | 6290 | 21110 | 5 | 8 |
| 594 | 6290 | -5696 | 5 | 9 |
| 269 | 6290 | -6021 | 5 | 10 |
| 1940 | 6290 | -4350 | 5 | 11 |
| 1280 | 6290 | -5010 | 5 | 12 |
| 9950 | 6290 | 3660 | 6 | 12 |
| 472 | 6290 | -5818 | 6 | 13 |
| 3.1 JB | 6290 | -6286.9 | 6 | 14 |
| 36300 | 6290 | 30010 | 7 | 14 |
| 7503 | 6290 | 1213 | 8 | 14 |
| 18640 | 6290 | 12350 | 9 | 14 |
| | | | | |
| 5490 | 3220 | 2270 | 10 | 14 |
| 1460 | 3220 | -1760 | 10 | 15 |
| 79.3 | 3220 | -3140.7 | 10 | 16 |
| 2210 | 3220 | -1010 | 10 | 17 |
| 5320 | 3220 | 2100 | 11 | 17 |
| 5470 | 3220 | 2250 | 12 | 17 |
| 5930 | 3220 | 2710 | 13 | 17 |
| 14200 | 3220 | 10980 | 14 | 17 |
| 13100 | 3220 | 9880 | 15 | 17 |
| 22400 | 3220 | 19180 | 16 | 17 |
| 21900 | 3220 | 18680 | 17 | 17 |
| 27400 2c | 3220 | 24180 | 18 | 17 |
| 594 | 3220 | -2626 | 18 | 18 |
| 269 | 3220 | -2951 | 18 | 19 |
| 1940 | 3220 | -1280 | 18 | 20 |
| 1280 | 3220 | -1940 | 18 | 21 |
| 9950 | 3220 | 6730 | 19 | 21 |
| 472 | 3220 | -2748 | 19 | 22 |
| 3.1 JB | 3220 | -3216.9 | 19 | 23 |
| 36300 | 3220 | 33080 | 20 | 23 |
| 7503 | 3220 | 4283 | 21 | 23 |
| 18640 | 3220 | 15420 | 22 | 23 |

| | | | | |
|---|---|---|---|---|
| 1460 | 5490 | -4030 | 22 | 24 |
| 79.3 | 5490 | -5410.7 | 22 | 25 |
| 2210 | 5490 | -3280 | 22 | 26 |
| 5320 | 5490 | -170 | 22 | 27 |
| 5470 | 5490 | -20 | 22 | 28 |
| 5930 | 5490 | 440 | 23 | 28 |
| 14200 | 5490 | 8710 | 24 | 28 |
| 13100 | 5490 | 7610 | 25 | 28 |
| 22400 | 5490 | 16910 | 26 | 28 |
| 21900 | 5490 | 16410 | 27 | 28 |
| 27400 2c | 5490 | 21910 | 28 | 28 |
| 594 | 5490 | -4896 | 28 | 29 |
| 269 | 5490 | -5221 | 28 | 30 |
| 1940 | 5490 | -3550 | 28 | 31 |
| 1280 | 5490 | -4210 | 28 | 32 |
| 9950 | 5490 | 4460 | 29 | 32 |
| 472 | 5490 | -5018 | 29 | 33 |
| 3.1 JB | 5490 | -5486.9 | 29 | 34 |
| 36300 | 5490 | 30810 | 30 | 34 |
| 7503 | 5490 | 2013 | 31 | 34 |
| 18640 | 5490 | 13150 | 32 | 34 |
| | | | | |
| 79.3 | 1460 | -1380.7 | 32 | 35 |
| 2210 | 1460 | 750 | 33 | 35 |
| 5320 | 1460 | 3860 | 34 | 35 |
| 5470 | 1460 | 4010 | 35 | 35 |
| 5930 | 1460 | 4470 | 36 | 35 |
| 14200 | 1460 | 12740 | 37 | 35 |
| 13100 | 1460 | 11640 | 38 | 35 |
| 22400 | 1460 | 20940 | 39 | 35 |
| 21900 | 1460 | 20440 | 40 | 35 |
| 27400 2c | 1460 | 25940 | 41 | 35 |
| 594 | 1460 | -866 | 41 | 36 |
| 269 | 1460 | -1191 | 41 | 37 |
| 1940 | 1460 | 480 | 42 | 37 |
| 1280 | 1460 | -180 | 42 | 38 |
| 9950 | 1460 | 8490 | 43 | 38 |
| 472 | 1460 | -988 | 43 | 39 |
| 3.1 JB | 1460 | -1456.9 | 43 | 40 |
| 36300 | 1460 | 34840 | 44 | 40 |
| 7503 | 1460 | 6043 | 45 | 40 |
| 18640 | 1460 | 17180 | 46 | 40 |
| | | | | |
| 2210 | 79.3 | 2130.7 | 47 | 40 |
| 5320 | 79.3 | 5240.7 | 48 | 40 |
| 5470 | 79.3 | 5390.7 | 49 | 40 |
| 5930 | 79.3 | 5850.7 | 50 | 40 |
| 14200 | 79.3 | 14120.7 | 51 | 40 |
| 13100 | 79.3 | 13020.7 | 52 | 40 |
| 22400 | 79.3 | 22320.7 | 53 | 40 |
| 21900 | 79.3 | 21820.7 | 54 | 40 |
| 27400 2c | 79.3 | 27320.7 | 55 | 40 |
| 594 | 79.3 | 514.7 | 56 | 40 |
| 269 | 79.3 | 189.7 | 57 | 40 |
| 1940 | 79.3 | 1860.7 | 58 | 40 |
| 1280 | 79.3 | 1200.7 | 59 | 40 |
| 9950 | 79.3 | 9870.7 | 60 | 40 |

| | | | | |
|---|---|---|---|---|
| 472 | 79.3 | 392.7 | 61 | 40 |
| 3.1 JB | 79.3 | -76.2 | 61 | 41 |
| 36300 | 79.3 | 36220.7 | 62 | 41 |
| 7503 | 79.3 | 7423.7 | 63 | 41 |
| 18640 | 79.3 | 18560.7 | 64 | 41 |
| | | | | |
| 5320 | 2210 | 3110 | 65 | 41 |
| 5470 | 2210 | 3260 | 66 | 41 |
| 5930 | 2210 | 3720 | 67 | 41 |
| 14200 | 2210 | 11990 | 68 | 41 |
| 13100 | 2210 | 10890 | 69 | 41 |
| 22400 | 2210 | 20190 | 70 | 41 |
| 21900 | 2210 | 19690 | 71 | 41 |
| 27400 2c | 2210 | 25190 | 72 | 41 |
| 594 | 2210 | -1616 | 72 | 42 |
| 269 | 2210 | -1941 | 72 | 43 |
| 1940 | 2210 | -270 | 72 | 44 |
| 1280 | 2210 | -930 | 72 | 45 |
| 9950 | 2210 | 7740 | 73 | 45 |
| 472 | 2210 | -1738 | 73 | 46 |
| 3.1 JB | 2210 | -2206.9 | 73 | 47 |
| 36300 | 2210 | 34090 | 74 | 47 |
| 7503 | 2210 | 5293 | 75 | 47 |
| 18640 | 2210 | 16430 | 76 | 47 |
| | | | | |
| 5470 | 5320 | 150 | 77 | 47 |
| 5930 | 5320 | 610 | 78 | 47 |
| 14200 | 5320 | 8880 | 79 | 47 |
| 13100 | 5320 | 7780 | 80 | 47 |
| 22400 | 5320 | 17080 | 81 | 47 |
| 21900 | 5320 | 16580 | 82 | 47 |
| 27400 2c | 5320 | 22080 | 83 | 47 |
| 594 | 5320 | -4726 | 83 | 48 |
| 269 | 5320 | -5051 | 83 | 49 |
| 1940 | 5320 | -3380 | 83 | 50 |
| 1280 | 5320 | -4040 | 83 | 51 |
| 9950 | 5320 | 4630 | 84 | 51 |
| 472 | 5320 | -4848 | 84 | 52 |
| 3.1 JB | 5320 | -5316.9 | 84 | 53 |
| 36300 | 5320 | 30980 | 85 | 53 |
| 7503 | 5320 | 2183 | 86 | 53 |
| 18640 | 5320 | 13320 | 87 | 53 |
| | | | | |
| 5930 | 5470 | 460 | 88 | 53 |
| 14200 | 5470 | 8730 | 89 | 53 |
| 13100 | 5470 | 7630 | 90 | 53 |
| 22400 | 5470 | 16930 | 91 | 53 |
| 21900 | 5470 | 16430 | 92 | 53 |
| 27400 2c | 5470 | 21930 | 93 | 53 |
| 594 | 5470 | -4876 | 93 | 54 |
| 269 | 5470 | -5201 | 93 | 55 |
| 1940 | 5470 | -3530 | 93 | 56 |
| 1280 | 5470 | -4190 | 93 | 57 |
| 9950 | 5470 | 4480 | 94 | 57 |
| 472 | 5470 | -4998 | 94 | 58 |
| 3.1 JB | 5470 | -5466.9 | 94 | 59 |
| 36300 | 5470 | 30830 | 95 | 59 |

| | | | | |
|---|---|---|---|---|
| 7503 | 5470 | 2033 | 96 | 59 |
| 18640 | 5470 | 13170 | 97 | 59 |
| | | | | |
| 14200 | 5930 | 8270 | 98 | 59 |
| 13100 | 5930 | 7170 | 99 | 59 |
| 22400 | 5930 | 16470 | 100 | 59 |
| 21900 | 5930 | 15970 | 101 | 59 |
| 27400 2c | 5930 | 21470 | 102 | 59 |
| 594 | 5930 | -5336 | 102 | 60 |
| 269 | 5930 | -5661 | 102 | 61 |
| 1940 | 5930 | -3990 | 102 | 62 |
| 1280 | 5930 | -4650 | 102 | 63 |
| 9950 | 5930 | 4020 | 103 | 63 |
| 472 | 5930 | -5458 | 103 | 64 |
| 3.1 JB | 5930 | -5926.9 | 103 | 65 |
| 36300 | 5930 | 30370 | 104 | 65 |
| 7503 | 5930 | 1573 | 105 | 65 |
| 18640 | 5930 | 12710 | 106 | 65 |
| | | | | |
| 13100 | 14200 | Same Date | 106 | 65 |
| 22400 | 14200 | 8200 | 107 | 65 |
| 21900 | 14200 | 7700 | 108 | 65 |
| 27400 2c | 14200 | 13200 | 109 | 65 |
| 594 | 14200 | -13606 | 109 | 66 |
| 269 | 14200 | -13931 | 109 | 67 |
| 1940 | 14200 | -12260 | 109 | 68 |
| 1280 | 14200 | -12920 | 109 | 69 |
| 9950 | 14200 | -4250 | 109 | 70 |
| 472 | 14200 | -13728 | 109 | 71 |
| 3.1 JB | 14200 | -14196.9 | 109 | 72 |
| 36300 | 14200 | 22100 | 110 | 72 |
| 7503 | 14200 | -6697 | 110 | 73 |
| 18640 | 14200 | 4440 | 111 | 73 |
| | | | | |
| 22400 | 13100 | 9300 | 112 | 73 |
| 21900 | 13100 | 8800 | 113 | 73 |
| 27400 2c | 13100 | 14300 | 114 | 73 |
| 594 | 13100 | -12506 | 114 | 74 |
| 269 | 13100 | -12831 | 114 | 75 |
| 1940 | 13100 | -11160 | 114 | 76 |
| 1280 | 13100 | -11820 | 114 | 77 |
| 9950 | 13100 | -3150 | 114 | 78 |
| 472 | 13100 | -12628 | 114 | 79 |
| 3.1 JB | 13100 | -13096.9 | 114 | 80 |
| 36300 | 13100 | 23200 | 115 | 80 |
| 7503 | 13100 | -5597 | 115 | 81 |
| 18640 | 13100 | 5540 | 116 | 81 |
| | | | | |
| 21900 | 22400 | Same Date | 116 | 81 |
| 27400 2c | 22400 | 5000 | 117 | 81 |
| 594 | 22400 | -21806 | 117 | 82 |
| 269 | 22400 | -22131 | 117 | 83 |
| 1940 | 22400 | -20460 | 117 | 84 |
| 1280 | 22400 | -21120 | 117 | 85 |
| 9950 | 22400 | -12450 | 117 | 86 |
| 472 | 22400 | -21928 | 117 | 87 |
| 3.1 JB | 22400 | -22396.9 | 117 | 88 |

| | | | | |
|---|---|---|---|---|
| 36300 | 22400 | 13900 | 118 | 88 |
| 7503 | 22400 | -14897 | 118 | 89 |
| 18640 | 22400 | -3760 | 118 | 90 |
| | | | | |
| 27400 2c | 21900 | 5500 | 119 | 90 |
| 594 | 21900 | -21306 | 119 | 91 |
| 269 | 21900 | -21631 | 119 | 92 |
| 1940 | 21900 | -19960 | 119 | 93 |
| 1280 | 21900 | -20620 | 119 | 94 |
| 9950 | 21900 | -11950 | 119 | 95 |
| 472 | 21900 | -21428 | 119 | 96 |
| 3.1 JB | 21900 | -21896.9 | 119 | 97 |
| 36300 | 21900 | 14400 | 120 | 97 |
| 7503 | 21900 | -14397 | 120 | 98 |
| 18640 | 21900 | -3260 | 120 | 99 |
| | | | | |
| 594 | 27400 2c | -26806 | 120 | 100 |
| 269 | 27400 2c | -27131 | 120 | 101 |
| 1940 | 27400 2c | -25460 | 120 | 102 |
| 1280 | 27400 2c | -26120 | 120 | 103 |
| 9950 | 27400 2c | -17450 | 120 | 104 |
| 472 | 27400 2c | -26928 | 120 | 105 |
| 3.1 JB | 27400 2c | -27396.9 | 120 | 106 |
| 36300 | 27400 2c | 8900 | 121 | 106 |
| 7503 | 27400 2c | -19897 | 121 | 107 |
| 18640 | 27400 2c | -8760 | 121 | 108 |
| | | | | |
| 269 | 594 | -325 | 121 | 109 |
| 1940 | 594 | 1346 | 122 | 109 |
| 1280 | 594 | 686 | 123 | 109 |
| 9950 | 594 | 9356 | 124 | 109 |
| 472 | 594 | -122 | 124 | 110 |
| 3.1 JB | 594 | -590.9 | 124 | 111 |
| 36300 | 594 | 35706 | 125 | 111 |
| 7503 | 594 | 6909 | 126 | 111 |
| 18640 | 594 | 18046 | 127 | 111 |
| | | | | |
| 1940 | 269 | 1671 | 128 | 111 |
| 1280 | 269 | 1011 | 129 | 111 |
| 9950 | 269 | 9681 | 130 | 111 |
| 472 | 269 | 203 | 131 | 111 |
| 3.1 JB | 269 | -265.9 | 131 | 112 |
| 36300 | 269 | 36031 | 132 | 112 |
| 7503 | 269 | 7234 | 133 | 112 |
| 18640 | 269 | 18371 | 134 | 112 |
| | | | | |
| 1280 | 1940 | -660 | 134 | 113 |
| 9950 | 1940 | 8010 | 135 | 113 |
| 472 | 1940 | -1468 | 135 | 114 |
| 3.1 JB | 1940 | -1936.9 | 135 | 115 |
| 36300 | 1940 | 34360 | 136 | 115 |
| 7503 | 1940 | 5563 | 137 | 115 |
| 18640 | 1940 | 16700 | 138 | 115 |
| | | | | |
| 9950 | 1280 | 8670 | 139 | 115 |
| 472 | 1280 | -808 | 139 | 116 |
| 3.1 JB | 1280 | -1276.9 | 139 | 117 |

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|---|---|---|---|---|
| 36300 | 1280 | 35020 | 140 | 117 |
| 7503 | 1280 | 6223 | 141 | 117 |
| 18640 | 1280 | 17360 | 142 | 117 |
| | | | | |
| 472 | 9950 | -9478 | 142 | 118 |
| 3.1 JB | 9950 | -9946.9 | 142 | 119 |
| 36300 | 9950 | 26350 | 143 | 119 |
| 7503 | 9950 | -2447 | 143 | 120 |
| 18640 | 9950 | 8690 | 144 | 120 |
| | | | | |
| 3.1 JB | 472 | -468.9 | 144 | 121 |
| 36300 | 472 | 35828 | 145 | 121 |
| 7503 | 472 | 7031 | 146 | 121 |
| 18640 | 472 | 18168 | 147 | 121 |
| | | | | |
| 36300 | 3.1 JB | 36296.9 | 148 | 121 |
| 7503 | 3.1 JB | 7499.9 | 149 | 121 |
| 18640 | 3.1 JB | 18636.9 | 150 | 121 |
| | | | | |
| 7503 | 36300 | -28797 | 150 | 122 |
| 18640 | 36300 | -17660 | 150 | 123 |
| | | | | |
| 18640 | 7503 | 11137 | 151 | 123 |

S Statistic = 151 - 123 = 28

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |

There are 2 time periods with multiple data

A = 0
B = 36
C = 0

D = 0
E = 0
F = 4
a = 29256
b = 109296
c = 1104
Group Variance = 1623.33
Z-Score = 0.670131
Comparison Level at 95% confidence level = 1.65463 (upward trend)
0.670131 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RW03R-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 657.9 | 101.9 | 556 | 1 | 0 |
| 82.75 | 101.9 | -19.15 | 1 | 1 |
| 25.78 | 101.9 | -76.12 | 1 | 2 |
| ND<250 U | 101.9 | 148.1 | 2 | 2 |
| | | | | |
| 82.75 | 657.9 | -575.15 | 2 | 3 |
| 25.78 | 657.9 | -632.12 | 2 | 4 |
| ND<250 U | 657.9 | -407.9 | 2 | 5 |
| | | | | |
| 25.78 | 82.75 | -56.97 | 2 | 6 |
| ND<250 U | 82.75 | 167.25 | 3 | 6 |
| | | | | |
| ND<250 U | 25.78 | 224.22 | 4 | 6 |

S Statistic = 4 - 6 = -2

Comparing at 95% confidence level (upward trend)

Probability of obtaining S >= -2 is 0.408

S < 0 or 0.408 >= 0.05 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RW04-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 179 | 58.2 | 120.8 | 1 | 0 |
| 74.7 | 58.2 | 16.5 | 2 | 0 |
| 163 | 58.2 | 104.8 | 3 | 0 |
| 137 | 58.2 | 78.8 | 4 | 0 |
| 123 | 58.2 | 64.8 | 5 | 0 |
| 279 | 58.2 | 220.8 | 6 | 0 |
| 384 | 58.2 | 325.8 | 7 | 0 |
| 300 | 58.2 | 241.8 | 8 | 0 |
| 7.9 J | 58.2 | -50.3 | 8 | 1 |
| 168 | 58.2 | 109.8 | 9 | 1 |
| 142 1c | 58.2 | 83.8 | 10 | 1 |
| 33.6 2c | 58.2 | -24.6 | 10 | 2 |
| ND<5 U | 58.2 | -53.2 | 10 | 3 |
| 132 | 58.2 | 73.8 | 11 | 3 |
| 313 | 58.2 | 254.8 | 12 | 3 |
| 604 | 58.2 | 545.8 | 13 | 3 |
| 37.8 | 58.2 | -20.4 | 13 | 4 |
| 79.4 1c | 58.2 | 21.2 | 14 | 4 |
| 75.4 | 58.2 | 17.2 | 15 | 4 |
| 54.6 | 58.2 | -3.6 | 15 | 5 |
| | | | | |
| 74.7 | 179 | -104.3 | 15 | 6 |
| 163 | 179 | -16 | 15 | 7 |
| 137 | 179 | -42 | 15 | 8 |
| 123 | 179 | -56 | 15 | 9 |
| 279 | 179 | 100 | 16 | 9 |
| 384 | 179 | 205 | 17 | 9 |
| 300 | 179 | 121 | 18 | 9 |
| 7.9 J | 179 | -171.1 | 18 | 10 |
| 168 | 179 | -11 | 18 | 11 |
| 142 1c | 179 | -37 | 18 | 12 |
| 33.6 2c | 179 | -145.4 | 18 | 13 |
| ND<5 U | 179 | -174 | 18 | 14 |
| 132 | 179 | -47 | 18 | 15 |
| 313 | 179 | 134 | 19 | 15 |
| 604 | 179 | 425 | 20 | 15 |
| 37.8 | 179 | -141.2 | 20 | 16 |
| 79.4 1c | 179 | -99.6 | 20 | 17 |
| 75.4 | 179 | -103.6 | 20 | 18 |
| 54.6 | 179 | -124.4 | 20 | 19 |
| | | | | |
| 163 | 74.7 | 88.3 | 21 | 19 |
| 137 | 74.7 | 62.3 | 22 | 19 |
| 123 | 74.7 | 48.3 | 23 | 19 |
| 279 | 74.7 | 204.3 | 24 | 19 |
| 384 | 74.7 | 309.3 | 25 | 19 |
| 300 | 74.7 | 225.3 | 26 | 19 |

| | | | | |
|---|---|---|---|---|
| 7.9 J | 74.7 | -66.8 | 26 | 20 |
| 168 | 74.7 | 93.3 | 27 | 20 |
| 142 1c | 74.7 | 67.3 | 28 | 20 |
| 33.6 2c | 74.7 | -41.1 | 28 | 21 |
| ND<5 U | 74.7 | -69.7 | 28 | 22 |
| 132 | 74.7 | 57.3 | 29 | 22 |
| 313 | 74.7 | 238.3 | 30 | 22 |
| 604 | 74.7 | 529.3 | 31 | 22 |
| 37.8 | 74.7 | -36.9 | 31 | 23 |
| 79.4 1c | 74.7 | 4.7 | 32 | 23 |
| 75.4 | 74.7 | 0.7 | 33 | 23 |
| 54.6 | 74.7 | -20.1 | 33 | 24 |
| | | | | |
| 137 | 163 | -26 | 33 | 25 |
| 123 | 163 | -40 | 33 | 26 |
| 279 | 163 | 116 | 34 | 26 |
| 384 | 163 | 221 | 35 | 26 |
| 300 | 163 | 137 | 36 | 26 |
| 7.9 J | 163 | -155.1 | 36 | 27 |
| 168 | 163 | 5 | 37 | 27 |
| 142 1c | 163 | -21 | 37 | 28 |
| 33.6 2c | 163 | -129.4 | 37 | 29 |
| ND<5 U | 163 | -158 | 37 | 30 |
| 132 | 163 | -31 | 37 | 31 |
| 313 | 163 | 150 | 38 | 31 |
| 604 | 163 | 441 | 39 | 31 |
| 37.8 | 163 | -125.2 | 39 | 32 |
| 79.4 1c | 163 | -83.6 | 39 | 33 |
| 75.4 | 163 | -87.6 | 39 | 34 |
| 54.6 | 163 | -108.4 | 39 | 35 |
| | | | | |
| 123 | 137 | -14 | 39 | 36 |
| 279 | 137 | 142 | 40 | 36 |
| 384 | 137 | 247 | 41 | 36 |
| 300 | 137 | 163 | 42 | 36 |
| 7.9 J | 137 | -129.1 | 42 | 37 |
| 168 | 137 | 31 | 43 | 37 |
| 142 1c | 137 | 5 | 44 | 37 |
| 33.6 2c | 137 | -103.4 | 44 | 38 |
| ND<5 U | 137 | -132 | 44 | 39 |
| 132 | 137 | -5 | 44 | 40 |
| 313 | 137 | 176 | 45 | 40 |
| 604 | 137 | 467 | 46 | 40 |
| 37.8 | 137 | -99.2 | 46 | 41 |
| 79.4 1c | 137 | -57.6 | 46 | 42 |
| 75.4 | 137 | -61.6 | 46 | 43 |
| 54.6 | 137 | -82.4 | 46 | 44 |
| | | | | |
| 279 | 123 | 156 | 47 | 44 |
| 384 | 123 | 261 | 48 | 44 |
| 300 | 123 | 177 | 49 | 44 |
| 7.9 J | 123 | -115.1 | 49 | 45 |
| 168 | 123 | 45 | 50 | 45 |
| 142 1c | 123 | 19 | 51 | 45 |
| 33.6 2c | 123 | -89.4 | 51 | 46 |
| ND<5 U | 123 | -118 | 51 | 47 |
| 132 | 123 | 9 | 52 | 47 |

| | | | | |
|---|---|---|---|---|
| 313 | 123 | 190 | 53 | 47 |
| 604 | 123 | 481 | 54 | 47 |
| 37.8 | 123 | -85.2 | 54 | 48 |
| 79.4 1c | 123 | -43.6 | 54 | 49 |
| 75.4 | 123 | -47.6 | 54 | 50 |
| 54.6 | 123 | -68.4 | 54 | 51 |
| | | | | |
| 384 | 279 | 105 | 55 | 51 |
| 300 | 279 | 21 | 56 | 51 |
| 7.9 J | 279 | -271.1 | 56 | 52 |
| 168 | 279 | -111 | 56 | 53 |
| 142 1c | 279 | -137 | 56 | 54 |
| 33.6 2c | 279 | -245.4 | 56 | 55 |
| ND<5 U | 279 | -274 | 56 | 56 |
| 132 | 279 | -147 | 56 | 57 |
| 313 | 279 | 34 | 57 | 57 |
| 604 | 279 | 325 | 58 | 57 |
| 37.8 | 279 | -241.2 | 58 | 58 |
| 79.4 1c | 279 | -199.6 | 58 | 59 |
| 75.4 | 279 | -203.6 | 58 | 60 |
| 54.6 | 279 | -224.4 | 58 | 61 |
| | | | | |
| 300 | 384 | -84 | 58 | 62 |
| 7.9 J | 384 | -376.1 | 58 | 63 |
| 168 | 384 | -216 | 58 | 64 |
| 142 1c | 384 | -242 | 58 | 65 |
| 33.6 2c | 384 | -350.4 | 58 | 66 |
| ND<5 U | 384 | -379 | 58 | 67 |
| 132 | 384 | -252 | 58 | 68 |
| 313 | 384 | -71 | 58 | 69 |
| 604 | 384 | 220 | 59 | 69 |
| 37.8 | 384 | -346.2 | 59 | 70 |
| 79.4 1c | 384 | -304.6 | 59 | 71 |
| 75.4 | 384 | -308.6 | 59 | 72 |
| 54.6 | 384 | -329.4 | 59 | 73 |
| | | | | |
| 7.9 J | 300 | -292.1 | 59 | 74 |
| 168 | 300 | -132 | 59 | 75 |
| 142 1c | 300 | -158 | 59 | 76 |
| 33.6 2c | 300 | -266.4 | 59 | 77 |
| ND<5 U | 300 | -295 | 59 | 78 |
| 132 | 300 | -168 | 59 | 79 |
| 313 | 300 | 13 | 60 | 79 |
| 604 | 300 | 304 | 61 | 79 |
| 37.8 | 300 | -262.2 | 61 | 80 |
| 79.4 1c | 300 | -220.6 | 61 | 81 |
| 75.4 | 300 | -224.6 | 61 | 82 |
| 54.6 | 300 | -245.4 | 61 | 83 |
| | | | | |
| 168 | 7.9 J | 160.1 | 62 | 83 |
| 142 1c | 7.9 J | 134.1 | 63 | 83 |
| 33.6 2c | 7.9 J | 25.7 | 64 | 83 |
| ND<5 U | 7.9 J | -2.9 | 64 | 84 |
| 132 | 7.9 J | 124.1 | 65 | 84 |
| 313 | 7.9 J | 305.1 | 66 | 84 |
| 604 | 7.9 J | 596.1 | 67 | 84 |
| 37.8 | 7.9 J | 29.9 | 68 | 84 |

| | | | | |
|---|---|---|---|---|
| 79.4 1c | 7.9 J | 71.5 | 69 | 84 |
| 75.4 | 7.9 J | 67.5 | 70 | 84 |
| 54.6 | 7.9 J | 46.7 | 71 | 84 |
| | | | | |
| 142 1c | 168 | -26 | 71 | 85 |
| 33.6 2c | 168 | -134.4 | 71 | 86 |
| ND<5 U | 168 | -163 | 71 | 87 |
| 132 | 168 | -36 | 71 | 88 |
| 313 | 168 | 145 | 72 | 88 |
| 604 | 168 | 436 | 73 | 88 |
| 37.8 | 168 | -130.2 | 73 | 89 |
| 79.4 1c | 168 | -88.6 | 73 | 90 |
| 75.4 | 168 | -92.6 | 73 | 91 |
| 54.6 | 168 | -113.4 | 73 | 92 |
| | | | | |
| 33.6 2c | 142 1c | Same Date | 73 | 92 |
| ND<5 U | 142 1c | -137 | 73 | 93 |
| 132 | 142 1c | -10 | 73 | 94 |
| 313 | 142 1c | 171 | 74 | 94 |
| 604 | 142 1c | 462 | 75 | 94 |
| 37.8 | 142 1c | -104.2 | 75 | 95 |
| 79.4 1c | 142 1c | -62.6 | 75 | 96 |
| 75.4 | 142 1c | -66.6 | 75 | 97 |
| 54.6 | 142 1c | -87.4 | 75 | 98 |
| | | | | |
| ND<5 U | 33.6 2c | -28.6 | 75 | 99 |
| 132 | 33.6 2c | 98.4 | 76 | 99 |
| 313 | 33.6 2c | 279.4 | 77 | 99 |
| 604 | 33.6 2c | 570.4 | 78 | 99 |
| 37.8 | 33.6 2c | 4.2 | 79 | 99 |
| 79.4 1c | 33.6 2c | 45.8 | 80 | 99 |
| 75.4 | 33.6 2c | 41.8 | 81 | 99 |
| 54.6 | 33.6 2c | 21 | 82 | 99 |
| | | | | |
| 132 | ND<5 U | Same Date | 82 | 99 |
| 313 | ND<5 U | 308 | 83 | 99 |
| 604 | ND<5 U | 599 | 84 | 99 |
| 37.8 | ND<5 U | 32.8 | 85 | 99 |
| 79.4 1c | ND<5 U | 74.4 | 86 | 99 |
| 75.4 | ND<5 U | 70.4 | 87 | 99 |
| 54.6 | ND<5 U | 49.6 | 88 | 99 |
| | | | | |
| 313 | 132 | 181 | 89 | 99 |
| 604 | 132 | 472 | 90 | 99 |
| 37.8 | 132 | -94.2 | 90 | 100 |
| 79.4 1c | 132 | -52.6 | 90 | 101 |
| 75.4 | 132 | -56.6 | 90 | 102 |
| 54.6 | 132 | -77.4 | 90 | 103 |
| | | | | |
| 604 | 313 | 291 | 91 | 103 |
| 37.8 | 313 | -275.2 | 91 | 104 |
| 79.4 1c | 313 | -233.6 | 91 | 105 |
| 75.4 | 313 | -237.6 | 91 | 106 |
| 54.6 | 313 | -258.4 | 91 | 107 |
| | | | | |
| 37.8 | 604 | -566.2 | 91 | 108 |
| 79.4 1c | 604 | -524.6 | 91 | 109 |

| | | | | |
|---|---|---|---|---|
| 75.4 | 604 | -528.6 | 91 | 110 |
| 54.6 | 604 | -549.4 | 91 | 111 |
| | | | | |
| 79.4 1c | 37.8 | 41.6 | 92 | 111 |
| 75.4 | 37.8 | 37.6 | 93 | 111 |
| 54.6 | 37.8 | 16.8 | 94 | 111 |
| | | | | |
| 75.4 | 79.4 1c | -4 | 94 | 112 |
| 54.6 | 79.4 1c | -24.8 | 94 | 113 |
| | | | | |
| 54.6 | 75.4 | -20.8 | 94 | 114 |

S Statistic = 94 - 114 = -20

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 6/1/2017 | 1 |
| 7/1/2017 | 1 |
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |

There are 2 time periods with multiple data

A = 0
B = 36
C = 0
D = 0
E = 0
F = 4
a = 19740
b = 71820
c = 840
Group Variance = 1094.67
Z-Score = -0.574265
Comparison Level at 95% confidence level = 1.65463 (upward trend)
-0.574265 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RW05-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 184 | 550 | -366 | 0 | 1 |
| 1410 | 550 | 860 | 1 | 1 |
| 503 | 550 | -47 | 1 | 2 |
| 5440 | 550 | 4890 | 2 | 2 |
| 35.7 | 550 | -514.3 | 2 | 3 |
| 75.3 | 550 | -474.7 | 2 | 4 |
| 32.6 | 550 | -517.4 | 2 | 5 |
| 21.7 | 550 | -528.3 | 2 | 6 |
| ND<5 U2c | 550 | -545 | 2 | 7 |
| 48.3 1c | 550 | -501.7 | 2 | 8 |
| ND<5 U | 550 | -545 | 2 | 9 |
| 10 J | 550 | -540 | 2 | 10 |
| 8.3 JB2c | 550 | -541.7 | 2 | 11 |
| 41.6 | 550 | -508.4 | 2 | 12 |
| 5.4 J | 550 | -544.6 | 2 | 13 |
| 8.6 J | 550 | -541.4 | 2 | 14 |
| 5.9 J1c | 550 | -544.1 | 2 | 15 |
| 9.8 J1c | 550 | -540.2 | 2 | 16 |
| 7 JB | 550 | -543 | 2 | 17 |
| 17.8 J | 550 | -532.2 | 2 | 18 |
| 56.7 | 550 | -493.3 | 2 | 19 |
| 14.65 | 550 | -535.35 | 2 | 20 |
| 14.5 | 550 | -535.5 | 2 | 21 |
| | | | | |
| 1410 | 184 | 1226 | 3 | 21 |
| 503 | 184 | 319 | 4 | 21 |
| 5440 | 184 | 5256 | 5 | 21 |
| 35.7 | 184 | -148.3 | 5 | 22 |
| 75.3 | 184 | -108.7 | 5 | 23 |
| 32.6 | 184 | -151.4 | 5 | 24 |
| 21.7 | 184 | -162.3 | 5 | 25 |
| ND<5 U2c | 184 | -179 | 5 | 26 |
| 48.3 1c | 184 | -135.7 | 5 | 27 |
| ND<5 U | 184 | -179 | 5 | 28 |
| 10 J | 184 | -174 | 5 | 29 |
| 8.3 JB2c | 184 | -175.7 | 5 | 30 |
| 41.6 | 184 | -142.4 | 5 | 31 |
| 5.4 J | 184 | -178.6 | 5 | 32 |
| 8.6 J | 184 | -175.4 | 5 | 33 |
| 5.9 J1c | 184 | -178.1 | 5 | 34 |
| 9.8 J1c | 184 | -174.2 | 5 | 35 |
| 7 JB | 184 | -177 | 5 | 36 |
| 17.8 J | 184 | -166.2 | 5 | 37 |
| 56.7 | 184 | -127.3 | 5 | 38 |
| 14.65 | 184 | -169.35 | 5 | 39 |
| 14.5 | 184 | -169.5 | 5 | 40 |

| | | | | |
|---|---|---|---|---|
| 503 | 1410 | -907 | 5 | 41 |
| 5440 | 1410 | 4030 | 6 | 41 |
| 35.7 | 1410 | -1374.3 | 6 | 42 |
| 75.3 | 1410 | -1334.7 | 6 | 43 |
| 32.6 | 1410 | -1377.4 | 6 | 44 |
| 21.7 | 1410 | -1388.3 | 6 | 45 |
| ND<5 U2c | 1410 | -1405 | 6 | 46 |
| 48.3 1c | 1410 | -1361.7 | 6 | 47 |
| ND<5 U | 1410 | -1405 | 6 | 48 |
| 10 J | 1410 | -1400 | 6 | 49 |
| 8.3 JB2c | 1410 | -1401.7 | 6 | 50 |
| 41.6 | 1410 | -1368.4 | 6 | 51 |
| 5.4 J | 1410 | -1404.6 | 6 | 52 |
| 8.6 J | 1410 | -1401.4 | 6 | 53 |
| 5.9 J1c | 1410 | -1404.1 | 6 | 54 |
| 9.8 J1c | 1410 | -1400.2 | 6 | 55 |
| 7 JB | 1410 | -1403 | 6 | 56 |
| 17.8 J | 1410 | -1392.2 | 6 | 57 |
| 56.7 | 1410 | -1353.3 | 6 | 58 |
| 14.65 | 1410 | -1395.35 | 6 | 59 |
| 14.5 | 1410 | -1395.5 | 6 | 60 |
| | | | | |
| 5440 | 503 | 4937 | 7 | 60 |
| 35.7 | 503 | -467.3 | 7 | 61 |
| 75.3 | 503 | -427.7 | 7 | 62 |
| 32.6 | 503 | -470.4 | 7 | 63 |
| 21.7 | 503 | -481.3 | 7 | 64 |
| ND<5 U2c | 503 | -498 | 7 | 65 |
| 48.3 1c | 503 | -454.7 | 7 | 66 |
| ND<5 U | 503 | -498 | 7 | 67 |
| 10 J | 503 | -493 | 7 | 68 |
| 8.3 JB2c | 503 | -494.7 | 7 | 69 |
| 41.6 | 503 | -461.4 | 7 | 70 |
| 5.4 J | 503 | -497.6 | 7 | 71 |
| 8.6 J | 503 | -494.4 | 7 | 72 |
| 5.9 J1c | 503 | -497.1 | 7 | 73 |
| 9.8 J1c | 503 | -493.2 | 7 | 74 |
| 7 JB | 503 | -496 | 7 | 75 |
| 17.8 J | 503 | -485.2 | 7 | 76 |
| 56.7 | 503 | -446.3 | 7 | 77 |
| 14.65 | 503 | -488.35 | 7 | 78 |
| 14.5 | 503 | -488.5 | 7 | 79 |
| | | | | |
| 35.7 | 5440 | -5404.3 | 7 | 80 |
| 75.3 | 5440 | -5364.7 | 7 | 81 |
| 32.6 | 5440 | -5407.4 | 7 | 82 |
| 21.7 | 5440 | -5418.3 | 7 | 83 |
| ND<5 U2c | 5440 | -5435 | 7 | 84 |
| 48.3 1c | 5440 | -5391.7 | 7 | 85 |
| ND<5 U | 5440 | -5435 | 7 | 86 |
| 10 J | 5440 | -5430 | 7 | 87 |
| 8.3 JB2c | 5440 | -5431.7 | 7 | 88 |
| 41.6 | 5440 | -5398.4 | 7 | 89 |
| 5.4 J | 5440 | -5434.6 | 7 | 90 |
| 8.6 J | 5440 | -5431.4 | 7 | 91 |
| 5.9 J1c | 5440 | -5434.1 | 7 | 92 |
| 9.8 J1c | 5440 | -5430.2 | 7 | 93 |

| | | | | |
|---|---|---|---|---|
| 7 JB | 5440 | -5433 | 7 | 94 |
| 17.8 J | 5440 | -5422.2 | 7 | 95 |
| 56.7 | 5440 | -5383.3 | 7 | 96 |
| 14.65 | 5440 | -5425.35 | 7 | 97 |
| 14.5 | 5440 | -5425.5 | 7 | 98 |
| | | | | |
| 75.3 | 35.7 | 39.6 | 8 | 98 |
| 32.6 | 35.7 | -3.1 | 8 | 99 |
| 21.7 | 35.7 | -14 | 8 | 100 |
| ND<5 U2c | 35.7 | -30.7 | 8 | 101 |
| 48.3 1c | 35.7 | 12.6 | 9 | 101 |
| ND<5 U | 35.7 | -30.7 | 9 | 102 |
| 10 J | 35.7 | -25.7 | 9 | 103 |
| 8.3 JB2c | 35.7 | -27.4 | 9 | 104 |
| 41.6 | 35.7 | 5.9 | 10 | 104 |
| 5.4 J | 35.7 | -30.3 | 10 | 105 |
| 8.6 J | 35.7 | -27.1 | 10 | 106 |
| 5.9 J1c | 35.7 | -29.8 | 10 | 107 |
| 9.8 J1c | 35.7 | -25.9 | 10 | 108 |
| 7 JB | 35.7 | -28.7 | 10 | 109 |
| 17.8 J | 35.7 | -17.9 | 10 | 110 |
| 56.7 | 35.7 | 21 | 11 | 110 |
| 14.65 | 35.7 | -21.05 | 11 | 111 |
| 14.5 | 35.7 | -21.2 | 11 | 112 |
| | | | | |
| 32.6 | 75.3 | -42.7 | 11 | 113 |
| 21.7 | 75.3 | -53.6 | 11 | 114 |
| ND<5 U2c | 75.3 | -70.3 | 11 | 115 |
| 48.3 1c | 75.3 | -27 | 11 | 116 |
| ND<5 U | 75.3 | -70.3 | 11 | 117 |
| 10 J | 75.3 | -65.3 | 11 | 118 |
| 8.3 JB2c | 75.3 | -67 | 11 | 119 |
| 41.6 | 75.3 | -33.7 | 11 | 120 |
| 5.4 J | 75.3 | -69.9 | 11 | 121 |
| 8.6 J | 75.3 | -66.7 | 11 | 122 |
| 5.9 J1c | 75.3 | -69.4 | 11 | 123 |
| 9.8 J1c | 75.3 | -65.5 | 11 | 124 |
| 7 JB | 75.3 | -68.3 | 11 | 125 |
| 17.8 J | 75.3 | -57.5 | 11 | 126 |
| 56.7 | 75.3 | -18.6 | 11 | 127 |
| 14.65 | 75.3 | -60.65 | 11 | 128 |
| 14.5 | 75.3 | -60.8 | 11 | 129 |
| | | | | |
| 21.7 | 32.6 | -10.9 | 11 | 130 |
| ND<5 U2c | 32.6 | -27.6 | 11 | 131 |
| 48.3 1c | 32.6 | 15.7 | 12 | 131 |
| ND<5 U | 32.6 | -27.6 | 12 | 132 |
| 10 J | 32.6 | -22.6 | 12 | 133 |
| 8.3 JB2c | 32.6 | -24.3 | 12 | 134 |
| 41.6 | 32.6 | 9 | 13 | 134 |
| 5.4 J | 32.6 | -27.2 | 13 | 135 |
| 8.6 J | 32.6 | -24 | 13 | 136 |
| 5.9 J1c | 32.6 | -26.7 | 13 | 137 |
| 9.8 J1c | 32.6 | -22.8 | 13 | 138 |
| 7 JB | 32.6 | -25.6 | 13 | 139 |
| 17.8 J | 32.6 | -14.8 | 13 | 140 |
| 56.7 | 32.6 | 24.1 | 14 | 140 |

| | | | | |
|---|---|---|---|---|
| 14.65 | 32.6 | -17.95 | 14 | 141 |
| 14.5 | 32.6 | -18.1 | 14 | 142 |
| | | | | |
| ND<5 U2c | 21.7 | -16.7 | 14 | 143 |
| 48.3 1c | 21.7 | 26.6 | 15 | 143 |
| ND<5 U | 21.7 | -16.7 | 15 | 144 |
| 10 J | 21.7 | -11.7 | 15 | 145 |
| 8.3 JB2c | 21.7 | -13.4 | 15 | 146 |
| 41.6 | 21.7 | 19.9 | 16 | 146 |
| 5.4 J | 21.7 | -16.3 | 16 | 147 |
| 8.6 J | 21.7 | -13.1 | 16 | 148 |
| 5.9 J1c | 21.7 | -15.8 | 16 | 149 |
| 9.8 J1c | 21.7 | -11.9 | 16 | 150 |
| 7 JB | 21.7 | -14.7 | 16 | 151 |
| 17.8 J | 21.7 | -3.9 | 16 | 152 |
| 56.7 | 21.7 | 35 | 17 | 152 |
| 14.65 | 21.7 | -7.05 | 17 | 153 |
| 14.5 | 21.7 | -7.2 | 17 | 154 |
| | | | | |
| 48.3 1c | ND<5 U2c | Same Date | 17 | 154 |
| ND<5 U | ND<5 U2c | 0 | 17 | 154 |
| 10 J | ND<5 U2c | 5 | 18 | 154 |
| 8.3 JB2c | ND<5 U2c | 3.3 | 19 | 154 |
| 41.6 | ND<5 U2c | 36.6 | 20 | 154 |
| 5.4 J | ND<5 U2c | 0.4 | 21 | 154 |
| 8.6 J | ND<5 U2c | 3.6 | 22 | 154 |
| 5.9 J1c | ND<5 U2c | 0.9 | 23 | 154 |
| 9.8 J1c | ND<5 U2c | 4.8 | 24 | 154 |
| 7 JB | ND<5 U2c | 2 | 25 | 154 |
| 17.8 J | ND<5 U2c | 12.8 | 26 | 154 |
| 56.7 | ND<5 U2c | 51.7 | 27 | 154 |
| 14.65 | ND<5 U2c | 9.65 | 28 | 154 |
| 14.5 | ND<5 U2c | 9.5 | 29 | 154 |
| | | | | |
| ND<5 U | 48.3 1c | -43.3 | 29 | 155 |
| 10 J | 48.3 1c | -38.3 | 29 | 156 |
| 8.3 JB2c | 48.3 1c | -40 | 29 | 157 |
| 41.6 | 48.3 1c | -6.7 | 29 | 158 |
| 5.4 J | 48.3 1c | -42.9 | 29 | 159 |
| 8.6 J | 48.3 1c | -39.7 | 29 | 160 |
| 5.9 J1c | 48.3 1c | -42.4 | 29 | 161 |
| 9.8 J1c | 48.3 1c | -38.5 | 29 | 162 |
| 7 JB | 48.3 1c | -41.3 | 29 | 163 |
| 17.8 J | 48.3 1c | -30.5 | 29 | 164 |
| 56.7 | 48.3 1c | 8.4 | 30 | 164 |
| 14.65 | 48.3 1c | -33.65 | 30 | 165 |
| 14.5 | 48.3 1c | -33.8 | 30 | 166 |
| | | | | |
| 10 J | ND<5 U | Same Date | 30 | 166 |
| 8.3 JB2c | ND<5 U | 3.3 | 31 | 166 |
| 41.6 | ND<5 U | 36.6 | 32 | 166 |
| 5.4 J | ND<5 U | 0.4 | 33 | 166 |
| 8.6 J | ND<5 U | 3.6 | 34 | 166 |
| 5.9 J1c | ND<5 U | 0.9 | 35 | 166 |
| 9.8 J1c | ND<5 U | 4.8 | 36 | 166 |
| 7 JB | ND<5 U | 2 | 37 | 166 |
| 17.8 J | ND<5 U | 12.8 | 38 | 166 |

| | | | | |
|---|---|---|---|---|
| 56.7 | ND<5 U | 51.7 | 39 | 166 |
| 14.65 | ND<5 U | 9.65 | 40 | 166 |
| 14.5 | ND<5 U | 9.5 | 41 | 166 |
| | | | | |
| 8.3 JB2c | 10 J | -1.7 | 41 | 167 |
| 41.6 | 10 J | 31.6 | 42 | 167 |
| 5.4 J | 10 J | -4.6 | 42 | 168 |
| 8.6 J | 10 J | -1.4 | 42 | 169 |
| 5.9 J1c | 10 J | -4.1 | 42 | 170 |
| 9.8 J1c | 10 J | -0.2 | 42 | 171 |
| 7 JB | 10 J | -3 | 42 | 172 |
| 17.8 J | 10 J | 7.8 | 43 | 172 |
| 56.7 | 10 J | 46.7 | 44 | 172 |
| 14.65 | 10 J | 4.65 | 45 | 172 |
| 14.5 | 10 J | 4.5 | 46 | 172 |
| | | | | |
| 41.6 | 8.3 JB2c | 33.3 | 47 | 172 |
| 5.4 J | 8.3 JB2c | -2.9 | 47 | 173 |
| 8.6 J | 8.3 JB2c | 0.3 | 48 | 173 |
| 5.9 J1c | 8.3 JB2c | -2.4 | 48 | 174 |
| 9.8 J1c | 8.3 JB2c | 1.5 | 49 | 174 |
| 7 JB | 8.3 JB2c | -1.3 | 49 | 175 |
| 17.8 J | 8.3 JB2c | 9.5 | 50 | 175 |
| 56.7 | 8.3 JB2c | 48.4 | 51 | 175 |
| 14.65 | 8.3 JB2c | 6.35 | 52 | 175 |
| 14.5 | 8.3 JB2c | 6.2 | 53 | 175 |
| | | | | |
| 5.4 J | 41.6 | -36.2 | 53 | 176 |
| 8.6 J | 41.6 | -33 | 53 | 177 |
| 5.9 J1c | 41.6 | -35.7 | 53 | 178 |
| 9.8 J1c | 41.6 | -31.8 | 53 | 179 |
| 7 JB | 41.6 | -34.6 | 53 | 180 |
| 17.8 J | 41.6 | -23.8 | 53 | 181 |
| 56.7 | 41.6 | 15.1 | 54 | 181 |
| 14.65 | 41.6 | -26.95 | 54 | 182 |
| 14.5 | 41.6 | -27.1 | 54 | 183 |
| | | | | |
| 8.6 J | 5.4 J | 3.2 | 55 | 183 |
| 5.9 J1c | 5.4 J | 0.5 | 56 | 183 |
| 9.8 J1c | 5.4 J | 4.4 | 57 | 183 |
| 7 JB | 5.4 J | 1.6 | 58 | 183 |
| 17.8 J | 5.4 J | 12.4 | 59 | 183 |
| 56.7 | 5.4 J | 51.3 | 60 | 183 |
| 14.65 | 5.4 J | 9.25 | 61 | 183 |
| 14.5 | 5.4 J | 9.1 | 62 | 183 |
| | | | | |
| 5.9 J1c | 8.6 J | -2.7 | 62 | 184 |
| 9.8 J1c | 8.6 J | 1.2 | 63 | 184 |
| 7 JB | 8.6 J | -1.6 | 63 | 185 |
| 17.8 J | 8.6 J | 9.2 | 64 | 185 |
| 56.7 | 8.6 J | 48.1 | 65 | 185 |
| 14.65 | 8.6 J | 6.05 | 66 | 185 |
| 14.5 | 8.6 J | 5.9 | 67 | 185 |
| | | | | |
| 9.8 J1c | 5.9 J1c | 3.9 | 68 | 185 |
| 7 JB | 5.9 J1c | 1.1 | 69 | 185 |
| 17.8 J | 5.9 J1c | 11.9 | 70 | 185 |

| | | | | |
|---|---|---|---|---|
| 56.7 | 5.9 J1c | 50.8 | 71 | 185 |
| 14.65 | 5.9 J1c | 8.75 | 72 | 185 |
| 14.5 | 5.9 J1c | 8.6 | 73 | 185 |
| | | | | |
| 7 JB | 9.8 J1c | -2.8 | 73 | 186 |
| 17.8 J | 9.8 J1c | 8 | 74 | 186 |
| 56.7 | 9.8 J1c | 46.9 | 75 | 186 |
| 14.65 | 9.8 J1c | 4.85 | 76 | 186 |
| 14.5 | 9.8 J1c | 4.7 | 77 | 186 |
| | | | | |
| 17.8 J | 7 JB | 10.8 | 78 | 186 |
| 56.7 | 7 JB | 49.7 | 79 | 186 |
| 14.65 | 7 JB | 7.65 | 80 | 186 |
| 14.5 | 7 JB | 7.5 | 81 | 186 |
| | | | | |
| 56.7 | 17.8 J | 38.9 | 82 | 186 |
| 14.65 | 17.8 J | -3.15 | 82 | 187 |
| 14.5 | 17.8 J | -3.3 | 82 | 188 |
| | | | | |
| 14.65 | 56.7 | -42.05 | 82 | 189 |
| 14.5 | 56.7 | -42.2 | 82 | 190 |
| | | | | |
| 14.5 | 14.65 | -0.15 | 82 | 191 |

S Statistic = 82 - 191 = -109

| Tied Group | Value | Members |
|---|---|---|
| 1 | 5 | 2 |

| Time Period | Observations |
|---|---|
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |

There are 2 time periods with multiple data

A = 18
B = 36

C = 0
D = 0
E = 2
F = 4
a = 29256
b = 109296
c = 1104
Group Variance = 1622.34
Z-Score = -2.68135
Comparison Level at 95% confidence level = 1.65463 (upward trend)
-2.68135 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RW06R-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 3.7 J | 22 | -18.3 | 0 | 1 |
| ND<5 U2c | 22 | -17 | 0 | 2 |
| ND<5 U1c | 22 | -17 | 0 | 3 |
| 4.1 JB | 22 | -17.9 | 0 | 4 |
| 4.1 J | 22 | -17.9 | 0 | 5 |
| 19.4 | 22 | -2.6 | 0 | 6 |
| ND<5 U | 22 | -17 | 0 | 7 |
| ND<5 U | 22 | -17 | 0 | 8 |
| ND<10 U | 22 | -12 | 0 | 9 |
| ND<5 U | 22 | -17 | 0 | 10 |
| 3.552 J | 22 | -18.448 | 0 | 11 |
| | | | | |
| ND<5 U2c | 3.7 J | 1.3 | 1 | 11 |
| ND<5 U1c | 3.7 J | 1.3 | 2 | 11 |
| 4.1 JB | 3.7 J | 0.4 | 3 | 11 |
| 4.1 J | 3.7 J | 0.4 | 4 | 11 |
| 19.4 | 3.7 J | 15.7 | 5 | 11 |
| ND<5 U | 3.7 J | 1.3 | 6 | 11 |
| ND<5 U | 3.7 J | 1.3 | 7 | 11 |
| ND<10 U | 3.7 J | 6.3 | 8 | 11 |
| ND<5 U | 3.7 J | 1.3 | 9 | 11 |
| 3.552 J | 3.7 J | -0.148 | 9 | 12 |
| | | | | |
| ND<5 U1c | ND<5 U2c | Same Date | 9 | 12 |
| 4.1 JB | ND<5 U2c | -0.9 | 9 | 13 |
| 4.1 J | ND<5 U2c | -0.9 | 9 | 14 |
| 19.4 | ND<5 U2c | 14.4 | 10 | 14 |
| ND<5 U | ND<5 U2c | 0 | 10 | 14 |
| ND<5 U | ND<5 U2c | 0 | 10 | 14 |
| ND<10 U | ND<5 U2c | 5 | 11 | 14 |
| ND<5 U | ND<5 U2c | 0 | 11 | 14 |
| 3.552 J | ND<5 U2c | -1.448 | 11 | 15 |
| | | | | |
| 4.1 JB | ND<5 U1c | -0.9 | 11 | 16 |
| 4.1 J | ND<5 U1c | -0.9 | 11 | 17 |
| 19.4 | ND<5 U1c | 14.4 | 12 | 17 |
| ND<5 U | ND<5 U1c | 0 | 12 | 17 |
| ND<5 U | ND<5 U1c | 0 | 12 | 17 |
| ND<10 U | ND<5 U1c | 5 | 13 | 17 |
| ND<5 U | ND<5 U1c | 0 | 13 | 17 |
| 3.552 J | ND<5 U1c | -1.448 | 13 | 18 |
| | | | | |
| 4.1 J | 4.1 JB | 0 | 13 | 18 |
| 19.4 | 4.1 JB | 15.3 | 14 | 18 |
| ND<5 U | 4.1 JB | 0.9 | 15 | 18 |
| ND<5 U | 4.1 JB | 0.9 | 16 | 18 |
| ND<10 U | 4.1 JB | 5.9 | 17 | 18 |

| | | | | |
|---|---|---|---|---|
| ND<5 U | 4.1 JB | 0.9 | 18 | 18 |
| 3.552 J | 4.1 JB | -0.548 | 18 | 19 |
| | | | | |
| 19.4 | 4.1 J | 15.3 | 19 | 19 |
| ND<5 U | 4.1 J | 0.9 | 20 | 19 |
| ND<5 U | 4.1 J | 0.9 | 21 | 19 |
| ND<10 U | 4.1 J | 5.9 | 22 | 19 |
| ND<5 U | 4.1 J | 0.9 | 23 | 19 |
| 3.552 J | 4.1 J | -0.548 | 23 | 20 |
| | | | | |
| ND<5 U | 19.4 | -14.4 | 23 | 21 |
| ND<5 U | 19.4 | -14.4 | 23 | 22 |
| ND<10 U | 19.4 | -9.4 | 23 | 23 |
| ND<5 U | 19.4 | -14.4 | 23 | 24 |
| 3.552 J | 19.4 | -15.848 | 23 | 25 |
| | | | | |
| ND<5 U | ND<5 U | 0 | 23 | 25 |
| ND<10 U | ND<5 U | 5 | 24 | 25 |
| ND<5 U | ND<5 U | 0 | 24 | 25 |
| 3.552 J | ND<5 U | -1.448 | 24 | 26 |
| | | | | |
| ND<10 U | ND<5 U | 5 | 25 | 26 |
| ND<5 U | ND<5 U | 0 | 25 | 26 |
| 3.552 J | ND<5 U | -1.448 | 25 | 27 |
| | | | | |
| ND<5 U | ND<10 U | -5 | 25 | 28 |
| 3.552 J | ND<10 U | -6.448 | 25 | 29 |
| | | | | |
| 3.552 J | ND<5 U | -1.448 | 25 | 30 |

S Statistic = 25 - 30 = -5

| Tied Group | Value | Members |
|---|---|---|
| 1 | 5 | 5 |
| 2 | 4.1 | 2 |

| Time Period | Observations |
|---|---|
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 9/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 3/1/2022 | 1 |
| 3/1/2023 | 1 |
| 3/1/2024 | 1 |

There are 1 time periods with multiple data

A = 318
B = 18
C = 60
D = 0
E = 22
F = 2

a = 3828
b = 11880
c = 264
Group Variance = 194.167
Z-Score = -0.28706
Comparison Level at 95% confidence level = 1.65463 (upward trend)
-0.28706 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RW07-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 74.8 | 81.6 | -6.8 | 0 | 1 |
| 86.4 | 81.6 | 4.8 | 1 | 1 |
| 102 | 81.6 | 20.4 | 2 | 1 |
| 107 | 81.6 | 25.4 | 3 | 1 |
| 114 | 81.6 | 32.4 | 4 | 1 |
| 127 | 81.6 | 45.4 | 5 | 1 |
| 165 | 81.6 | 83.4 | 6 | 1 |
| 144 | 81.6 | 62.4 | 7 | 1 |
| 227 | 81.6 | 145.4 | 8 | 1 |
| 216 | 81.6 | 134.4 | 9 | 1 |
| 276 | 81.6 | 194.4 | 10 | 1 |
| 204 | 81.6 | 122.4 | 11 | 1 |
| 248 | 81.6 | 166.4 | 12 | 1 |
| 223 | 81.6 | 141.4 | 13 | 1 |
| 199 | 81.6 | 117.4 | 14 | 1 |
| 142 | 81.6 | 60.4 | 15 | 1 |
| 137 | 81.6 | 55.4 | 16 | 1 |
| 151 | 81.6 | 69.4 | 17 | 1 |
| 148 | 81.6 | 66.4 | 18 | 1 |
| 168 | 81.6 | 86.4 | 19 | 1 |
| 124 | 81.6 | 42.4 | 20 | 1 |
| 220 | 81.6 | 138.4 | 21 | 1 |
| 298 | 81.6 | 216.4 | 22 | 1 |
| 406 | 81.6 | 324.4 | 23 | 1 |
| 96.09 | 81.6 | 14.49 | 24 | 1 |
| 149.2 | 81.6 | 67.6 | 25 | 1 |
| | | | | |
| 86.4 | 74.8 | 11.6 | 26 | 1 |
| 102 | 74.8 | 27.2 | 27 | 1 |
| 107 | 74.8 | 32.2 | 28 | 1 |
| 114 | 74.8 | 39.2 | 29 | 1 |
| 127 | 74.8 | 52.2 | 30 | 1 |
| 165 | 74.8 | 90.2 | 31 | 1 |
| 144 | 74.8 | 69.2 | 32 | 1 |
| 227 | 74.8 | 152.2 | 33 | 1 |
| 216 | 74.8 | 141.2 | 34 | 1 |
| 276 | 74.8 | 201.2 | 35 | 1 |
| 204 | 74.8 | 129.2 | 36 | 1 |
| 248 | 74.8 | 173.2 | 37 | 1 |
| 223 | 74.8 | 148.2 | 38 | 1 |
| 199 | 74.8 | 124.2 | 39 | 1 |
| 142 | 74.8 | 67.2 | 40 | 1 |
| 137 | 74.8 | 62.2 | 41 | 1 |
| 151 | 74.8 | 76.2 | 42 | 1 |
| 148 | 74.8 | 73.2 | 43 | 1 |
| 168 | 74.8 | 93.2 | 44 | 1 |
| 124 | 74.8 | 49.2 | 45 | 1 |

| | | | | |
|---|---|---|---|---|
| 220 | 74.8 | 145.2 | 46 | 1 |
| 298 | 74.8 | 223.2 | 47 | 1 |
| 406 | 74.8 | 331.2 | 48 | 1 |
| 96.09 | 74.8 | 21.29 | 49 | 1 |
| 149.2 | 74.8 | 74.4 | 50 | 1 |
| | | | | |
| 102 | 86.4 | 15.6 | 51 | 1 |
| 107 | 86.4 | 20.6 | 52 | 1 |
| 114 | 86.4 | 27.6 | 53 | 1 |
| 127 | 86.4 | 40.6 | 54 | 1 |
| 165 | 86.4 | 78.6 | 55 | 1 |
| 144 | 86.4 | 57.6 | 56 | 1 |
| 227 | 86.4 | 140.6 | 57 | 1 |
| 216 | 86.4 | 129.6 | 58 | 1 |
| 276 | 86.4 | 189.6 | 59 | 1 |
| 204 | 86.4 | 117.6 | 60 | 1 |
| 248 | 86.4 | 161.6 | 61 | 1 |
| 223 | 86.4 | 136.6 | 62 | 1 |
| 199 | 86.4 | 112.6 | 63 | 1 |
| 142 | 86.4 | 55.6 | 64 | 1 |
| 137 | 86.4 | 50.6 | 65 | 1 |
| 151 | 86.4 | 64.6 | 66 | 1 |
| 148 | 86.4 | 61.6 | 67 | 1 |
| 168 | 86.4 | 81.6 | 68 | 1 |
| 124 | 86.4 | 37.6 | 69 | 1 |
| 220 | 86.4 | 133.6 | 70 | 1 |
| 298 | 86.4 | 211.6 | 71 | 1 |
| 406 | 86.4 | 319.6 | 72 | 1 |
| 96.09 | 86.4 | 9.69 | 73 | 1 |
| 149.2 | 86.4 | 62.8 | 74 | 1 |
| | | | | |
| 107 | 102 | 5 | 75 | 1 |
| 114 | 102 | 12 | 76 | 1 |
| 127 | 102 | 25 | 77 | 1 |
| 165 | 102 | 63 | 78 | 1 |
| 144 | 102 | 42 | 79 | 1 |
| 227 | 102 | 125 | 80 | 1 |
| 216 | 102 | 114 | 81 | 1 |
| 276 | 102 | 174 | 82 | 1 |
| 204 | 102 | 102 | 83 | 1 |
| 248 | 102 | 146 | 84 | 1 |
| 223 | 102 | 121 | 85 | 1 |
| 199 | 102 | 97 | 86 | 1 |
| 142 | 102 | 40 | 87 | 1 |
| 137 | 102 | 35 | 88 | 1 |
| 151 | 102 | 49 | 89 | 1 |
| 148 | 102 | 46 | 90 | 1 |
| 168 | 102 | 66 | 91 | 1 |
| 124 | 102 | 22 | 92 | 1 |
| 220 | 102 | 118 | 93 | 1 |
| 298 | 102 | 196 | 94 | 1 |
| 406 | 102 | 304 | 95 | 1 |
| 96.09 | 102 | -5.91 | 95 | 2 |
| 149.2 | 102 | 47.2 | 96 | 2 |
| | | | | |
| 114 | 107 | 7 | 97 | 2 |
| 127 | 107 | 20 | 98 | 2 |

| | | | | |
|---|---|---|---|---|
| 165 | 107 | 58 | 99 | 2 |
| 144 | 107 | 37 | 100 | 2 |
| 227 | 107 | 120 | 101 | 2 |
| 216 | 107 | 109 | 102 | 2 |
| 276 | 107 | 169 | 103 | 2 |
| 204 | 107 | 97 | 104 | 2 |
| 248 | 107 | 141 | 105 | 2 |
| 223 | 107 | 116 | 106 | 2 |
| 199 | 107 | 92 | 107 | 2 |
| 142 | 107 | 35 | 108 | 2 |
| 137 | 107 | 30 | 109 | 2 |
| 151 | 107 | 44 | 110 | 2 |
| 148 | 107 | 41 | 111 | 2 |
| 168 | 107 | 61 | 112 | 2 |
| 124 | 107 | 17 | 113 | 2 |
| 220 | 107 | 113 | 114 | 2 |
| 298 | 107 | 191 | 115 | 2 |
| 406 | 107 | 299 | 116 | 2 |
| 96.09 | 107 | -10.91 | 116 | 3 |
| 149.2 | 107 | 42.2 | 117 | 3 |
| | | | | |
| 127 | 114 | 13 | 118 | 3 |
| 165 | 114 | 51 | 119 | 3 |
| 144 | 114 | 30 | 120 | 3 |
| 227 | 114 | 113 | 121 | 3 |
| 216 | 114 | 102 | 122 | 3 |
| 276 | 114 | 162 | 123 | 3 |
| 204 | 114 | 90 | 124 | 3 |
| 248 | 114 | 134 | 125 | 3 |
| 223 | 114 | 109 | 126 | 3 |
| 199 | 114 | 85 | 127 | 3 |
| 142 | 114 | 28 | 128 | 3 |
| 137 | 114 | 23 | 129 | 3 |
| 151 | 114 | 37 | 130 | 3 |
| 148 | 114 | 34 | 131 | 3 |
| 168 | 114 | 54 | 132 | 3 |
| 124 | 114 | 10 | 133 | 3 |
| 220 | 114 | 106 | 134 | 3 |
| 298 | 114 | 184 | 135 | 3 |
| 406 | 114 | 292 | 136 | 3 |
| 96.09 | 114 | -17.91 | 136 | 4 |
| 149.2 | 114 | 35.2 | 137 | 4 |
| | | | | |
| 165 | 127 | 38 | 138 | 4 |
| 144 | 127 | 17 | 139 | 4 |
| 227 | 127 | 100 | 140 | 4 |
| 216 | 127 | 89 | 141 | 4 |
| 276 | 127 | 149 | 142 | 4 |
| 204 | 127 | 77 | 143 | 4 |
| 248 | 127 | 121 | 144 | 4 |
| 223 | 127 | 96 | 145 | 4 |
| 199 | 127 | 72 | 146 | 4 |
| 142 | 127 | 15 | 147 | 4 |
| 137 | 127 | 10 | 148 | 4 |
| 151 | 127 | 24 | 149 | 4 |
| 148 | 127 | 21 | 150 | 4 |
| 168 | 127 | 41 | 151 | 4 |

| | | | | |
|---|---|---|---|---|
| 124 | 127 | -3 | 151 | 5 |
| 220 | 127 | 93 | 152 | 5 |
| 298 | 127 | 171 | 153 | 5 |
| 406 | 127 | 279 | 154 | 5 |
| 96.09 | 127 | -30.91 | 154 | 6 |
| 149.2 | 127 | 22.2 | 155 | 6 |
| | | | | |
| 144 | 165 | -21 | 155 | 7 |
| 227 | 165 | 62 | 156 | 7 |
| 216 | 165 | 51 | 157 | 7 |
| 276 | 165 | 111 | 158 | 7 |
| 204 | 165 | 39 | 159 | 7 |
| 248 | 165 | 83 | 160 | 7 |
| 223 | 165 | 58 | 161 | 7 |
| 199 | 165 | 34 | 162 | 7 |
| 142 | 165 | -23 | 162 | 8 |
| 137 | 165 | -28 | 162 | 9 |
| 151 | 165 | -14 | 162 | 10 |
| 148 | 165 | -17 | 162 | 11 |
| 168 | 165 | 3 | 163 | 11 |
| 124 | 165 | -41 | 163 | 12 |
| 220 | 165 | 55 | 164 | 12 |
| 298 | 165 | 133 | 165 | 12 |
| 406 | 165 | 241 | 166 | 12 |
| 96.09 | 165 | -68.91 | 166 | 13 |
| 149.2 | 165 | -15.8 | 166 | 14 |
| | | | | |
| 227 | 144 | 83 | 167 | 14 |
| 216 | 144 | 72 | 168 | 14 |
| 276 | 144 | 132 | 169 | 14 |
| 204 | 144 | 60 | 170 | 14 |
| 248 | 144 | 104 | 171 | 14 |
| 223 | 144 | 79 | 172 | 14 |
| 199 | 144 | 55 | 173 | 14 |
| 142 | 144 | -2 | 173 | 15 |
| 137 | 144 | -7 | 173 | 16 |
| 151 | 144 | 7 | 174 | 16 |
| 148 | 144 | 4 | 175 | 16 |
| 168 | 144 | 24 | 176 | 16 |
| 124 | 144 | -20 | 176 | 17 |
| 220 | 144 | 76 | 177 | 17 |
| 298 | 144 | 154 | 178 | 17 |
| 406 | 144 | 262 | 179 | 17 |
| 96.09 | 144 | -47.91 | 179 | 18 |
| 149.2 | 144 | 5.2 | 180 | 18 |
| | | | | |
| 216 | 227 | -11 | 180 | 19 |
| 276 | 227 | 49 | 181 | 19 |
| 204 | 227 | -23 | 181 | 20 |
| 248 | 227 | 21 | 182 | 20 |
| 223 | 227 | -4 | 182 | 21 |
| 199 | 227 | -28 | 182 | 22 |
| 142 | 227 | -85 | 182 | 23 |
| 137 | 227 | -90 | 182 | 24 |
| 151 | 227 | -76 | 182 | 25 |
| 148 | 227 | -79 | 182 | 26 |
| 168 | 227 | -59 | 182 | 27 |

| | | | | |
|---|---|---|---|---|
| 124 | 227 | -103 | 182 | 28 |
| 220 | 227 | -7 | 182 | 29 |
| 298 | 227 | 71 | 183 | 29 |
| 406 | 227 | 179 | 184 | 29 |
| 96.09 | 227 | -130.91 | 184 | 30 |
| 149.2 | 227 | -77.8 | 184 | 31 |
| | | | | |
| 276 | 216 | 60 | 185 | 31 |
| 204 | 216 | -12 | 185 | 32 |
| 248 | 216 | 32 | 186 | 32 |
| 223 | 216 | 7 | 187 | 32 |
| 199 | 216 | -17 | 187 | 33 |
| 142 | 216 | -74 | 187 | 34 |
| 137 | 216 | -79 | 187 | 35 |
| 151 | 216 | -65 | 187 | 36 |
| 148 | 216 | -68 | 187 | 37 |
| 168 | 216 | -48 | 187 | 38 |
| 124 | 216 | -92 | 187 | 39 |
| 220 | 216 | 4 | 188 | 39 |
| 298 | 216 | 82 | 189 | 39 |
| 406 | 216 | 190 | 190 | 39 |
| 96.09 | 216 | -119.91 | 190 | 40 |
| 149.2 | 216 | -66.8 | 190 | 41 |
| | | | | |
| 204 | 276 | -72 | 190 | 42 |
| 248 | 276 | -28 | 190 | 43 |
| 223 | 276 | -53 | 190 | 44 |
| 199 | 276 | -77 | 190 | 45 |
| 142 | 276 | -134 | 190 | 46 |
| 137 | 276 | -139 | 190 | 47 |
| 151 | 276 | -125 | 190 | 48 |
| 148 | 276 | -128 | 190 | 49 |
| 168 | 276 | -108 | 190 | 50 |
| 124 | 276 | -152 | 190 | 51 |
| 220 | 276 | -56 | 190 | 52 |
| 298 | 276 | 22 | 191 | 52 |
| 406 | 276 | 130 | 192 | 52 |
| 96.09 | 276 | -179.91 | 192 | 53 |
| 149.2 | 276 | -126.8 | 192 | 54 |
| | | | | |
| 248 | 204 | 44 | 193 | 54 |
| 223 | 204 | 19 | 194 | 54 |
| 199 | 204 | -5 | 194 | 55 |
| 142 | 204 | -62 | 194 | 56 |
| 137 | 204 | -67 | 194 | 57 |
| 151 | 204 | -53 | 194 | 58 |
| 148 | 204 | -56 | 194 | 59 |
| 168 | 204 | -36 | 194 | 60 |
| 124 | 204 | -80 | 194 | 61 |
| 220 | 204 | 16 | 195 | 61 |
| 298 | 204 | 94 | 196 | 61 |
| 406 | 204 | 202 | 197 | 61 |
| 96.09 | 204 | -107.91 | 197 | 62 |
| 149.2 | 204 | -54.8 | 197 | 63 |
| | | | | |
| 223 | 248 | -25 | 197 | 64 |
| 199 | 248 | -49 | 197 | 65 |

| | | | | |
|---|---|---|---|---|
| 142 | 248 | -106 | 197 | 66 |
| 137 | 248 | -111 | 197 | 67 |
| 151 | 248 | -97 | 197 | 68 |
| 148 | 248 | -100 | 197 | 69 |
| 168 | 248 | -80 | 197 | 70 |
| 124 | 248 | -124 | 197 | 71 |
| 220 | 248 | -28 | 197 | 72 |
| 298 | 248 | 50 | 198 | 72 |
| 406 | 248 | 158 | 199 | 72 |
| 96.09 | 248 | -151.91 | 199 | 73 |
| 149.2 | 248 | -98.8 | 199 | 74 |
| | | | | |
| 199 | 223 | -24 | 199 | 75 |
| 142 | 223 | -81 | 199 | 76 |
| 137 | 223 | -86 | 199 | 77 |
| 151 | 223 | -72 | 199 | 78 |
| 148 | 223 | -75 | 199 | 79 |
| 168 | 223 | -55 | 199 | 80 |
| 124 | 223 | -99 | 199 | 81 |
| 220 | 223 | -3 | 199 | 82 |
| 298 | 223 | 75 | 200 | 82 |
| 406 | 223 | 183 | 201 | 82 |
| 96.09 | 223 | -126.91 | 201 | 83 |
| 149.2 | 223 | -73.8 | 201 | 84 |
| | | | | |
| 142 | 199 | Same Date | 201 | 84 |
| 137 | 199 | -62 | 201 | 85 |
| 151 | 199 | -48 | 201 | 86 |
| 148 | 199 | -51 | 201 | 87 |
| 168 | 199 | -31 | 201 | 88 |
| 124 | 199 | -75 | 201 | 89 |
| 220 | 199 | 21 | 202 | 89 |
| 298 | 199 | 99 | 203 | 89 |
| 406 | 199 | 207 | 204 | 89 |
| 96.09 | 199 | -102.91 | 204 | 90 |
| 149.2 | 199 | -49.8 | 204 | 91 |
| | | | | |
| 137 | 142 | -5 | 204 | 92 |
| 151 | 142 | 9 | 205 | 92 |
| 148 | 142 | 6 | 206 | 92 |
| 168 | 142 | 26 | 207 | 92 |
| 124 | 142 | -18 | 207 | 93 |
| 220 | 142 | 78 | 208 | 93 |
| 298 | 142 | 156 | 209 | 93 |
| 406 | 142 | 264 | 210 | 93 |
| 96.09 | 142 | -45.91 | 210 | 94 |
| 149.2 | 142 | 7.2 | 211 | 94 |
| | | | | |
| 151 | 137 | Same Date | 211 | 94 |
| 148 | 137 | 11 | 212 | 94 |
| 168 | 137 | 31 | 213 | 94 |
| 124 | 137 | -13 | 213 | 95 |
| 220 | 137 | 83 | 214 | 95 |
| 298 | 137 | 161 | 215 | 95 |
| 406 | 137 | 269 | 216 | 95 |
| 96.09 | 137 | -40.91 | 216 | 96 |
| 149.2 | 137 | 12.2 | 217 | 96 |

| | | | | |
|---|---|---|---|---|
| 148 | 151 | -3 | 217 | 97 |
| 168 | 151 | 17 | 218 | 97 |
| 124 | 151 | -27 | 218 | 98 |
| 220 | 151 | 69 | 219 | 98 |
| 298 | 151 | 147 | 220 | 98 |
| 406 | 151 | 255 | 221 | 98 |
| 96.09 | 151 | -54.91 | 221 | 99 |
| 149.2 | 151 | -1.8 | 221 | 100 |
| | | | | |
| 168 | 148 | 20 | 222 | 100 |
| 124 | 148 | -24 | 222 | 101 |
| 220 | 148 | 72 | 223 | 101 |
| 298 | 148 | 150 | 224 | 101 |
| 406 | 148 | 258 | 225 | 101 |
| 96.09 | 148 | -51.91 | 225 | 102 |
| 149.2 | 148 | 1.2 | 226 | 102 |
| | | | | |
| 124 | 168 | -44 | 226 | 103 |
| 220 | 168 | 52 | 227 | 103 |
| 298 | 168 | 130 | 228 | 103 |
| 406 | 168 | 238 | 229 | 103 |
| 96.09 | 168 | -71.91 | 229 | 104 |
| 149.2 | 168 | -18.8 | 229 | 105 |
| | | | | |
| 220 | 124 | 96 | 230 | 105 |
| 298 | 124 | 174 | 231 | 105 |
| 406 | 124 | 282 | 232 | 105 |
| 96.09 | 124 | -27.91 | 232 | 106 |
| 149.2 | 124 | 25.2 | 233 | 106 |
| | | | | |
| 298 | 220 | 78 | 234 | 106 |
| 406 | 220 | 186 | 235 | 106 |
| 96.09 | 220 | -123.91 | 235 | 107 |
| 149.2 | 220 | -70.8 | 235 | 108 |
| | | | | |
| 406 | 298 | 108 | 236 | 108 |
| 96.09 | 298 | -201.91 | 236 | 109 |
| 149.2 | 298 | -148.8 | 236 | 110 |
| | | | | |
| 96.09 | 406 | -309.91 | 236 | 111 |
| 149.2 | 406 | -256.8 | 236 | 112 |
| | | | | |
| 149.2 | 96.09 | 53.11 | 237 | 112 |

S Statistic = 237 - 112 = 125

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 2/1/2017 | 1 |
| 3/1/2017 | 1 |
| 4/1/2017 | 1 |
| 5/1/2017 | 1 |
| 6/1/2017 | 1 |
| 7/1/2017 | 1 |

| | |
|---|---|
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 11/1/2021 | 1 |
| 3/1/2022 | 1 |
| 3/1/2023 | 1 |
| 3/1/2024 | 1 |

There are 2 time periods with multiple data

---

A = 0
B = 36
C = 0
D = 0
E = 0
F = 4
a = 41418
b = 157950
c = 1404
Group Variance = 2299
Z-Score = 2.58614
Comparison Level at 95% confidence level = 1.65463 (upward trend)
**2.58614 > 1.65463 indicating an upward trend**

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RW08-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 8710 | 1080 | 7630 | 1 | 0 |
| 9520 MH | 1080 | 8440 | 2 | 0 |
| 2680 | 1080 | 1600 | 3 | 0 |
| 1870 | 1080 | 790 | 4 | 0 |
| 968 | 1080 | -112 | 4 | 1 |
| 3190 | 1080 | 2110 | 5 | 1 |
| 4460 | 1080 | 3380 | 6 | 1 |
| 1950 | 1080 | 870 | 7 | 1 |
| 1600 | 1080 | 520 | 8 | 1 |
| 1770 | 1080 | 690 | 9 | 1 |
| 2600 | 1080 | 1520 | 10 | 1 |
| 13200 | 1080 | 12120 | 11 | 1 |
| 6640 | 1080 | 5560 | 12 | 1 |
| 13300 | 1080 | 12220 | 13 | 1 |
| 14600 2c | 1080 | 13520 | 14 | 1 |
| 14300 1c | 1080 | 13220 | 15 | 1 |
| 11300 | 1080 | 10220 | 16 | 1 |
| 12500 | 1080 | 11420 | 17 | 1 |
| 1350 | 1080 | 270 | 18 | 1 |
| 1250 | 1080 | 170 | 19 | 1 |
| 10300 | 1080 | 9220 | 20 | 1 |
| 12000 | 1080 | 10920 | 21 | 1 |
| 2330 | 1080 | 1250 | 22 | 1 |
| 1600 | 1080 | 520 | 23 | 1 |
| | | | | |
| 9520 MH | 8710 | 810 | 24 | 1 |
| 2680 | 8710 | -6030 | 24 | 2 |
| 1870 | 8710 | -6840 | 24 | 3 |
| 968 | 8710 | -7742 | 24 | 4 |
| 3190 | 8710 | -5520 | 24 | 5 |
| 4460 | 8710 | -4250 | 24 | 6 |
| 1950 | 8710 | -6760 | 24 | 7 |
| 1600 | 8710 | -7110 | 24 | 8 |
| 1770 | 8710 | -6940 | 24 | 9 |
| 2600 | 8710 | -6110 | 24 | 10 |
| 13200 | 8710 | 4490 | 25 | 10 |
| 6640 | 8710 | -2070 | 25 | 11 |
| 13300 | 8710 | 4590 | 26 | 11 |
| 14600 2c | 8710 | 5890 | 27 | 11 |
| 14300 1c | 8710 | 5590 | 28 | 11 |
| 11300 | 8710 | 2590 | 29 | 11 |
| 12500 | 8710 | 3790 | 30 | 11 |
| 1350 | 8710 | -7360 | 30 | 12 |
| 1250 | 8710 | -7460 | 30 | 13 |
| 10300 | 8710 | 1590 | 31 | 13 |
| 12000 | 8710 | 3290 | 32 | 13 |
| 2330 | 8710 | -6380 | 32 | 14 |

| | | | | |
|---|---|---|---|---|
| 1600 | 8710 | -7110 | 32 | 15 |
| | | | | |
| 2680 | 9520 MH | -6840 | 32 | 16 |
| 1870 | 9520 MH | -7650 | 32 | 17 |
| 968 | 9520 MH | -8552 | 32 | 18 |
| 3190 | 9520 MH | -6330 | 32 | 19 |
| 4460 | 9520 MH | -5060 | 32 | 20 |
| 1950 | 9520 MH | -7570 | 32 | 21 |
| 1600 | 9520 MH | -7920 | 32 | 22 |
| 1770 | 9520 MH | -7750 | 32 | 23 |
| 2600 | 9520 MH | -6920 | 32 | 24 |
| 13200 | 9520 MH | 3680 | 33 | 24 |
| 6640 | 9520 MH | -2880 | 33 | 25 |
| 13300 | 9520 MH | 3780 | 34 | 25 |
| 14600 2c | 9520 MH | 5080 | 35 | 25 |
| 14300 1c | 9520 MH | 4780 | 36 | 25 |
| 11300 | 9520 MH | 1780 | 37 | 25 |
| 12500 | 9520 MH | 2980 | 38 | 25 |
| 1350 | 9520 MH | -8170 | 38 | 26 |
| 1250 | 9520 MH | -8270 | 38 | 27 |
| 10300 | 9520 MH | 780 | 39 | 27 |
| 12000 | 9520 MH | 2480 | 40 | 27 |
| 2330 | 9520 MH | -7190 | 40 | 28 |
| 1600 | 9520 MH | -7920 | 40 | 29 |
| | | | | |
| 1870 | 2680 | -810 | 40 | 30 |
| 968 | 2680 | -1712 | 40 | 31 |
| 3190 | 2680 | 510 | 41 | 31 |
| 4460 | 2680 | 1780 | 42 | 31 |
| 1950 | 2680 | -730 | 42 | 32 |
| 1600 | 2680 | -1080 | 42 | 33 |
| 1770 | 2680 | -910 | 42 | 34 |
| 2600 | 2680 | -80 | 42 | 35 |
| 13200 | 2680 | 10520 | 43 | 35 |
| 6640 | 2680 | 3960 | 44 | 35 |
| 13300 | 2680 | 10620 | 45 | 35 |
| 14600 2c | 2680 | 11920 | 46 | 35 |
| 14300 1c | 2680 | 11620 | 47 | 35 |
| 11300 | 2680 | 8620 | 48 | 35 |
| 12500 | 2680 | 9820 | 49 | 35 |
| 1350 | 2680 | -1330 | 49 | 36 |
| 1250 | 2680 | -1430 | 49 | 37 |
| 10300 | 2680 | 7620 | 50 | 37 |
| 12000 | 2680 | 9320 | 51 | 37 |
| 2330 | 2680 | -350 | 51 | 38 |
| 1600 | 2680 | -1080 | 51 | 39 |
| | | | | |
| 968 | 1870 | -902 | 51 | 40 |
| 3190 | 1870 | 1320 | 52 | 40 |
| 4460 | 1870 | 2590 | 53 | 40 |
| 1950 | 1870 | 80 | 54 | 40 |
| 1600 | 1870 | -270 | 54 | 41 |
| 1770 | 1870 | -100 | 54 | 42 |
| 2600 | 1870 | 730 | 55 | 42 |
| 13200 | 1870 | 11330 | 56 | 42 |
| 6640 | 1870 | 4770 | 57 | 42 |
| 13300 | 1870 | 11430 | 58 | 42 |

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|---|---|---|---|---|
| 14600 2c | 1870 | 12730 | 59 | 42 |
| 14300 1c | 1870 | 12430 | 60 | 42 |
| 11300 | 1870 | 9430 | 61 | 42 |
| 12500 | 1870 | 10630 | 62 | 42 |
| 1350 | 1870 | -520 | 62 | 43 |
| 1250 | 1870 | -620 | 62 | 44 |
| 10300 | 1870 | 8430 | 63 | 44 |
| 12000 | 1870 | 10130 | 64 | 44 |
| 2330 | 1870 | 460 | 65 | 44 |
| 1600 | 1870 | -270 | 65 | 45 |
| | | | | |
| 3190 | 968 | 2222 | 66 | 45 |
| 4460 | 968 | 3492 | 67 | 45 |
| 1950 | 968 | 982 | 68 | 45 |
| 1600 | 968 | 632 | 69 | 45 |
| 1770 | 968 | 802 | 70 | 45 |
| 2600 | 968 | 1632 | 71 | 45 |
| 13200 | 968 | 12232 | 72 | 45 |
| 6640 | 968 | 5672 | 73 | 45 |
| 13300 | 968 | 12332 | 74 | 45 |
| 14600 2c | 968 | 13632 | 75 | 45 |
| 14300 1c | 968 | 13332 | 76 | 45 |
| 11300 | 968 | 10332 | 77 | 45 |
| 12500 | 968 | 11532 | 78 | 45 |
| 1350 | 968 | 382 | 79 | 45 |
| 1250 | 968 | 282 | 80 | 45 |
| 10300 | 968 | 9332 | 81 | 45 |
| 12000 | 968 | 11032 | 82 | 45 |
| 2330 | 968 | 1362 | 83 | 45 |
| 1600 | 968 | 632 | 84 | 45 |
| | | | | |
| 4460 | 3190 | 1270 | 85 | 45 |
| 1950 | 3190 | -1240 | 85 | 46 |
| 1600 | 3190 | -1590 | 85 | 47 |
| 1770 | 3190 | -1420 | 85 | 48 |
| 2600 | 3190 | -590 | 85 | 49 |
| 13200 | 3190 | 10010 | 86 | 49 |
| 6640 | 3190 | 3450 | 87 | 49 |
| 13300 | 3190 | 10110 | 88 | 49 |
| 14600 2c | 3190 | 11410 | 89 | 49 |
| 14300 1c | 3190 | 11110 | 90 | 49 |
| 11300 | 3190 | 8110 | 91 | 49 |
| 12500 | 3190 | 9310 | 92 | 49 |
| 1350 | 3190 | -1840 | 92 | 50 |
| 1250 | 3190 | -1940 | 92 | 51 |
| 10300 | 3190 | 7110 | 93 | 51 |
| 12000 | 3190 | 8810 | 94 | 51 |
| 2330 | 3190 | -860 | 94 | 52 |
| 1600 | 3190 | -1590 | 94 | 53 |
| | | | | |
| 1950 | 4460 | -2510 | 94 | 54 |
| 1600 | 4460 | -2860 | 94 | 55 |
| 1770 | 4460 | -2690 | 94 | 56 |
| 2600 | 4460 | -1860 | 94 | 57 |
| 13200 | 4460 | 8740 | 95 | 57 |
| 6640 | 4460 | 2180 | 96 | 57 |
| 13300 | 4460 | 8840 | 97 | 57 |

| | | | | |
|---|---|---|---|---|
| 14600 2c | 4460 | 10140 | 98 | 57 |
| 14300 1c | 4460 | 9840 | 99 | 57 |
| 11300 | 4460 | 6840 | 100 | 57 |
| 12500 | 4460 | 8040 | 101 | 57 |
| 1350 | 4460 | -3110 | 101 | 58 |
| 1250 | 4460 | -3210 | 101 | 59 |
| 10300 | 4460 | 5840 | 102 | 59 |
| 12000 | 4460 | 7540 | 103 | 59 |
| 2330 | 4460 | -2130 | 103 | 60 |
| 1600 | 4460 | -2860 | 103 | 61 |
| | | | | |
| 1600 | 1950 | -350 | 103 | 62 |
| 1770 | 1950 | -180 | 103 | 63 |
| 2600 | 1950 | 650 | 104 | 63 |
| 13200 | 1950 | 11250 | 105 | 63 |
| 6640 | 1950 | 4690 | 106 | 63 |
| 13300 | 1950 | 11350 | 107 | 63 |
| 14600 2c | 1950 | 12650 | 108 | 63 |
| 14300 1c | 1950 | 12350 | 109 | 63 |
| 11300 | 1950 | 9350 | 110 | 63 |
| 12500 | 1950 | 10550 | 111 | 63 |
| 1350 | 1950 | -600 | 111 | 64 |
| 1250 | 1950 | -700 | 111 | 65 |
| 10300 | 1950 | 8350 | 112 | 65 |
| 12000 | 1950 | 10050 | 113 | 65 |
| 2330 | 1950 | 380 | 114 | 65 |
| 1600 | 1950 | -350 | 114 | 66 |
| | | | | |
| 1770 | 1600 | 170 | 115 | 66 |
| 2600 | 1600 | 1000 | 116 | 66 |
| 13200 | 1600 | 11600 | 117 | 66 |
| 6640 | 1600 | 5040 | 118 | 66 |
| 13300 | 1600 | 11700 | 119 | 66 |
| 14600 2c | 1600 | 13000 | 120 | 66 |
| 14300 1c | 1600 | 12700 | 121 | 66 |
| 11300 | 1600 | 9700 | 122 | 66 |
| 12500 | 1600 | 10900 | 123 | 66 |
| 1350 | 1600 | -250 | 123 | 67 |
| 1250 | 1600 | -350 | 123 | 68 |
| 10300 | 1600 | 8700 | 124 | 68 |
| 12000 | 1600 | 10400 | 125 | 68 |
| 2330 | 1600 | 730 | 126 | 68 |
| 1600 | 1600 | 0 | 126 | 68 |
| | | | | |
| 2600 | 1770 | 830 | 127 | 68 |
| 13200 | 1770 | 11430 | 128 | 68 |
| 6640 | 1770 | 4870 | 129 | 68 |
| 13300 | 1770 | 11530 | 130 | 68 |
| 14600 2c | 1770 | 12830 | 131 | 68 |
| 14300 1c | 1770 | 12530 | 132 | 68 |
| 11300 | 1770 | 9530 | 133 | 68 |
| 12500 | 1770 | 10730 | 134 | 68 |
| 1350 | 1770 | -420 | 134 | 69 |
| 1250 | 1770 | -520 | 134 | 70 |
| 10300 | 1770 | 8530 | 135 | 70 |
| 12000 | 1770 | 10230 | 136 | 70 |
| 2330 | 1770 | 560 | 137 | 70 |

| | | | | |
|---|---|---|---|---|
| 1600 | 1770 | -170 | 137 | 71 |
| | | | | |
| 13200 | 2600 | 10600 | 138 | 71 |
| 6640 | 2600 | 4040 | 139 | 71 |
| 13300 | 2600 | 10700 | 140 | 71 |
| 14600 2c | 2600 | 12000 | 141 | 71 |
| 14300 1c | 2600 | 11700 | 142 | 71 |
| 11300 | 2600 | 8700 | 143 | 71 |
| 12500 | 2600 | 9900 | 144 | 71 |
| 1350 | 2600 | -1250 | 144 | 72 |
| 1250 | 2600 | -1350 | 144 | 73 |
| 10300 | 2600 | 7700 | 145 | 73 |
| 12000 | 2600 | 9400 | 146 | 73 |
| 2330 | 2600 | -270 | 146 | 74 |
| 1600 | 2600 | -1000 | 146 | 75 |
| | | | | |
| 6640 | 13200 | -6560 | 146 | 76 |
| 13300 | 13200 | 100 | 147 | 76 |
| 14600 2c | 13200 | 1400 | 148 | 76 |
| 14300 1c | 13200 | 1100 | 149 | 76 |
| 11300 | 13200 | -1900 | 149 | 77 |
| 12500 | 13200 | -700 | 149 | 78 |
| 1350 | 13200 | -11850 | 149 | 79 |
| 1250 | 13200 | -11950 | 149 | 80 |
| 10300 | 13200 | -2900 | 149 | 81 |
| 12000 | 13200 | -1200 | 149 | 82 |
| 2330 | 13200 | -10870 | 149 | 83 |
| 1600 | 13200 | -11600 | 149 | 84 |
| | | | | |
| 13300 | 6640 | 6660 | 150 | 84 |
| 14600 2c | 6640 | 7960 | 151 | 84 |
| 14300 1c | 6640 | 7660 | 152 | 84 |
| 11300 | 6640 | 4660 | 153 | 84 |
| 12500 | 6640 | 5860 | 154 | 84 |
| 1350 | 6640 | -5290 | 154 | 85 |
| 1250 | 6640 | -5390 | 154 | 86 |
| 10300 | 6640 | 3660 | 155 | 86 |
| 12000 | 6640 | 5360 | 156 | 86 |
| 2330 | 6640 | -4310 | 156 | 87 |
| 1600 | 6640 | -5040 | 156 | 88 |
| | | | | |
| 14600 2c | 13300 | 1300 | 157 | 88 |
| 14300 1c | 13300 | 1000 | 158 | 88 |
| 11300 | 13300 | -2000 | 158 | 89 |
| 12500 | 13300 | -800 | 158 | 90 |
| 1350 | 13300 | -11950 | 158 | 91 |
| 1250 | 13300 | -12050 | 158 | 92 |
| 10300 | 13300 | -3000 | 158 | 93 |
| 12000 | 13300 | -1300 | 158 | 94 |
| 2330 | 13300 | -10970 | 158 | 95 |
| 1600 | 13300 | -11700 | 158 | 96 |
| | | | | |
| 14300 1c | 14600 2c | Same Date | 158 | 96 |
| 11300 | 14600 2c | -3300 | 158 | 97 |
| 12500 | 14600 2c | -2100 | 158 | 98 |
| 1350 | 14600 2c | -13250 | 158 | 99 |
| 1250 | 14600 2c | -13350 | 158 | 100 |

| | | | | |
|---|---|---|---|---|
| 10300 | 14600 2c | -4300 | 158 | 101 |
| 12000 | 14600 2c | -2600 | 158 | 102 |
| 2330 | 14600 2c | -12270 | 158 | 103 |
| 1600 | 14600 2c | -13000 | 158 | 104 |
| | | | | |
| 11300 | 14300 1c | -3000 | 158 | 105 |
| 12500 | 14300 1c | -1800 | 158 | 106 |
| 1350 | 14300 1c | -12950 | 158 | 107 |
| 1250 | 14300 1c | -13050 | 158 | 108 |
| 10300 | 14300 1c | -4000 | 158 | 109 |
| 12000 | 14300 1c | -2300 | 158 | 110 |
| 2330 | 14300 1c | -11970 | 158 | 111 |
| 1600 | 14300 1c | -12700 | 158 | 112 |
| | | | | |
| 12500 | 11300 | Same Date | 158 | 112 |
| 1350 | 11300 | -9950 | 158 | 113 |
| 1250 | 11300 | -10050 | 158 | 114 |
| 10300 | 11300 | -1000 | 158 | 115 |
| 12000 | 11300 | 700 | 159 | 115 |
| 2330 | 11300 | -8970 | 159 | 116 |
| 1600 | 11300 | -9700 | 159 | 117 |
| | | | | |
| 1350 | 12500 | -11150 | 159 | 118 |
| 1250 | 12500 | -11250 | 159 | 119 |
| 10300 | 12500 | -2200 | 159 | 120 |
| 12000 | 12500 | -500 | 159 | 121 |
| 2330 | 12500 | -10170 | 159 | 122 |
| 1600 | 12500 | -10900 | 159 | 123 |
| | | | | |
| 1250 | 1350 | -100 | 159 | 124 |
| 10300 | 1350 | 8950 | 160 | 124 |
| 12000 | 1350 | 10650 | 161 | 124 |
| 2330 | 1350 | 980 | 162 | 124 |
| 1600 | 1350 | 250 | 163 | 124 |
| | | | | |
| 10300 | 1250 | 9050 | 164 | 124 |
| 12000 | 1250 | 10750 | 165 | 124 |
| 2330 | 1250 | 1080 | 166 | 124 |
| 1600 | 1250 | 350 | 167 | 124 |
| | | | | |
| 12000 | 10300 | 1700 | 168 | 124 |
| 2330 | 10300 | -7970 | 168 | 125 |
| 1600 | 10300 | -8700 | 168 | 126 |
| | | | | |
| 2330 | 12000 | -9670 | 168 | 127 |
| 1600 | 12000 | -10400 | 168 | 128 |
| | | | | |
| 1600 | 2330 | -730 | 168 | 129 |

S Statistic = 168 - 129 = 39

| Tied Group | Value | Members |
|---|---|---|
| 1 | 1600 | 2 |

| Time Period | Observations |
|---|---|
| 2/1/2017 | 1 |

| | |
|---|---|
| 3/1/2017 | 1 |
| 4/1/2017 | 1 |
| 5/1/2017 | 1 |
| 6/1/2017 | 1 |
| 7/1/2017 | 1 |
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |

There are 2 time periods with multiple data

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A = 18
B = 36
C = 0
D = 0
E = 2
F = 4
a = 33000
b = 124200
c = 1200
Group Variance = 1830.34
Z-Score = 0.888214
Comparison Level at 95% confidence level = 1.65463 (upward trend)
0.888214 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RW09-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 12400 | 14500 | -2100 | 0 | 1 |
| 12900 | 14500 | -1600 | 0 | 2 |
| 11900 | 14500 | -2600 | 0 | 3 |
| 13000 | 14500 | -1500 | 0 | 4 |
| 11500 | 14500 | -3000 | 0 | 5 |
| 9700 | 14500 | -4800 | 0 | 6 |
| 8750 | 14500 | -5750 | 0 | 7 |
| 8310 ML | 14500 | -6190 | 0 | 8 |
| 9290 | 14500 | -5210 | 0 | 9 |
| 8550 | 14500 | -5950 | 0 | 10 |
| 9310 | 14500 | -5190 | 0 | 11 |
| 8980 | 14500 | -5520 | 0 | 12 |
| 10700 | 14500 | -3800 | 0 | 13 |
| 10800 | 14500 | -3700 | 0 | 14 |
| 11800 1c | 14500 | -2700 | 0 | 15 |
| 11300 MH2c | 14500 | -3200 | 0 | 16 |
| 14100 | 14500 | -400 | 0 | 17 |
| 15300 | 14500 | 800 | 1 | 17 |
| 19600 M61c | 14500 | 5100 | 2 | 17 |
| 20600 | 14500 | 6100 | 3 | 17 |
| 20700 | 14500 | 6200 | 4 | 17 |
| 26700 | 14500 | 12200 | 5 | 17 |
| 39900 | 14500 | 25400 | 6 | 17 |
| 45200 | 14500 | 30700 | 7 | 17 |
| | | | | |
| 12900 | 12400 | 500 | 8 | 17 |
| 11900 | 12400 | -500 | 8 | 18 |
| 13000 | 12400 | 600 | 9 | 18 |
| 11500 | 12400 | -900 | 9 | 19 |
| 9700 | 12400 | -2700 | 9 | 20 |
| 8750 | 12400 | -3650 | 9 | 21 |
| 8310 ML | 12400 | -4090 | 9 | 22 |
| 9290 | 12400 | -3110 | 9 | 23 |
| 8550 | 12400 | -3850 | 9 | 24 |
| 9310 | 12400 | -3090 | 9 | 25 |
| 8980 | 12400 | -3420 | 9 | 26 |
| 10700 | 12400 | -1700 | 9 | 27 |
| 10800 | 12400 | -1600 | 9 | 28 |
| 11800 1c | 12400 | -600 | 9 | 29 |
| 11300 MH2c | 12400 | -1100 | 9 | 30 |
| 14100 | 12400 | 1700 | 10 | 30 |
| 15300 | 12400 | 2900 | 11 | 30 |
| 19600 M61c | 12400 | 7200 | 12 | 30 |
| 20600 | 12400 | 8200 | 13 | 30 |
| 20700 | 12400 | 8300 | 14 | 30 |
| 26700 | 12400 | 14300 | 15 | 30 |
| 39900 | 12400 | 27500 | 16 | 30 |

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|---|---|---|---|---|
| 45200 | 12400 | 32800 | 17 | 30 |
| | | | | |
| 11900 | 12900 | -1000 | 17 | 31 |
| 13000 | 12900 | 100 | 18 | 31 |
| 11500 | 12900 | -1400 | 18 | 32 |
| 9700 | 12900 | -3200 | 18 | 33 |
| 8750 | 12900 | -4150 | 18 | 34 |
| 8310 ML | 12900 | -4590 | 18 | 35 |
| 9290 | 12900 | -3610 | 18 | 36 |
| 8550 | 12900 | -4350 | 18 | 37 |
| 9310 | 12900 | -3590 | 18 | 38 |
| 8980 | 12900 | -3920 | 18 | 39 |
| 10700 | 12900 | -2200 | 18 | 40 |
| 10800 | 12900 | -2100 | 18 | 41 |
| 11800 1c | 12900 | -1100 | 18 | 42 |
| 11300 MH2c | 12900 | -1600 | 18 | 43 |
| 14100 | 12900 | 1200 | 19 | 43 |
| 15300 | 12900 | 2400 | 20 | 43 |
| 19600 M61c | 12900 | 6700 | 21 | 43 |
| 20600 | 12900 | 7700 | 22 | 43 |
| 20700 | 12900 | 7800 | 23 | 43 |
| 26700 | 12900 | 13800 | 24 | 43 |
| 39900 | 12900 | 27000 | 25 | 43 |
| 45200 | 12900 | 32300 | 26 | 43 |
| | | | | |
| 13000 | 11900 | 1100 | 27 | 43 |
| 11500 | 11900 | -400 | 27 | 44 |
| 9700 | 11900 | -2200 | 27 | 45 |
| 8750 | 11900 | -3150 | 27 | 46 |
| 8310 ML | 11900 | -3590 | 27 | 47 |
| 9290 | 11900 | -2610 | 27 | 48 |
| 8550 | 11900 | -3350 | 27 | 49 |
| 9310 | 11900 | -2590 | 27 | 50 |
| 8980 | 11900 | -2920 | 27 | 51 |
| 10700 | 11900 | -1200 | 27 | 52 |
| 10800 | 11900 | -1100 | 27 | 53 |
| 11800 1c | 11900 | -100 | 27 | 54 |
| 11300 MH2c | 11900 | -600 | 27 | 55 |
| 14100 | 11900 | 2200 | 28 | 55 |
| 15300 | 11900 | 3400 | 29 | 55 |
| 19600 M61c | 11900 | 7700 | 30 | 55 |
| 20600 | 11900 | 8700 | 31 | 55 |
| 20700 | 11900 | 8800 | 32 | 55 |
| 26700 | 11900 | 14800 | 33 | 55 |
| 39900 | 11900 | 28000 | 34 | 55 |
| 45200 | 11900 | 33300 | 35 | 55 |
| | | | | |
| 11500 | 13000 | -1500 | 35 | 56 |
| 9700 | 13000 | -3300 | 35 | 57 |
| 8750 | 13000 | -4250 | 35 | 58 |
| 8310 ML | 13000 | -4690 | 35 | 59 |
| 9290 | 13000 | -3710 | 35 | 60 |
| 8550 | 13000 | -4450 | 35 | 61 |
| 9310 | 13000 | -3690 | 35 | 62 |
| 8980 | 13000 | -4020 | 35 | 63 |
| 10700 | 13000 | -2300 | 35 | 64 |
| 10800 | 13000 | -2200 | 35 | 65 |

| | | | | |
|---|---|---|---|---|
| 11800 1c | 13000 | -1200 | 35 | 66 |
| 11300 MH2c | 13000 | -1700 | 35 | 67 |
| 14100 | 13000 | 1100 | 36 | 67 |
| 15300 | 13000 | 2300 | 37 | 67 |
| 19600 M61c | 13000 | 6600 | 38 | 67 |
| 20600 | 13000 | 7600 | 39 | 67 |
| 20700 | 13000 | 7700 | 40 | 67 |
| 26700 | 13000 | 13700 | 41 | 67 |
| 39900 | 13000 | 26900 | 42 | 67 |
| 45200 | 13000 | 32200 | 43 | 67 |
| | | | | |
| 9700 | 11500 | -1800 | 43 | 68 |
| 8750 | 11500 | -2750 | 43 | 69 |
| 8310 ML | 11500 | -3190 | 43 | 70 |
| 9290 | 11500 | -2210 | 43 | 71 |
| 8550 | 11500 | -2950 | 43 | 72 |
| 9310 | 11500 | -2190 | 43 | 73 |
| 8980 | 11500 | -2520 | 43 | 74 |
| 10700 | 11500 | -800 | 43 | 75 |
| 10800 | 11500 | -700 | 43 | 76 |
| 11800 1c | 11500 | 300 | 44 | 76 |
| 11300 MH2c | 11500 | -200 | 44 | 77 |
| 14100 | 11500 | 2600 | 45 | 77 |
| 15300 | 11500 | 3800 | 46 | 77 |
| 19600 M61c | 11500 | 8100 | 47 | 77 |
| 20600 | 11500 | 9100 | 48 | 77 |
| 20700 | 11500 | 9200 | 49 | 77 |
| 26700 | 11500 | 15200 | 50 | 77 |
| 39900 | 11500 | 28400 | 51 | 77 |
| 45200 | 11500 | 33700 | 52 | 77 |
| | | | | |
| 8750 | 9700 | -950 | 52 | 78 |
| 8310 ML | 9700 | -1390 | 52 | 79 |
| 9290 | 9700 | -410 | 52 | 80 |
| 8550 | 9700 | -1150 | 52 | 81 |
| 9310 | 9700 | -390 | 52 | 82 |
| 8980 | 9700 | -720 | 52 | 83 |
| 10700 | 9700 | 1000 | 53 | 83 |
| 10800 | 9700 | 1100 | 54 | 83 |
| 11800 1c | 9700 | 2100 | 55 | 83 |
| 11300 MH2c | 9700 | 1600 | 56 | 83 |
| 14100 | 9700 | 4400 | 57 | 83 |
| 15300 | 9700 | 5600 | 58 | 83 |
| 19600 M61c | 9700 | 9900 | 59 | 83 |
| 20600 | 9700 | 10900 | 60 | 83 |
| 20700 | 9700 | 11000 | 61 | 83 |
| 26700 | 9700 | 17000 | 62 | 83 |
| 39900 | 9700 | 30200 | 63 | 83 |
| 45200 | 9700 | 35500 | 64 | 83 |
| | | | | |
| 8310 ML | 8750 | -440 | 64 | 84 |
| 9290 | 8750 | 540 | 65 | 84 |
| 8550 | 8750 | -200 | 65 | 85 |
| 9310 | 8750 | 560 | 66 | 85 |
| 8980 | 8750 | 230 | 67 | 85 |
| 10700 | 8750 | 1950 | 68 | 85 |
| 10800 | 8750 | 2050 | 69 | 85 |

| | | | | |
|---|---|---|---|---|
| 11800 1c | 8750 | 3050 | 70 | 85 |
| 11300 MH2c | 8750 | 2550 | 71 | 85 |
| 14100 | 8750 | 5350 | 72 | 85 |
| 15300 | 8750 | 6550 | 73 | 85 |
| 19600 M61c | 8750 | 10850 | 74 | 85 |
| 20600 | 8750 | 11850 | 75 | 85 |
| 20700 | 8750 | 11950 | 76 | 85 |
| 26700 | 8750 | 17950 | 77 | 85 |
| 39900 | 8750 | 31150 | 78 | 85 |
| 45200 | 8750 | 36450 | 79 | 85 |
| | | | | |
| 9290 | 8310 ML | 980 | 80 | 85 |
| 8550 | 8310 ML | 240 | 81 | 85 |
| 9310 | 8310 ML | 1000 | 82 | 85 |
| 8980 | 8310 ML | 670 | 83 | 85 |
| 10700 | 8310 ML | 2390 | 84 | 85 |
| 10800 | 8310 ML | 2490 | 85 | 85 |
| 11800 1c | 8310 ML | 3490 | 86 | 85 |
| 11300 MH2c | 8310 ML | 2990 | 87 | 85 |
| 14100 | 8310 ML | 5790 | 88 | 85 |
| 15300 | 8310 ML | 6990 | 89 | 85 |
| 19600 M61c | 8310 ML | 11290 | 90 | 85 |
| 20600 | 8310 ML | 12290 | 91 | 85 |
| 20700 | 8310 ML | 12390 | 92 | 85 |
| 26700 | 8310 ML | 18390 | 93 | 85 |
| 39900 | 8310 ML | 31590 | 94 | 85 |
| 45200 | 8310 ML | 36890 | 95 | 85 |
| | | | | |
| 8550 | 9290 | -740 | 95 | 86 |
| 9310 | 9290 | 20 | 96 | 86 |
| 8980 | 9290 | -310 | 96 | 87 |
| 10700 | 9290 | 1410 | 97 | 87 |
| 10800 | 9290 | 1510 | 98 | 87 |
| 11800 1c | 9290 | 2510 | 99 | 87 |
| 11300 MH2c | 9290 | 2010 | 100 | 87 |
| 14100 | 9290 | 4810 | 101 | 87 |
| 15300 | 9290 | 6010 | 102 | 87 |
| 19600 M61c | 9290 | 10310 | 103 | 87 |
| 20600 | 9290 | 11310 | 104 | 87 |
| 20700 | 9290 | 11410 | 105 | 87 |
| 26700 | 9290 | 17410 | 106 | 87 |
| 39900 | 9290 | 30610 | 107 | 87 |
| 45200 | 9290 | 35910 | 108 | 87 |
| | | | | |
| 9310 | 8550 | 760 | 109 | 87 |
| 8980 | 8550 | 430 | 110 | 87 |
| 10700 | 8550 | 2150 | 111 | 87 |
| 10800 | 8550 | 2250 | 112 | 87 |
| 11800 1c | 8550 | 3250 | 113 | 87 |
| 11300 MH2c | 8550 | 2750 | 114 | 87 |
| 14100 | 8550 | 5550 | 115 | 87 |
| 15300 | 8550 | 6750 | 116 | 87 |
| 19600 M61c | 8550 | 11050 | 117 | 87 |
| 20600 | 8550 | 12050 | 118 | 87 |
| 20700 | 8550 | 12150 | 119 | 87 |
| 26700 | 8550 | 18150 | 120 | 87 |
| 39900 | 8550 | 31350 | 121 | 87 |

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|---|---|---|---|---|
| 45200 | 8550 | 36650 | 122 | 87 |
| | | | | |
| 8980 | 9310 | -330 | 122 | 88 |
| 10700 | 9310 | 1390 | 123 | 88 |
| 10800 | 9310 | 1490 | 124 | 88 |
| 11800 1c | 9310 | 2490 | 125 | 88 |
| 11300 MH2c | 9310 | 1990 | 126 | 88 |
| 14100 | 9310 | 4790 | 127 | 88 |
| 15300 | 9310 | 5990 | 128 | 88 |
| 19600 M61c | 9310 | 10290 | 129 | 88 |
| 20600 | 9310 | 11290 | 130 | 88 |
| 20700 | 9310 | 11390 | 131 | 88 |
| 26700 | 9310 | 17390 | 132 | 88 |
| 39900 | 9310 | 30590 | 133 | 88 |
| 45200 | 9310 | 35890 | 134 | 88 |
| | | | | |
| 10700 | 8980 | 1720 | 135 | 88 |
| 10800 | 8980 | 1820 | 136 | 88 |
| 11800 1c | 8980 | 2820 | 137 | 88 |
| 11300 MH2c | 8980 | 2320 | 138 | 88 |
| 14100 | 8980 | 5120 | 139 | 88 |
| 15300 | 8980 | 6320 | 140 | 88 |
| 19600 M61c | 8980 | 10620 | 141 | 88 |
| 20600 | 8980 | 11620 | 142 | 88 |
| 20700 | 8980 | 11720 | 143 | 88 |
| 26700 | 8980 | 17720 | 144 | 88 |
| 39900 | 8980 | 30920 | 145 | 88 |
| 45200 | 8980 | 36220 | 146 | 88 |
| | | | | |
| 10800 | 10700 | 100 | 147 | 88 |
| 11800 1c | 10700 | 1100 | 148 | 88 |
| 11300 MH2c | 10700 | 600 | 149 | 88 |
| 14100 | 10700 | 3400 | 150 | 88 |
| 15300 | 10700 | 4600 | 151 | 88 |
| 19600 M61c | 10700 | 8900 | 152 | 88 |
| 20600 | 10700 | 9900 | 153 | 88 |
| 20700 | 10700 | 10000 | 154 | 88 |
| 26700 | 10700 | 16000 | 155 | 88 |
| 39900 | 10700 | 29200 | 156 | 88 |
| 45200 | 10700 | 34500 | 157 | 88 |
| | | | | |
| 11800 1c | 10800 | 1000 | 158 | 88 |
| 11300 MH2c | 10800 | 500 | 159 | 88 |
| 14100 | 10800 | 3300 | 160 | 88 |
| 15300 | 10800 | 4500 | 161 | 88 |
| 19600 M61c | 10800 | 8800 | 162 | 88 |
| 20600 | 10800 | 9800 | 163 | 88 |
| 20700 | 10800 | 9900 | 164 | 88 |
| 26700 | 10800 | 15900 | 165 | 88 |
| 39900 | 10800 | 29100 | 166 | 88 |
| 45200 | 10800 | 34400 | 167 | 88 |
| | | | | |
| 11300 MH2c | 11800 1c | Same Date | 167 | 88 |
| 14100 | 11800 1c | 2300 | 168 | 88 |
| 15300 | 11800 1c | 3500 | 169 | 88 |
| 19600 M61c | 11800 1c | 7800 | 170 | 88 |
| 20600 | 11800 1c | 8800 | 171 | 88 |

| | | | | |
|---|---|---|---|---|
| 20700 | 11800 1c | 8900 | 172 | 88 |
| 26700 | 11800 1c | 14900 | 173 | 88 |
| 39900 | 11800 1c | 28100 | 174 | 88 |
| 45200 | 11800 1c | 33400 | 175 | 88 |
| | | | | |
| 14100 | 11300 MH2c | 2800 | 176 | 88 |
| 15300 | 11300 MH2c | 4000 | 177 | 88 |
| 19600 M61c | 11300 MH2c | 8300 | 178 | 88 |
| 20600 | 11300 MH2c | 9300 | 179 | 88 |
| 20700 | 11300 MH2c | 9400 | 180 | 88 |
| 26700 | 11300 MH2c | 15400 | 181 | 88 |
| 39900 | 11300 MH2c | 28600 | 182 | 88 |
| 45200 | 11300 MH2c | 33900 | 183 | 88 |
| | | | | |
| 15300 | 14100 | Same Date | 183 | 88 |
| 19600 M61c | 14100 | 5500 | 184 | 88 |
| 20600 | 14100 | 6500 | 185 | 88 |
| 20700 | 14100 | 6600 | 186 | 88 |
| 26700 | 14100 | 12600 | 187 | 88 |
| 39900 | 14100 | 25800 | 188 | 88 |
| 45200 | 14100 | 31100 | 189 | 88 |
| | | | | |
| 19600 M61c | 15300 | 4300 | 190 | 88 |
| 20600 | 15300 | 5300 | 191 | 88 |
| 20700 | 15300 | 5400 | 192 | 88 |
| 26700 | 15300 | 11400 | 193 | 88 |
| 39900 | 15300 | 24600 | 194 | 88 |
| 45200 | 15300 | 29900 | 195 | 88 |
| | | | | |
| 20600 | 19600 M61c | 1000 | 196 | 88 |
| 20700 | 19600 M61c | 1100 | 197 | 88 |
| 26700 | 19600 M61c | 7100 | 198 | 88 |
| 39900 | 19600 M61c | 20300 | 199 | 88 |
| 45200 | 19600 M61c | 25600 | 200 | 88 |
| | | | | |
| 20700 | 20600 | 100 | 201 | 88 |
| 26700 | 20600 | 6100 | 202 | 88 |
| 39900 | 20600 | 19300 | 203 | 88 |
| 45200 | 20600 | 24600 | 204 | 88 |
| | | | | |
| 26700 | 20700 | 6000 | 205 | 88 |
| 39900 | 20700 | 19200 | 206 | 88 |
| 45200 | 20700 | 24500 | 207 | 88 |
| | | | | |
| 39900 | 26700 | 13200 | 208 | 88 |
| 45200 | 26700 | 18500 | 209 | 88 |
| | | | | |
| 45200 | 39900 | 5300 | 210 | 88 |

S Statistic = 210 - 88 = 122

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 2/1/2017 | 1 |
| 3/1/2017 | 1 |

| | |
|---|---|
| 4/1/2017 | 1 |
| 5/1/2017 | 1 |
| 6/1/2017 | 1 |
| 7/1/2017 | 1 |
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |

There are 2 time periods with multiple data

---

A = 0
B = 36
C = 0
D = 0
E = 0
F = 4
a = 33000
b = 124200
c = 1200
Group Variance = 1831.33
Z-Score = 2.82749
Comparison Level at 95% confidence level = 1.65463 (upward trend)
**2.82749 > 1.65463 indicating an upward trend**

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RW11-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 10500 | 8790 | 1710 | 1 | 0 |
| 13100 | 8790 | 4310 | 2 | 0 |
| 12500 | 8790 | 3710 | 3 | 0 |
| 13500 | 8790 | 4710 | 4 | 0 |
| 10900 | 8790 | 2110 | 5 | 0 |
| 10800 | 8790 | 2010 | 6 | 0 |
| 10600 | 8790 | 1810 | 7 | 0 |
| 9270 | 8790 | 480 | 8 | 0 |
| 18300 | 8790 | 9510 | 9 | 0 |
| 24000 | 8790 | 15210 | 10 | 0 |
| 27700 | 8790 | 18910 | 11 | 0 |
| 37100 | 8790 | 28310 | 12 | 0 |
| 109000 | 8790 | 100210 | 13 | 0 |
| 29500 | 8790 | 20710 | 14 | 0 |
| 13500 MHML2c | 8790 | 4710 | 15 | 0 |
| 16600 ML1c | 8790 | 7810 | 16 | 0 |
| 38600 | 8790 | 29810 | 17 | 0 |
| 38900 | 8790 | 30110 | 18 | 0 |
| 44000 M6 | 8790 | 35210 | 19 | 0 |
| 37500 | 8790 | 28710 | 20 | 0 |
| 28900 | 8790 | 20110 | 21 | 0 |
| 37200 ML | 8790 | 28410 | 22 | 0 |
| 46600 | 8790 | 37810 | 23 | 0 |
| 55200 | 8790 | 46410 | 24 | 0 |
| 61000 BML1c | 8790 | 52210 | 25 | 0 |
| 13500 | 8790 | 4710 | 26 | 0 |
| 58030 | 8790 | 49240 | 27 | 0 |
| 254.3 | 8790 | -8535.7 | 27 | 1 |
| | | | | |
| 13100 | 10500 | 2600 | 28 | 1 |
| 12500 | 10500 | 2000 | 29 | 1 |
| 13500 | 10500 | 3000 | 30 | 1 |
| 10900 | 10500 | 400 | 31 | 1 |
| 10800 | 10500 | 300 | 32 | 1 |
| 10600 | 10500 | 100 | 33 | 1 |
| 9270 | 10500 | -1230 | 33 | 2 |
| 18300 | 10500 | 7800 | 34 | 2 |
| 24000 | 10500 | 13500 | 35 | 2 |
| 27700 | 10500 | 17200 | 36 | 2 |
| 37100 | 10500 | 26600 | 37 | 2 |
| 109000 | 10500 | 98500 | 38 | 2 |
| 29500 | 10500 | 19000 | 39 | 2 |
| 13500 MHML2c | 10500 | 3000 | 40 | 2 |
| 16600 ML1c | 10500 | 6100 | 41 | 2 |
| 38600 | 10500 | 28100 | 42 | 2 |
| 38900 | 10500 | 28400 | 43 | 2 |
| 44000 M6 | 10500 | 33500 | 44 | 2 |

| | | | | |
|---|---|---|---|---|
| 37500 | 10500 | 27000 | 45 | 2 |
| 28900 | 10500 | 18400 | 46 | 2 |
| 37200 ML | 10500 | 26700 | 47 | 2 |
| 46600 | 10500 | 36100 | 48 | 2 |
| 55200 | 10500 | 44700 | 49 | 2 |
| 61000 BML1c | 10500 | 50500 | 50 | 2 |
| 13500 | 10500 | 3000 | 51 | 2 |
| 58030 | 10500 | 47530 | 52 | 2 |
| 254.3 | 10500 | -10245.7 | 52 | 3 |
| | | | | |
| 12500 | 13100 | -600 | 52 | 4 |
| 13500 | 13100 | 400 | 53 | 4 |
| 10900 | 13100 | -2200 | 53 | 5 |
| 10800 | 13100 | -2300 | 53 | 6 |
| 10600 | 13100 | -2500 | 53 | 7 |
| 9270 | 13100 | -3830 | 53 | 8 |
| 18300 | 13100 | 5200 | 54 | 8 |
| 24000 | 13100 | 10900 | 55 | 8 |
| 27700 | 13100 | 14600 | 56 | 8 |
| 37100 | 13100 | 24000 | 57 | 8 |
| 109000 | 13100 | 95900 | 58 | 8 |
| 29500 | 13100 | 16400 | 59 | 8 |
| 13500 MHML2c3 | 13100 | 400 | 60 | 8 |
| 16600 ML1c | 13100 | 3500 | 61 | 8 |
| 38600 | 13100 | 25500 | 62 | 8 |
| 38900 | 13100 | 25800 | 63 | 8 |
| 44000 M6 | 13100 | 30900 | 64 | 8 |
| 37500 | 13100 | 24400 | 65 | 8 |
| 28900 | 13100 | 15800 | 66 | 8 |
| 37200 ML | 13100 | 24100 | 67 | 8 |
| 46600 | 13100 | 33500 | 68 | 8 |
| 55200 | 13100 | 42100 | 69 | 8 |
| 61000 BML1c | 13100 | 47900 | 70 | 8 |
| 13500 | 13100 | 400 | 71 | 8 |
| 58030 | 13100 | 44930 | 72 | 8 |
| 254.3 | 13100 | -12845.7 | 72 | 9 |
| | | | | |
| 13500 | 12500 | 1000 | 73 | 9 |
| 10900 | 12500 | -1600 | 73 | 10 |
| 10800 | 12500 | -1700 | 73 | 11 |
| 10600 | 12500 | -1900 | 73 | 12 |
| 9270 | 12500 | -3230 | 73 | 13 |
| 18300 | 12500 | 5800 | 74 | 13 |
| 24000 | 12500 | 11500 | 75 | 13 |
| 27700 | 12500 | 15200 | 76 | 13 |
| 37100 | 12500 | 24600 | 77 | 13 |
| 109000 | 12500 | 96500 | 78 | 13 |
| 29500 | 12500 | 17000 | 79 | 13 |
| 13500 MHML2c3 | 12500 | 1000 | 80 | 13 |
| 16600 ML1c | 12500 | 4100 | 81 | 13 |
| 38600 | 12500 | 26100 | 82 | 13 |
| 38900 | 12500 | 26400 | 83 | 13 |
| 44000 M6 | 12500 | 31500 | 84 | 13 |
| 37500 | 12500 | 25000 | 85 | 13 |
| 28900 | 12500 | 16400 | 86 | 13 |
| 37200 ML | 12500 | 24700 | 87 | 13 |
| 46600 | 12500 | 34100 | 88 | 13 |

| | | | | |
|---|---|---|---|---|
| 55200 | 12500 | 42700 | 89 | 13 |
| 61000 BML1c | 12500 | 48500 | 90 | 13 |
| 13500 | 12500 | 1000 | 91 | 13 |
| 58030 | 12500 | 45530 | 92 | 13 |
| 254.3 | 12500 | -12245.7 | 92 | 14 |
| | | | | |
| 10900 | 13500 | -2600 | 92 | 15 |
| 10800 | 13500 | -2700 | 92 | 16 |
| 10600 | 13500 | -2900 | 92 | 17 |
| 9270 | 13500 | -4230 | 92 | 18 |
| 18300 | 13500 | 4800 | 93 | 18 |
| 24000 | 13500 | 10500 | 94 | 18 |
| 27700 | 13500 | 14200 | 95 | 18 |
| 37100 | 13500 | 23600 | 96 | 18 |
| 109000 | 13500 | 95500 | 97 | 18 |
| 29500 | 13500 | 16000 | 98 | 18 |
| 13500 MHML2c3 | 13500 | 0 | 98 | 18 |
| 16600 ML1c | 13500 | 3100 | 99 | 18 |
| 38600 | 13500 | 25100 | 100 | 18 |
| 38900 | 13500 | 25400 | 101 | 18 |
| 44000 M6 | 13500 | 30500 | 102 | 18 |
| 37500 | 13500 | 24000 | 103 | 18 |
| 28900 | 13500 | 15400 | 104 | 18 |
| 37200 ML | 13500 | 23700 | 105 | 18 |
| 46600 | 13500 | 33100 | 106 | 18 |
| 55200 | 13500 | 41700 | 107 | 18 |
| 61000 BML1c | 13500 | 47500 | 108 | 18 |
| 13500 | 13500 | 0 | 108 | 18 |
| 58030 | 13500 | 44530 | 109 | 18 |
| 254.3 | 13500 | -13245.7 | 109 | 19 |
| | | | | |
| 10800 | 10900 | -100 | 109 | 20 |
| 10600 | 10900 | -300 | 109 | 21 |
| 9270 | 10900 | -1630 | 109 | 22 |
| 18300 | 10900 | 7400 | 110 | 22 |
| 24000 | 10900 | 13100 | 111 | 22 |
| 27700 | 10900 | 16800 | 112 | 22 |
| 37100 | 10900 | 26200 | 113 | 22 |
| 109000 | 10900 | 98100 | 114 | 22 |
| 29500 | 10900 | 18600 | 115 | 22 |
| 13500 MHML2c3 | 10900 | 2600 | 116 | 22 |
| 16600 ML1c | 10900 | 5700 | 117 | 22 |
| 38600 | 10900 | 27700 | 118 | 22 |
| 38900 | 10900 | 28000 | 119 | 22 |
| 44000 M6 | 10900 | 33100 | 120 | 22 |
| 37500 | 10900 | 26600 | 121 | 22 |
| 28900 | 10900 | 18000 | 122 | 22 |
| 37200 ML | 10900 | 26300 | 123 | 22 |
| 46600 | 10900 | 35700 | 124 | 22 |
| 55200 | 10900 | 44300 | 125 | 22 |
| 61000 BML1c | 10900 | 50100 | 126 | 22 |
| 13500 | 10900 | 2600 | 127 | 22 |
| 58030 | 10900 | 47130 | 128 | 22 |
| 254.3 | 10900 | -10645.7 | 128 | 23 |
| | | | | |
| 10600 | 10800 | -200 | 128 | 24 |
| 9270 | 10800 | -1530 | 128 | 25 |

| | | | | |
|---|---|---|---|---|
| 18300 | 10800 | 7500 | 129 | 25 |
| 24000 | 10800 | 13200 | 130 | 25 |
| 27700 | 10800 | 16900 | 131 | 25 |
| 37100 | 10800 | 26300 | 132 | 25 |
| 109000 | 10800 | 98200 | 133 | 25 |
| 29500 | 10800 | 18700 | 134 | 25 |
| 13500 MHML2c3 | 10800 | 2700 | 135 | 25 |
| 16600 ML1c | 10800 | 5800 | 136 | 25 |
| 38600 | 10800 | 27800 | 137 | 25 |
| 38900 | 10800 | 28100 | 138 | 25 |
| 44000 M6 | 10800 | 33200 | 139 | 25 |
| 37500 | 10800 | 26700 | 140 | 25 |
| 28900 | 10800 | 18100 | 141 | 25 |
| 37200 ML | 10800 | 26400 | 142 | 25 |
| 46600 | 10800 | 35800 | 143 | 25 |
| 55200 | 10800 | 44400 | 144 | 25 |
| 61000 BML1c | 10800 | 50200 | 145 | 25 |
| 13500 | 10800 | 2700 | 146 | 25 |
| 58030 | 10800 | 47230 | 147 | 25 |
| 254.3 | 10800 | -10545.7 | 147 | 26 |
| | | | | |
| 9270 | 10600 | -1330 | 147 | 27 |
| 18300 | 10600 | 7700 | 148 | 27 |
| 24000 | 10600 | 13400 | 149 | 27 |
| 27700 | 10600 | 17100 | 150 | 27 |
| 37100 | 10600 | 26500 | 151 | 27 |
| 109000 | 10600 | 98400 | 152 | 27 |
| 29500 | 10600 | 18900 | 153 | 27 |
| 13500 MHML2c3 | 10600 | 2900 | 154 | 27 |
| 16600 ML1c | 10600 | 6000 | 155 | 27 |
| 38600 | 10600 | 28000 | 156 | 27 |
| 38900 | 10600 | 28300 | 157 | 27 |
| 44000 M6 | 10600 | 33400 | 158 | 27 |
| 37500 | 10600 | 26900 | 159 | 27 |
| 28900 | 10600 | 18300 | 160 | 27 |
| 37200 ML | 10600 | 26600 | 161 | 27 |
| 46600 | 10600 | 36000 | 162 | 27 |
| 55200 | 10600 | 44600 | 163 | 27 |
| 61000 BML1c | 10600 | 50400 | 164 | 27 |
| 13500 | 10600 | 2900 | 165 | 27 |
| 58030 | 10600 | 47430 | 166 | 27 |
| 254.3 | 10600 | -10345.7 | 166 | 28 |
| | | | | |
| 18300 | 9270 | 9030 | 167 | 28 |
| 24000 | 9270 | 14730 | 168 | 28 |
| 27700 | 9270 | 18430 | 169 | 28 |
| 37100 | 9270 | 27830 | 170 | 28 |
| 109000 | 9270 | 99730 | 171 | 28 |
| 29500 | 9270 | 20230 | 172 | 28 |
| 13500 MHML2c3 | 9270 | 4230 | 173 | 28 |
| 16600 ML1c | 9270 | 7330 | 174 | 28 |
| 38600 | 9270 | 29330 | 175 | 28 |
| 38900 | 9270 | 29630 | 176 | 28 |
| 44000 M6 | 9270 | 34730 | 177 | 28 |
| 37500 | 9270 | 28230 | 178 | 28 |
| 28900 | 9270 | 19630 | 179 | 28 |
| 37200 ML | 9270 | 27930 | 180 | 28 |

| | | | | |
|---|---|---|---|---|
| 46600 | 9270 | 37330 | 181 | 28 |
| 55200 | 9270 | 45930 | 182 | 28 |
| 61000 BML1c | 9270 | 51730 | 183 | 28 |
| 13500 | 9270 | 4230 | 184 | 28 |
| 58030 | 9270 | 48760 | 185 | 28 |
| 254.3 | 9270 | -9015.7 | 185 | 29 |
| | | | | |
| 24000 | 18300 | 5700 | 186 | 29 |
| 27700 | 18300 | 9400 | 187 | 29 |
| 37100 | 18300 | 18800 | 188 | 29 |
| 109000 | 18300 | 90700 | 189 | 29 |
| 29500 | 18300 | 11200 | 190 | 29 |
| 13500 MHML2c3 | 18300 | -4800 | 190 | 30 |
| 16600 ML1c | 18300 | -1700 | 190 | 31 |
| 38600 | 18300 | 20300 | 191 | 31 |
| 38900 | 18300 | 20600 | 192 | 31 |
| 44000 M6 | 18300 | 25700 | 193 | 31 |
| 37500 | 18300 | 19200 | 194 | 31 |
| 28900 | 18300 | 10600 | 195 | 31 |
| 37200 ML | 18300 | 18900 | 196 | 31 |
| 46600 | 18300 | 28300 | 197 | 31 |
| 55200 | 18300 | 36900 | 198 | 31 |
| 61000 BML1c | 18300 | 42700 | 199 | 31 |
| 13500 | 18300 | -4800 | 199 | 32 |
| 58030 | 18300 | 39730 | 200 | 32 |
| 254.3 | 18300 | -18045.7 | 200 | 33 |
| | | | | |
| 27700 | 24000 | 3700 | 201 | 33 |
| 37100 | 24000 | 13100 | 202 | 33 |
| 109000 | 24000 | 85000 | 203 | 33 |
| 29500 | 24000 | 5500 | 204 | 33 |
| 13500 MHML2c3 | 24000 | -10500 | 204 | 34 |
| 16600 ML1c | 24000 | -7400 | 204 | 35 |
| 38600 | 24000 | 14600 | 205 | 35 |
| 38900 | 24000 | 14900 | 206 | 35 |
| 44000 M6 | 24000 | 20000 | 207 | 35 |
| 37500 | 24000 | 13500 | 208 | 35 |
| 28900 | 24000 | 4900 | 209 | 35 |
| 37200 ML | 24000 | 13200 | 210 | 35 |
| 46600 | 24000 | 22600 | 211 | 35 |
| 55200 | 24000 | 31200 | 212 | 35 |
| 61000 BML1c | 24000 | 37000 | 213 | 35 |
| 13500 | 24000 | -10500 | 213 | 36 |
| 58030 | 24000 | 34030 | 214 | 36 |
| 254.3 | 24000 | -23745.7 | 214 | 37 |
| | | | | |
| 37100 | 27700 | 9400 | 215 | 37 |
| 109000 | 27700 | 81300 | 216 | 37 |
| 29500 | 27700 | 1800 | 217 | 37 |
| 13500 MHML2c3 | 27700 | -14200 | 217 | 38 |
| 16600 ML1c | 27700 | -11100 | 217 | 39 |
| 38600 | 27700 | 10900 | 218 | 39 |
| 38900 | 27700 | 11200 | 219 | 39 |
| 44000 M6 | 27700 | 16300 | 220 | 39 |
| 37500 | 27700 | 9800 | 221 | 39 |
| 28900 | 27700 | 1200 | 222 | 39 |
| 37200 ML | 27700 | 9500 | 223 | 39 |

| | | | | |
|---|---|---|---|---|
| 46600 | 27700 | 18900 | 224 | 39 |
| 55200 | 27700 | 27500 | 225 | 39 |
| 61000 BML1c | 27700 | 33300 | 226 | 39 |
| 13500 | 27700 | -14200 | 226 | 40 |
| 58030 | 27700 | 30330 | 227 | 40 |
| 254.3 | 27700 | -27445.7 | 227 | 41 |
| | | | | |
| 109000 | 37100 | 71900 | 228 | 41 |
| 29500 | 37100 | -7600 | 228 | 42 |
| 13500 MHML2c3 | 37100 | -23600 | 228 | 43 |
| 16600 ML1c | 37100 | -20500 | 228 | 44 |
| 38600 | 37100 | 1500 | 229 | 44 |
| 38900 | 37100 | 1800 | 230 | 44 |
| 44000 M6 | 37100 | 6900 | 231 | 44 |
| 37500 | 37100 | 400 | 232 | 44 |
| 28900 | 37100 | -8200 | 232 | 45 |
| 37200 ML | 37100 | 100 | 233 | 45 |
| 46600 | 37100 | 9500 | 234 | 45 |
| 55200 | 37100 | 18100 | 235 | 45 |
| 61000 BML1c | 37100 | 23900 | 236 | 45 |
| 13500 | 37100 | -23600 | 236 | 46 |
| 58030 | 37100 | 20930 | 237 | 46 |
| 254.3 | 37100 | -36845.7 | 237 | 47 |
| | | | | |
| 29500 | 109000 | -79500 | 237 | 48 |
| 13500 MHML2c3 | 109000 | -95500 | 237 | 49 |
| 16600 ML1c | 109000 | -92400 | 237 | 50 |
| 38600 | 109000 | -70400 | 237 | 51 |
| 38900 | 109000 | -70100 | 237 | 52 |
| 44000 M6 | 109000 | -65000 | 237 | 53 |
| 37500 | 109000 | -71500 | 237 | 54 |
| 28900 | 109000 | -80100 | 237 | 55 |
| 37200 ML | 109000 | -71800 | 237 | 56 |
| 46600 | 109000 | -62400 | 237 | 57 |
| 55200 | 109000 | -53800 | 237 | 58 |
| 61000 BML1c | 109000 | -48000 | 237 | 59 |
| 13500 | 109000 | -95500 | 237 | 60 |
| 58030 | 109000 | -50970 | 237 | 61 |
| 254.3 | 109000 | -108746 | 237 | 62 |
| | | | | |
| 13500 MHML2c3 | 29500 | -16000 | 237 | 63 |
| 16600 ML1c | 29500 | -12900 | 237 | 64 |
| 38600 | 29500 | 9100 | 238 | 64 |
| 38900 | 29500 | 9400 | 239 | 64 |
| 44000 M6 | 29500 | 14500 | 240 | 64 |
| 37500 | 29500 | 8000 | 241 | 64 |
| 28900 | 29500 | -600 | 241 | 65 |
| 37200 ML | 29500 | 7700 | 242 | 65 |
| 46600 | 29500 | 17100 | 243 | 65 |
| 55200 | 29500 | 25700 | 244 | 65 |
| 61000 BML1c | 29500 | 31500 | 245 | 65 |
| 13500 | 29500 | -16000 | 245 | 66 |
| 58030 | 29500 | 28530 | 246 | 66 |
| 254.3 | 29500 | -29245.7 | 246 | 67 |
| | | | | |
| 16600 ML1c | 13500 MHML2c3 | Same Date | 246 | 67 |
| 38600 | 13500 MHML2c3 | 25100 | 247 | 67 |

| | | | | |
|---|---|---|---|---|
| 38900 | 13500 MHML2c3 | 25400 | 248 | 67 |
| 44000 M6 | 13500 MHML2c3 | 30500 | 249 | 67 |
| 37500 | 13500 MHML2c3 | 24000 | 250 | 67 |
| 28900 | 13500 MHML2c3 | 15400 | 251 | 67 |
| 37200 ML | 13500 MHML2c3 | 23700 | 252 | 67 |
| 46600 | 13500 MHML2c3 | 33100 | 253 | 67 |
| 55200 | 13500 MHML2c3 | 41700 | 254 | 67 |
| 61000 BML1c | 13500 MHML2c3 | 47500 | 255 | 67 |
| 13500 | 13500 MHML2c3 | 0 | 255 | 67 |
| 58030 | 13500 MHML2c3 | 44530 | 256 | 67 |
| 254.3 | 13500 MHML2c3 | -13245.7 | 256 | 68 |

| | | | | |
|---|---|---|---|---|
| 38600 | 16600 ML1c | 22000 | 257 | 68 |
| 38900 | 16600 ML1c | 22300 | 258 | 68 |
| 44000 M6 | 16600 ML1c | 27400 | 259 | 68 |
| 37500 | 16600 ML1c | 20900 | 260 | 68 |
| 28900 | 16600 ML1c | 12300 | 261 | 68 |
| 37200 ML | 16600 ML1c | 20600 | 262 | 68 |
| 46600 | 16600 ML1c | 30000 | 263 | 68 |
| 55200 | 16600 ML1c | 38600 | 264 | 68 |
| 61000 BML1c | 16600 ML1c | 44400 | 265 | 68 |
| 13500 | 16600 ML1c | -3100 | 265 | 69 |
| 58030 | 16600 ML1c | 41430 | 266 | 69 |
| 254.3 | 16600 ML1c | -16345.7 | 266 | 70 |

| | | | | |
|---|---|---|---|---|
| 38900 | 38600 | Same Date | 266 | 70 |
| 44000 M6 | 38600 | 5400 | 267 | 70 |
| 37500 | 38600 | -1100 | 267 | 71 |
| 28900 | 38600 | -9700 | 267 | 72 |
| 37200 ML | 38600 | -1400 | 267 | 73 |
| 46600 | 38600 | 8000 | 268 | 73 |
| 55200 | 38600 | 16600 | 269 | 73 |
| 61000 BML1c | 38600 | 22400 | 270 | 73 |
| 13500 | 38600 | -25100 | 270 | 74 |
| 58030 | 38600 | 19430 | 271 | 74 |
| 254.3 | 38600 | -38345.7 | 271 | 75 |

| | | | | |
|---|---|---|---|---|
| 44000 M6 | 38900 | 5100 | 272 | 75 |
| 37500 | 38900 | -1400 | 272 | 76 |
| 28900 | 38900 | -10000 | 272 | 77 |
| 37200 ML | 38900 | -1700 | 272 | 78 |
| 46600 | 38900 | 7700 | 273 | 78 |
| 55200 | 38900 | 16300 | 274 | 78 |
| 61000 BML1c | 38900 | 22100 | 275 | 78 |
| 13500 | 38900 | -25400 | 275 | 79 |
| 58030 | 38900 | 19130 | 276 | 79 |
| 254.3 | 38900 | -38645.7 | 276 | 80 |

| | | | | |
|---|---|---|---|---|
| 37500 | 44000 M6 | -6500 | 276 | 81 |
| 28900 | 44000 M6 | -15100 | 276 | 82 |
| 37200 ML | 44000 M6 | -6800 | 276 | 83 |
| 46600 | 44000 M6 | 2600 | 277 | 83 |
| 55200 | 44000 M6 | 11200 | 278 | 83 |
| 61000 BML1c | 44000 M6 | 17000 | 279 | 83 |
| 13500 | 44000 M6 | -30500 | 279 | 84 |
| 58030 | 44000 M6 | 14030 | 280 | 84 |
| 254.3 | 44000 M6 | -43745.7 | 280 | 85 |

| | | | | |
|---|---|---|---|---|
| 28900 | 37500 | -8600 | 280 | 86 |
| 37200 ML | 37500 | -300 | 280 | 87 |
| 46600 | 37500 | 9100 | 281 | 87 |
| 55200 | 37500 | 17700 | 282 | 87 |
| 61000 BML1c | 37500 | 23500 | 283 | 87 |
| 13500 | 37500 | -24000 | 283 | 88 |
| 58030 | 37500 | 20530 | 284 | 88 |
| 254.3 | 37500 | -37245.7 | 284 | 89 |
| | | | | |
| 37200 ML | 28900 | 8300 | 285 | 89 |
| 46600 | 28900 | 17700 | 286 | 89 |
| 55200 | 28900 | 26300 | 287 | 89 |
| 61000 BML1c | 28900 | 32100 | 288 | 89 |
| 13500 | 28900 | -15400 | 288 | 90 |
| 58030 | 28900 | 29130 | 289 | 90 |
| 254.3 | 28900 | -28645.7 | 289 | 91 |
| | | | | |
| 46600 | 37200 ML | 9400 | 290 | 91 |
| 55200 | 37200 ML | 18000 | 291 | 91 |
| 61000 BML1c | 37200 ML | 23800 | 292 | 91 |
| 13500 | 37200 ML | -23700 | 292 | 92 |
| 58030 | 37200 ML | 20830 | 293 | 92 |
| 254.3 | 37200 ML | -36945.7 | 293 | 93 |
| | | | | |
| 55200 | 46600 | 8600 | 294 | 93 |
| 61000 BML1c | 46600 | 14400 | 295 | 93 |
| 13500 | 46600 | -33100 | 295 | 94 |
| 58030 | 46600 | 11430 | 296 | 94 |
| 254.3 | 46600 | -46345.7 | 296 | 95 |
| | | | | |
| 61000 BML1c | 55200 | 5800 | 297 | 95 |
| 13500 | 55200 | -41700 | 297 | 96 |
| 58030 | 55200 | 2830 | 298 | 96 |
| 254.3 | 55200 | -54945.7 | 298 | 97 |
| | | | | |
| 13500 | 61000 BML1c | -47500 | 298 | 98 |
| 58030 | 61000 BML1c | -2970 | 298 | 99 |
| 254.3 | 61000 BML1c | -60745.7 | 298 | 100 |
| | | | | |
| 58030 | 13500 | 44530 | 299 | 100 |
| 254.3 | 13500 | -13245.7 | 299 | 101 |
| | | | | |
| 254.3 | 58030 | -57775.7 | 299 | 102 |

S Statistic = 299 - 102 = 197

| Tied Group | Value | Members |
|---|---|---|
| 1 | 13500 | 3 |

| Time Period | Observations |
|---|---|
| 2/1/2017 | 1 |
| 3/1/2017 | 1 |
| 4/1/2017 | 1 |
| 5/1/2017 | 1 |
| 6/1/2017 | 1 |

| | |
|---|---|
| 7/1/2017 | 1 |
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 3/1/2022 | 1 |
| 3/1/2023 | 1 |
| 3/1/2024 | 1 |

There are 2 time periods with multiple data

---

A = 66
B = 36
C = 6
D = 0
E = 6
F = 4
a = 51156
b = 197316
c = 1624
Group Variance = 2836.35
Z-Score = 3.68024
Comparison Level at 95% confidence level = 1.65463 (upward trend)
**3.68024 > 1.65463 indicating an upward trend**

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RW12-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 9090 | 11400 | -2310 | 0 | 1 |
| 5090 | 11400 | -6310 | 0 | 2 |
| 3980 | 11400 | -7420 | 0 | 3 |
| 3790 | 11400 | -7610 | 0 | 4 |
| 235000 ML | 11400 | 223600 | 1 | 4 |
| 2980 | 11400 | -8420 | 1 | 5 |
| 10100 | 11400 | -1300 | 1 | 6 |
| 10600 | 11400 | -800 | 1 | 7 |
| 2900 | 11400 | -8500 | 1 | 8 |
| 1140 | 11400 | -10260 | 1 | 9 |
| 5360 | 11400 | -6040 | 1 | 10 |
| 4640 | 11400 | -6760 | 1 | 11 |
| 1550 | 11400 | -9850 | 1 | 12 |
| 5870 | 11400 | -5530 | 1 | 13 |
| 5390 | 11400 | -6010 | 1 | 14 |
| 763 | 11400 | -10637 | 1 | 15 |
| 4660 | 11400 | -6740 | 1 | 16 |
| 4960 | 11400 | -6440 | 1 | 17 |
| 12400 R1M1 | 11400 | 1000 | 2 | 17 |
| 21800 | 11400 | 10400 | 3 | 17 |
| 20890 | 11400 | 9490 | 4 | 17 |
| 19360 | 11400 | 7960 | 5 | 17 |
| 6243 | 11400 | -5157 | 5 | 18 |
| 5627 | 11400 | -5773 | 5 | 19 |
| | | | | |
| 5090 | 9090 | -4000 | 5 | 20 |
| 3980 | 9090 | -5110 | 5 | 21 |
| 3790 | 9090 | -5300 | 5 | 22 |
| 235000 ML | 9090 | 225910 | 6 | 22 |
| 2980 | 9090 | -6110 | 6 | 23 |
| 10100 | 9090 | 1010 | 7 | 23 |
| 10600 | 9090 | 1510 | 8 | 23 |
| 2900 | 9090 | -6190 | 8 | 24 |
| 1140 | 9090 | -7950 | 8 | 25 |
| 5360 | 9090 | -3730 | 8 | 26 |
| 4640 | 9090 | -4450 | 8 | 27 |
| 1550 | 9090 | -7540 | 8 | 28 |
| 5870 | 9090 | -3220 | 8 | 29 |
| 5390 | 9090 | -3700 | 8 | 30 |
| 763 | 9090 | -8327 | 8 | 31 |
| 4660 | 9090 | -4430 | 8 | 32 |
| 4960 | 9090 | -4130 | 8 | 33 |
| 12400 R1M1 | 9090 | 3310 | 9 | 33 |
| 21800 | 9090 | 12710 | 10 | 33 |
| 20890 | 9090 | 11800 | 11 | 33 |
| 19360 | 9090 | 10270 | 12 | 33 |
| 6243 | 9090 | -2847 | 12 | 34 |

| | | | | |
|---|---|---|---|---|
| 5627 | 9090 | -3463 | 12 | 35 |
| | | | | |
| 3980 | 5090 | -1110 | 12 | 36 |
| 3790 | 5090 | -1300 | 12 | 37 |
| 235000 ML | 5090 | 229910 | 13 | 37 |
| 2980 | 5090 | -2110 | 13 | 38 |
| 10100 | 5090 | 5010 | 14 | 38 |
| 10600 | 5090 | 5510 | 15 | 38 |
| 2900 | 5090 | -2190 | 15 | 39 |
| 1140 | 5090 | -3950 | 15 | 40 |
| 5360 | 5090 | 270 | 16 | 40 |
| 4640 | 5090 | -450 | 16 | 41 |
| 1550 | 5090 | -3540 | 16 | 42 |
| 5870 | 5090 | 780 | 17 | 42 |
| 5390 | 5090 | 300 | 18 | 42 |
| 763 | 5090 | -4327 | 18 | 43 |
| 4660 | 5090 | -430 | 18 | 44 |
| 4960 | 5090 | -130 | 18 | 45 |
| 12400 R1M1 | 5090 | 7310 | 19 | 45 |
| 21800 | 5090 | 16710 | 20 | 45 |
| 20890 | 5090 | 15800 | 21 | 45 |
| 19360 | 5090 | 14270 | 22 | 45 |
| 6243 | 5090 | 1153 | 23 | 45 |
| 5627 | 5090 | 537 | 24 | 45 |
| | | | | |
| 3790 | 3980 | -190 | 24 | 46 |
| 235000 ML | 3980 | 231020 | 25 | 46 |
| 2980 | 3980 | -1000 | 25 | 47 |
| 10100 | 3980 | 6120 | 26 | 47 |
| 10600 | 3980 | 6620 | 27 | 47 |
| 2900 | 3980 | -1080 | 27 | 48 |
| 1140 | 3980 | -2840 | 27 | 49 |
| 5360 | 3980 | 1380 | 28 | 49 |
| 4640 | 3980 | 660 | 29 | 49 |
| 1550 | 3980 | -2430 | 29 | 50 |
| 5870 | 3980 | 1890 | 30 | 50 |
| 5390 | 3980 | 1410 | 31 | 50 |
| 763 | 3980 | -3217 | 31 | 51 |
| 4660 | 3980 | 680 | 32 | 51 |
| 4960 | 3980 | 980 | 33 | 51 |
| 12400 R1M1 | 3980 | 8420 | 34 | 51 |
| 21800 | 3980 | 17820 | 35 | 51 |
| 20890 | 3980 | 16910 | 36 | 51 |
| 19360 | 3980 | 15380 | 37 | 51 |
| 6243 | 3980 | 2263 | 38 | 51 |
| 5627 | 3980 | 1647 | 39 | 51 |
| | | | | |
| 235000 ML | 3790 | 231210 | 40 | 51 |
| 2980 | 3790 | -810 | 40 | 52 |
| 10100 | 3790 | 6310 | 41 | 52 |
| 10600 | 3790 | 6810 | 42 | 52 |
| 2900 | 3790 | -890 | 42 | 53 |
| 1140 | 3790 | -2650 | 42 | 54 |
| 5360 | 3790 | 1570 | 43 | 54 |
| 4640 | 3790 | 850 | 44 | 54 |
| 1550 | 3790 | -2240 | 44 | 55 |
| 5870 | 3790 | 2080 | 45 | 55 |

| | | | | |
|---|---|---|---|---|
| 5390 | 3790 | 1600 | 46 | 55 |
| 763 | 3790 | -3027 | 46 | 56 |
| 4660 | 3790 | 870 | 47 | 56 |
| 4960 | 3790 | 1170 | 48 | 56 |
| 12400 R1M1 | 3790 | 8610 | 49 | 56 |
| 21800 | 3790 | 18010 | 50 | 56 |
| 20890 | 3790 | 17100 | 51 | 56 |
| 19360 | 3790 | 15570 | 52 | 56 |
| 6243 | 3790 | 2453 | 53 | 56 |
| 5627 | 3790 | 1837 | 54 | 56 |
| | | | | |
| 2980 | 235000 ML | -232020 | 54 | 57 |
| 10100 | 235000 ML | -224900 | 54 | 58 |
| 10600 | 235000 ML | -224400 | 54 | 59 |
| 2900 | 235000 ML | -232100 | 54 | 60 |
| 1140 | 235000 ML | -233860 | 54 | 61 |
| 5360 | 235000 ML | -229640 | 54 | 62 |
| 4640 | 235000 ML | -230360 | 54 | 63 |
| 1550 | 235000 ML | -233450 | 54 | 64 |
| 5870 | 235000 ML | -229130 | 54 | 65 |
| 5390 | 235000 ML | -229610 | 54 | 66 |
| 763 | 235000 ML | -234237 | 54 | 67 |
| 4660 | 235000 ML | -230340 | 54 | 68 |
| 4960 | 235000 ML | -230040 | 54 | 69 |
| 12400 R1M1 | 235000 ML | -222600 | 54 | 70 |
| 21800 | 235000 ML | -213200 | 54 | 71 |
| 20890 | 235000 ML | -214110 | 54 | 72 |
| 19360 | 235000 ML | -215640 | 54 | 73 |
| 6243 | 235000 ML | -228757 | 54 | 74 |
| 5627 | 235000 ML | -229373 | 54 | 75 |
| | | | | |
| 10100 | 2980 | 7120 | 55 | 75 |
| 10600 | 2980 | 7620 | 56 | 75 |
| 2900 | 2980 | -80 | 56 | 76 |
| 1140 | 2980 | -1840 | 56 | 77 |
| 5360 | 2980 | 2380 | 57 | 77 |
| 4640 | 2980 | 1660 | 58 | 77 |
| 1550 | 2980 | -1430 | 58 | 78 |
| 5870 | 2980 | 2890 | 59 | 78 |
| 5390 | 2980 | 2410 | 60 | 78 |
| 763 | 2980 | -2217 | 60 | 79 |
| 4660 | 2980 | 1680 | 61 | 79 |
| 4960 | 2980 | 1980 | 62 | 79 |
| 12400 R1M1 | 2980 | 9420 | 63 | 79 |
| 21800 | 2980 | 18820 | 64 | 79 |
| 20890 | 2980 | 17910 | 65 | 79 |
| 19360 | 2980 | 16380 | 66 | 79 |
| 6243 | 2980 | 3263 | 67 | 79 |
| 5627 | 2980 | 2647 | 68 | 79 |
| | | | | |
| 10600 | 10100 | 500 | 69 | 79 |
| 2900 | 10100 | -7200 | 69 | 80 |
| 1140 | 10100 | -8960 | 69 | 81 |
| 5360 | 10100 | -4740 | 69 | 82 |
| 4640 | 10100 | -5460 | 69 | 83 |
| 1550 | 10100 | -8550 | 69 | 84 |
| 5870 | 10100 | -4230 | 69 | 85 |

| | | | | |
|---|---|---|---|---|
| 5390 | 10100 | -4710 | 69 | 86 |
| 763 | 10100 | -9337 | 69 | 87 |
| 4660 | 10100 | -5440 | 69 | 88 |
| 4960 | 10100 | -5140 | 69 | 89 |
| 12400 R1M1 | 10100 | 2300 | 70 | 89 |
| 21800 | 10100 | 11700 | 71 | 89 |
| 20890 | 10100 | 10790 | 72 | 89 |
| 19360 | 10100 | 9260 | 73 | 89 |
| 6243 | 10100 | -3857 | 73 | 90 |
| 5627 | 10100 | -4473 | 73 | 91 |
| | | | | |
| 2900 | 10600 | -7700 | 73 | 92 |
| 1140 | 10600 | -9460 | 73 | 93 |
| 5360 | 10600 | -5240 | 73 | 94 |
| 4640 | 10600 | -5960 | 73 | 95 |
| 1550 | 10600 | -9050 | 73 | 96 |
| 5870 | 10600 | -4730 | 73 | 97 |
| 5390 | 10600 | -5210 | 73 | 98 |
| 763 | 10600 | -9837 | 73 | 99 |
| 4660 | 10600 | -5940 | 73 | 100 |
| 4960 | 10600 | -5640 | 73 | 101 |
| 12400 R1M1 | 10600 | 1800 | 74 | 101 |
| 21800 | 10600 | 11200 | 75 | 101 |
| 20890 | 10600 | 10290 | 76 | 101 |
| 19360 | 10600 | 8760 | 77 | 101 |
| 6243 | 10600 | -4357 | 77 | 102 |
| 5627 | 10600 | -4973 | 77 | 103 |
| | | | | |
| 1140 | 2900 | -1760 | 77 | 104 |
| 5360 | 2900 | 2460 | 78 | 104 |
| 4640 | 2900 | 1740 | 79 | 104 |
| 1550 | 2900 | -1350 | 79 | 105 |
| 5870 | 2900 | 2970 | 80 | 105 |
| 5390 | 2900 | 2490 | 81 | 105 |
| 763 | 2900 | -2137 | 81 | 106 |
| 4660 | 2900 | 1760 | 82 | 106 |
| 4960 | 2900 | 2060 | 83 | 106 |
| 12400 R1M1 | 2900 | 9500 | 84 | 106 |
| 21800 | 2900 | 18900 | 85 | 106 |
| 20890 | 2900 | 17990 | 86 | 106 |
| 19360 | 2900 | 16460 | 87 | 106 |
| 6243 | 2900 | 3343 | 88 | 106 |
| 5627 | 2900 | 2727 | 89 | 106 |
| | | | | |
| 5360 | 1140 | 4220 | 90 | 106 |
| 4640 | 1140 | 3500 | 91 | 106 |
| 1550 | 1140 | 410 | 92 | 106 |
| 5870 | 1140 | 4730 | 93 | 106 |
| 5390 | 1140 | 4250 | 94 | 106 |
| 763 | 1140 | -377 | 94 | 107 |
| 4660 | 1140 | 3520 | 95 | 107 |
| 4960 | 1140 | 3820 | 96 | 107 |
| 12400 R1M1 | 1140 | 11260 | 97 | 107 |
| 21800 | 1140 | 20660 | 98 | 107 |
| 20890 | 1140 | 19750 | 99 | 107 |
| 19360 | 1140 | 18220 | 100 | 107 |
| 6243 | 1140 | 5103 | 101 | 107 |

| | | | | |
|---|---|---|---|---|
| 5627 | 1140 | 4487 | 102 | 107 |
| | | | | |
| 4640 | 5360 | Same Date | 102 | 107 |
| 1550 | 5360 | -3810 | 102 | 108 |
| 5870 | 5360 | 510 | 103 | 108 |
| 5390 | 5360 | 30 | 104 | 108 |
| 763 | 5360 | -4597 | 104 | 109 |
| 4660 | 5360 | -700 | 104 | 110 |
| 4960 | 5360 | -400 | 104 | 111 |
| 12400 R1M1 | 5360 | 7040 | 105 | 111 |
| 21800 | 5360 | 16440 | 106 | 111 |
| 20890 | 5360 | 15530 | 107 | 111 |
| 19360 | 5360 | 14000 | 108 | 111 |
| 6243 | 5360 | 883 | 109 | 111 |
| 5627 | 5360 | 267 | 110 | 111 |
| | | | | |
| 1550 | 4640 | -3090 | 110 | 112 |
| 5870 | 4640 | 1230 | 111 | 112 |
| 5390 | 4640 | 750 | 112 | 112 |
| 763 | 4640 | -3877 | 112 | 113 |
| 4660 | 4640 | 20 | 113 | 113 |
| 4960 | 4640 | 320 | 114 | 113 |
| 12400 R1M1 | 4640 | 7760 | 115 | 113 |
| 21800 | 4640 | 17160 | 116 | 113 |
| 20890 | 4640 | 16250 | 117 | 113 |
| 19360 | 4640 | 14720 | 118 | 113 |
| 6243 | 4640 | 1603 | 119 | 113 |
| 5627 | 4640 | 987 | 120 | 113 |
| | | | | |
| 5870 | 1550 | Same Date | 120 | 113 |
| 5390 | 1550 | 3840 | 121 | 113 |
| 763 | 1550 | -787 | 121 | 114 |
| 4660 | 1550 | 3110 | 122 | 114 |
| 4960 | 1550 | 3410 | 123 | 114 |
| 12400 R1M1 | 1550 | 10850 | 124 | 114 |
| 21800 | 1550 | 20250 | 125 | 114 |
| 20890 | 1550 | 19340 | 126 | 114 |
| 19360 | 1550 | 17810 | 127 | 114 |
| 6243 | 1550 | 4693 | 128 | 114 |
| 5627 | 1550 | 4077 | 129 | 114 |
| | | | | |
| 5390 | 5870 | -480 | 129 | 115 |
| 763 | 5870 | -5107 | 129 | 116 |
| 4660 | 5870 | -1210 | 129 | 117 |
| 4960 | 5870 | -910 | 129 | 118 |
| 12400 R1M1 | 5870 | 6530 | 130 | 118 |
| 21800 | 5870 | 15930 | 131 | 118 |
| 20890 | 5870 | 15020 | 132 | 118 |
| 19360 | 5870 | 13490 | 133 | 118 |
| 6243 | 5870 | 373 | 134 | 118 |
| 5627 | 5870 | -243 | 134 | 119 |
| | | | | |
| 763 | 5390 | -4627 | 134 | 120 |
| 4660 | 5390 | -730 | 134 | 121 |
| 4960 | 5390 | -430 | 134 | 122 |
| 12400 R1M1 | 5390 | 7010 | 135 | 122 |
| 21800 | 5390 | 16410 | 136 | 122 |

| | | | | |
|---|---|---|---|---|
| 20890 | 5390 | 15500 | 137 | 122 |
| 19360 | 5390 | 13970 | 138 | 122 |
| 6243 | 5390 | 853 | 139 | 122 |
| 5627 | 5390 | 237 | 140 | 122 |
| | | | | |
| 4660 | 763 | 3897 | 141 | 122 |
| 4960 | 763 | 4197 | 142 | 122 |
| 12400 R1M1 | 763 | 11637 | 143 | 122 |
| 21800 | 763 | 21037 | 144 | 122 |
| 20890 | 763 | 20127 | 145 | 122 |
| 19360 | 763 | 18597 | 146 | 122 |
| 6243 | 763 | 5480 | 147 | 122 |
| 5627 | 763 | 4864 | 148 | 122 |
| | | | | |
| 4960 | 4660 | 300 | 149 | 122 |
| 12400 R1M1 | 4660 | 7740 | 150 | 122 |
| 21800 | 4660 | 17140 | 151 | 122 |
| 20890 | 4660 | 16230 | 152 | 122 |
| 19360 | 4660 | 14700 | 153 | 122 |
| 6243 | 4660 | 1583 | 154 | 122 |
| 5627 | 4660 | 967 | 155 | 122 |
| | | | | |
| 12400 R1M1 | 4960 | 7440 | 156 | 122 |
| 21800 | 4960 | 16840 | 157 | 122 |
| 20890 | 4960 | 15930 | 158 | 122 |
| 19360 | 4960 | 14400 | 159 | 122 |
| 6243 | 4960 | 1283 | 160 | 122 |
| 5627 | 4960 | 667 | 161 | 122 |
| | | | | |
| 21800 | 12400 R1M1 | 9400 | 162 | 122 |
| 20890 | 12400 R1M1 | 8490 | 163 | 122 |
| 19360 | 12400 R1M1 | 6960 | 164 | 122 |
| 6243 | 12400 R1M1 | -6157 | 164 | 123 |
| 5627 | 12400 R1M1 | -6773 | 164 | 124 |
| | | | | |
| 20890 | 21800 | -910 | 164 | 125 |
| 19360 | 21800 | -2440 | 164 | 126 |
| 6243 | 21800 | -15557 | 164 | 127 |
| 5627 | 21800 | -16173 | 164 | 128 |
| | | | | |
| 19360 | 20890 | -1530 | 164 | 129 |
| 6243 | 20890 | -14647 | 164 | 130 |
| 5627 | 20890 | -15263 | 164 | 131 |
| | | | | |
| 6243 | 19360 | -13117 | 164 | 132 |
| 5627 | 19360 | -13733 | 164 | 133 |
| | | | | |
| 5627 | 6243 | -616 | 164 | 134 |

S Statistic = 164 - 134 = 30

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 6/1/2017 | 1 |
| 7/1/2017 | 1 |

| | |
|---|---|
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 6/1/2020 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 2 time periods with multiple data

---

A = 0
B = 36
C = 0
D = 0
E = 0
F = 4
a = 33000
b = 124200
c = 1200
Group Variance = 1831.33
Z-Score = 0.677664
Comparison Level at 95% confidence level = 1.65463 (upward trend)
0.677664 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RW14-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 42000 | 12200 MH | 29800 | 1 | 0 |
| 43500 | 12200 MH | 31300 | 2 | 0 |
| 28900 | 12200 MH | 16700 | 3 | 0 |
| 28100 | 12200 MH | 15900 | 4 | 0 |
| 49200 | 12200 MH | 37000 | 5 | 0 |
| 61800 | 12200 MH | 49600 | 6 | 0 |
| 62100 | 12200 MH | 49900 | 7 | 0 |
| 64100 | 12200 MH | 51900 | 8 | 0 |
| 80100 | 12200 MH | 67900 | 9 | 0 |
| 65700 | 12200 MH | 53500 | 10 | 0 |
| 65500 | 12200 MH | 53300 | 11 | 0 |
| 69600 | 12200 MH | 57400 | 12 | 0 |
| 73600 | 12200 MH | 61400 | 13 | 0 |
| 70500 | 12200 MH | 58300 | 14 | 0 |
| 77500 | 12200 MH | 65300 | 15 | 0 |
| 70800 | 12200 MH | 58600 | 16 | 0 |
| 71900 | 12200 MH | 59700 | 17 | 0 |
| 56600 1c | 12200 MH | 44400 | 18 | 0 |
| 50200 1c | 12200 MH | 38000 | 19 | 0 |
| | | | | |
| 43500 | 42000 | 1500 | 20 | 0 |
| 28900 | 42000 | -13100 | 20 | 1 |
| 28100 | 42000 | -13900 | 20 | 2 |
| 49200 | 42000 | 7200 | 21 | 2 |
| 61800 | 42000 | 19800 | 22 | 2 |
| 62100 | 42000 | 20100 | 23 | 2 |
| 64100 | 42000 | 22100 | 24 | 2 |
| 80100 | 42000 | 38100 | 25 | 2 |
| 65700 | 42000 | 23700 | 26 | 2 |
| 65500 | 42000 | 23500 | 27 | 2 |
| 69600 | 42000 | 27600 | 28 | 2 |
| 73600 | 42000 | 31600 | 29 | 2 |
| 70500 | 42000 | 28500 | 30 | 2 |
| 77500 | 42000 | 35500 | 31 | 2 |
| 70800 | 42000 | 28800 | 32 | 2 |
| 71900 | 42000 | 29900 | 33 | 2 |
| 56600 1c | 42000 | 14600 | 34 | 2 |
| 50200 1c | 42000 | 8200 | 35 | 2 |
| | | | | |
| 28900 | 43500 | -14600 | 35 | 3 |
| 28100 | 43500 | -15400 | 35 | 4 |
| 49200 | 43500 | 5700 | 36 | 4 |
| 61800 | 43500 | 18300 | 37 | 4 |
| 62100 | 43500 | 18600 | 38 | 4 |
| 64100 | 43500 | 20600 | 39 | 4 |
| 80100 | 43500 | 36600 | 40 | 4 |
| 65700 | 43500 | 22200 | 41 | 4 |

| | | | | |
|---|---|---|---|---|
| 65500 | 43500 | 22000 | 42 | 4 |
| 69600 | 43500 | 26100 | 43 | 4 |
| 73600 | 43500 | 30100 | 44 | 4 |
| 70500 | 43500 | 27000 | 45 | 4 |
| 77500 | 43500 | 34000 | 46 | 4 |
| 70800 | 43500 | 27300 | 47 | 4 |
| 71900 | 43500 | 28400 | 48 | 4 |
| 56600 1c | 43500 | 13100 | 49 | 4 |
| 50200 1c | 43500 | 6700 | 50 | 4 |
| | | | | |
| 28100 | 28900 | -800 | 50 | 5 |
| 49200 | 28900 | 20300 | 51 | 5 |
| 61800 | 28900 | 32900 | 52 | 5 |
| 62100 | 28900 | 33200 | 53 | 5 |
| 64100 | 28900 | 35200 | 54 | 5 |
| 80100 | 28900 | 51200 | 55 | 5 |
| 65700 | 28900 | 36800 | 56 | 5 |
| 65500 | 28900 | 36600 | 57 | 5 |
| 69600 | 28900 | 40700 | 58 | 5 |
| 73600 | 28900 | 44700 | 59 | 5 |
| 70500 | 28900 | 41600 | 60 | 5 |
| 77500 | 28900 | 48600 | 61 | 5 |
| 70800 | 28900 | 41900 | 62 | 5 |
| 71900 | 28900 | 43000 | 63 | 5 |
| 56600 1c | 28900 | 27700 | 64 | 5 |
| 50200 1c | 28900 | 21300 | 65 | 5 |
| | | | | |
| 49200 | 28100 | 21100 | 66 | 5 |
| 61800 | 28100 | 33700 | 67 | 5 |
| 62100 | 28100 | 34000 | 68 | 5 |
| 64100 | 28100 | 36000 | 69 | 5 |
| 80100 | 28100 | 52000 | 70 | 5 |
| 65700 | 28100 | 37600 | 71 | 5 |
| 65500 | 28100 | 37400 | 72 | 5 |
| 69600 | 28100 | 41500 | 73 | 5 |
| 73600 | 28100 | 45500 | 74 | 5 |
| 70500 | 28100 | 42400 | 75 | 5 |
| 77500 | 28100 | 49400 | 76 | 5 |
| 70800 | 28100 | 42700 | 77 | 5 |
| 71900 | 28100 | 43800 | 78 | 5 |
| 56600 1c | 28100 | 28500 | 79 | 5 |
| 50200 1c | 28100 | 22100 | 80 | 5 |
| | | | | |
| 61800 | 49200 | 12600 | 81 | 5 |
| 62100 | 49200 | 12900 | 82 | 5 |
| 64100 | 49200 | 14900 | 83 | 5 |
| 80100 | 49200 | 30900 | 84 | 5 |
| 65700 | 49200 | 16500 | 85 | 5 |
| 65500 | 49200 | 16300 | 86 | 5 |
| 69600 | 49200 | 20400 | 87 | 5 |
| 73600 | 49200 | 24400 | 88 | 5 |
| 70500 | 49200 | 21300 | 89 | 5 |
| 77500 | 49200 | 28300 | 90 | 5 |
| 70800 | 49200 | 21600 | 91 | 5 |
| 71900 | 49200 | 22700 | 92 | 5 |
| 56600 1c | 49200 | 7400 | 93 | 5 |
| 50200 1c | 49200 | 1000 | 94 | 5 |

| | | | | |
|---|---|---|---|---|
| 62100 | 61800 | 300 | 95 | 5 |
| 64100 | 61800 | 2300 | 96 | 5 |
| 80100 | 61800 | 18300 | 97 | 5 |
| 65700 | 61800 | 3900 | 98 | 5 |
| 65500 | 61800 | 3700 | 99 | 5 |
| 69600 | 61800 | 7800 | 100 | 5 |
| 73600 | 61800 | 11800 | 101 | 5 |
| 70500 | 61800 | 8700 | 102 | 5 |
| 77500 | 61800 | 15700 | 103 | 5 |
| 70800 | 61800 | 9000 | 104 | 5 |
| 71900 | 61800 | 10100 | 105 | 5 |
| 56600 1c | 61800 | -5200 | 105 | 6 |
| 50200 1c | 61800 | -11600 | 105 | 7 |
| | | | | |
| 64100 | 62100 | 2000 | 106 | 7 |
| 80100 | 62100 | 18000 | 107 | 7 |
| 65700 | 62100 | 3600 | 108 | 7 |
| 65500 | 62100 | 3400 | 109 | 7 |
| 69600 | 62100 | 7500 | 110 | 7 |
| 73600 | 62100 | 11500 | 111 | 7 |
| 70500 | 62100 | 8400 | 112 | 7 |
| 77500 | 62100 | 15400 | 113 | 7 |
| 70800 | 62100 | 8700 | 114 | 7 |
| 71900 | 62100 | 9800 | 115 | 7 |
| 56600 1c | 62100 | -5500 | 115 | 8 |
| 50200 1c | 62100 | -11900 | 115 | 9 |
| | | | | |
| 80100 | 64100 | 16000 | 116 | 9 |
| 65700 | 64100 | 1600 | 117 | 9 |
| 65500 | 64100 | 1400 | 118 | 9 |
| 69600 | 64100 | 5500 | 119 | 9 |
| 73600 | 64100 | 9500 | 120 | 9 |
| 70500 | 64100 | 6400 | 121 | 9 |
| 77500 | 64100 | 13400 | 122 | 9 |
| 70800 | 64100 | 6700 | 123 | 9 |
| 71900 | 64100 | 7800 | 124 | 9 |
| 56600 1c | 64100 | -7500 | 124 | 10 |
| 50200 1c | 64100 | -13900 | 124 | 11 |
| | | | | |
| 65700 | 80100 | -14400 | 124 | 12 |
| 65500 | 80100 | -14600 | 124 | 13 |
| 69600 | 80100 | -10500 | 124 | 14 |
| 73600 | 80100 | -6500 | 124 | 15 |
| 70500 | 80100 | -9600 | 124 | 16 |
| 77500 | 80100 | -2600 | 124 | 17 |
| 70800 | 80100 | -9300 | 124 | 18 |
| 71900 | 80100 | -8200 | 124 | 19 |
| 56600 1c | 80100 | -23500 | 124 | 20 |
| 50200 1c | 80100 | -29900 | 124 | 21 |
| | | | | |
| 65500 | 65700 | Same Date | 124 | 21 |
| 69600 | 65700 | 3900 | 125 | 21 |
| 73600 | 65700 | 7900 | 126 | 21 |
| 70500 | 65700 | 4800 | 127 | 21 |
| 77500 | 65700 | 11800 | 128 | 21 |
| 70800 | 65700 | 5100 | 129 | 21 |

| | | | | |
|---|---|---|---|---|
| 71900 | 65700 | 6200 | 130 | 21 |
| 56600 1c | 65700 | -9100 | 130 | 22 |
| 50200 1c | 65700 | -15500 | 130 | 23 |
| | | | | |
| 69600 | 65500 | 4100 | 131 | 23 |
| 73600 | 65500 | 8100 | 132 | 23 |
| 70500 | 65500 | 5000 | 133 | 23 |
| 77500 | 65500 | 12000 | 134 | 23 |
| 70800 | 65500 | 5300 | 135 | 23 |
| 71900 | 65500 | 6400 | 136 | 23 |
| 56600 1c | 65500 | -8900 | 136 | 24 |
| 50200 1c | 65500 | -15300 | 136 | 25 |
| | | | | |
| 73600 | 69600 | Same Date | 136 | 25 |
| 70500 | 69600 | 900 | 137 | 25 |
| 77500 | 69600 | 7900 | 138 | 25 |
| 70800 | 69600 | 1200 | 139 | 25 |
| 71900 | 69600 | 2300 | 140 | 25 |
| 56600 1c | 69600 | -13000 | 140 | 26 |
| 50200 1c | 69600 | -19400 | 140 | 27 |
| | | | | |
| 70500 | 73600 | -3100 | 140 | 28 |
| 77500 | 73600 | 3900 | 141 | 28 |
| 70800 | 73600 | -2800 | 141 | 29 |
| 71900 | 73600 | -1700 | 141 | 30 |
| 56600 1c | 73600 | -17000 | 141 | 31 |
| 50200 1c | 73600 | -23400 | 141 | 32 |
| | | | | |
| 77500 | 70500 | 7000 | 142 | 32 |
| 70800 | 70500 | 300 | 143 | 32 |
| 71900 | 70500 | 1400 | 144 | 32 |
| 56600 1c | 70500 | -13900 | 144 | 33 |
| 50200 1c | 70500 | -20300 | 144 | 34 |
| | | | | |
| 70800 | 77500 | -6700 | 144 | 35 |
| 71900 | 77500 | -5600 | 144 | 36 |
| 56600 1c | 77500 | -20900 | 144 | 37 |
| 50200 1c | 77500 | -27300 | 144 | 38 |
| | | | | |
| 71900 | 70800 | 1100 | 145 | 38 |
| 56600 1c | 70800 | -14200 | 145 | 39 |
| 50200 1c | 70800 | -20600 | 145 | 40 |
| | | | | |
| 56600 1c | 71900 | -15300 | 145 | 41 |
| 50200 1c | 71900 | -21700 | 145 | 42 |
| | | | | |
| 50200 1c | 56600 1c | -6400 | 145 | 43 |

S Statistic = 145 - 43 = 102

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 6/1/2017 | 1 |
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |

| | |
|---|---|
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |

There are 2 time periods with multiple data

---

A = 0
B = 36
C = 0
D = 0
E = 0
F = 4
a = 17100
b = 61560
c = 760
Group Variance = 948
Z-Score = 3.28033
Comparison Level at 95% confidence level = 1.65463 (upward trend)
**3.28033 > 1.65463 indicating an upward trend**

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RW15-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 1080 | 276 | 804 | 1 | 0 |
| 900 | 276 | 624 | 2 | 0 |
| 8800 | 276 | 8524 | 3 | 0 |
| 7630 | 276 | 7354 | 4 | 0 |
| 5150 | 276 | 4874 | 5 | 0 |
| 5940 | 276 | 5664 | 6 | 0 |
| 1320 | 276 | 1044 | 7 | 0 |
| 2950 | 276 | 2674 | 8 | 0 |
| 499 | 276 | 223 | 9 | 0 |
| 1060 | 276 | 784 | 10 | 0 |
| 766 | 276 | 490 | 11 | 0 |
| 684 | 276 | 408 | 12 | 0 |
| 134 | 276 | -142 | 12 | 1 |
| 378 | 276 | 102 | 13 | 1 |
| 105 | 276 | -171 | 13 | 2 |
| 2.7 J | 276 | -273.3 | 13 | 3 |
| 9.4 J1c | 276 | -266.6 | 13 | 4 |
| 3.3 J1c | 276 | -272.7 | 13 | 5 |
| | | | | |
| 900 | 1080 | -180 | 13 | 6 |
| 8800 | 1080 | 7720 | 14 | 6 |
| 7630 | 1080 | 6550 | 15 | 6 |
| 5150 | 1080 | 4070 | 16 | 6 |
| 5940 | 1080 | 4860 | 17 | 6 |
| 1320 | 1080 | 240 | 18 | 6 |
| 2950 | 1080 | 1870 | 19 | 6 |
| 499 | 1080 | -581 | 19 | 7 |
| 1060 | 1080 | -20 | 19 | 8 |
| 766 | 1080 | -314 | 19 | 9 |
| 684 | 1080 | -396 | 19 | 10 |
| 134 | 1080 | -946 | 19 | 11 |
| 378 | 1080 | -702 | 19 | 12 |
| 105 | 1080 | -975 | 19 | 13 |
| 2.7 J | 1080 | -1077.3 | 19 | 14 |
| 9.4 J1c | 1080 | -1070.6 | 19 | 15 |
| 3.3 J1c | 1080 | -1076.7 | 19 | 16 |
| | | | | |
| 8800 | 900 | 7900 | 20 | 16 |
| 7630 | 900 | 6730 | 21 | 16 |
| 5150 | 900 | 4250 | 22 | 16 |
| 5940 | 900 | 5040 | 23 | 16 |
| 1320 | 900 | 420 | 24 | 16 |
| 2950 | 900 | 2050 | 25 | 16 |
| 499 | 900 | -401 | 25 | 17 |
| 1060 | 900 | 160 | 26 | 17 |
| 766 | 900 | -134 | 26 | 18 |
| 684 | 900 | -216 | 26 | 19 |

| | | | | |
|---|---|---|---|---|
| 134 | 900 | -766 | 26 | 20 |
| 378 | 900 | -522 | 26 | 21 |
| 105 | 900 | -795 | 26 | 22 |
| 2.7 J | 900 | -897.3 | 26 | 23 |
| 9.4 J1c | 900 | -890.6 | 26 | 24 |
| 3.3 J1c | 900 | -896.7 | 26 | 25 |
| | | | | |
| 7630 | 8800 | -1170 | 26 | 26 |
| 5150 | 8800 | -3650 | 26 | 27 |
| 5940 | 8800 | -2860 | 26 | 28 |
| 1320 | 8800 | -7480 | 26 | 29 |
| 2950 | 8800 | -5850 | 26 | 30 |
| 499 | 8800 | -8301 | 26 | 31 |
| 1060 | 8800 | -7740 | 26 | 32 |
| 766 | 8800 | -8034 | 26 | 33 |
| 684 | 8800 | -8116 | 26 | 34 |
| 134 | 8800 | -8666 | 26 | 35 |
| 378 | 8800 | -8422 | 26 | 36 |
| 105 | 8800 | -8695 | 26 | 37 |
| 2.7 J | 8800 | -8797.3 | 26 | 38 |
| 9.4 J1c | 8800 | -8790.6 | 26 | 39 |
| 3.3 J1c | 8800 | -8796.7 | 26 | 40 |
| | | | | |
| 5150 | 7630 | -2480 | 26 | 41 |
| 5940 | 7630 | -1690 | 26 | 42 |
| 1320 | 7630 | -6310 | 26 | 43 |
| 2950 | 7630 | -4680 | 26 | 44 |
| 499 | 7630 | -7131 | 26 | 45 |
| 1060 | 7630 | -6570 | 26 | 46 |
| 766 | 7630 | -6864 | 26 | 47 |
| 684 | 7630 | -6946 | 26 | 48 |
| 134 | 7630 | -7496 | 26 | 49 |
| 378 | 7630 | -7252 | 26 | 50 |
| 105 | 7630 | -7525 | 26 | 51 |
| 2.7 J | 7630 | -7627.3 | 26 | 52 |
| 9.4 J1c | 7630 | -7620.6 | 26 | 53 |
| 3.3 J1c | 7630 | -7626.7 | 26 | 54 |
| | | | | |
| 5940 | 5150 | 790 | 27 | 54 |
| 1320 | 5150 | -3830 | 27 | 55 |
| 2950 | 5150 | -2200 | 27 | 56 |
| 499 | 5150 | -4651 | 27 | 57 |
| 1060 | 5150 | -4090 | 27 | 58 |
| 766 | 5150 | -4384 | 27 | 59 |
| 684 | 5150 | -4466 | 27 | 60 |
| 134 | 5150 | -5016 | 27 | 61 |
| 378 | 5150 | -4772 | 27 | 62 |
| 105 | 5150 | -5045 | 27 | 63 |
| 2.7 J | 5150 | -5147.3 | 27 | 64 |
| 9.4 J1c | 5150 | -5140.6 | 27 | 65 |
| 3.3 J1c | 5150 | -5146.7 | 27 | 66 |
| | | | | |
| 1320 | 5940 | -4620 | 27 | 67 |
| 2950 | 5940 | -2990 | 27 | 68 |
| 499 | 5940 | -5441 | 27 | 69 |
| 1060 | 5940 | -4880 | 27 | 70 |
| 766 | 5940 | -5174 | 27 | 71 |

| | | | | |
|---|---|---|---|---|
| 684 | 5940 | -5256 | 27 | 72 |
| 134 | 5940 | -5806 | 27 | 73 |
| 378 | 5940 | -5562 | 27 | 74 |
| 105 | 5940 | -5835 | 27 | 75 |
| 2.7 J | 5940 | -5937.3 | 27 | 76 |
| 9.4 J1c | 5940 | -5930.6 | 27 | 77 |
| 3.3 J1c | 5940 | -5936.7 | 27 | 78 |
| | | | | |
| 2950 | 1320 | 1630 | 28 | 78 |
| 499 | 1320 | -821 | 28 | 79 |
| 1060 | 1320 | -260 | 28 | 80 |
| 766 | 1320 | -554 | 28 | 81 |
| 684 | 1320 | -636 | 28 | 82 |
| 134 | 1320 | -1186 | 28 | 83 |
| 378 | 1320 | -942 | 28 | 84 |
| 105 | 1320 | -1215 | 28 | 85 |
| 2.7 J | 1320 | -1317.3 | 28 | 86 |
| 9.4 J1c | 1320 | -1310.6 | 28 | 87 |
| 3.3 J1c | 1320 | -1316.7 | 28 | 88 |
| | | | | |
| 499 | 2950 | -2451 | 28 | 89 |
| 1060 | 2950 | -1890 | 28 | 90 |
| 766 | 2950 | -2184 | 28 | 91 |
| 684 | 2950 | -2266 | 28 | 92 |
| 134 | 2950 | -2816 | 28 | 93 |
| 378 | 2950 | -2572 | 28 | 94 |
| 105 | 2950 | -2845 | 28 | 95 |
| 2.7 J | 2950 | -2947.3 | 28 | 96 |
| 9.4 J1c | 2950 | -2940.6 | 28 | 97 |
| 3.3 J1c | 2950 | -2946.7 | 28 | 98 |
| | | | | |
| 1060 | 499 | Same Date | 28 | 98 |
| 766 | 499 | 267 | 29 | 98 |
| 684 | 499 | 185 | 30 | 98 |
| 134 | 499 | -365 | 30 | 99 |
| 378 | 499 | -121 | 30 | 100 |
| 105 | 499 | -394 | 30 | 101 |
| 2.7 J | 499 | -496.3 | 30 | 102 |
| 9.4 J1c | 499 | -489.6 | 30 | 103 |
| 3.3 J1c | 499 | -495.7 | 30 | 104 |
| | | | | |
| 766 | 1060 | -294 | 30 | 105 |
| 684 | 1060 | -376 | 30 | 106 |
| 134 | 1060 | -926 | 30 | 107 |
| 378 | 1060 | -682 | 30 | 108 |
| 105 | 1060 | -955 | 30 | 109 |
| 2.7 J | 1060 | -1057.3 | 30 | 110 |
| 9.4 J1c | 1060 | -1050.6 | 30 | 111 |
| 3.3 J1c | 1060 | -1056.7 | 30 | 112 |
| | | | | |
| 684 | 766 | Same Date | 30 | 112 |
| 134 | 766 | -632 | 30 | 113 |
| 378 | 766 | -388 | 30 | 114 |
| 105 | 766 | -661 | 30 | 115 |
| 2.7 J | 766 | -763.3 | 30 | 116 |
| 9.4 J1c | 766 | -756.6 | 30 | 117 |
| 3.3 J1c | 766 | -762.7 | 30 | 118 |

| | | | | |
|---|---|---|---|---|
| 134 | 684 | -550 | 30 | 119 |
| 378 | 684 | -306 | 30 | 120 |
| 105 | 684 | -579 | 30 | 121 |
| 2.7 J | 684 | -681.3 | 30 | 122 |
| 9.4 J1c | 684 | -674.6 | 30 | 123 |
| 3.3 J1c | 684 | -680.7 | 30 | 124 |
| | | | | |
| 378 | 134 | 244 | 31 | 124 |
| 105 | 134 | -29 | 31 | 125 |
| 2.7 J | 134 | -131.3 | 31 | 126 |
| 9.4 J1c | 134 | -124.6 | 31 | 127 |
| 3.3 J1c | 134 | -130.7 | 31 | 128 |
| | | | | |
| 105 | 378 | -273 | 31 | 129 |
| 2.7 J | 378 | -375.3 | 31 | 130 |
| 9.4 J1c | 378 | -368.6 | 31 | 131 |
| 3.3 J1c | 378 | -374.7 | 31 | 132 |
| | | | | |
| 2.7 J | 105 | -102.3 | 31 | 133 |
| 9.4 J1c | 105 | -95.6 | 31 | 134 |
| 3.3 J1c | 105 | -101.7 | 31 | 135 |
| | | | | |
| 9.4 J1c | 2.7 J | 6.7 | 32 | 135 |
| 3.3 J1c | 2.7 J | 0.6 | 33 | 135 |
| | | | | |
| 3.3 J1c | 9.4 J1c | -6.1 | 33 | 136 |

S Statistic = 33 - 136 = -103

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |

There are 2 time periods with multiple data

A = 0
B = 36
C = 0
D = 0

E = 0
F = 4
a = 14706
b = 52326
c = 684
Group Variance = 815
Z-Score = -3.5729
Comparison Level at 95% confidence level = 1.65463 (upward trend)
-3.5729 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RW16-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 4320 | 3370 | 950 | 1 | 0 |
| 3350 | 3370 | -20 | 1 | 1 |
| 15800 | 3370 | 12430 | 2 | 1 |
| 25.6 | 3370 | -3344.4 | 2 | 2 |
| 26.2 | 3370 | -3343.8 | 2 | 3 |
| 48.6 | 3370 | -3321.4 | 2 | 4 |
| 27.7 | 3370 | -3342.3 | 2 | 5 |
| 31.2 | 3370 | -3338.8 | 2 | 6 |
| 25 | 3370 | -3345 | 2 | 7 |
| 35.9 | 3370 | -3334.1 | 2 | 8 |
| 30 | 3370 | -3340 | 2 | 9 |
| 7 J | 3370 | -3363 | 2 | 10 |
| 24 | 3370 | -3346 | 2 | 11 |
| 106 | 3370 | -3264 | 2 | 12 |
| 5.5 J | 3370 | -3364.5 | 2 | 13 |
| ND<5 U | 3370 | -3365 | 2 | 14 |
| 22.7 | 3370 | -3347.3 | 2 | 15 |
| ND<5 U | 3370 | -3365 | 2 | 16 |
| ND<5 U | 3370 | -3365 | 2 | 17 |
| 22.3 | 3370 | -3347.7 | 2 | 18 |
| 3.7 J1c | 3370 | -3366.3 | 2 | 19 |
| 3 J | 3370 | -3367 | 2 | 20 |
| ND<10 U | 3370 | -3360 | 2 | 21 |
| 10.39 | 3370 | -3359.61 | 2 | 22 |
| ND<5 U | 3370 | -3365 | 2 | 23 |
| | | | | |
| 3350 | 4320 | -970 | 2 | 24 |
| 15800 | 4320 | 11480 | 3 | 24 |
| 25.6 | 4320 | -4294.4 | 3 | 25 |
| 26.2 | 4320 | -4293.8 | 3 | 26 |
| 48.6 | 4320 | -4271.4 | 3 | 27 |
| 27.7 | 4320 | -4292.3 | 3 | 28 |
| 31.2 | 4320 | -4288.8 | 3 | 29 |
| 25 | 4320 | -4295 | 3 | 30 |
| 35.9 | 4320 | -4284.1 | 3 | 31 |
| 30 | 4320 | -4290 | 3 | 32 |
| 7 J | 4320 | -4313 | 3 | 33 |
| 24 | 4320 | -4296 | 3 | 34 |
| 106 | 4320 | -4214 | 3 | 35 |
| 5.5 J | 4320 | -4314.5 | 3 | 36 |
| ND<5 U | 4320 | -4315 | 3 | 37 |
| 22.7 | 4320 | -4297.3 | 3 | 38 |
| ND<5 U | 4320 | -4315 | 3 | 39 |
| ND<5 U | 4320 | -4315 | 3 | 40 |
| 22.3 | 4320 | -4297.7 | 3 | 41 |
| 3.7 J1c | 4320 | -4316.3 | 3 | 42 |
| 3 J | 4320 | -4317 | 3 | 43 |

| | | | | |
|---|---|---|---|---|
| ND<10 U | 4320 | -4310 | 3 | 44 |
| 10.39 | 4320 | -4309.61 | 3 | 45 |
| ND<5 U | 4320 | -4315 | 3 | 46 |
| | | | | |
| 15800 | 3350 | 12450 | 4 | 46 |
| 25.6 | 3350 | -3324.4 | 4 | 47 |
| 26.2 | 3350 | -3323.8 | 4 | 48 |
| 48.6 | 3350 | -3301.4 | 4 | 49 |
| 27.7 | 3350 | -3322.3 | 4 | 50 |
| 31.2 | 3350 | -3318.8 | 4 | 51 |
| 25 | 3350 | -3325 | 4 | 52 |
| 35.9 | 3350 | -3314.1 | 4 | 53 |
| 30 | 3350 | -3320 | 4 | 54 |
| 7 J | 3350 | -3343 | 4 | 55 |
| 24 | 3350 | -3326 | 4 | 56 |
| 106 | 3350 | -3244 | 4 | 57 |
| 5.5 J | 3350 | -3344.5 | 4 | 58 |
| ND<5 U | 3350 | -3345 | 4 | 59 |
| 22.7 | 3350 | -3327.3 | 4 | 60 |
| ND<5 U | 3350 | -3345 | 4 | 61 |
| ND<5 U | 3350 | -3345 | 4 | 62 |
| 22.3 | 3350 | -3327.7 | 4 | 63 |
| 3.7 J1c | 3350 | -3346.3 | 4 | 64 |
| 3 J | 3350 | -3347 | 4 | 65 |
| ND<10 U | 3350 | -3340 | 4 | 66 |
| 10.39 | 3350 | -3339.61 | 4 | 67 |
| ND<5 U | 3350 | -3345 | 4 | 68 |
| | | | | |
| 25.6 | 15800 | -15774.4 | 4 | 69 |
| 26.2 | 15800 | -15773.8 | 4 | 70 |
| 48.6 | 15800 | -15751.4 | 4 | 71 |
| 27.7 | 15800 | -15772.3 | 4 | 72 |
| 31.2 | 15800 | -15768.8 | 4 | 73 |
| 25 | 15800 | -15775 | 4 | 74 |
| 35.9 | 15800 | -15764.1 | 4 | 75 |
| 30 | 15800 | -15770 | 4 | 76 |
| 7 J | 15800 | -15793 | 4 | 77 |
| 24 | 15800 | -15776 | 4 | 78 |
| 106 | 15800 | -15694 | 4 | 79 |
| 5.5 J | 15800 | -15794.5 | 4 | 80 |
| ND<5 U | 15800 | -15795 | 4 | 81 |
| 22.7 | 15800 | -15777.3 | 4 | 82 |
| ND<5 U | 15800 | -15795 | 4 | 83 |
| ND<5 U | 15800 | -15795 | 4 | 84 |
| 22.3 | 15800 | -15777.7 | 4 | 85 |
| 3.7 J1c | 15800 | -15796.3 | 4 | 86 |
| 3 J | 15800 | -15797 | 4 | 87 |
| ND<10 U | 15800 | -15790 | 4 | 88 |
| 10.39 | 15800 | -15789.6 | 4 | 89 |
| ND<5 U | 15800 | -15795 | 4 | 90 |
| | | | | |
| 26.2 | 25.6 | 0.6 | 5 | 90 |
| 48.6 | 25.6 | 23 | 6 | 90 |
| 27.7 | 25.6 | 2.1 | 7 | 90 |
| 31.2 | 25.6 | 5.6 | 8 | 90 |
| 25 | 25.6 | -0.6 | 8 | 91 |
| 35.9 | 25.6 | 10.3 | 9 | 91 |

| | | | | |
|---|---|---|---|---|
| 30 | 25.6 | 4.4 | 10 | 91 |
| 7 J | 25.6 | -18.6 | 10 | 92 |
| 24 | 25.6 | -1.6 | 10 | 93 |
| 106 | 25.6 | 80.4 | 11 | 93 |
| 5.5 J | 25.6 | -20.1 | 11 | 94 |
| ND<5 U | 25.6 | -20.6 | 11 | 95 |
| 22.7 | 25.6 | -2.9 | 11 | 96 |
| ND<5 U | 25.6 | -20.6 | 11 | 97 |
| ND<5 U | 25.6 | -20.6 | 11 | 98 |
| 22.3 | 25.6 | -3.3 | 11 | 99 |
| 3.7 J1c | 25.6 | -21.9 | 11 | 100 |
| 3 J | 25.6 | -22.6 | 11 | 101 |
| ND<10 U | 25.6 | -15.6 | 11 | 102 |
| 10.39 | 25.6 | -15.21 | 11 | 103 |
| ND<5 U | 25.6 | -20.6 | 11 | 104 |
| | | | | |
| 48.6 | 26.2 | 22.4 | 12 | 104 |
| 27.7 | 26.2 | 1.5 | 13 | 104 |
| 31.2 | 26.2 | 5 | 14 | 104 |
| 25 | 26.2 | -1.2 | 14 | 105 |
| 35.9 | 26.2 | 9.7 | 15 | 105 |
| 30 | 26.2 | 3.8 | 16 | 105 |
| 7 J | 26.2 | -19.2 | 16 | 106 |
| 24 | 26.2 | -2.2 | 16 | 107 |
| 106 | 26.2 | 79.8 | 17 | 107 |
| 5.5 J | 26.2 | -20.7 | 17 | 108 |
| ND<5 U | 26.2 | -21.2 | 17 | 109 |
| 22.7 | 26.2 | -3.5 | 17 | 110 |
| ND<5 U | 26.2 | -21.2 | 17 | 111 |
| ND<5 U | 26.2 | -21.2 | 17 | 112 |
| 22.3 | 26.2 | -3.9 | 17 | 113 |
| 3.7 J1c | 26.2 | -22.5 | 17 | 114 |
| 3 J | 26.2 | -23.2 | 17 | 115 |
| ND<10 U | 26.2 | -16.2 | 17 | 116 |
| 10.39 | 26.2 | -15.81 | 17 | 117 |
| ND<5 U | 26.2 | -21.2 | 17 | 118 |
| | | | | |
| 27.7 | 48.6 | -20.9 | 17 | 119 |
| 31.2 | 48.6 | -17.4 | 17 | 120 |
| 25 | 48.6 | -23.6 | 17 | 121 |
| 35.9 | 48.6 | -12.7 | 17 | 122 |
| 30 | 48.6 | -18.6 | 17 | 123 |
| 7 J | 48.6 | -41.6 | 17 | 124 |
| 24 | 48.6 | -24.6 | 17 | 125 |
| 106 | 48.6 | 57.4 | 18 | 125 |
| 5.5 J | 48.6 | -43.1 | 18 | 126 |
| ND<5 U | 48.6 | -43.6 | 18 | 127 |
| 22.7 | 48.6 | -25.9 | 18 | 128 |
| ND<5 U | 48.6 | -43.6 | 18 | 129 |
| ND<5 U | 48.6 | -43.6 | 18 | 130 |
| 22.3 | 48.6 | -26.3 | 18 | 131 |
| 3.7 J1c | 48.6 | -44.9 | 18 | 132 |
| 3 J | 48.6 | -45.6 | 18 | 133 |
| ND<10 U | 48.6 | -38.6 | 18 | 134 |
| 10.39 | 48.6 | -38.21 | 18 | 135 |
| ND<5 U | 48.6 | -43.6 | 18 | 136 |

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|---|---|---|---|---|
| 31.2 | 27.7 | 3.5 | 19 | 136 |
| 25 | 27.7 | -2.7 | 19 | 137 |
| 35.9 | 27.7 | 8.2 | 20 | 137 |
| 30 | 27.7 | 2.3 | 21 | 137 |
| 7 J | 27.7 | -20.7 | 21 | 138 |
| 24 | 27.7 | -3.7 | 21 | 139 |
| 106 | 27.7 | 78.3 | 22 | 139 |
| 5.5 J | 27.7 | -22.2 | 22 | 140 |
| ND<5 U | 27.7 | -22.7 | 22 | 141 |
| 22.7 | 27.7 | -5 | 22 | 142 |
| ND<5 U | 27.7 | -22.7 | 22 | 143 |
| ND<5 U | 27.7 | -22.7 | 22 | 144 |
| 22.3 | 27.7 | -5.4 | 22 | 145 |
| 3.7 J1c | 27.7 | -24 | 22 | 146 |
| 3 J | 27.7 | -24.7 | 22 | 147 |
| ND<10 U | 27.7 | -17.7 | 22 | 148 |
| 10.39 | 27.7 | -17.31 | 22 | 149 |
| ND<5 U | 27.7 | -22.7 | 22 | 150 |
| | | | | |
| 25 | 31.2 | -6.2 | 22 | 151 |
| 35.9 | 31.2 | 4.7 | 23 | 151 |
| 30 | 31.2 | -1.2 | 23 | 152 |
| 7 J | 31.2 | -24.2 | 23 | 153 |
| 24 | 31.2 | -7.2 | 23 | 154 |
| 106 | 31.2 | 74.8 | 24 | 154 |
| 5.5 J | 31.2 | -25.7 | 24 | 155 |
| ND<5 U | 31.2 | -26.2 | 24 | 156 |
| 22.7 | 31.2 | -8.5 | 24 | 157 |
| ND<5 U | 31.2 | -26.2 | 24 | 158 |
| ND<5 U | 31.2 | -26.2 | 24 | 159 |
| 22.3 | 31.2 | -8.9 | 24 | 160 |
| 3.7 J1c | 31.2 | -27.5 | 24 | 161 |
| 3 J | 31.2 | -28.2 | 24 | 162 |
| ND<10 U | 31.2 | -21.2 | 24 | 163 |
| 10.39 | 31.2 | -20.81 | 24 | 164 |
| ND<5 U | 31.2 | -26.2 | 24 | 165 |
| | | | | |
| 35.9 | 25 | 10.9 | 25 | 165 |
| 30 | 25 | 5 | 26 | 165 |
| 7 J | 25 | -18 | 26 | 166 |
| 24 | 25 | -1 | 26 | 167 |
| 106 | 25 | 81 | 27 | 167 |
| 5.5 J | 25 | -19.5 | 27 | 168 |
| ND<5 U | 25 | -20 | 27 | 169 |
| 22.7 | 25 | -2.3 | 27 | 170 |
| ND<5 U | 25 | -20 | 27 | 171 |
| ND<5 U | 25 | -20 | 27 | 172 |
| 22.3 | 25 | -2.7 | 27 | 173 |
| 3.7 J1c | 25 | -21.3 | 27 | 174 |
| 3 J | 25 | -22 | 27 | 175 |
| ND<10 U | 25 | -15 | 27 | 176 |
| 10.39 | 25 | -14.61 | 27 | 177 |
| ND<5 U | 25 | -20 | 27 | 178 |
| | | | | |
| 30 | 35.9 | -5.9 | 27 | 179 |
| 7 J | 35.9 | -28.9 | 27 | 180 |
| 24 | 35.9 | -11.9 | 27 | 181 |

| | | | | |
|---|---|---|---|---|
| 106 | 35.9 | 70.1 | 28 | 181 |
| 5.5 J | 35.9 | -30.4 | 28 | 182 |
| ND<5 U | 35.9 | -30.9 | 28 | 183 |
| 22.7 | 35.9 | -13.2 | 28 | 184 |
| ND<5 U | 35.9 | -30.9 | 28 | 185 |
| ND<5 U | 35.9 | -30.9 | 28 | 186 |
| 22.3 | 35.9 | -13.6 | 28 | 187 |
| 3.7 J1c | 35.9 | -32.2 | 28 | 188 |
| 3 J | 35.9 | -32.9 | 28 | 189 |
| ND<10 U | 35.9 | -25.9 | 28 | 190 |
| 10.39 | 35.9 | -25.51 | 28 | 191 |
| ND<5 U | 35.9 | -30.9 | 28 | 192 |
| | | | | |
| 7 J | 30 | -23 | 28 | 193 |
| 24 | 30 | -6 | 28 | 194 |
| 106 | 30 | 76 | 29 | 194 |
| 5.5 J | 30 | -24.5 | 29 | 195 |
| ND<5 U | 30 | -25 | 29 | 196 |
| 22.7 | 30 | -7.3 | 29 | 197 |
| ND<5 U | 30 | -25 | 29 | 198 |
| ND<5 U | 30 | -25 | 29 | 199 |
| 22.3 | 30 | -7.7 | 29 | 200 |
| 3.7 J1c | 30 | -26.3 | 29 | 201 |
| 3 J | 30 | -27 | 29 | 202 |
| ND<10 U | 30 | -20 | 29 | 203 |
| 10.39 | 30 | -19.61 | 29 | 204 |
| ND<5 U | 30 | -25 | 29 | 205 |
| | | | | |
| 24 | 7 J | Same Date | 29 | 205 |
| 106 | 7 J | 99 | 30 | 205 |
| 5.5 J | 7 J | -1.5 | 30 | 206 |
| ND<5 U | 7 J | -2 | 30 | 207 |
| 22.7 | 7 J | 15.7 | 31 | 207 |
| ND<5 U | 7 J | -2 | 31 | 208 |
| ND<5 U | 7 J | -2 | 31 | 209 |
| 22.3 | 7 J | 15.3 | 32 | 209 |
| 3.7 J1c | 7 J | -3.3 | 32 | 210 |
| 3 J | 7 J | -4 | 32 | 211 |
| ND<10 U | 7 J | 3 | 33 | 211 |
| 10.39 | 7 J | 3.39 | 34 | 211 |
| ND<5 U | 7 J | -2 | 34 | 212 |
| | | | | |
| 106 | 24 | 82 | 35 | 212 |
| 5.5 J | 24 | -18.5 | 35 | 213 |
| ND<5 U | 24 | -19 | 35 | 214 |
| 22.7 | 24 | -1.3 | 35 | 215 |
| ND<5 U | 24 | -19 | 35 | 216 |
| ND<5 U | 24 | -19 | 35 | 217 |
| 22.3 | 24 | -1.7 | 35 | 218 |
| 3.7 J1c | 24 | -20.3 | 35 | 219 |
| 3 J | 24 | -21 | 35 | 220 |
| ND<10 U | 24 | -14 | 35 | 221 |
| 10.39 | 24 | -13.61 | 35 | 222 |
| ND<5 U | 24 | -19 | 35 | 223 |
| | | | | |
| 5.5 J | 106 | Same Date | 35 | 223 |
| ND<5 U | 106 | -101 | 35 | 224 |

| | | | | |
|---|---|---|---|---|
| 22.7 | 106 | -83.3 | 35 | 225 |
| ND<5 U | 106 | -101 | 35 | 226 |
| ND<5 U | 106 | -101 | 35 | 227 |
| 22.3 | 106 | -83.7 | 35 | 228 |
| 3.7 J1c | 106 | -102.3 | 35 | 229 |
| 3 J | 106 | -103 | 35 | 230 |
| ND<10 U | 106 | -96 | 35 | 231 |
| 10.39 | 106 | -95.61 | 35 | 232 |
| ND<5 U | 106 | -101 | 35 | 233 |
| | | | | |
| ND<5 U | 5.5 J | -0.5 | 35 | 234 |
| 22.7 | 5.5 J | 17.2 | 36 | 234 |
| ND<5 U | 5.5 J | -0.5 | 36 | 235 |
| ND<5 U | 5.5 J | -0.5 | 36 | 236 |
| 22.3 | 5.5 J | 16.8 | 37 | 236 |
| 3.7 J1c | 5.5 J | -1.8 | 37 | 237 |
| 3 J | 5.5 J | -2.5 | 37 | 238 |
| ND<10 U | 5.5 J | 4.5 | 38 | 238 |
| 10.39 | 5.5 J | 4.89 | 39 | 238 |
| ND<5 U | 5.5 J | -0.5 | 39 | 239 |
| | | | | |
| 22.7 | ND<5 U | 17.7 | 40 | 239 |
| ND<5 U | ND<5 U | 0 | 40 | 239 |
| ND<5 U | ND<5 U | 0 | 40 | 239 |
| 22.3 | ND<5 U | 17.3 | 41 | 239 |
| 3.7 J1c | ND<5 U | -1.3 | 41 | 240 |
| 3 J | ND<5 U | -2 | 41 | 241 |
| ND<10 U | ND<5 U | 5 | 42 | 241 |
| 10.39 | ND<5 U | 5.39 | 43 | 241 |
| ND<5 U | ND<5 U | 0 | 43 | 241 |
| | | | | |
| ND<5 U | 22.7 | -17.7 | 43 | 242 |
| ND<5 U | 22.7 | -17.7 | 43 | 243 |
| 22.3 | 22.7 | -0.4 | 43 | 244 |
| 3.7 J1c | 22.7 | -19 | 43 | 245 |
| 3 J | 22.7 | -19.7 | 43 | 246 |
| ND<10 U | 22.7 | -12.7 | 43 | 247 |
| 10.39 | 22.7 | -12.31 | 43 | 248 |
| ND<5 U | 22.7 | -17.7 | 43 | 249 |
| | | | | |
| ND<5 U | ND<5 U | 0 | 43 | 249 |
| 22.3 | ND<5 U | 17.3 | 44 | 249 |
| 3.7 J1c | ND<5 U | -1.3 | 44 | 250 |
| 3 J | ND<5 U | -2 | 44 | 251 |
| ND<10 U | ND<5 U | 5 | 45 | 251 |
| 10.39 | ND<5 U | 5.39 | 46 | 251 |
| ND<5 U | ND<5 U | 0 | 46 | 251 |
| | | | | |
| 22.3 | ND<5 U | 17.3 | 47 | 251 |
| 3.7 J1c | ND<5 U | -1.3 | 47 | 252 |
| 3 J | ND<5 U | -2 | 47 | 253 |
| ND<10 U | ND<5 U | 5 | 48 | 253 |
| 10.39 | ND<5 U | 5.39 | 49 | 253 |
| ND<5 U | ND<5 U | 0 | 49 | 253 |
| | | | | |
| 3.7 J1c | 22.3 | -18.6 | 49 | 254 |
| 3 J | 22.3 | -19.3 | 49 | 255 |

| | | | | |
|---|---|---|---|---|
| ND<10 U | 22.3 | -12.3 | 49 | 256 |
| 10.39 | 22.3 | -11.91 | 49 | 257 |
| ND<5 U | 22.3 | -17.3 | 49 | 258 |
| | | | | |
| 3 J | 3.7 J1c | -0.7 | 49 | 259 |
| ND<10 U | 3.7 J1c | 6.3 | 50 | 259 |
| 10.39 | 3.7 J1c | 6.69 | 51 | 259 |
| ND<5 U | 3.7 J1c | 1.3 | 52 | 259 |
| | | | | |
| ND<10 U | 3 J | 7 | 53 | 259 |
| 10.39 | 3 J | 7.39 | 54 | 259 |
| ND<5 U | 3 J | 2 | 55 | 259 |
| | | | | |
| 10.39 | ND<10 U | 0.39 | 56 | 259 |
| ND<5 U | ND<10 U | -5 | 56 | 260 |
| | | | | |
| ND<5 U | 10.39 | -5.39 | 56 | 261 |

S Statistic = 56 - 261 = -205

| Tied Group | Value | Members |
|---|---|---|
| 1 | 5 | 4 |

| Time Period | Observations |
|---|---|
| 2/1/2017 | 1 |
| 3/1/2017 | 1 |
| 4/1/2017 | 1 |
| 5/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 3/1/2022 | 1 |
| 3/1/2023 | 1 |
| 3/1/2024 | 1 |

There are 2 time periods with multiple data

A = 156
B = 36
C = 24
D = 0
E = 12
F = 4

a = 37050
b = 140400
c = 1300
Group Variance = 2047.7
Z-Score = -4.50813
Comparison Level at 95% confidence level = 1.65463 (upward trend)
-4.50813 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RW18-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 13300 | 25500 | -12200 | 0 | 1 |
| 964 | 25500 | -24536 | 0 | 2 |
| 6160 | 25500 | -19340 | 0 | 3 |
| 14500 | 25500 | -11000 | 0 | 4 |
| 10700 | 25500 | -14800 | 0 | 5 |
| 23400 | 25500 | -2100 | 0 | 6 |
| 11600 | 25500 | -13900 | 0 | 7 |
| 25900 | 25500 | 400 | 1 | 7 |
| 439 | 25500 | -25061 | 1 | 8 |
| 44.9 | 25500 | -25455.1 | 1 | 9 |
| 88.7 | 25500 | -25411.3 | 1 | 10 |
| 30 | 25500 | -25470 | 1 | 11 |
| 16.9 | 25500 | -25483.1 | 1 | 12 |
| 25.6 | 25500 | -25474.4 | 1 | 13 |
| 4.3 JB | 25500 | -25495.7 | 1 | 14 |
| 15.2 D6 | 25500 | -25484.8 | 1 | 15 |
| 4.2 J | 25500 | -25495.8 | 1 | 16 |
| 4.2 J | 25500 | -25495.8 | 1 | 17 |
| 22.7 1c | 25500 | -25477.3 | 1 | 18 |
| 3.3 J1c | 25500 | -25496.7 | 1 | 19 |
| 20.1 | 25500 | -25479.9 | 1 | 20 |
| ND<100 U | 25500 | -25400 | 1 | 21 |
| 12.57 | 25500 | -25487.4 | 1 | 22 |
| 19.99 | 25500 | -25480 | 1 | 23 |
| | | | | |
| 964 | 13300 | -12336 | 1 | 24 |
| 6160 | 13300 | -7140 | 1 | 25 |
| 14500 | 13300 | 1200 | 2 | 25 |
| 10700 | 13300 | -2600 | 2 | 26 |
| 23400 | 13300 | 10100 | 3 | 26 |
| 11600 | 13300 | -1700 | 3 | 27 |
| 25900 | 13300 | 12600 | 4 | 27 |
| 439 | 13300 | -12861 | 4 | 28 |
| 44.9 | 13300 | -13255.1 | 4 | 29 |
| 88.7 | 13300 | -13211.3 | 4 | 30 |
| 30 | 13300 | -13270 | 4 | 31 |
| 16.9 | 13300 | -13283.1 | 4 | 32 |
| 25.6 | 13300 | -13274.4 | 4 | 33 |
| 4.3 JB | 13300 | -13295.7 | 4 | 34 |
| 15.2 D6 | 13300 | -13284.8 | 4 | 35 |
| 4.2 J | 13300 | -13295.8 | 4 | 36 |
| 4.2 J | 13300 | -13295.8 | 4 | 37 |
| 22.7 1c | 13300 | -13277.3 | 4 | 38 |
| 3.3 J1c | 13300 | -13296.7 | 4 | 39 |
| 20.1 | 13300 | -13279.9 | 4 | 40 |
| ND<100 U | 13300 | -13200 | 4 | 41 |
| 12.57 | 13300 | -13287.4 | 4 | 42 |

| | | | | |
|---|---|---|---|---|
| 19.99 | 13300 | -13280 | 4 | 43 |
| | | | | |
| 6160 | 964 | 5196 | 5 | 43 |
| 14500 | 964 | 13536 | 6 | 43 |
| 10700 | 964 | 9736 | 7 | 43 |
| 23400 | 964 | 22436 | 8 | 43 |
| 11600 | 964 | 10636 | 9 | 43 |
| 25900 | 964 | 24936 | 10 | 43 |
| 439 | 964 | -525 | 10 | 44 |
| 44.9 | 964 | -919.1 | 10 | 45 |
| 88.7 | 964 | -875.3 | 10 | 46 |
| 30 | 964 | -934 | 10 | 47 |
| 16.9 | 964 | -947.1 | 10 | 48 |
| 25.6 | 964 | -938.4 | 10 | 49 |
| 4.3 JB | 964 | -959.7 | 10 | 50 |
| 15.2 D6 | 964 | -948.8 | 10 | 51 |
| 4.2 J | 964 | -959.8 | 10 | 52 |
| 4.2 J | 964 | -959.8 | 10 | 53 |
| 22.7 1c | 964 | -941.3 | 10 | 54 |
| 3.3 J1c | 964 | -960.7 | 10 | 55 |
| 20.1 | 964 | -943.9 | 10 | 56 |
| ND<100 U | 964 | -864 | 10 | 57 |
| 12.57 | 964 | -951.43 | 10 | 58 |
| 19.99 | 964 | -944.01 | 10 | 59 |
| | | | | |
| 14500 | 6160 | 8340 | 11 | 59 |
| 10700 | 6160 | 4540 | 12 | 59 |
| 23400 | 6160 | 17240 | 13 | 59 |
| 11600 | 6160 | 5440 | 14 | 59 |
| 25900 | 6160 | 19740 | 15 | 59 |
| 439 | 6160 | -5721 | 15 | 60 |
| 44.9 | 6160 | -6115.1 | 15 | 61 |
| 88.7 | 6160 | -6071.3 | 15 | 62 |
| 30 | 6160 | -6130 | 15 | 63 |
| 16.9 | 6160 | -6143.1 | 15 | 64 |
| 25.6 | 6160 | -6134.4 | 15 | 65 |
| 4.3 JB | 6160 | -6155.7 | 15 | 66 |
| 15.2 D6 | 6160 | -6144.8 | 15 | 67 |
| 4.2 J | 6160 | -6155.8 | 15 | 68 |
| 4.2 J | 6160 | -6155.8 | 15 | 69 |
| 22.7 1c | 6160 | -6137.3 | 15 | 70 |
| 3.3 J1c | 6160 | -6156.7 | 15 | 71 |
| 20.1 | 6160 | -6139.9 | 15 | 72 |
| ND<100 U | 6160 | -6060 | 15 | 73 |
| 12.57 | 6160 | -6147.43 | 15 | 74 |
| 19.99 | 6160 | -6140.01 | 15 | 75 |
| | | | | |
| 10700 | 14500 | -3800 | 15 | 76 |
| 23400 | 14500 | 8900 | 16 | 76 |
| 11600 | 14500 | -2900 | 16 | 77 |
| 25900 | 14500 | 11400 | 17 | 77 |
| 439 | 14500 | -14061 | 17 | 78 |
| 44.9 | 14500 | -14455.1 | 17 | 79 |
| 88.7 | 14500 | -14411.3 | 17 | 80 |
| 30 | 14500 | -14470 | 17 | 81 |
| 16.9 | 14500 | -14483.1 | 17 | 82 |
| 25.6 | 14500 | -14474.4 | 17 | 83 |

| | | | | |
|---|---|---|---|---|
| 4.3 JB | 14500 | -14495.7 | 17 | 84 |
| 15.2 D6 | 14500 | -14484.8 | 17 | 85 |
| 4.2 J | 14500 | -14495.8 | 17 | 86 |
| 4.2 J | 14500 | -14495.8 | 17 | 87 |
| 22.7 1c | 14500 | -14477.3 | 17 | 88 |
| 3.3 J1c | 14500 | -14496.7 | 17 | 89 |
| 20.1 | 14500 | -14479.9 | 17 | 90 |
| ND<100 U | 14500 | -14400 | 17 | 91 |
| 12.57 | 14500 | -14487.4 | 17 | 92 |
| 19.99 | 14500 | -14480 | 17 | 93 |
| | | | | |
| 23400 | 10700 | 12700 | 18 | 93 |
| 11600 | 10700 | 900 | 19 | 93 |
| 25900 | 10700 | 15200 | 20 | 93 |
| 439 | 10700 | -10261 | 20 | 94 |
| 44.9 | 10700 | -10655.1 | 20 | 95 |
| 88.7 | 10700 | -10611.3 | 20 | 96 |
| 30 | 10700 | -10670 | 20 | 97 |
| 16.9 | 10700 | -10683.1 | 20 | 98 |
| 25.6 | 10700 | -10674.4 | 20 | 99 |
| 4.3 JB | 10700 | -10695.7 | 20 | 100 |
| 15.2 D6 | 10700 | -10684.8 | 20 | 101 |
| 4.2 J | 10700 | -10695.8 | 20 | 102 |
| 4.2 J | 10700 | -10695.8 | 20 | 103 |
| 22.7 1c | 10700 | -10677.3 | 20 | 104 |
| 3.3 J1c | 10700 | -10696.7 | 20 | 105 |
| 20.1 | 10700 | -10679.9 | 20 | 106 |
| ND<100 U | 10700 | -10600 | 20 | 107 |
| 12.57 | 10700 | -10687.4 | 20 | 108 |
| 19.99 | 10700 | -10680 | 20 | 109 |
| | | | | |
| 11600 | 23400 | -11800 | 20 | 110 |
| 25900 | 23400 | 2500 | 21 | 110 |
| 439 | 23400 | -22961 | 21 | 111 |
| 44.9 | 23400 | -23355.1 | 21 | 112 |
| 88.7 | 23400 | -23311.3 | 21 | 113 |
| 30 | 23400 | -23370 | 21 | 114 |
| 16.9 | 23400 | -23383.1 | 21 | 115 |
| 25.6 | 23400 | -23374.4 | 21 | 116 |
| 4.3 JB | 23400 | -23395.7 | 21 | 117 |
| 15.2 D6 | 23400 | -23384.8 | 21 | 118 |
| 4.2 J | 23400 | -23395.8 | 21 | 119 |
| 4.2 J | 23400 | -23395.8 | 21 | 120 |
| 22.7 1c | 23400 | -23377.3 | 21 | 121 |
| 3.3 J1c | 23400 | -23396.7 | 21 | 122 |
| 20.1 | 23400 | -23379.9 | 21 | 123 |
| ND<100 U | 23400 | -23300 | 21 | 124 |
| 12.57 | 23400 | -23387.4 | 21 | 125 |
| 19.99 | 23400 | -23380 | 21 | 126 |
| | | | | |
| 25900 | 11600 | 14300 | 22 | 126 |
| 439 | 11600 | -11161 | 22 | 127 |
| 44.9 | 11600 | -11555.1 | 22 | 128 |
| 88.7 | 11600 | -11511.3 | 22 | 129 |
| 30 | 11600 | -11570 | 22 | 130 |
| 16.9 | 11600 | -11583.1 | 22 | 131 |
| 25.6 | 11600 | -11574.4 | 22 | 132 |

| | | | | |
|---|---|---|---|---|
| 4.3 JB | 11600 | -11595.7 | 22 | 133 |
| 15.2 D6 | 11600 | -11584.8 | 22 | 134 |
| 4.2 J | 11600 | -11595.8 | 22 | 135 |
| 4.2 J | 11600 | -11595.8 | 22 | 136 |
| 22.7 1c | 11600 | -11577.3 | 22 | 137 |
| 3.3 J1c | 11600 | -11596.7 | 22 | 138 |
| 20.1 | 11600 | -11579.9 | 22 | 139 |
| ND<100 U | 11600 | -11500 | 22 | 140 |
| 12.57 | 11600 | -11587.4 | 22 | 141 |
| 19.99 | 11600 | -11580 | 22 | 142 |
| | | | | |
| 439 | 25900 | -25461 | 22 | 143 |
| 44.9 | 25900 | -25855.1 | 22 | 144 |
| 88.7 | 25900 | -25811.3 | 22 | 145 |
| 30 | 25900 | -25870 | 22 | 146 |
| 16.9 | 25900 | -25883.1 | 22 | 147 |
| 25.6 | 25900 | -25874.4 | 22 | 148 |
| 4.3 JB | 25900 | -25895.7 | 22 | 149 |
| 15.2 D6 | 25900 | -25884.8 | 22 | 150 |
| 4.2 J | 25900 | -25895.8 | 22 | 151 |
| 4.2 J | 25900 | -25895.8 | 22 | 152 |
| 22.7 1c | 25900 | -25877.3 | 22 | 153 |
| 3.3 J1c | 25900 | -25896.7 | 22 | 154 |
| 20.1 | 25900 | -25879.9 | 22 | 155 |
| ND<100 U | 25900 | -25800 | 22 | 156 |
| 12.57 | 25900 | -25887.4 | 22 | 157 |
| 19.99 | 25900 | -25880 | 22 | 158 |
| | | | | |
| 44.9 | 439 | -394.1 | 22 | 159 |
| 88.7 | 439 | -350.3 | 22 | 160 |
| 30 | 439 | -409 | 22 | 161 |
| 16.9 | 439 | -422.1 | 22 | 162 |
| 25.6 | 439 | -413.4 | 22 | 163 |
| 4.3 JB | 439 | -434.7 | 22 | 164 |
| 15.2 D6 | 439 | -423.8 | 22 | 165 |
| 4.2 J | 439 | -434.8 | 22 | 166 |
| 4.2 J | 439 | -434.8 | 22 | 167 |
| 22.7 1c | 439 | -416.3 | 22 | 168 |
| 3.3 J1c | 439 | -435.7 | 22 | 169 |
| 20.1 | 439 | -418.9 | 22 | 170 |
| ND<100 U | 439 | -339 | 22 | 171 |
| 12.57 | 439 | -426.43 | 22 | 172 |
| 19.99 | 439 | -419.01 | 22 | 173 |
| | | | | |
| 88.7 | 44.9 | 43.8 | 23 | 173 |
| 30 | 44.9 | -14.9 | 23 | 174 |
| 16.9 | 44.9 | -28 | 23 | 175 |
| 25.6 | 44.9 | -19.3 | 23 | 176 |
| 4.3 JB | 44.9 | -40.6 | 23 | 177 |
| 15.2 D6 | 44.9 | -29.7 | 23 | 178 |
| 4.2 J | 44.9 | -40.7 | 23 | 179 |
| 4.2 J | 44.9 | -40.7 | 23 | 180 |
| 22.7 1c | 44.9 | -22.2 | 23 | 181 |
| 3.3 J1c | 44.9 | -41.6 | 23 | 182 |
| 20.1 | 44.9 | -24.8 | 23 | 183 |
| ND<100 U | 44.9 | 55.1 | 24 | 183 |
| 12.57 | 44.9 | -32.33 | 24 | 184 |

| | | | | |
|---|---|---|---|---|
| 19.99 | 44.9 | -24.91 | 24 | 185 |
| | | | | |
| 30 | 88.7 | Same Date | 24 | 185 |
| 16.9 | 88.7 | -71.8 | 24 | 186 |
| 25.6 | 88.7 | -63.1 | 24 | 187 |
| 4.3 JB | 88.7 | -84.4 | 24 | 188 |
| 15.2 D6 | 88.7 | -73.5 | 24 | 189 |
| 4.2 J | 88.7 | -84.5 | 24 | 190 |
| 4.2 J | 88.7 | -84.5 | 24 | 191 |
| 22.7 1c | 88.7 | -66 | 24 | 192 |
| 3.3 J1c | 88.7 | -85.4 | 24 | 193 |
| 20.1 | 88.7 | -68.6 | 24 | 194 |
| ND<100 U | 88.7 | 11.3 | 25 | 194 |
| 12.57 | 88.7 | -76.13 | 25 | 195 |
| 19.99 | 88.7 | -68.71 | 25 | 196 |
| | | | | |
| 16.9 | 30 | -13.1 | 25 | 197 |
| 25.6 | 30 | -4.4 | 25 | 198 |
| 4.3 JB | 30 | -25.7 | 25 | 199 |
| 15.2 D6 | 30 | -14.8 | 25 | 200 |
| 4.2 J | 30 | -25.8 | 25 | 201 |
| 4.2 J | 30 | -25.8 | 25 | 202 |
| 22.7 1c | 30 | -7.3 | 25 | 203 |
| 3.3 J1c | 30 | -26.7 | 25 | 204 |
| 20.1 | 30 | -9.9 | 25 | 205 |
| ND<100 U | 30 | 70 | 26 | 205 |
| 12.57 | 30 | -17.43 | 26 | 206 |
| 19.99 | 30 | -10.01 | 26 | 207 |
| | | | | |
| 25.6 | 16.9 | Same Date | 26 | 207 |
| 4.3 JB | 16.9 | -12.6 | 26 | 208 |
| 15.2 D6 | 16.9 | -1.7 | 26 | 209 |
| 4.2 J | 16.9 | -12.7 | 26 | 210 |
| 4.2 J | 16.9 | -12.7 | 26 | 211 |
| 22.7 1c | 16.9 | 5.8 | 27 | 211 |
| 3.3 J1c | 16.9 | -13.6 | 27 | 212 |
| 20.1 | 16.9 | 3.2 | 28 | 212 |
| ND<100 U | 16.9 | 83.1 | 29 | 212 |
| 12.57 | 16.9 | -4.33 | 29 | 213 |
| 19.99 | 16.9 | 3.09 | 30 | 213 |
| | | | | |
| 4.3 JB | 25.6 | -21.3 | 30 | 214 |
| 15.2 D6 | 25.6 | -10.4 | 30 | 215 |
| 4.2 J | 25.6 | -21.4 | 30 | 216 |
| 4.2 J | 25.6 | -21.4 | 30 | 217 |
| 22.7 1c | 25.6 | -2.9 | 30 | 218 |
| 3.3 J1c | 25.6 | -22.3 | 30 | 219 |
| 20.1 | 25.6 | -5.5 | 30 | 220 |
| ND<100 U | 25.6 | 74.4 | 31 | 220 |
| 12.57 | 25.6 | -13.03 | 31 | 221 |
| 19.99 | 25.6 | -5.61 | 31 | 222 |
| | | | | |
| 15.2 D6 | 4.3 JB | 10.9 | 32 | 222 |
| 4.2 J | 4.3 JB | -0.1 | 32 | 223 |
| 4.2 J | 4.3 JB | -0.1 | 32 | 224 |
| 22.7 1c | 4.3 JB | 18.4 | 33 | 224 |
| 3.3 J1c | 4.3 JB | -1 | 33 | 225 |

| | | | | |
|---|---|---|---|---|
| 20.1 | 4.3 JB | 15.8 | 34 | 225 |
| ND<100 U | 4.3 JB | 95.7 | 35 | 225 |
| 12.57 | 4.3 JB | 8.27 | 36 | 225 |
| 19.99 | 4.3 JB | 15.69 | 37 | 225 |
| | | | | |
| 4.2 J | 15.2 D6 | -11 | 37 | 226 |
| 4.2 J | 15.2 D6 | -11 | 37 | 227 |
| 22.7 1c | 15.2 D6 | 7.5 | 38 | 227 |
| 3.3 J1c | 15.2 D6 | -11.9 | 38 | 228 |
| 20.1 | 15.2 D6 | 4.9 | 39 | 228 |
| ND<100 U | 15.2 D6 | 84.8 | 40 | 228 |
| 12.57 | 15.2 D6 | -2.63 | 40 | 229 |
| 19.99 | 15.2 D6 | 4.79 | 41 | 229 |
| | | | | |
| 4.2 J | 4.2 J | 0 | 41 | 229 |
| 22.7 1c | 4.2 J | 18.5 | 42 | 229 |
| 3.3 J1c | 4.2 J | -0.9 | 42 | 230 |
| 20.1 | 4.2 J | 15.9 | 43 | 230 |
| ND<100 U | 4.2 J | 95.8 | 44 | 230 |
| 12.57 | 4.2 J | 8.37 | 45 | 230 |
| 19.99 | 4.2 J | 15.79 | 46 | 230 |
| | | | | |
| 22.7 1c | 4.2 J | 18.5 | 47 | 230 |
| 3.3 J1c | 4.2 J | -0.9 | 47 | 231 |
| 20.1 | 4.2 J | 15.9 | 48 | 231 |
| ND<100 U | 4.2 J | 95.8 | 49 | 231 |
| 12.57 | 4.2 J | 8.37 | 50 | 231 |
| 19.99 | 4.2 J | 15.79 | 51 | 231 |
| | | | | |
| 3.3 J1c | 22.7 1c | -19.4 | 51 | 232 |
| 20.1 | 22.7 1c | -2.6 | 51 | 233 |
| ND<100 U | 22.7 1c | 77.3 | 52 | 233 |
| 12.57 | 22.7 1c | -10.13 | 52 | 234 |
| 19.99 | 22.7 1c | -2.71 | 52 | 235 |
| | | | | |
| 20.1 | 3.3 J1c | 16.8 | 53 | 235 |
| ND<100 U | 3.3 J1c | 96.7 | 54 | 235 |
| 12.57 | 3.3 J1c | 9.27 | 55 | 235 |
| 19.99 | 3.3 J1c | 16.69 | 56 | 235 |
| | | | | |
| ND<100 U | 20.1 | 79.9 | 57 | 235 |
| 12.57 | 20.1 | -7.53 | 57 | 236 |
| 19.99 | 20.1 | -0.11 | 57 | 237 |
| | | | | |
| 12.57 | ND<100 U | -87.43 | 57 | 238 |
| 19.99 | ND<100 U | -80.01 | 57 | 239 |
| | | | | |
| 19.99 | 12.57 | 7.42 | 58 | 239 |

S Statistic = 58 - 239 = -181

| Tied Group | Value | Members |
|---|---|---|
| 1 | 4.2 | 2 |

| Time Period | Observations |
|---|---|
| 6/1/2017 | 1 |

| | |
|---|---|
| 7/1/2017 | 1 |
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 3/1/2022 | 1 |
| 3/1/2023 | 1 |
| 3/1/2024 | 1 |

There are 2 time periods with multiple data

---

A = 18
B = 36
C = 0
D = 0
E = 2
F = 4
a = 33000
b = 124200
c = 1200
Group Variance = 1830.34
Z-Score = -4.20733
Comparison Level at 95% confidence level = 1.65463 (upward trend)
-4.20733 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RW19-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 7100 | 10100 | -3000 | 0 | 1 |
| 6260 | 10100 | -3840 | 0 | 2 |
| 4860 | 10100 | -5240 | 0 | 3 |
| 3720 | 10100 | -6380 | 0 | 4 |
| 3700 | 10100 | -6400 | 0 | 5 |
| 3360 | 10100 | -6740 | 0 | 6 |
| 2990 | 10100 | -7110 | 0 | 7 |
| 18700 ML | 10100 | 8600 | 1 | 7 |
| 2730 | 10100 | -7370 | 1 | 8 |
| 3380 | 10100 | -6720 | 1 | 9 |
| 10200 | 10100 | 100 | 2 | 9 |
| 7060 | 10100 | -3040 | 2 | 10 |
| 10100 | 10100 | 0 | 2 | 10 |
| 10500 | 10100 | 400 | 3 | 10 |
| 5210 | 10100 | -4890 | 3 | 11 |
| 4680 | 10100 | -5420 | 3 | 12 |
| 3180 | 10100 | -6920 | 3 | 13 |
| 3150 | 10100 | -6950 | 3 | 14 |
| 2260 | 10100 | -7840 | 3 | 15 |
| 2640 | 10100 | -7460 | 3 | 16 |
| 5300 | 10100 | -4800 | 3 | 17 |
| 2710 | 10100 | -7390 | 3 | 18 |
| 22600 | 10100 | 12500 | 4 | 18 |
| 6190 | 10100 | -3910 | 4 | 19 |
| | | | | |
| 6260 | 7100 | -840 | 4 | 20 |
| 4860 | 7100 | -2240 | 4 | 21 |
| 3720 | 7100 | -3380 | 4 | 22 |
| 3700 | 7100 | -3400 | 4 | 23 |
| 3360 | 7100 | -3740 | 4 | 24 |
| 2990 | 7100 | -4110 | 4 | 25 |
| 18700 ML | 7100 | 11600 | 5 | 25 |
| 2730 | 7100 | -4370 | 5 | 26 |
| 3380 | 7100 | -3720 | 5 | 27 |
| 10200 | 7100 | 3100 | 6 | 27 |
| 7060 | 7100 | -40 | 6 | 28 |
| 10100 | 7100 | 3000 | 7 | 28 |
| 10500 | 7100 | 3400 | 8 | 28 |
| 5210 | 7100 | -1890 | 8 | 29 |
| 4680 | 7100 | -2420 | 8 | 30 |
| 3180 | 7100 | -3920 | 8 | 31 |
| 3150 | 7100 | -3950 | 8 | 32 |
| 2260 | 7100 | -4840 | 8 | 33 |
| 2640 | 7100 | -4460 | 8 | 34 |
| 5300 | 7100 | -1800 | 8 | 35 |
| 2710 | 7100 | -4390 | 8 | 36 |
| 22600 | 7100 | 15500 | 9 | 36 |

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|---|---|---|---|---|
| 6190 | 7100 | -910 | 9 | 37 |
| | | | | |
| 4860 | 6260 | -1400 | 9 | 38 |
| 3720 | 6260 | -2540 | 9 | 39 |
| 3700 | 6260 | -2560 | 9 | 40 |
| 3360 | 6260 | -2900 | 9 | 41 |
| 2990 | 6260 | -3270 | 9 | 42 |
| 18700 ML | 6260 | 12440 | 10 | 42 |
| 2730 | 6260 | -3530 | 10 | 43 |
| 3380 | 6260 | -2880 | 10 | 44 |
| 10200 | 6260 | 3940 | 11 | 44 |
| 7060 | 6260 | 800 | 12 | 44 |
| 10100 | 6260 | 3840 | 13 | 44 |
| 10500 | 6260 | 4240 | 14 | 44 |
| 5210 | 6260 | -1050 | 14 | 45 |
| 4680 | 6260 | -1580 | 14 | 46 |
| 3180 | 6260 | -3080 | 14 | 47 |
| 3150 | 6260 | -3110 | 14 | 48 |
| 2260 | 6260 | -4000 | 14 | 49 |
| 2640 | 6260 | -3620 | 14 | 50 |
| 5300 | 6260 | -960 | 14 | 51 |
| 2710 | 6260 | -3550 | 14 | 52 |
| 22600 | 6260 | 16340 | 15 | 52 |
| 6190 | 6260 | -70 | 15 | 53 |
| | | | | |
| 3720 | 4860 | -1140 | 15 | 54 |
| 3700 | 4860 | -1160 | 15 | 55 |
| 3360 | 4860 | -1500 | 15 | 56 |
| 2990 | 4860 | -1870 | 15 | 57 |
| 18700 ML | 4860 | 13840 | 16 | 57 |
| 2730 | 4860 | -2130 | 16 | 58 |
| 3380 | 4860 | -1480 | 16 | 59 |
| 10200 | 4860 | 5340 | 17 | 59 |
| 7060 | 4860 | 2200 | 18 | 59 |
| 10100 | 4860 | 5240 | 19 | 59 |
| 10500 | 4860 | 5640 | 20 | 59 |
| 5210 | 4860 | 350 | 21 | 59 |
| 4680 | 4860 | -180 | 21 | 60 |
| 3180 | 4860 | -1680 | 21 | 61 |
| 3150 | 4860 | -1710 | 21 | 62 |
| 2260 | 4860 | -2600 | 21 | 63 |
| 2640 | 4860 | -2220 | 21 | 64 |
| 5300 | 4860 | 440 | 22 | 64 |
| 2710 | 4860 | -2150 | 22 | 65 |
| 22600 | 4860 | 17740 | 23 | 65 |
| 6190 | 4860 | 1330 | 24 | 65 |
| | | | | |
| 3700 | 3720 | -20 | 24 | 66 |
| 3360 | 3720 | -360 | 24 | 67 |
| 2990 | 3720 | -730 | 24 | 68 |
| 18700 ML | 3720 | 14980 | 25 | 68 |
| 2730 | 3720 | -990 | 25 | 69 |
| 3380 | 3720 | -340 | 25 | 70 |
| 10200 | 3720 | 6480 | 26 | 70 |
| 7060 | 3720 | 3340 | 27 | 70 |
| 10100 | 3720 | 6380 | 28 | 70 |
| 10500 | 3720 | 6780 | 29 | 70 |

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|---|---|---|---|---|
| 5210 | 3720 | 1490 | 30 | 70 |
| 4680 | 3720 | 960 | 31 | 70 |
| 3180 | 3720 | -540 | 31 | 71 |
| 3150 | 3720 | -570 | 31 | 72 |
| 2260 | 3720 | -1460 | 31 | 73 |
| 2640 | 3720 | -1080 | 31 | 74 |
| 5300 | 3720 | 1580 | 32 | 74 |
| 2710 | 3720 | -1010 | 32 | 75 |
| 22600 | 3720 | 18880 | 33 | 75 |
| 6190 | 3720 | 2470 | 34 | 75 |
| | | | | |
| 3360 | 3700 | -340 | 34 | 76 |
| 2990 | 3700 | -710 | 34 | 77 |
| 18700 ML | 3700 | 15000 | 35 | 77 |
| 2730 | 3700 | -970 | 35 | 78 |
| 3380 | 3700 | -320 | 35 | 79 |
| 10200 | 3700 | 6500 | 36 | 79 |
| 7060 | 3700 | 3360 | 37 | 79 |
| 10100 | 3700 | 6400 | 38 | 79 |
| 10500 | 3700 | 6800 | 39 | 79 |
| 5210 | 3700 | 1510 | 40 | 79 |
| 4680 | 3700 | 980 | 41 | 79 |
| 3180 | 3700 | -520 | 41 | 80 |
| 3150 | 3700 | -550 | 41 | 81 |
| 2260 | 3700 | -1440 | 41 | 82 |
| 2640 | 3700 | -1060 | 41 | 83 |
| 5300 | 3700 | 1600 | 42 | 83 |
| 2710 | 3700 | -990 | 42 | 84 |
| 22600 | 3700 | 18900 | 43 | 84 |
| 6190 | 3700 | 2490 | 44 | 84 |
| | | | | |
| 2990 | 3360 | -370 | 44 | 85 |
| 18700 ML | 3360 | 15340 | 45 | 85 |
| 2730 | 3360 | -630 | 45 | 86 |
| 3380 | 3360 | 20 | 46 | 86 |
| 10200 | 3360 | 6840 | 47 | 86 |
| 7060 | 3360 | 3700 | 48 | 86 |
| 10100 | 3360 | 6740 | 49 | 86 |
| 10500 | 3360 | 7140 | 50 | 86 |
| 5210 | 3360 | 1850 | 51 | 86 |
| 4680 | 3360 | 1320 | 52 | 86 |
| 3180 | 3360 | -180 | 52 | 87 |
| 3150 | 3360 | -210 | 52 | 88 |
| 2260 | 3360 | -1100 | 52 | 89 |
| 2640 | 3360 | -720 | 52 | 90 |
| 5300 | 3360 | 1940 | 53 | 90 |
| 2710 | 3360 | -650 | 53 | 91 |
| 22600 | 3360 | 19240 | 54 | 91 |
| 6190 | 3360 | 2830 | 55 | 91 |
| | | | | |
| 18700 ML | 2990 | 15710 | 56 | 91 |
| 2730 | 2990 | -260 | 56 | 92 |
| 3380 | 2990 | 390 | 57 | 92 |
| 10200 | 2990 | 7210 | 58 | 92 |
| 7060 | 2990 | 4070 | 59 | 92 |
| 10100 | 2990 | 7110 | 60 | 92 |
| 10500 | 2990 | 7510 | 61 | 92 |

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|---|---|---|---|---|
| 5210 | 2990 | 2220 | 62 | 92 |
| 4680 | 2990 | 1690 | 63 | 92 |
| 3180 | 2990 | 190 | 64 | 92 |
| 3150 | 2990 | 160 | 65 | 92 |
| 2260 | 2990 | -730 | 65 | 93 |
| 2640 | 2990 | -350 | 65 | 94 |
| 5300 | 2990 | 2310 | 66 | 94 |
| 2710 | 2990 | -280 | 66 | 95 |
| 22600 | 2990 | 19610 | 67 | 95 |
| 6190 | 2990 | 3200 | 68 | 95 |
| | | | | |
| 2730 | 18700 ML | -15970 | 68 | 96 |
| 3380 | 18700 ML | -15320 | 68 | 97 |
| 10200 | 18700 ML | -8500 | 68 | 98 |
| 7060 | 18700 ML | -11640 | 68 | 99 |
| 10100 | 18700 ML | -8600 | 68 | 100 |
| 10500 | 18700 ML | -8200 | 68 | 101 |
| 5210 | 18700 ML | -13490 | 68 | 102 |
| 4680 | 18700 ML | -14020 | 68 | 103 |
| 3180 | 18700 ML | -15520 | 68 | 104 |
| 3150 | 18700 ML | -15550 | 68 | 105 |
| 2260 | 18700 ML | -16440 | 68 | 106 |
| 2640 | 18700 ML | -16060 | 68 | 107 |
| 5300 | 18700 ML | -13400 | 68 | 108 |
| 2710 | 18700 ML | -15990 | 68 | 109 |
| 22600 | 18700 ML | 3900 | 69 | 109 |
| 6190 | 18700 ML | -12510 | 69 | 110 |
| | | | | |
| 3380 | 2730 | 650 | 70 | 110 |
| 10200 | 2730 | 7470 | 71 | 110 |
| 7060 | 2730 | 4330 | 72 | 110 |
| 10100 | 2730 | 7370 | 73 | 110 |
| 10500 | 2730 | 7770 | 74 | 110 |
| 5210 | 2730 | 2480 | 75 | 110 |
| 4680 | 2730 | 1950 | 76 | 110 |
| 3180 | 2730 | 450 | 77 | 110 |
| 3150 | 2730 | 420 | 78 | 110 |
| 2260 | 2730 | -470 | 78 | 111 |
| 2640 | 2730 | -90 | 78 | 112 |
| 5300 | 2730 | 2570 | 79 | 112 |
| 2710 | 2730 | -20 | 79 | 113 |
| 22600 | 2730 | 19870 | 80 | 113 |
| 6190 | 2730 | 3460 | 81 | 113 |
| | | | | |
| 10200 | 3380 | 6820 | 82 | 113 |
| 7060 | 3380 | 3680 | 83 | 113 |
| 10100 | 3380 | 6720 | 84 | 113 |
| 10500 | 3380 | 7120 | 85 | 113 |
| 5210 | 3380 | 1830 | 86 | 113 |
| 4680 | 3380 | 1300 | 87 | 113 |
| 3180 | 3380 | -200 | 87 | 114 |
| 3150 | 3380 | -230 | 87 | 115 |
| 2260 | 3380 | -1120 | 87 | 116 |
| 2640 | 3380 | -740 | 87 | 117 |
| 5300 | 3380 | 1920 | 88 | 117 |
| 2710 | 3380 | -670 | 88 | 118 |
| 22600 | 3380 | 19220 | 89 | 118 |

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|---|---|---|---|---|
| 6190 | 3380 | 2810 | 90 | 118 |
| | | | | |
| 7060 | 10200 | -3140 | 90 | 119 |
| 10100 | 10200 | -100 | 90 | 120 |
| 10500 | 10200 | 300 | 91 | 120 |
| 5210 | 10200 | -4990 | 91 | 121 |
| 4680 | 10200 | -5520 | 91 | 122 |
| 3180 | 10200 | -7020 | 91 | 123 |
| 3150 | 10200 | -7050 | 91 | 124 |
| 2260 | 10200 | -7940 | 91 | 125 |
| 2640 | 10200 | -7560 | 91 | 126 |
| 5300 | 10200 | -4900 | 91 | 127 |
| 2710 | 10200 | -7490 | 91 | 128 |
| 22600 | 10200 | 12400 | 92 | 128 |
| 6190 | 10200 | -4010 | 92 | 129 |
| | | | | |
| 10100 | 7060 | 3040 | 93 | 129 |
| 10500 | 7060 | 3440 | 94 | 129 |
| 5210 | 7060 | -1850 | 94 | 130 |
| 4680 | 7060 | -2380 | 94 | 131 |
| 3180 | 7060 | -3880 | 94 | 132 |
| 3150 | 7060 | -3910 | 94 | 133 |
| 2260 | 7060 | -4800 | 94 | 134 |
| 2640 | 7060 | -4420 | 94 | 135 |
| 5300 | 7060 | -1760 | 94 | 136 |
| 2710 | 7060 | -4350 | 94 | 137 |
| 22600 | 7060 | 15540 | 95 | 137 |
| 6190 | 7060 | -870 | 95 | 138 |
| | | | | |
| 10500 | 10100 | 400 | 96 | 138 |
| 5210 | 10100 | -4890 | 96 | 139 |
| 4680 | 10100 | -5420 | 96 | 140 |
| 3180 | 10100 | -6920 | 96 | 141 |
| 3150 | 10100 | -6950 | 96 | 142 |
| 2260 | 10100 | -7840 | 96 | 143 |
| 2640 | 10100 | -7460 | 96 | 144 |
| 5300 | 10100 | -4800 | 96 | 145 |
| 2710 | 10100 | -7390 | 96 | 146 |
| 22600 | 10100 | 12500 | 97 | 146 |
| 6190 | 10100 | -3910 | 97 | 147 |
| | | | | |
| 5210 | 10500 | -5290 | 97 | 148 |
| 4680 | 10500 | -5820 | 97 | 149 |
| 3180 | 10500 | -7320 | 97 | 150 |
| 3150 | 10500 | -7350 | 97 | 151 |
| 2260 | 10500 | -8240 | 97 | 152 |
| 2640 | 10500 | -7860 | 97 | 153 |
| 5300 | 10500 | -5200 | 97 | 154 |
| 2710 | 10500 | -7790 | 97 | 155 |
| 22600 | 10500 | 12100 | 98 | 155 |
| 6190 | 10500 | -4310 | 98 | 156 |
| | | | | |
| 4680 | 5210 | Same Date | 98 | 156 |
| 3180 | 5210 | -2030 | 98 | 157 |
| 3150 | 5210 | -2060 | 98 | 158 |
| 2260 | 5210 | -2950 | 98 | 159 |
| 2640 | 5210 | -2570 | 98 | 160 |

| | | | | |
|---|---|---|---|---|
| 5300 | 5210 | 90 | 99 | 160 |
| 2710 | 5210 | -2500 | 99 | 161 |
| 22600 | 5210 | 17390 | 100 | 161 |
| 6190 | 5210 | 980 | 101 | 161 |
| | | | | |
| 3180 | 4680 | -1500 | 101 | 162 |
| 3150 | 4680 | -1530 | 101 | 163 |
| 2260 | 4680 | -2420 | 101 | 164 |
| 2640 | 4680 | -2040 | 101 | 165 |
| 5300 | 4680 | 620 | 102 | 165 |
| 2710 | 4680 | -1970 | 102 | 166 |
| 22600 | 4680 | 17920 | 103 | 166 |
| 6190 | 4680 | 1510 | 104 | 166 |
| | | | | |
| 3150 | 3180 | Same Date | 104 | 166 |
| 2260 | 3180 | -920 | 104 | 167 |
| 2640 | 3180 | -540 | 104 | 168 |
| 5300 | 3180 | 2120 | 105 | 168 |
| 2710 | 3180 | -470 | 105 | 169 |
| 22600 | 3180 | 19420 | 106 | 169 |
| 6190 | 3180 | 3010 | 107 | 169 |
| | | | | |
| 2260 | 3150 | -890 | 107 | 170 |
| 2640 | 3150 | -510 | 107 | 171 |
| 5300 | 3150 | 2150 | 108 | 171 |
| 2710 | 3150 | -440 | 108 | 172 |
| 22600 | 3150 | 19450 | 109 | 172 |
| 6190 | 3150 | 3040 | 110 | 172 |
| | | | | |
| 2640 | 2260 | 380 | 111 | 172 |
| 5300 | 2260 | 3040 | 112 | 172 |
| 2710 | 2260 | 450 | 113 | 172 |
| 22600 | 2260 | 20340 | 114 | 172 |
| 6190 | 2260 | 3930 | 115 | 172 |
| | | | | |
| 5300 | 2640 | 2660 | 116 | 172 |
| 2710 | 2640 | 70 | 117 | 172 |
| 22600 | 2640 | 19960 | 118 | 172 |
| 6190 | 2640 | 3550 | 119 | 172 |
| | | | | |
| 2710 | 5300 | -2590 | 119 | 173 |
| 22600 | 5300 | 17300 | 120 | 173 |
| 6190 | 5300 | 890 | 121 | 173 |
| | | | | |
| 22600 | 2710 | 19890 | 122 | 173 |
| 6190 | 2710 | 3480 | 123 | 173 |
| | | | | |
| 6190 | 22600 | -16410 | 123 | 174 |

S Statistic = 123 - 174 = -51

| Tied Group | Value | Members |
|---|---|---|
| 1 | 10100 | 2 |

| Time Period | Observations |
|---|---|
| 2/1/2017 | 1 |

| | |
|---|---|
| 3/1/2017 | 1 |
| 4/1/2017 | 1 |
| 5/1/2017 | 1 |
| 6/1/2017 | 1 |
| 7/1/2017 | 1 |
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |

There are 2 time periods with multiple data

---

A = 18
B = 36
C = 0
D = 0
E = 2
F = 4
a = 33000
b = 124200
c = 1200
Group Variance = 1830.34
Z-Score = -1.1687
Comparison Level at 95% confidence level = 1.65463 (upward trend)
-1.1687 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RW21-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 282000 M61c2c | 282000 M61c2c | Same Date | 0 | 0 |
| 279000 M61c2c | 282000 M61c2c | Same Date | 0 | 0 |
| 279000 M61c2c | 282000 M61c2c | Same Date | 0 | 0 |
| 330000 1c | 282000 M61c2c | 48000 | 1 | 0 |
| 368000 | 282000 M61c2c | 86000 | 2 | 0 |
| 301000 | 282000 M61c2c | 19000 | 3 | 0 |
| 268000 M63c | 282000 M61c2c | -14000 | 3 | 1 |
| 298000 3c | 282000 M61c2c | 16000 | 4 | 1 |
| 145000 ML | 282000 M61c2c | -137000 | 4 | 2 |
| 325000 | 282000 M61c2c | 43000 | 5 | 2 |
| 279000 M61c2c | 282000 M61c2c | Same Date | 5 | 2 |
| 279000 M61c2c | 282000 M61c2c | Same Date | 5 | 2 |
| 330000 1c | 282000 M61c2c | 48000 | 6 | 2 |
| 368000 | 282000 M61c2c | 86000 | 7 | 2 |
| 301000 | 282000 M61c2c | 19000 | 8 | 2 |
| 268000 M63c | 282000 M61c2c | -14000 | 8 | 3 |
| 298000 3c | 282000 M61c2c | 16000 | 9 | 3 |
| 145000 ML | 282000 M61c2c | -137000 | 9 | 4 |
| 325000 | 282000 M61c2c | 43000 | 10 | 4 |
| 279000 M61c2c | 279000 M61c2c | Same Date | 10 | 4 |
| 330000 1c | 279000 M61c2c | 51000 | 11 | 4 |
| 368000 | 279000 M61c2c | 89000 | 12 | 4 |
| 301000 | 279000 M61c2c | 22000 | 13 | 4 |
| 268000 M63c | 279000 M61c2c | -11000 | 13 | 5 |
| 298000 3c | 279000 M61c2c | 19000 | 14 | 5 |
| 145000 ML | 279000 M61c2c | -134000 | 14 | 6 |
| 325000 | 279000 M61c2c | 46000 | 15 | 6 |
| 330000 1c | 279000 M61c2c | 51000 | 16 | 6 |
| 368000 | 279000 M61c2c | 89000 | 17 | 6 |
| 301000 | 279000 M61c2c | 22000 | 18 | 6 |
| 268000 M63c | 279000 M61c2c | -11000 | 18 | 7 |
| 298000 3c | 279000 M61c2c | 19000 | 19 | 7 |
| 145000 ML | 279000 M61c2c | -134000 | 19 | 8 |
| 325000 | 279000 M61c2c | 46000 | 20 | 8 |
| 368000 | 330000 1c | 38000 | 21 | 8 |
| 301000 | 330000 1c | -29000 | 21 | 9 |
| 268000 M63c | 330000 1c | -62000 | 21 | 10 |
| 298000 3c | 330000 1c | -32000 | 21 | 11 |
| 145000 ML | 330000 1c | -185000 | 21 | 12 |
| 325000 | 330000 1c | -5000 | 21 | 13 |
| 301000 | 368000 | -67000 | 21 | 14 |
| 268000 M63c | 368000 | -100000 | 21 | 15 |

| | | | | |
|---|---|---|---|---|
| 298000 3c | 368000 | -70000 | 21 | 16 |
| 145000 ML | 368000 | -223000 | 21 | 17 |
| 325000 | 368000 | -43000 | 21 | 18 |
| | | | | |
| 268000 M63c | 301000 | -33000 | 21 | 19 |
| 298000 3c | 301000 | -3000 | 21 | 20 |
| 145000 ML | 301000 | -156000 | 21 | 21 |
| 325000 | 301000 | 24000 | 22 | 21 |
| | | | | |
| 298000 3c | 268000 M63c | 30000 | 23 | 21 |
| 145000 ML | 268000 M63c | -123000 | 23 | 22 |
| 325000 | 268000 M63c | 57000 | 24 | 22 |
| | | | | |
| 145000 ML | 298000 3c | -153000 | 24 | 23 |
| 325000 | 298000 3c | 27000 | 25 | 23 |
| | | | | |
| 325000 | 145000 ML | Same Date | 25 | 23 |

S Statistic = 25 - 23 = 2

| Tied Group | Value | Members |
|---|---|---|
| 1 | 282000 | 2 |
| 2 | 279000 | 2 |

| Time Period | Observations |
|---|---|
| 6/1/2019 | 4 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 2 |

There are 2 time periods with multiple data

A = 36
B = 174
C = 0
D = 24
E = 4
F = 14
a = 2970
b = 8910
c = 220
Group Variance = 153.588
Z-Score = 0.0806903
Comparison Level at 95% confidence level = 1.65463 (upward trend)
0.0806903 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RW22R-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 65300 1c2c | 58100 | Same Date | 0 | 0 |
| 176000 | 58100 | Same Date | 0 | 0 |
| 176000 | 58100 | Same Date | 0 | 0 |
| 178000 | 58100 | Same Date | 0 | 0 |
| 178000 | 58100 | Same Date | 0 | 0 |
| 176000 | 58100 | Same Date | 0 | 0 |
| 176000 | 58100 | Same Date | 0 | 0 |
| 178000 | 58100 | Same Date | 0 | 0 |
| 178000 | 58100 | Same Date | 0 | 0 |
| 188000 | 58100 | 129900 | 1 | 0 |
| 112000 M6 | 58100 | 53900 | 2 | 0 |
| 213000 | 58100 | 154900 | 3 | 0 |
| 217000 | 58100 | 158900 | 4 | 0 |
| 253000 ML | 58100 | 194900 | 5 | 0 |
| 169000 MH | 58100 | 110900 | 6 | 0 |
| 137000 | 58100 | 78900 | 7 | 0 |
| 113000 | 58100 | 54900 | 8 | 0 |
| 197000 | 58100 | 138900 | 9 | 0 |
| 197000 | 58100 | 138900 | 10 | 0 |
| 138800 | 58100 | 80700 | 11 | 0 |
| 154200 | 58100 | 96100 | 12 | 0 |
| 88690 | 58100 | 30590 | 13 | 0 |
| 196900 | 58100 | 138800 | 14 | 0 |
| | | | | |
| 176000 | 65300 1c2c | Same Date | 14 | 0 |
| 176000 | 65300 1c2c | Same Date | 14 | 0 |
| 178000 | 65300 1c2c | Same Date | 14 | 0 |
| 178000 | 65300 1c2c | Same Date | 14 | 0 |
| 176000 | 65300 1c2c | Same Date | 14 | 0 |
| 176000 | 65300 1c2c | Same Date | 14 | 0 |
| 178000 | 65300 1c2c | Same Date | 14 | 0 |
| 178000 | 65300 1c2c | Same Date | 14 | 0 |
| 188000 | 65300 1c2c | 122700 | 15 | 0 |
| 112000 M6 | 65300 1c2c | 46700 | 16 | 0 |
| 213000 | 65300 1c2c | 147700 | 17 | 0 |
| 217000 | 65300 1c2c | 151700 | 18 | 0 |
| 253000 ML | 65300 1c2c | 187700 | 19 | 0 |
| 169000 MH | 65300 1c2c | 103700 | 20 | 0 |
| 137000 | 65300 1c2c | 71700 | 21 | 0 |
| 113000 | 65300 1c2c | 47700 | 22 | 0 |
| 197000 | 65300 1c2c | 131700 | 23 | 0 |
| 197000 | 65300 1c2c | 131700 | 24 | 0 |
| 138800 | 65300 1c2c | 73500 | 25 | 0 |
| 154200 | 65300 1c2c | 88900 | 26 | 0 |
| 88690 | 65300 1c2c | 23390 | 27 | 0 |
| 196900 | 65300 1c2c | 131600 | 28 | 0 |

| | | | | |
|---|---|---|---|---|
| 176000 | 176000 | Same Date | 28 | 0 |
| 178000 | 176000 | Same Date | 28 | 0 |
| 178000 | 176000 | Same Date | 28 | 0 |
| 176000 | 176000 | Same Date | 28 | 0 |
| 176000 | 176000 | Same Date | 28 | 0 |
| 178000 | 176000 | Same Date | 28 | 0 |
| 178000 | 176000 | Same Date | 28 | 0 |
| 188000 | 176000 | 12000 | 29 | 0 |
| 112000 M6 | 176000 | -64000 | 29 | 1 |
| 213000 | 176000 | 37000 | 30 | 1 |
| 217000 | 176000 | 41000 | 31 | 1 |
| 253000 ML | 176000 | 77000 | 32 | 1 |
| 169000 MH | 176000 | -7000 | 32 | 2 |
| 137000 | 176000 | -39000 | 32 | 3 |
| 113000 | 176000 | -63000 | 32 | 4 |
| 197000 | 176000 | 21000 | 33 | 4 |
| 197000 | 176000 | 21000 | 34 | 4 |
| 138800 | 176000 | -37200 | 34 | 5 |
| 154200 | 176000 | -21800 | 34 | 6 |
| 88690 | 176000 | -87310 | 34 | 7 |
| 196900 | 176000 | 20900 | 35 | 7 |
| | | | | |
| 178000 | 176000 | Same Date | 35 | 7 |
| 178000 | 176000 | Same Date | 35 | 7 |
| 176000 | 176000 | Same Date | 35 | 7 |
| 176000 | 176000 | Same Date | 35 | 7 |
| 178000 | 176000 | Same Date | 35 | 7 |
| 178000 | 176000 | Same Date | 35 | 7 |
| 188000 | 176000 | 12000 | 36 | 7 |
| 112000 M6 | 176000 | -64000 | 36 | 8 |
| 213000 | 176000 | 37000 | 37 | 8 |
| 217000 | 176000 | 41000 | 38 | 8 |
| 253000 ML | 176000 | 77000 | 39 | 8 |
| 169000 MH | 176000 | -7000 | 39 | 9 |
| 137000 | 176000 | -39000 | 39 | 10 |
| 113000 | 176000 | -63000 | 39 | 11 |
| 197000 | 176000 | 21000 | 40 | 11 |
| 197000 | 176000 | 21000 | 41 | 11 |
| 138800 | 176000 | -37200 | 41 | 12 |
| 154200 | 176000 | -21800 | 41 | 13 |
| 88690 | 176000 | -87310 | 41 | 14 |
| 196900 | 176000 | 20900 | 42 | 14 |
| | | | | |
| 178000 | 178000 | Same Date | 42 | 14 |
| 176000 | 178000 | Same Date | 42 | 14 |
| 176000 | 178000 | Same Date | 42 | 14 |
| 178000 | 178000 | Same Date | 42 | 14 |
| 178000 | 178000 | Same Date | 42 | 14 |
| 188000 | 178000 | 10000 | 43 | 14 |
| 112000 M6 | 178000 | -66000 | 43 | 15 |
| 213000 | 178000 | 35000 | 44 | 15 |
| 217000 | 178000 | 39000 | 45 | 15 |
| 253000 ML | 178000 | 75000 | 46 | 15 |
| 169000 MH | 178000 | -9000 | 46 | 16 |
| 137000 | 178000 | -41000 | 46 | 17 |
| 113000 | 178000 | -65000 | 46 | 18 |
| 197000 | 178000 | 19000 | 47 | 18 |

| | | | | |
|---|---|---|---|---|
| 197000 | 178000 | 19000 | 48 | 18 |
| 138800 | 178000 | -39200 | 48 | 19 |
| 154200 | 178000 | -23800 | 48 | 20 |
| 88690 | 178000 | -89310 | 48 | 21 |
| 196900 | 178000 | 18900 | 49 | 21 |
| | | | | |
| 176000 | 178000 | Same Date | 49 | 21 |
| 176000 | 178000 | Same Date | 49 | 21 |
| 178000 | 178000 | Same Date | 49 | 21 |
| 178000 | 178000 | Same Date | 49 | 21 |
| 188000 | 178000 | 10000 | 50 | 21 |
| 112000 M6 | 178000 | -66000 | 50 | 22 |
| 213000 | 178000 | 35000 | 51 | 22 |
| 217000 | 178000 | 39000 | 52 | 22 |
| 253000 ML | 178000 | 75000 | 53 | 22 |
| 169000 MH | 178000 | -9000 | 53 | 23 |
| 137000 | 178000 | -41000 | 53 | 24 |
| 113000 | 178000 | -65000 | 53 | 25 |
| 197000 | 178000 | 19000 | 54 | 25 |
| 197000 | 178000 | 19000 | 55 | 25 |
| 138800 | 178000 | -39200 | 55 | 26 |
| 154200 | 178000 | -23800 | 55 | 27 |
| 88690 | 178000 | -89310 | 55 | 28 |
| 196900 | 178000 | 18900 | 56 | 28 |
| | | | | |
| 176000 | 176000 | Same Date | 56 | 28 |
| 178000 | 176000 | Same Date | 56 | 28 |
| 178000 | 176000 | Same Date | 56 | 28 |
| 188000 | 176000 | 12000 | 57 | 28 |
| 112000 M6 | 176000 | -64000 | 57 | 29 |
| 213000 | 176000 | 37000 | 58 | 29 |
| 217000 | 176000 | 41000 | 59 | 29 |
| 253000 ML | 176000 | 77000 | 60 | 29 |
| 169000 MH | 176000 | -7000 | 60 | 30 |
| 137000 | 176000 | -39000 | 60 | 31 |
| 113000 | 176000 | -63000 | 60 | 32 |
| 197000 | 176000 | 21000 | 61 | 32 |
| 197000 | 176000 | 21000 | 62 | 32 |
| 138800 | 176000 | -37200 | 62 | 33 |
| 154200 | 176000 | -21800 | 62 | 34 |
| 88690 | 176000 | -87310 | 62 | 35 |
| 196900 | 176000 | 20900 | 63 | 35 |
| | | | | |
| 178000 | 176000 | Same Date | 63 | 35 |
| 178000 | 176000 | Same Date | 63 | 35 |
| 188000 | 176000 | 12000 | 64 | 35 |
| 112000 M6 | 176000 | -64000 | 64 | 36 |
| 213000 | 176000 | 37000 | 65 | 36 |
| 217000 | 176000 | 41000 | 66 | 36 |
| 253000 ML | 176000 | 77000 | 67 | 36 |
| 169000 MH | 176000 | -7000 | 67 | 37 |
| 137000 | 176000 | -39000 | 67 | 38 |
| 113000 | 176000 | -63000 | 67 | 39 |
| 197000 | 176000 | 21000 | 68 | 39 |
| 197000 | 176000 | 21000 | 69 | 39 |
| 138800 | 176000 | -37200 | 69 | 40 |
| 154200 | 176000 | -21800 | 69 | 41 |

| | | | | |
|---|---|---|---|---|
| 88690 | 176000 | -87310 | 69 | 42 |
| 196900 | 176000 | 20900 | 70 | 42 |
| | | | | |
| 178000 | 178000 | Same Date | 70 | 42 |
| 188000 | 178000 | 10000 | 71 | 42 |
| 112000 M6 | 178000 | -66000 | 71 | 43 |
| 213000 | 178000 | 35000 | 72 | 43 |
| 217000 | 178000 | 39000 | 73 | 43 |
| 253000 ML | 178000 | 75000 | 74 | 43 |
| 169000 MH | 178000 | -9000 | 74 | 44 |
| 137000 | 178000 | -41000 | 74 | 45 |
| 113000 | 178000 | -65000 | 74 | 46 |
| 197000 | 178000 | 19000 | 75 | 46 |
| 197000 | 178000 | 19000 | 76 | 46 |
| 138800 | 178000 | -39200 | 76 | 47 |
| 154200 | 178000 | -23800 | 76 | 48 |
| 88690 | 178000 | -89310 | 76 | 49 |
| 196900 | 178000 | 18900 | 77 | 49 |
| | | | | |
| 188000 | 178000 | 10000 | 78 | 49 |
| 112000 M6 | 178000 | -66000 | 78 | 50 |
| 213000 | 178000 | 35000 | 79 | 50 |
| 217000 | 178000 | 39000 | 80 | 50 |
| 253000 ML | 178000 | 75000 | 81 | 50 |
| 169000 MH | 178000 | -9000 | 81 | 51 |
| 137000 | 178000 | -41000 | 81 | 52 |
| 113000 | 178000 | -65000 | 81 | 53 |
| 197000 | 178000 | 19000 | 82 | 53 |
| 197000 | 178000 | 19000 | 83 | 53 |
| 138800 | 178000 | -39200 | 83 | 54 |
| 154200 | 178000 | -23800 | 83 | 55 |
| 88690 | 178000 | -89310 | 83 | 56 |
| 196900 | 178000 | 18900 | 84 | 56 |
| | | | | |
| 112000 M6 | 188000 | -76000 | 84 | 57 |
| 213000 | 188000 | 25000 | 85 | 57 |
| 217000 | 188000 | 29000 | 86 | 57 |
| 253000 ML | 188000 | 65000 | 87 | 57 |
| 169000 MH | 188000 | -19000 | 87 | 58 |
| 137000 | 188000 | -51000 | 87 | 59 |
| 113000 | 188000 | -75000 | 87 | 60 |
| 197000 | 188000 | 9000 | 88 | 60 |
| 197000 | 188000 | 9000 | 89 | 60 |
| 138800 | 188000 | -49200 | 89 | 61 |
| 154200 | 188000 | -33800 | 89 | 62 |
| 88690 | 188000 | -99310 | 89 | 63 |
| 196900 | 188000 | 8900 | 90 | 63 |
| | | | | |
| 213000 | 112000 M6 | 101000 | 91 | 63 |
| 217000 | 112000 M6 | 105000 | 92 | 63 |
| 253000 ML | 112000 M6 | 141000 | 93 | 63 |
| 169000 MH | 112000 M6 | 57000 | 94 | 63 |
| 137000 | 112000 M6 | 25000 | 95 | 63 |
| 113000 | 112000 M6 | 1000 | 96 | 63 |
| 197000 | 112000 M6 | 85000 | 97 | 63 |
| 197000 | 112000 M6 | 85000 | 98 | 63 |
| 138800 | 112000 M6 | 26800 | 99 | 63 |

| | | | | |
|---|---|---|---|---|
| 154200 | 112000 M6 | 42200 | 100 | 63 |
| 88690 | 112000 M6 | -23310 | 100 | 64 |
| 196900 | 112000 M6 | 84900 | 101 | 64 |
| | | | | |
| 217000 | 213000 | 4000 | 102 | 64 |
| 253000 ML | 213000 | 40000 | 103 | 64 |
| 169000 MH | 213000 | -44000 | 103 | 65 |
| 137000 | 213000 | -76000 | 103 | 66 |
| 113000 | 213000 | -100000 | 103 | 67 |
| 197000 | 213000 | -16000 | 103 | 68 |
| 197000 | 213000 | -16000 | 103 | 69 |
| 138800 | 213000 | -74200 | 103 | 70 |
| 154200 | 213000 | -58800 | 103 | 71 |
| 88690 | 213000 | -124310 | 103 | 72 |
| 196900 | 213000 | -16100 | 103 | 73 |
| | | | | |
| 253000 ML | 217000 | 36000 | 104 | 73 |
| 169000 MH | 217000 | -48000 | 104 | 74 |
| 137000 | 217000 | -80000 | 104 | 75 |
| 113000 | 217000 | -104000 | 104 | 76 |
| 197000 | 217000 | -20000 | 104 | 77 |
| 197000 | 217000 | -20000 | 104 | 78 |
| 138800 | 217000 | -78200 | 104 | 79 |
| 154200 | 217000 | -62800 | 104 | 80 |
| 88690 | 217000 | -128310 | 104 | 81 |
| 196900 | 217000 | -20100 | 104 | 82 |
| | | | | |
| 169000 MH | 253000 ML | -84000 | 104 | 83 |
| 137000 | 253000 ML | -116000 | 104 | 84 |
| 113000 | 253000 ML | -140000 | 104 | 85 |
| 197000 | 253000 ML | -56000 | 104 | 86 |
| 197000 | 253000 ML | -56000 | 104 | 87 |
| 138800 | 253000 ML | -114200 | 104 | 88 |
| 154200 | 253000 ML | -98800 | 104 | 89 |
| 88690 | 253000 ML | -164310 | 104 | 90 |
| 196900 | 253000 ML | -56100 | 104 | 91 |
| | | | | |
| 137000 | 169000 MH | -32000 | 104 | 92 |
| 113000 | 169000 MH | -56000 | 104 | 93 |
| 197000 | 169000 MH | 28000 | 105 | 93 |
| 197000 | 169000 MH | 28000 | 106 | 93 |
| 138800 | 169000 MH | -30200 | 106 | 94 |
| 154200 | 169000 MH | -14800 | 106 | 95 |
| 88690 | 169000 MH | -80310 | 106 | 96 |
| 196900 | 169000 MH | 27900 | 107 | 96 |
| | | | | |
| 113000 | 137000 | -24000 | 107 | 97 |
| 197000 | 137000 | 60000 | 108 | 97 |
| 197000 | 137000 | 60000 | 109 | 97 |
| 138800 | 137000 | 1800 | 110 | 97 |
| 154200 | 137000 | 17200 | 111 | 97 |
| 88690 | 137000 | -48310 | 111 | 98 |
| 196900 | 137000 | 59900 | 112 | 98 |
| | | | | |
| 197000 | 113000 | 84000 | 113 | 98 |
| 197000 | 113000 | 84000 | 114 | 98 |
| 138800 | 113000 | 25800 | 115 | 98 |

| | | | | |
|---|---|---|---|---|
| 154200 | 113000 | 41200 | 116 | 98 |
| 88690 | 113000 | -24310 | 116 | 99 |
| 196900 | 113000 | 83900 | 117 | 99 |
| | | | | |
| 197000 | 197000 | Same Date | 117 | 99 |
| 138800 | 197000 | -58200 | 117 | 100 |
| 154200 | 197000 | -42800 | 117 | 101 |
| 88690 | 197000 | -108310 | 117 | 102 |
| 196900 | 197000 | -100 | 117 | 103 |
| | | | | |
| 138800 | 197000 | -58200 | 117 | 104 |
| 154200 | 197000 | -42800 | 117 | 105 |
| 88690 | 197000 | -108310 | 117 | 106 |
| 196900 | 197000 | -100 | 117 | 107 |
| | | | | |
| 154200 | 138800 | 15400 | 118 | 107 |
| 88690 | 138800 | -50110 | 118 | 108 |
| 196900 | 138800 | 58100 | 119 | 108 |
| | | | | |
| 88690 | 154200 | -65510 | 119 | 109 |
| 196900 | 154200 | 42700 | 120 | 109 |
| | | | | |
| 196900 | 88690 | 108210 | 121 | 109 |

S Statistic = 121 - 109 = 12

| Tied Group | Value | Members |
|---|---|---|
| 1 | 176000 | 4 |
| 2 | 178000 | 4 |
| 3 | 197000 | 2 |

| Time Period | Observations |
|---|---|
| 5/1/2019 | 10 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 2 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 2 time periods with multiple data

A = 330
B = 2268
C = 48
D = 720
E = 26
F = 92
a = 29256
b = 109296

c = 1104
Group Variance = 1483.48
Z-Score = 0.285596
Comparison Level at 95% confidence level = 1.65463 (upward trend)
0.285596 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RW23-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 22.4 | 12.7 | Same Date | 0 | 0 |
| 20.6 | 12.7 | 7.9 | 1 | 0 |
| 38.6 | 12.7 | 25.9 | 2 | 0 |
| 5 J | 12.7 | -7.7 | 2 | 1 |
| 2.7 J | 12.7 | -10 | 2 | 2 |
| 6.4 J2c | 12.7 | -6.3 | 2 | 3 |
| 5.9 J | 12.7 | -6.8 | 2 | 4 |
| 2.8 J | 12.7 | -9.9 | 2 | 5 |
| 6.5 J | 12.7 | -6.2 | 2 | 6 |
| ND<10 U | 12.7 | -2.7 | 2 | 7 |
| ND<5 U | 12.7 | -7.7 | 2 | 8 |
| 3.472 J | 12.7 | -9.228 | 2 | 9 |
| 4.053 J | 12.7 | -8.647 | 2 | 10 |
| 5.737 J | 12.7 | -6.963 | 2 | 11 |
| 538.7 | 12.7 | 526 | 3 | 11 |
| | | | | |
| 20.6 | 22.4 | -1.8 | 3 | 12 |
| 38.6 | 22.4 | 16.2 | 4 | 12 |
| 5 J | 22.4 | -17.4 | 4 | 13 |
| 2.7 J | 22.4 | -19.7 | 4 | 14 |
| 6.4 J2c | 22.4 | -16 | 4 | 15 |
| 5.9 J | 22.4 | -16.5 | 4 | 16 |
| 2.8 J | 22.4 | -19.6 | 4 | 17 |
| 6.5 J | 22.4 | -15.9 | 4 | 18 |
| ND<10 U | 22.4 | -12.4 | 4 | 19 |
| ND<5 U | 22.4 | -17.4 | 4 | 20 |
| 3.472 J | 22.4 | -18.928 | 4 | 21 |
| 4.053 J | 22.4 | -18.347 | 4 | 22 |
| 5.737 J | 22.4 | -16.663 | 4 | 23 |
| 538.7 | 22.4 | 516.3 | 5 | 23 |
| | | | | |
| 38.6 | 20.6 | 18 | 6 | 23 |
| 5 J | 20.6 | -15.6 | 6 | 24 |
| 2.7 J | 20.6 | -17.9 | 6 | 25 |
| 6.4 J2c | 20.6 | -14.2 | 6 | 26 |
| 5.9 J | 20.6 | -14.7 | 6 | 27 |
| 2.8 J | 20.6 | -17.8 | 6 | 28 |
| 6.5 J | 20.6 | -14.1 | 6 | 29 |
| ND<10 U | 20.6 | -10.6 | 6 | 30 |
| ND<5 U | 20.6 | -15.6 | 6 | 31 |
| 3.472 J | 20.6 | -17.128 | 6 | 32 |
| 4.053 J | 20.6 | -16.547 | 6 | 33 |
| 5.737 J | 20.6 | -14.863 | 6 | 34 |
| 538.7 | 20.6 | 518.1 | 7 | 34 |
| | | | | |
| 5 J | 38.6 | -33.6 | 7 | 35 |
| 2.7 J | 38.6 | -35.9 | 7 | 36 |

| | | | | |
|---|---|---|---|---|
| 6.4 J2c | 38.6 | -32.2 | 7 | 37 |
| 5.9 J | 38.6 | -32.7 | 7 | 38 |
| 2.8 J | 38.6 | -35.8 | 7 | 39 |
| 6.5 J | 38.6 | -32.1 | 7 | 40 |
| ND<10 U | 38.6 | -28.6 | 7 | 41 |
| ND<5 U | 38.6 | -33.6 | 7 | 42 |
| 3.472 J | 38.6 | -35.128 | 7 | 43 |
| 4.053 J | 38.6 | -34.547 | 7 | 44 |
| 5.737 J | 38.6 | -32.863 | 7 | 45 |
| 538.7 | 38.6 | 500.1 | 8 | 45 |
| | | | | |
| 2.7 J | 5 J | -2.3 | 8 | 46 |
| 6.4 J2c | 5 J | 1.4 | 9 | 46 |
| 5.9 J | 5 J | 0.9 | 10 | 46 |
| 2.8 J | 5 J | -2.2 | 10 | 47 |
| 6.5 J | 5 J | 1.5 | 11 | 47 |
| ND<10 U | 5 J | 5 | 12 | 47 |
| ND<5 U | 5 J | 0 | 12 | 47 |
| 3.472 J | 5 J | -1.528 | 12 | 48 |
| 4.053 J | 5 J | -0.947 | 12 | 49 |
| 5.737 J | 5 J | 0.737 | 13 | 49 |
| 538.7 | 5 J | 533.7 | 14 | 49 |
| | | | | |
| 6.4 J2c | 2.7 J | 3.7 | 15 | 49 |
| 5.9 J | 2.7 J | 3.2 | 16 | 49 |
| 2.8 J | 2.7 J | 0.1 | 17 | 49 |
| 6.5 J | 2.7 J | 3.8 | 18 | 49 |
| ND<10 U | 2.7 J | 7.3 | 19 | 49 |
| ND<5 U | 2.7 J | 2.3 | 20 | 49 |
| 3.472 J | 2.7 J | 0.772 | 21 | 49 |
| 4.053 J | 2.7 J | 1.353 | 22 | 49 |
| 5.737 J | 2.7 J | 3.037 | 23 | 49 |
| 538.7 | 2.7 J | 536 | 24 | 49 |
| | | | | |
| 5.9 J | 6.4 J2c | -0.5 | 24 | 50 |
| 2.8 J | 6.4 J2c | -3.6 | 24 | 51 |
| 6.5 J | 6.4 J2c | 0.1 | 25 | 51 |
| ND<10 U | 6.4 J2c | 3.6 | 26 | 51 |
| ND<5 U | 6.4 J2c | -1.4 | 26 | 52 |
| 3.472 J | 6.4 J2c | -2.928 | 26 | 53 |
| 4.053 J | 6.4 J2c | -2.347 | 26 | 54 |
| 5.737 J | 6.4 J2c | -0.663 | 26 | 55 |
| 538.7 | 6.4 J2c | 532.3 | 27 | 55 |
| | | | | |
| 2.8 J | 5.9 J | -3.1 | 27 | 56 |
| 6.5 J | 5.9 J | 0.6 | 28 | 56 |
| ND<10 U | 5.9 J | 4.1 | 29 | 56 |
| ND<5 U | 5.9 J | -0.9 | 29 | 57 |
| 3.472 J | 5.9 J | -2.428 | 29 | 58 |
| 4.053 J | 5.9 J | -1.847 | 29 | 59 |
| 5.737 J | 5.9 J | -0.163 | 29 | 60 |
| 538.7 | 5.9 J | 532.8 | 30 | 60 |
| | | | | |
| 6.5 J | 2.8 J | 3.7 | 31 | 60 |
| ND<10 U | 2.8 J | 7.2 | 32 | 60 |
| ND<5 U | 2.8 J | 2.2 | 33 | 60 |
| 3.472 J | 2.8 J | 0.672 | 34 | 60 |

| | | | | |
|---|---|---|---|---|
| 4.053 J | 2.8 J | 1.253 | 35 | 60 |
| 5.737 J | 2.8 J | 2.937 | 36 | 60 |
| 538.7 | 2.8 J | 535.9 | 37 | 60 |
| | | | | |
| ND<10 U | 6.5 J | 3.5 | 38 | 60 |
| ND<5 U | 6.5 J | -1.5 | 38 | 61 |
| 3.472 J | 6.5 J | -3.028 | 38 | 62 |
| 4.053 J | 6.5 J | -2.447 | 38 | 63 |
| 5.737 J | 6.5 J | -0.763 | 38 | 64 |
| 538.7 | 6.5 J | 532.2 | 39 | 64 |
| | | | | |
| ND<5 U | ND<10 U | -5 | 39 | 65 |
| 3.472 J | ND<10 U | -6.528 | 39 | 66 |
| 4.053 J | ND<10 U | -5.947 | 39 | 67 |
| 5.737 J | ND<10 U | -4.263 | 39 | 68 |
| 538.7 | ND<10 U | 528.7 | 40 | 68 |
| | | | | |
| 3.472 J | ND<5 U | -1.528 | 40 | 69 |
| 4.053 J | ND<5 U | -0.947 | 40 | 70 |
| 5.737 J | ND<5 U | 0.737 | 41 | 70 |
| 538.7 | ND<5 U | 533.7 | 42 | 70 |
| | | | | |
| 4.053 J | 3.472 J | 0.581 | 43 | 70 |
| 5.737 J | 3.472 J | 2.265 | 44 | 70 |
| 538.7 | 3.472 J | 535.228 | 45 | 70 |
| | | | | |
| 5.737 J | 4.053 J | 1.684 | 46 | 70 |
| 538.7 | 4.053 J | 534.647 | 47 | 70 |
| | | | | |
| 538.7 | 5.737 J | 532.963 | 48 | 70 |

S Statistic = 48 - 70 = -22

| Tied Group | Value | Members |
|---|---|---|
| 1 | 5 | 2 |

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 18
B = 18

C = 0
D = 0
E = 2
F = 2
a = 8880
b = 30240
c = 480
Group Variance = 491.342
Z-Score = -0.947387
Comparison Level at 95% confidence level = 1.65463 (upward trend)
-0.947387 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RW24-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 5 J | 94 | Same Date | 0 | 0 |
| 8.2 J | 94 | -85.8 | 0 | 1 |
| 6.7 J | 94 | -87.3 | 0 | 2 |
| 3.5 J | 94 | -90.5 | 0 | 3 |
| 3.4 J | 94 | -90.6 | 0 | 4 |
| 16.4 | 94 | -77.6 | 0 | 5 |
| ND<5 U1c | 94 | -89 | 0 | 6 |
| | | | | |
| 8.2 J | 5 J | 3.2 | 1 | 6 |
| 6.7 J | 5 J | 1.7 | 2 | 6 |
| 3.5 J | 5 J | -1.5 | 2 | 7 |
| 3.4 J | 5 J | -1.6 | 2 | 8 |
| 16.4 | 5 J | 11.4 | 3 | 8 |
| ND<5 U1c | 5 J | 0 | 3 | 8 |
| | | | | |
| 6.7 J | 8.2 J | -1.5 | 3 | 9 |
| 3.5 J | 8.2 J | -4.7 | 3 | 10 |
| 3.4 J | 8.2 J | -4.8 | 3 | 11 |
| 16.4 | 8.2 J | 8.2 | 4 | 11 |
| ND<5 U1c | 8.2 J | -3.2 | 4 | 12 |
| | | | | |
| 3.5 J | 6.7 J | -3.2 | 4 | 13 |
| 3.4 J | 6.7 J | -3.3 | 4 | 14 |
| 16.4 | 6.7 J | 9.7 | 5 | 14 |
| ND<5 U1c | 6.7 J | -1.7 | 5 | 15 |
| | | | | |
| 3.4 J | 3.5 J | -0.1 | 5 | 16 |
| 16.4 | 3.5 J | 12.9 | 6 | 16 |
| ND<5 U1c | 3.5 J | 1.5 | 7 | 16 |
| | | | | |
| 16.4 | 3.4 J | 13 | 8 | 16 |
| ND<5 U1c | 3.4 J | 1.6 | 9 | 16 |
| | | | | |
| ND<5 U1c | 16.4 | -11.4 | 9 | 17 |

S Statistic = 9 - 17 = -8

| Tied Group | Value | Members |
|---|---|---|
| 1 | 5 | 2 |

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |

6/1/2020 1
9/1/2020 1
11/1/2020 1
There are 1 time periods with multiple data

---

A = 18
B = 18
C = 0
D = 0
E = 2
F = 2
a = 1176
b = 3024
c = 112
Group Variance = 63.369
Z-Score = -0.879345
Comparison Level at 95% confidence level = 1.65463 (upward trend)
-0.879345 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RW25-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 70800 M6 | 70500 | Same Date | 0 | 0 |
| 437000 | 70500 | 366500 | 1 | 0 |
| 11900 | 70500 | -58600 | 1 | 1 |
| 2570 | 70500 | -67930 | 1 | 2 |
| 5720 | 70500 | -64780 | 1 | 3 |
| 2780 | 70500 | -67720 | 1 | 4 |
| 9930 1c | 70500 | -60570 | 1 | 5 |
| | | | | |
| 437000 | 70800 M6 | 366200 | 2 | 5 |
| 11900 | 70800 M6 | -58900 | 2 | 6 |
| 2570 | 70800 M6 | -68230 | 2 | 7 |
| 5720 | 70800 M6 | -65080 | 2 | 8 |
| 2780 | 70800 M6 | -68020 | 2 | 9 |
| 9930 1c | 70800 M6 | -60870 | 2 | 10 |
| | | | | |
| 11900 | 437000 | -425100 | 2 | 11 |
| 2570 | 437000 | -434430 | 2 | 12 |
| 5720 | 437000 | -431280 | 2 | 13 |
| 2780 | 437000 | -434220 | 2 | 14 |
| 9930 1c | 437000 | -427070 | 2 | 15 |
| | | | | |
| 2570 | 11900 | -9330 | 2 | 16 |
| 5720 | 11900 | -6180 | 2 | 17 |
| 2780 | 11900 | -9120 | 2 | 18 |
| 9930 1c | 11900 | -1970 | 2 | 19 |
| | | | | |
| 5720 | 2570 | 3150 | 3 | 19 |
| 2780 | 2570 | 210 | 4 | 19 |
| 9930 1c | 2570 | 7360 | 5 | 19 |
| | | | | |
| 2780 | 5720 | -2940 | 5 | 20 |
| 9930 1c | 5720 | 4210 | 6 | 20 |
| | | | | |
| 9930 1c | 2780 | 7150 | 7 | 20 |

S Statistic = 7 - 20 = -13

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |

9/1/2020 1
11/1/2020 1
There are 1 time periods with multiple data

---

A = 0
B = 18
C = 0
D = 0
E = 0
F = 2
a = 1176
b = 3024
c = 112
Group Variance = 64.3333
Z-Score = -1.49611
Comparison Level at 95% confidence level = 1.65463 (upward trend)
-1.49611 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RWA-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 17.6 | 516 | Same Date | 0 | 0 |
| 17.6 | 516 | Same Date | 0 | 0 |
| 32.6 | 516 | Same Date | 0 | 0 |
| 32.6 | 516 | Same Date | 0 | 0 |
| 750 1c2c | 516 | Same Date | 0 | 0 |
| 32.6 | 516 | Same Date | 0 | 0 |
| 32.6 | 516 | Same Date | 0 | 0 |
| 17.6 | 516 | Same Date | 0 | 0 |
| 17.6 | 516 | Same Date | 0 | 0 |
| 1720 | 516 | 1204 | 1 | 0 |
| 49.7 | 516 | -466.3 | 1 | 1 |
| 9.7 J | 516 | -506.3 | 1 | 2 |
| 21.5 | 516 | -494.5 | 1 | 3 |
| 182 | 516 | -334 | 1 | 4 |
| 52.1 1c | 516 | -463.9 | 1 | 5 |
| 6.1 J | 516 | -509.9 | 1 | 6 |
| 7.6 J | 516 | -508.4 | 1 | 7 |
| 46.8 | 516 | -469.2 | 1 | 8 |
| 627.7 | 516 | 111.7 | 2 | 8 |
| 284.4 | 516 | -231.6 | 2 | 9 |
| 319 | 516 | -197 | 2 | 10 |
| 152.4 | 516 | -363.6 | 2 | 11 |
| 183.9 | 516 | -332.1 | 2 | 12 |
| | | | | |
| 17.6 | 17.6 | Same Date | 2 | 12 |
| 32.6 | 17.6 | Same Date | 2 | 12 |
| 32.6 | 17.6 | Same Date | 2 | 12 |
| 750 1c2c | 17.6 | Same Date | 2 | 12 |
| 32.6 | 17.6 | Same Date | 2 | 12 |
| 32.6 | 17.6 | Same Date | 2 | 12 |
| 17.6 | 17.6 | Same Date | 2 | 12 |
| 17.6 | 17.6 | Same Date | 2 | 12 |
| 1720 | 17.6 | 1702.4 | 3 | 12 |
| 49.7 | 17.6 | 32.1 | 4 | 12 |
| 9.7 J | 17.6 | -7.9 | 4 | 13 |
| 21.5 | 17.6 | 3.9 | 5 | 13 |
| 182 | 17.6 | 164.4 | 6 | 13 |
| 52.1 1c | 17.6 | 34.5 | 7 | 13 |
| 6.1 J | 17.6 | -11.5 | 7 | 14 |
| 7.6 J | 17.6 | -10 | 7 | 15 |
| 46.8 | 17.6 | 29.2 | 8 | 15 |
| 627.7 | 17.6 | 610.1 | 9 | 15 |
| 284.4 | 17.6 | 266.8 | 10 | 15 |
| 319 | 17.6 | 301.4 | 11 | 15 |
| 152.4 | 17.6 | 134.8 | 12 | 15 |
| 183.9 | 17.6 | 166.3 | 13 | 15 |

| | | | | |
|---|---|---|---|---|
| 32.6 | 17.6 | Same Date | 13 | 15 |
| 32.6 | 17.6 | Same Date | 13 | 15 |
| 750 1c2c | 17.6 | Same Date | 13 | 15 |
| 32.6 | 17.6 | Same Date | 13 | 15 |
| 32.6 | 17.6 | Same Date | 13 | 15 |
| 17.6 | 17.6 | Same Date | 13 | 15 |
| 17.6 | 17.6 | Same Date | 13 | 15 |
| 1720 | 17.6 | 1702.4 | 14 | 15 |
| 49.7 | 17.6 | 32.1 | 15 | 15 |
| 9.7 J | 17.6 | -7.9 | 15 | 16 |
| 21.5 | 17.6 | 3.9 | 16 | 16 |
| 182 | 17.6 | 164.4 | 17 | 16 |
| 52.1 1c | 17.6 | 34.5 | 18 | 16 |
| 6.1 J | 17.6 | -11.5 | 18 | 17 |
| 7.6 J | 17.6 | -10 | 18 | 18 |
| 46.8 | 17.6 | 29.2 | 19 | 18 |
| 627.7 | 17.6 | 610.1 | 20 | 18 |
| 284.4 | 17.6 | 266.8 | 21 | 18 |
| 319 | 17.6 | 301.4 | 22 | 18 |
| 152.4 | 17.6 | 134.8 | 23 | 18 |
| 183.9 | 17.6 | 166.3 | 24 | 18 |
| | | | | |
| 32.6 | 32.6 | Same Date | 24 | 18 |
| 750 1c2c | 32.6 | Same Date | 24 | 18 |
| 32.6 | 32.6 | Same Date | 24 | 18 |
| 32.6 | 32.6 | Same Date | 24 | 18 |
| 17.6 | 32.6 | Same Date | 24 | 18 |
| 17.6 | 32.6 | Same Date | 24 | 18 |
| 1720 | 32.6 | 1687.4 | 25 | 18 |
| 49.7 | 32.6 | 17.1 | 26 | 18 |
| 9.7 J | 32.6 | -22.9 | 26 | 19 |
| 21.5 | 32.6 | -11.1 | 26 | 20 |
| 182 | 32.6 | 149.4 | 27 | 20 |
| 52.1 1c | 32.6 | 19.5 | 28 | 20 |
| 6.1 J | 32.6 | -26.5 | 28 | 21 |
| 7.6 J | 32.6 | -25 | 28 | 22 |
| 46.8 | 32.6 | 14.2 | 29 | 22 |
| 627.7 | 32.6 | 595.1 | 30 | 22 |
| 284.4 | 32.6 | 251.8 | 31 | 22 |
| 319 | 32.6 | 286.4 | 32 | 22 |
| 152.4 | 32.6 | 119.8 | 33 | 22 |
| 183.9 | 32.6 | 151.3 | 34 | 22 |
| | | | | |
| 750 1c2c | 32.6 | Same Date | 34 | 22 |
| 32.6 | 32.6 | Same Date | 34 | 22 |
| 32.6 | 32.6 | Same Date | 34 | 22 |
| 17.6 | 32.6 | Same Date | 34 | 22 |
| 17.6 | 32.6 | Same Date | 34 | 22 |
| 1720 | 32.6 | 1687.4 | 35 | 22 |
| 49.7 | 32.6 | 17.1 | 36 | 22 |
| 9.7 J | 32.6 | -22.9 | 36 | 23 |
| 21.5 | 32.6 | -11.1 | 36 | 24 |
| 182 | 32.6 | 149.4 | 37 | 24 |
| 52.1 1c | 32.6 | 19.5 | 38 | 24 |
| 6.1 J | 32.6 | -26.5 | 38 | 25 |
| 7.6 J | 32.6 | -25 | 38 | 26 |
| 46.8 | 32.6 | 14.2 | 39 | 26 |

| | | | | |
|---|---|---|---|---|
| 627.7 | 32.6 | 595.1 | 40 | 26 |
| 284.4 | 32.6 | 251.8 | 41 | 26 |
| 319 | 32.6 | 286.4 | 42 | 26 |
| 152.4 | 32.6 | 119.8 | 43 | 26 |
| 183.9 | 32.6 | 151.3 | 44 | 26 |
| | | | | |
| 32.6 | 750 1c2c | Same Date | 44 | 26 |
| 32.6 | 750 1c2c | Same Date | 44 | 26 |
| 17.6 | 750 1c2c | Same Date | 44 | 26 |
| 17.6 | 750 1c2c | Same Date | 44 | 26 |
| 1720 | 750 1c2c | 970 | 45 | 26 |
| 49.7 | 750 1c2c | -700.3 | 45 | 27 |
| 9.7 J | 750 1c2c | -740.3 | 45 | 28 |
| 21.5 | 750 1c2c | -728.5 | 45 | 29 |
| 182 | 750 1c2c | -568 | 45 | 30 |
| 52.1 1c | 750 1c2c | -697.9 | 45 | 31 |
| 6.1 J | 750 1c2c | -743.9 | 45 | 32 |
| 7.6 J | 750 1c2c | -742.4 | 45 | 33 |
| 46.8 | 750 1c2c | -703.2 | 45 | 34 |
| 627.7 | 750 1c2c | -122.3 | 45 | 35 |
| 284.4 | 750 1c2c | -465.6 | 45 | 36 |
| 319 | 750 1c2c | -431 | 45 | 37 |
| 152.4 | 750 1c2c | -597.6 | 45 | 38 |
| 183.9 | 750 1c2c | -566.1 | 45 | 39 |
| | | | | |
| 32.6 | 32.6 | Same Date | 45 | 39 |
| 17.6 | 32.6 | Same Date | 45 | 39 |
| 17.6 | 32.6 | Same Date | 45 | 39 |
| 1720 | 32.6 | 1687.4 | 46 | 39 |
| 49.7 | 32.6 | 17.1 | 47 | 39 |
| 9.7 J | 32.6 | -22.9 | 47 | 40 |
| 21.5 | 32.6 | -11.1 | 47 | 41 |
| 182 | 32.6 | 149.4 | 48 | 41 |
| 52.1 1c | 32.6 | 19.5 | 49 | 41 |
| 6.1 J | 32.6 | -26.5 | 49 | 42 |
| 7.6 J | 32.6 | -25 | 49 | 43 |
| 46.8 | 32.6 | 14.2 | 50 | 43 |
| 627.7 | 32.6 | 595.1 | 51 | 43 |
| 284.4 | 32.6 | 251.8 | 52 | 43 |
| 319 | 32.6 | 286.4 | 53 | 43 |
| 152.4 | 32.6 | 119.8 | 54 | 43 |
| 183.9 | 32.6 | 151.3 | 55 | 43 |
| | | | | |
| 17.6 | 32.6 | Same Date | 55 | 43 |
| 17.6 | 32.6 | Same Date | 55 | 43 |
| 1720 | 32.6 | 1687.4 | 56 | 43 |
| 49.7 | 32.6 | 17.1 | 57 | 43 |
| 9.7 J | 32.6 | -22.9 | 57 | 44 |
| 21.5 | 32.6 | -11.1 | 57 | 45 |
| 182 | 32.6 | 149.4 | 58 | 45 |
| 52.1 1c | 32.6 | 19.5 | 59 | 45 |
| 6.1 J | 32.6 | -26.5 | 59 | 46 |
| 7.6 J | 32.6 | -25 | 59 | 47 |
| 46.8 | 32.6 | 14.2 | 60 | 47 |
| 627.7 | 32.6 | 595.1 | 61 | 47 |
| 284.4 | 32.6 | 251.8 | 62 | 47 |
| 319 | 32.6 | 286.4 | 63 | 47 |

| | | | | |
|---|---|---|---|---|
| 152.4 | 32.6 | 119.8 | 64 | 47 |
| 183.9 | 32.6 | 151.3 | 65 | 47 |
| | | | | |
| 17.6 | 17.6 | Same Date | 65 | 47 |
| 1720 | 17.6 | 1702.4 | 66 | 47 |
| 49.7 | 17.6 | 32.1 | 67 | 47 |
| 9.7 J | 17.6 | -7.9 | 67 | 48 |
| 21.5 | 17.6 | 3.9 | 68 | 48 |
| 182 | 17.6 | 164.4 | 69 | 48 |
| 52.1 1c | 17.6 | 34.5 | 70 | 48 |
| 6.1 J | 17.6 | -11.5 | 70 | 49 |
| 7.6 J | 17.6 | -10 | 70 | 50 |
| 46.8 | 17.6 | 29.2 | 71 | 50 |
| 627.7 | 17.6 | 610.1 | 72 | 50 |
| 284.4 | 17.6 | 266.8 | 73 | 50 |
| 319 | 17.6 | 301.4 | 74 | 50 |
| 152.4 | 17.6 | 134.8 | 75 | 50 |
| 183.9 | 17.6 | 166.3 | 76 | 50 |
| | | | | |
| 1720 | 17.6 | 1702.4 | 77 | 50 |
| 49.7 | 17.6 | 32.1 | 78 | 50 |
| 9.7 J | 17.6 | -7.9 | 78 | 51 |
| 21.5 | 17.6 | 3.9 | 79 | 51 |
| 182 | 17.6 | 164.4 | 80 | 51 |
| 52.1 1c | 17.6 | 34.5 | 81 | 51 |
| 6.1 J | 17.6 | -11.5 | 81 | 52 |
| 7.6 J | 17.6 | -10 | 81 | 53 |
| 46.8 | 17.6 | 29.2 | 82 | 53 |
| 627.7 | 17.6 | 610.1 | 83 | 53 |
| 284.4 | 17.6 | 266.8 | 84 | 53 |
| 319 | 17.6 | 301.4 | 85 | 53 |
| 152.4 | 17.6 | 134.8 | 86 | 53 |
| 183.9 | 17.6 | 166.3 | 87 | 53 |
| | | | | |
| 49.7 | 1720 | -1670.3 | 87 | 54 |
| 9.7 J | 1720 | -1710.3 | 87 | 55 |
| 21.5 | 1720 | -1698.5 | 87 | 56 |
| 182 | 1720 | -1538 | 87 | 57 |
| 52.1 1c | 1720 | -1667.9 | 87 | 58 |
| 6.1 J | 1720 | -1713.9 | 87 | 59 |
| 7.6 J | 1720 | -1712.4 | 87 | 60 |
| 46.8 | 1720 | -1673.2 | 87 | 61 |
| 627.7 | 1720 | -1092.3 | 87 | 62 |
| 284.4 | 1720 | -1435.6 | 87 | 63 |
| 319 | 1720 | -1401 | 87 | 64 |
| 152.4 | 1720 | -1567.6 | 87 | 65 |
| 183.9 | 1720 | -1536.1 | 87 | 66 |
| | | | | |
| 9.7 J | 49.7 | -40 | 87 | 67 |
| 21.5 | 49.7 | -28.2 | 87 | 68 |
| 182 | 49.7 | 132.3 | 88 | 68 |
| 52.1 1c | 49.7 | 2.4 | 89 | 68 |
| 6.1 J | 49.7 | -43.6 | 89 | 69 |
| 7.6 J | 49.7 | -42.1 | 89 | 70 |
| 46.8 | 49.7 | -2.9 | 89 | 71 |
| 627.7 | 49.7 | 578 | 90 | 71 |
| 284.4 | 49.7 | 234.7 | 91 | 71 |

| | | | | |
|---|---|---|---|---|
| 319 | 49.7 | 269.3 | 92 | 71 |
| 152.4 | 49.7 | 102.7 | 93 | 71 |
| 183.9 | 49.7 | 134.2 | 94 | 71 |
| | | | | |
| 21.5 | 9.7 J | 11.8 | 95 | 71 |
| 182 | 9.7 J | 172.3 | 96 | 71 |
| 52.1 1c | 9.7 J | 42.4 | 97 | 71 |
| 6.1 J | 9.7 J | -3.6 | 97 | 72 |
| 7.6 J | 9.7 J | -2.1 | 97 | 73 |
| 46.8 | 9.7 J | 37.1 | 98 | 73 |
| 627.7 | 9.7 J | 618 | 99 | 73 |
| 284.4 | 9.7 J | 274.7 | 100 | 73 |
| 319 | 9.7 J | 309.3 | 101 | 73 |
| 152.4 | 9.7 J | 142.7 | 102 | 73 |
| 183.9 | 9.7 J | 174.2 | 103 | 73 |
| | | | | |
| 182 | 21.5 | 160.5 | 104 | 73 |
| 52.1 1c | 21.5 | 30.6 | 105 | 73 |
| 6.1 J | 21.5 | -15.4 | 105 | 74 |
| 7.6 J | 21.5 | -13.9 | 105 | 75 |
| 46.8 | 21.5 | 25.3 | 106 | 75 |
| 627.7 | 21.5 | 606.2 | 107 | 75 |
| 284.4 | 21.5 | 262.9 | 108 | 75 |
| 319 | 21.5 | 297.5 | 109 | 75 |
| 152.4 | 21.5 | 130.9 | 110 | 75 |
| 183.9 | 21.5 | 162.4 | 111 | 75 |
| | | | | |
| 52.1 1c | 182 | -129.9 | 111 | 76 |
| 6.1 J | 182 | -175.9 | 111 | 77 |
| 7.6 J | 182 | -174.4 | 111 | 78 |
| 46.8 | 182 | -135.2 | 111 | 79 |
| 627.7 | 182 | 445.7 | 112 | 79 |
| 284.4 | 182 | 102.4 | 113 | 79 |
| 319 | 182 | 137 | 114 | 79 |
| 152.4 | 182 | -29.6 | 114 | 80 |
| 183.9 | 182 | 1.9 | 115 | 80 |
| | | | | |
| 6.1 J | 52.1 1c | -46 | 115 | 81 |
| 7.6 J | 52.1 1c | -44.5 | 115 | 82 |
| 46.8 | 52.1 1c | -5.3 | 115 | 83 |
| 627.7 | 52.1 1c | 575.6 | 116 | 83 |
| 284.4 | 52.1 1c | 232.3 | 117 | 83 |
| 319 | 52.1 1c | 266.9 | 118 | 83 |
| 152.4 | 52.1 1c | 100.3 | 119 | 83 |
| 183.9 | 52.1 1c | 131.8 | 120 | 83 |
| | | | | |
| 7.6 J | 6.1 J | 1.5 | 121 | 83 |
| 46.8 | 6.1 J | 40.7 | 122 | 83 |
| 627.7 | 6.1 J | 621.6 | 123 | 83 |
| 284.4 | 6.1 J | 278.3 | 124 | 83 |
| 319 | 6.1 J | 312.9 | 125 | 83 |
| 152.4 | 6.1 J | 146.3 | 126 | 83 |
| 183.9 | 6.1 J | 177.8 | 127 | 83 |
| | | | | |
| 46.8 | 7.6 J | 39.2 | 128 | 83 |
| 627.7 | 7.6 J | 620.1 | 129 | 83 |
| 284.4 | 7.6 J | 276.8 | 130 | 83 |

| | | | | |
|---|---|---|---|---|
| 319 | 7.6 J | 311.4 | 131 | 83 |
| 152.4 | 7.6 J | 144.8 | 132 | 83 |
| 183.9 | 7.6 J | 176.3 | 133 | 83 |
| | | | | |
| 627.7 | 46.8 | 580.9 | 134 | 83 |
| 284.4 | 46.8 | 237.6 | 135 | 83 |
| 319 | 46.8 | 272.2 | 136 | 83 |
| 152.4 | 46.8 | 105.6 | 137 | 83 |
| 183.9 | 46.8 | 137.1 | 138 | 83 |
| | | | | |
| 284.4 | 627.7 | -343.3 | 138 | 84 |
| 319 | 627.7 | -308.7 | 138 | 85 |
| 152.4 | 627.7 | -475.3 | 138 | 86 |
| 183.9 | 627.7 | -443.8 | 138 | 87 |
| | | | | |
| 319 | 284.4 | 34.6 | 139 | 87 |
| 152.4 | 284.4 | -132 | 139 | 88 |
| 183.9 | 284.4 | -100.5 | 139 | 89 |
| | | | | |
| 152.4 | 319 | -166.6 | 139 | 90 |
| 183.9 | 319 | -135.1 | 139 | 91 |
| | | | | |
| 183.9 | 152.4 | 31.5 | 140 | 91 |

S Statistic = 140 - 91 = 49

| Tied Group | Value | Members |
|---|---|---|
| 1 | 17.6 | 4 |
| 2 | 32.6 | 4 |

| Time Period | Observations |
|---|---|
| 5/1/2019 | 10 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 312
B = 2250
C = 48
D = 720
E = 24
F = 90
a = 29256
b = 109296

c = 1104
Group Variance = 1485.27
Z-Score = 1.24548
Comparison Level at 95% confidence level = 1.65463 (upward trend)
1.24548 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RWB-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 254 | 254 | Same Date | 0 | 0 |
| 5.4 J | 254 | Same Date | 0 | 0 |
| 5.4 J | 254 | Same Date | 0 | 0 |
| 5.4 J | 254 | Same Date | 0 | 0 |
| 5.4 J | 254 | Same Date | 0 | 0 |
| 64.9 1c2c | 254 | Same Date | 0 | 0 |
| 7.4 J | 254 | Same Date | 0 | 0 |
| 254 | 254 | Same Date | 0 | 0 |
| 254 | 254 | Same Date | 0 | 0 |
| 5.5 J | 254 | -248.5 | 0 | 1 |
| 38.7 | 254 | -215.3 | 0 | 2 |
| 6.1 J | 254 | -247.9 | 0 | 3 |
| ND<5 U | 254 | -249 | 0 | 4 |
| 5.8 J1c | 254 | -248.2 | 0 | 5 |
| 11.9 1c | 254 | -242.1 | 0 | 6 |
| ND<5 U | 254 | -249 | 0 | 7 |
| 12.4 J | 254 | -241.6 | 0 | 8 |
| ND<10 U | 254 | -244 | 0 | 9 |
| 5.072 J | 254 | -248.928 | 0 | 10 |
| ND<5 U | 254 | -249 | 0 | 11 |
| 3.551 J | 254 | -250.449 | 0 | 12 |
| 17.04 | 254 | -236.96 | 0 | 13 |
| ND<5 U | 254 | -249 | 0 | 14 |
| | | | | |
| 5.4 J | 254 | Same Date | 0 | 14 |
| 5.4 J | 254 | Same Date | 0 | 14 |
| 5.4 J | 254 | Same Date | 0 | 14 |
| 5.4 J | 254 | Same Date | 0 | 14 |
| 64.9 1c2c | 254 | Same Date | 0 | 14 |
| 7.4 J | 254 | Same Date | 0 | 14 |
| 254 | 254 | Same Date | 0 | 14 |
| 254 | 254 | Same Date | 0 | 14 |
| 5.5 J | 254 | -248.5 | 0 | 15 |
| 38.7 | 254 | -215.3 | 0 | 16 |
| 6.1 J | 254 | -247.9 | 0 | 17 |
| ND<5 U | 254 | -249 | 0 | 18 |
| 5.8 J1c | 254 | -248.2 | 0 | 19 |
| 11.9 1c | 254 | -242.1 | 0 | 20 |
| ND<5 U | 254 | -249 | 0 | 21 |
| 12.4 J | 254 | -241.6 | 0 | 22 |
| ND<10 U | 254 | -244 | 0 | 23 |
| 5.072 J | 254 | -248.928 | 0 | 24 |
| ND<5 U | 254 | -249 | 0 | 25 |
| 3.551 J | 254 | -250.449 | 0 | 26 |
| 17.04 | 254 | -236.96 | 0 | 27 |
| ND<5 U | 254 | -249 | 0 | 28 |

| | | | | |
|---|---|---|---|---|
| 5.4 J | 5.4 J | Same Date | 0 | 28 |
| 5.4 J | 5.4 J | Same Date | 0 | 28 |
| 5.4 J | 5.4 J | Same Date | 0 | 28 |
| 64.9 1c2c | 5.4 J | Same Date | 0 | 28 |
| 7.4 J | 5.4 J | Same Date | 0 | 28 |
| 254 | 5.4 J | Same Date | 0 | 28 |
| 254 | 5.4 J | Same Date | 0 | 28 |
| 5.5 J | 5.4 J | 0.1 | 1 | 28 |
| 38.7 | 5.4 J | 33.3 | 2 | 28 |
| 6.1 J | 5.4 J | 0.7 | 3 | 28 |
| ND<5 U | 5.4 J | -0.4 | 3 | 29 |
| 5.8 J1c | 5.4 J | 0.4 | 4 | 29 |
| 11.9 1c | 5.4 J | 6.5 | 5 | 29 |
| ND<5 U | 5.4 J | -0.4 | 5 | 30 |
| 12.4 J | 5.4 J | 7 | 6 | 30 |
| ND<10 U | 5.4 J | 4.6 | 7 | 30 |
| 5.072 J | 5.4 J | -0.328 | 7 | 31 |
| ND<5 U | 5.4 J | -0.4 | 7 | 32 |
| 3.551 J | 5.4 J | -1.849 | 7 | 33 |
| 17.04 | 5.4 J | 11.64 | 8 | 33 |
| ND<5 U | 5.4 J | -0.4 | 8 | 34 |
| | | | | |
| 5.4 J | 5.4 J | Same Date | 8 | 34 |
| 5.4 J | 5.4 J | Same Date | 8 | 34 |
| 64.9 1c2c | 5.4 J | Same Date | 8 | 34 |
| 7.4 J | 5.4 J | Same Date | 8 | 34 |
| 254 | 5.4 J | Same Date | 8 | 34 |
| 254 | 5.4 J | Same Date | 8 | 34 |
| 5.5 J | 5.4 J | 0.1 | 9 | 34 |
| 38.7 | 5.4 J | 33.3 | 10 | 34 |
| 6.1 J | 5.4 J | 0.7 | 11 | 34 |
| ND<5 U | 5.4 J | -0.4 | 11 | 35 |
| 5.8 J1c | 5.4 J | 0.4 | 12 | 35 |
| 11.9 1c | 5.4 J | 6.5 | 13 | 35 |
| ND<5 U | 5.4 J | -0.4 | 13 | 36 |
| 12.4 J | 5.4 J | 7 | 14 | 36 |
| ND<10 U | 5.4 J | 4.6 | 15 | 36 |
| 5.072 J | 5.4 J | -0.328 | 15 | 37 |
| ND<5 U | 5.4 J | -0.4 | 15 | 38 |
| 3.551 J | 5.4 J | -1.849 | 15 | 39 |
| 17.04 | 5.4 J | 11.64 | 16 | 39 |
| ND<5 U | 5.4 J | -0.4 | 16 | 40 |
| | | | | |
| 5.4 J | 5.4 J | Same Date | 16 | 40 |
| 64.9 1c2c | 5.4 J | Same Date | 16 | 40 |
| 7.4 J | 5.4 J | Same Date | 16 | 40 |
| 254 | 5.4 J | Same Date | 16 | 40 |
| 254 | 5.4 J | Same Date | 16 | 40 |
| 5.5 J | 5.4 J | 0.1 | 17 | 40 |
| 38.7 | 5.4 J | 33.3 | 18 | 40 |
| 6.1 J | 5.4 J | 0.7 | 19 | 40 |
| ND<5 U | 5.4 J | -0.4 | 19 | 41 |
| 5.8 J1c | 5.4 J | 0.4 | 20 | 41 |
| 11.9 1c | 5.4 J | 6.5 | 21 | 41 |
| ND<5 U | 5.4 J | -0.4 | 21 | 42 |
| 12.4 J | 5.4 J | 7 | 22 | 42 |
| ND<10 U | 5.4 J | 4.6 | 23 | 42 |

| | | | | |
|---|---|---|---|---|
| 5.072 J | 5.4 J | -0.328 | 23 | 43 |
| ND<5 U | 5.4 J | -0.4 | 23 | 44 |
| 3.551 J | 5.4 J | -1.849 | 23 | 45 |
| 17.04 | 5.4 J | 11.64 | 24 | 45 |
| ND<5 U | 5.4 J | -0.4 | 24 | 46 |
| | | | | |
| 64.9 1c2c | 5.4 J | Same Date | 24 | 46 |
| 7.4 J | 5.4 J | Same Date | 24 | 46 |
| 254 | 5.4 J | Same Date | 24 | 46 |
| 254 | 5.4 J | Same Date | 24 | 46 |
| 5.5 J | 5.4 J | 0.1 | 25 | 46 |
| 38.7 | 5.4 J | 33.3 | 26 | 46 |
| 6.1 J | 5.4 J | 0.7 | 27 | 46 |
| ND<5 U | 5.4 J | -0.4 | 27 | 47 |
| 5.8 J1c | 5.4 J | 0.4 | 28 | 47 |
| 11.9 1c | 5.4 J | 6.5 | 29 | 47 |
| ND<5 U | 5.4 J | -0.4 | 29 | 48 |
| 12.4 J | 5.4 J | 7 | 30 | 48 |
| ND<10 U | 5.4 J | 4.6 | 31 | 48 |
| 5.072 J | 5.4 J | -0.328 | 31 | 49 |
| ND<5 U | 5.4 J | -0.4 | 31 | 50 |
| 3.551 J | 5.4 J | -1.849 | 31 | 51 |
| 17.04 | 5.4 J | 11.64 | 32 | 51 |
| ND<5 U | 5.4 J | -0.4 | 32 | 52 |
| | | | | |
| 7.4 J | 64.9 1c2c | Same Date | 32 | 52 |
| 254 | 64.9 1c2c | Same Date | 32 | 52 |
| 254 | 64.9 1c2c | Same Date | 32 | 52 |
| 5.5 J | 64.9 1c2c | -59.4 | 32 | 53 |
| 38.7 | 64.9 1c2c | -26.2 | 32 | 54 |
| 6.1 J | 64.9 1c2c | -58.8 | 32 | 55 |
| ND<5 U | 64.9 1c2c | -59.9 | 32 | 56 |
| 5.8 J1c | 64.9 1c2c | -59.1 | 32 | 57 |
| 11.9 1c | 64.9 1c2c | -53 | 32 | 58 |
| ND<5 U | 64.9 1c2c | -59.9 | 32 | 59 |
| 12.4 J | 64.9 1c2c | -52.5 | 32 | 60 |
| ND<10 U | 64.9 1c2c | -54.9 | 32 | 61 |
| 5.072 J | 64.9 1c2c | -59.828 | 32 | 62 |
| ND<5 U | 64.9 1c2c | -59.9 | 32 | 63 |
| 3.551 J | 64.9 1c2c | -61.349 | 32 | 64 |
| 17.04 | 64.9 1c2c | -47.86 | 32 | 65 |
| ND<5 U | 64.9 1c2c | -59.9 | 32 | 66 |
| | | | | |
| 254 | 7.4 J | Same Date | 32 | 66 |
| 254 | 7.4 J | Same Date | 32 | 66 |
| 5.5 J | 7.4 J | -1.9 | 32 | 67 |
| 38.7 | 7.4 J | 31.3 | 33 | 67 |
| 6.1 J | 7.4 J | -1.3 | 33 | 68 |
| ND<5 U | 7.4 J | -2.4 | 33 | 69 |
| 5.8 J1c | 7.4 J | -1.6 | 33 | 70 |
| 11.9 1c | 7.4 J | 4.5 | 34 | 70 |
| ND<5 U | 7.4 J | -2.4 | 34 | 71 |
| 12.4 J | 7.4 J | 5 | 35 | 71 |
| ND<10 U | 7.4 J | 2.6 | 36 | 71 |
| 5.072 J | 7.4 J | -2.328 | 36 | 72 |
| ND<5 U | 7.4 J | -2.4 | 36 | 73 |
| 3.551 J | 7.4 J | -3.849 | 36 | 74 |

| | | | | |
|---|---|---|---|---|
| 17.04 | 7.4 J | 9.64 | 37 | 74 |
| ND<5 U | 7.4 J | -2.4 | 37 | 75 |
| | | | | |
| 254 | 254 | Same Date | 37 | 75 |
| 5.5 J | 254 | -248.5 | 37 | 76 |
| 38.7 | 254 | -215.3 | 37 | 77 |
| 6.1 J | 254 | -247.9 | 37 | 78 |
| ND<5 U | 254 | -249 | 37 | 79 |
| 5.8 J1c | 254 | -248.2 | 37 | 80 |
| 11.9 1c | 254 | -242.1 | 37 | 81 |
| ND<5 U | 254 | -249 | 37 | 82 |
| 12.4 J | 254 | -241.6 | 37 | 83 |
| ND<10 U | 254 | -244 | 37 | 84 |
| 5.072 J | 254 | -248.928 | 37 | 85 |
| ND<5 U | 254 | -249 | 37 | 86 |
| 3.551 J | 254 | -250.449 | 37 | 87 |
| 17.04 | 254 | -236.96 | 37 | 88 |
| ND<5 U | 254 | -249 | 37 | 89 |
| | | | | |
| 5.5 J | 254 | -248.5 | 37 | 90 |
| 38.7 | 254 | -215.3 | 37 | 91 |
| 6.1 J | 254 | -247.9 | 37 | 92 |
| ND<5 U | 254 | -249 | 37 | 93 |
| 5.8 J1c | 254 | -248.2 | 37 | 94 |
| 11.9 1c | 254 | -242.1 | 37 | 95 |
| ND<5 U | 254 | -249 | 37 | 96 |
| 12.4 J | 254 | -241.6 | 37 | 97 |
| ND<10 U | 254 | -244 | 37 | 98 |
| 5.072 J | 254 | -248.928 | 37 | 99 |
| ND<5 U | 254 | -249 | 37 | 100 |
| 3.551 J | 254 | -250.449 | 37 | 101 |
| 17.04 | 254 | -236.96 | 37 | 102 |
| ND<5 U | 254 | -249 | 37 | 103 |
| | | | | |
| 38.7 | 5.5 J | 33.2 | 38 | 103 |
| 6.1 J | 5.5 J | 0.6 | 39 | 103 |
| ND<5 U | 5.5 J | -0.5 | 39 | 104 |
| 5.8 J1c | 5.5 J | 0.3 | 40 | 104 |
| 11.9 1c | 5.5 J | 6.4 | 41 | 104 |
| ND<5 U | 5.5 J | -0.5 | 41 | 105 |
| 12.4 J | 5.5 J | 6.9 | 42 | 105 |
| ND<10 U | 5.5 J | 4.5 | 43 | 105 |
| 5.072 J | 5.5 J | -0.428 | 43 | 106 |
| ND<5 U | 5.5 J | -0.5 | 43 | 107 |
| 3.551 J | 5.5 J | -1.949 | 43 | 108 |
| 17.04 | 5.5 J | 11.54 | 44 | 108 |
| ND<5 U | 5.5 J | -0.5 | 44 | 109 |
| | | | | |
| 6.1 J | 38.7 | -32.6 | 44 | 110 |
| ND<5 U | 38.7 | -33.7 | 44 | 111 |
| 5.8 J1c | 38.7 | -32.9 | 44 | 112 |
| 11.9 1c | 38.7 | -26.8 | 44 | 113 |
| ND<5 U | 38.7 | -33.7 | 44 | 114 |
| 12.4 J | 38.7 | -26.3 | 44 | 115 |
| ND<10 U | 38.7 | -28.7 | 44 | 116 |
| 5.072 J | 38.7 | -33.628 | 44 | 117 |
| ND<5 U | 38.7 | -33.7 | 44 | 118 |

| | | | | |
|---|---|---|---|---|
| 3.551 J | 38.7 | -35.149 | 44 | 119 |
| 17.04 | 38.7 | -21.66 | 44 | 120 |
| ND<5 U | 38.7 | -33.7 | 44 | 121 |
| | | | | |
| ND<5 U | 6.1 J | -1.1 | 44 | 122 |
| 5.8 J1c | 6.1 J | -0.3 | 44 | 123 |
| 11.9 1c | 6.1 J | 5.8 | 45 | 123 |
| ND<5 U | 6.1 J | -1.1 | 45 | 124 |
| 12.4 J | 6.1 J | 6.3 | 46 | 124 |
| ND<10 U | 6.1 J | 3.9 | 47 | 124 |
| 5.072 J | 6.1 J | -1.028 | 47 | 125 |
| ND<5 U | 6.1 J | -1.1 | 47 | 126 |
| 3.551 J | 6.1 J | -2.549 | 47 | 127 |
| 17.04 | 6.1 J | 10.94 | 48 | 127 |
| ND<5 U | 6.1 J | -1.1 | 48 | 128 |
| | | | | |
| 5.8 J1c | ND<5 U | 0.8 | 49 | 128 |
| 11.9 1c | ND<5 U | 6.9 | 50 | 128 |
| ND<5 U | ND<5 U | 0 | 50 | 128 |
| 12.4 J | ND<5 U | 7.4 | 51 | 128 |
| ND<10 U | ND<5 U | 5 | 52 | 128 |
| 5.072 J | ND<5 U | 0.072 | 53 | 128 |
| ND<5 U | ND<5 U | 0 | 53 | 128 |
| 3.551 J | ND<5 U | -1.449 | 53 | 129 |
| 17.04 | ND<5 U | 12.04 | 54 | 129 |
| ND<5 U | ND<5 U | 0 | 54 | 129 |
| | | | | |
| 11.9 1c | 5.8 J1c | 6.1 | 55 | 129 |
| ND<5 U | 5.8 J1c | -0.8 | 55 | 130 |
| 12.4 J | 5.8 J1c | 6.6 | 56 | 130 |
| ND<10 U | 5.8 J1c | 4.2 | 57 | 130 |
| 5.072 J | 5.8 J1c | -0.728 | 57 | 131 |
| ND<5 U | 5.8 J1c | -0.8 | 57 | 132 |
| 3.551 J | 5.8 J1c | -2.249 | 57 | 133 |
| 17.04 | 5.8 J1c | 11.24 | 58 | 133 |
| ND<5 U | 5.8 J1c | -0.8 | 58 | 134 |
| | | | | |
| ND<5 U | 11.9 1c | -6.9 | 58 | 135 |
| 12.4 J | 11.9 1c | 0.5 | 59 | 135 |
| ND<10 U | 11.9 1c | -1.9 | 59 | 136 |
| 5.072 J | 11.9 1c | -6.828 | 59 | 137 |
| ND<5 U | 11.9 1c | -6.9 | 59 | 138 |
| 3.551 J | 11.9 1c | -8.349 | 59 | 139 |
| 17.04 | 11.9 1c | 5.14 | 60 | 139 |
| ND<5 U | 11.9 1c | -6.9 | 60 | 140 |
| | | | | |
| 12.4 J | ND<5 U | 7.4 | 61 | 140 |
| ND<10 U | ND<5 U | 5 | 62 | 140 |
| 5.072 J | ND<5 U | 0.072 | 63 | 140 |
| ND<5 U | ND<5 U | 0 | 63 | 140 |
| 3.551 J | ND<5 U | -1.449 | 63 | 141 |
| 17.04 | ND<5 U | 12.04 | 64 | 141 |
| ND<5 U | ND<5 U | 0 | 64 | 141 |
| | | | | |
| ND<10 U | 12.4 J | -2.4 | 64 | 142 |
| 5.072 J | 12.4 J | -7.328 | 64 | 143 |
| ND<5 U | 12.4 J | -7.4 | 64 | 144 |

| | | | | |
|---|---|---|---|---|
| 3.551 J | 12.4 J | -8.849 | 64 | 145 |
| 17.04 | 12.4 J | 4.64 | 65 | 145 |
| ND<5 U | 12.4 J | -7.4 | 65 | 146 |
| | | | | |
| 5.072 J | ND<10 U | -4.928 | 65 | 147 |
| ND<5 U | ND<10 U | -5 | 65 | 148 |
| 3.551 J | ND<10 U | -6.449 | 65 | 149 |
| 17.04 | ND<10 U | 7.04 | 66 | 149 |
| ND<5 U | ND<10 U | -5 | 66 | 150 |
| | | | | |
| ND<5 U | 5.072 J | -0.072 | 66 | 151 |
| 3.551 J | 5.072 J | -1.521 | 66 | 152 |
| 17.04 | 5.072 J | 11.968 | 67 | 152 |
| ND<5 U | 5.072 J | -0.072 | 67 | 153 |
| | | | | |
| 3.551 J | ND<5 U | -1.449 | 67 | 154 |
| 17.04 | ND<5 U | 12.04 | 68 | 154 |
| ND<5 U | ND<5 U | 0 | 68 | 154 |
| | | | | |
| 17.04 | 3.551 J | 13.489 | 69 | 154 |
| ND<5 U | 3.551 J | 1.449 | 70 | 154 |
| | | | | |
| ND<5 U | 17.04 | -12.04 | 70 | 155 |

S Statistic = 70 - 155 = -85

| Tied Group | Value | Members |
|---|---|---|
| 1 | 254 | 4 |
| 2 | 5.4 | 4 |
| 3 | 5 | 4 |

| Time Period | Observations |
|---|---|
| 5/1/2019 | 10 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 468
B = 2250
C = 72
D = 720
E = 36
F = 90
a = 29256

b = 109296
c = 1104
Group Variance = 1477.74
Z-Score = -2.18514
Comparison Level at 95% confidence level = 1.65463 (upward trend)
-2.18514 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RWD-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 4.8 J1c3c | 4.7 J2c | Same Date | 0 | 0 |
| 9.1 J | 4.7 J2c | 4.4 | 1 | 0 |
| 5.4 J | 4.7 J2c | 0.7 | 2 | 0 |
| 3.6 J | 4.7 J2c | -1.1 | 2 | 1 |
| ND<5 U | 4.7 J2c | 0.3 | 3 | 1 |
| 4.2 J1c | 4.7 J2c | -0.5 | 3 | 2 |
| 3 J1c | 4.7 J2c | -1.7 | 3 | 3 |
| ND<5 U | 4.7 J2c | 0.3 | 4 | 3 |
| 10 J | 4.7 J2c | 5.3 | 5 | 3 |
| ND<10 U | 4.7 J2c | 5.3 | 6 | 3 |
| 38.2 | 4.7 J2c | 33.5 | 7 | 3 |
| ND<5 U | 4.7 J2c | 0.3 | 8 | 3 |
| ND<5 U | 4.7 J2c | 0.3 | 9 | 3 |
| ND<5 U | 4.7 J2c | 0.3 | 10 | 3 |
| ND<5 U | 4.7 J2c | 0.3 | 11 | 3 |
| | | | | |
| 9.1 J | 4.8 J1c3c | 4.3 | 12 | 3 |
| 5.4 J | 4.8 J1c3c | 0.6 | 13 | 3 |
| 3.6 J | 4.8 J1c3c | -1.2 | 13 | 4 |
| ND<5 U | 4.8 J1c3c | 0.2 | 14 | 4 |
| 4.2 J1c | 4.8 J1c3c | -0.6 | 14 | 5 |
| 3 J1c | 4.8 J1c3c | -1.8 | 14 | 6 |
| ND<5 U | 4.8 J1c3c | 0.2 | 15 | 6 |
| 10 J | 4.8 J1c3c | 5.2 | 16 | 6 |
| ND<10 U | 4.8 J1c3c | 5.2 | 17 | 6 |
| 38.2 | 4.8 J1c3c | 33.4 | 18 | 6 |
| ND<5 U | 4.8 J1c3c | 0.2 | 19 | 6 |
| ND<5 U | 4.8 J1c3c | 0.2 | 20 | 6 |
| ND<5 U | 4.8 J1c3c | 0.2 | 21 | 6 |
| ND<5 U | 4.8 J1c3c | 0.2 | 22 | 6 |
| | | | | |
| 5.4 J | 9.1 J | -3.7 | 22 | 7 |
| 3.6 J | 9.1 J | -5.5 | 22 | 8 |
| ND<5 U | 9.1 J | -4.1 | 22 | 9 |
| 4.2 J1c | 9.1 J | -4.9 | 22 | 10 |
| 3 J1c | 9.1 J | -6.1 | 22 | 11 |
| ND<5 U | 9.1 J | -4.1 | 22 | 12 |
| 10 J | 9.1 J | 0.9 | 23 | 12 |
| ND<10 U | 9.1 J | 0.9 | 24 | 12 |
| 38.2 | 9.1 J | 29.1 | 25 | 12 |
| ND<5 U | 9.1 J | -4.1 | 25 | 13 |
| ND<5 U | 9.1 J | -4.1 | 25 | 14 |
| ND<5 U | 9.1 J | -4.1 | 25 | 15 |
| ND<5 U | 9.1 J | -4.1 | 25 | 16 |
| | | | | |
| 3.6 J | 5.4 J | -1.8 | 25 | 17 |
| ND<5 U | 5.4 J | -0.4 | 25 | 18 |

| | | | | |
|---|---|---|---|---|
| 4.2 J1c | 5.4 J | -1.2 | 25 | 19 |
| 3 J1c | 5.4 J | -2.4 | 25 | 20 |
| ND<5 U | 5.4 J | -0.4 | 25 | 21 |
| 10 J | 5.4 J | 4.6 | 26 | 21 |
| ND<10 U | 5.4 J | 4.6 | 27 | 21 |
| 38.2 | 5.4 J | 32.8 | 28 | 21 |
| ND<5 U | 5.4 J | -0.4 | 28 | 22 |
| ND<5 U | 5.4 J | -0.4 | 28 | 23 |
| ND<5 U | 5.4 J | -0.4 | 28 | 24 |
| ND<5 U | 5.4 J | -0.4 | 28 | 25 |
| | | | | |
| ND<5 U | 3.6 J | 1.4 | 29 | 25 |
| 4.2 J1c | 3.6 J | 0.6 | 30 | 25 |
| 3 J1c | 3.6 J | -0.6 | 30 | 26 |
| ND<5 U | 3.6 J | 1.4 | 31 | 26 |
| 10 J | 3.6 J | 6.4 | 32 | 26 |
| ND<10 U | 3.6 J | 6.4 | 33 | 26 |
| 38.2 | 3.6 J | 34.6 | 34 | 26 |
| ND<5 U | 3.6 J | 1.4 | 35 | 26 |
| ND<5 U | 3.6 J | 1.4 | 36 | 26 |
| ND<5 U | 3.6 J | 1.4 | 37 | 26 |
| ND<5 U | 3.6 J | 1.4 | 38 | 26 |
| | | | | |
| 4.2 J1c | ND<5 U | -0.8 | 38 | 27 |
| 3 J1c | ND<5 U | -2 | 38 | 28 |
| ND<5 U | ND<5 U | 0 | 38 | 28 |
| 10 J | ND<5 U | 5 | 39 | 28 |
| ND<10 U | ND<5 U | 5 | 40 | 28 |
| 38.2 | ND<5 U | 33.2 | 41 | 28 |
| ND<5 U | ND<5 U | 0 | 41 | 28 |
| ND<5 U | ND<5 U | 0 | 41 | 28 |
| ND<5 U | ND<5 U | 0 | 41 | 28 |
| ND<5 U | ND<5 U | 0 | 41 | 28 |
| | | | | |
| 3 J1c | 4.2 J1c | -1.2 | 41 | 29 |
| ND<5 U | 4.2 J1c | 0.8 | 42 | 29 |
| 10 J | 4.2 J1c | 5.8 | 43 | 29 |
| ND<10 U | 4.2 J1c | 5.8 | 44 | 29 |
| 38.2 | 4.2 J1c | 34 | 45 | 29 |
| ND<5 U | 4.2 J1c | 0.8 | 46 | 29 |
| ND<5 U | 4.2 J1c | 0.8 | 47 | 29 |
| ND<5 U | 4.2 J1c | 0.8 | 48 | 29 |
| ND<5 U | 4.2 J1c | 0.8 | 49 | 29 |
| | | | | |
| ND<5 U | 3 J1c | 2 | 50 | 29 |
| 10 J | 3 J1c | 7 | 51 | 29 |
| ND<10 U | 3 J1c | 7 | 52 | 29 |
| 38.2 | 3 J1c | 35.2 | 53 | 29 |
| ND<5 U | 3 J1c | 2 | 54 | 29 |
| ND<5 U | 3 J1c | 2 | 55 | 29 |
| ND<5 U | 3 J1c | 2 | 56 | 29 |
| ND<5 U | 3 J1c | 2 | 57 | 29 |
| | | | | |
| 10 J | ND<5 U | 5 | 58 | 29 |
| ND<10 U | ND<5 U | 5 | 59 | 29 |
| 38.2 | ND<5 U | 33.2 | 60 | 29 |
| ND<5 U | ND<5 U | 0 | 60 | 29 |

| | | | | |
|---|---|---|---|---|
| ND<5 U | ND<5 U | 0 | 60 | 29 |
| ND<5 U | ND<5 U | 0 | 60 | 29 |
| ND<5 U | ND<5 U | 0 | 60 | 29 |
| | | | | |
| ND<10 U | 10 J | 0 | 60 | 29 |
| 38.2 | 10 J | 28.2 | 61 | 29 |
| ND<5 U | 10 J | -5 | 61 | 30 |
| ND<5 U | 10 J | -5 | 61 | 31 |
| ND<5 U | 10 J | -5 | 61 | 32 |
| ND<5 U | 10 J | -5 | 61 | 33 |
| | | | | |
| 38.2 | ND<10 U | 28.2 | 62 | 33 |
| ND<5 U | ND<10 U | -5 | 62 | 34 |
| ND<5 U | ND<10 U | -5 | 62 | 35 |
| ND<5 U | ND<10 U | -5 | 62 | 36 |
| ND<5 U | ND<10 U | -5 | 62 | 37 |
| | | | | |
| ND<5 U | 38.2 | -33.2 | 62 | 38 |
| ND<5 U | 38.2 | -33.2 | 62 | 39 |
| ND<5 U | 38.2 | -33.2 | 62 | 40 |
| ND<5 U | 38.2 | -33.2 | 62 | 41 |
| | | | | |
| ND<5 U | ND<5 U | 0 | 62 | 41 |
| ND<5 U | ND<5 U | 0 | 62 | 41 |
| ND<5 U | ND<5 U | 0 | 62 | 41 |
| | | | | |
| ND<5 U | ND<5 U | 0 | 62 | 41 |
| ND<5 U | ND<5 U | 0 | 62 | 41 |
| | | | | |
| ND<5 U | ND<5 U | 0 | 62 | 41 |

S Statistic = 62 - 41 = 21

| Tied Group | Value | Members |
|---|---|---|
| 1 | 5 | 6 |
| 2 | 10 | 2 |

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 528

B = 18
C = 120
D = 0
E = 32
F = 2
a = 8880
b = 30240
c = 480
Group Variance = 463.133
Z-Score = 0.929345
Comparison Level at 95% confidence level = 1.65463 (upward trend)
0.929345 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RWE-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 489 1c3c | 468 2c | Same Date | 0 | 0 |
| 422 | 468 2c | -46 | 0 | 1 |
| 261 | 468 2c | -207 | 0 | 2 |
| 303 | 468 2c | -165 | 0 | 3 |
| 1360 | 468 2c | 892 | 1 | 3 |
| 22100 1c | 468 2c | 21632 | 2 | 3 |
| 156 1c | 468 2c | -312 | 2 | 4 |
| 21900 | 468 2c | 21432 | 3 | 4 |
| 1630 | 468 2c | 1162 | 4 | 4 |
| 174 | 468 2c | -294 | 4 | 5 |
| 8214 | 468 2c | 7746 | 5 | 5 |
| 8214 | 468 2c | 7746 | 6 | 5 |
| 4432 | 468 2c | 3964 | 7 | 5 |
| 7079 | 468 2c | 6611 | 8 | 5 |
| 13660 | 468 2c | 13192 | 9 | 5 |
| 12150 | 468 2c | 11682 | 10 | 5 |
| | | | | |
| 422 | 489 1c3c | -67 | 10 | 6 |
| 261 | 489 1c3c | -228 | 10 | 7 |
| 303 | 489 1c3c | -186 | 10 | 8 |
| 1360 | 489 1c3c | 871 | 11 | 8 |
| 22100 1c | 489 1c3c | 21611 | 12 | 8 |
| 156 1c | 489 1c3c | -333 | 12 | 9 |
| 21900 | 489 1c3c | 21411 | 13 | 9 |
| 1630 | 489 1c3c | 1141 | 14 | 9 |
| 174 | 489 1c3c | -315 | 14 | 10 |
| 8214 | 489 1c3c | 7725 | 15 | 10 |
| 8214 | 489 1c3c | 7725 | 16 | 10 |
| 4432 | 489 1c3c | 3943 | 17 | 10 |
| 7079 | 489 1c3c | 6590 | 18 | 10 |
| 13660 | 489 1c3c | 13171 | 19 | 10 |
| 12150 | 489 1c3c | 11661 | 20 | 10 |
| | | | | |
| 261 | 422 | -161 | 20 | 11 |
| 303 | 422 | -119 | 20 | 12 |
| 1360 | 422 | 938 | 21 | 12 |
| 22100 1c | 422 | 21678 | 22 | 12 |
| 156 1c | 422 | -266 | 22 | 13 |
| 21900 | 422 | 21478 | 23 | 13 |
| 1630 | 422 | 1208 | 24 | 13 |
| 174 | 422 | -248 | 24 | 14 |
| 8214 | 422 | 7792 | 25 | 14 |
| 8214 | 422 | 7792 | 26 | 14 |
| 4432 | 422 | 4010 | 27 | 14 |
| 7079 | 422 | 6657 | 28 | 14 |
| 13660 | 422 | 13238 | 29 | 14 |
| 12150 | 422 | 11728 | 30 | 14 |

| | | | | |
|---|---|---|---|---|
| 303 | 261 | 42 | 31 | 14 |
| 1360 | 261 | 1099 | 32 | 14 |
| 22100 1c | 261 | 21839 | 33 | 14 |
| 156 1c | 261 | -105 | 33 | 15 |
| 21900 | 261 | 21639 | 34 | 15 |
| 1630 | 261 | 1369 | 35 | 15 |
| 174 | 261 | -87 | 35 | 16 |
| 8214 | 261 | 7953 | 36 | 16 |
| 8214 | 261 | 7953 | 37 | 16 |
| 4432 | 261 | 4171 | 38 | 16 |
| 7079 | 261 | 6818 | 39 | 16 |
| 13660 | 261 | 13399 | 40 | 16 |
| 12150 | 261 | 11889 | 41 | 16 |
| | | | | |
| 1360 | 303 | 1057 | 42 | 16 |
| 22100 1c | 303 | 21797 | 43 | 16 |
| 156 1c | 303 | -147 | 43 | 17 |
| 21900 | 303 | 21597 | 44 | 17 |
| 1630 | 303 | 1327 | 45 | 17 |
| 174 | 303 | -129 | 45 | 18 |
| 8214 | 303 | 7911 | 46 | 18 |
| 8214 | 303 | 7911 | 47 | 18 |
| 4432 | 303 | 4129 | 48 | 18 |
| 7079 | 303 | 6776 | 49 | 18 |
| 13660 | 303 | 13357 | 50 | 18 |
| 12150 | 303 | 11847 | 51 | 18 |
| | | | | |
| 22100 1c | 1360 | 20740 | 52 | 18 |
| 156 1c | 1360 | -1204 | 52 | 19 |
| 21900 | 1360 | 20540 | 53 | 19 |
| 1630 | 1360 | 270 | 54 | 19 |
| 174 | 1360 | -1186 | 54 | 20 |
| 8214 | 1360 | 6854 | 55 | 20 |
| 8214 | 1360 | 6854 | 56 | 20 |
| 4432 | 1360 | 3072 | 57 | 20 |
| 7079 | 1360 | 5719 | 58 | 20 |
| 13660 | 1360 | 12300 | 59 | 20 |
| 12150 | 1360 | 10790 | 60 | 20 |
| | | | | |
| 156 1c | 22100 1c | -21944 | 60 | 21 |
| 21900 | 22100 1c | -200 | 60 | 22 |
| 1630 | 22100 1c | -20470 | 60 | 23 |
| 174 | 22100 1c | -21926 | 60 | 24 |
| 8214 | 22100 1c | -13886 | 60 | 25 |
| 8214 | 22100 1c | -13886 | 60 | 26 |
| 4432 | 22100 1c | -17668 | 60 | 27 |
| 7079 | 22100 1c | -15021 | 60 | 28 |
| 13660 | 22100 1c | -8440 | 60 | 29 |
| 12150 | 22100 1c | -9950 | 60 | 30 |
| | | | | |
| 21900 | 156 1c | 21744 | 61 | 30 |
| 1630 | 156 1c | 1474 | 62 | 30 |
| 174 | 156 1c | 18 | 63 | 30 |
| 8214 | 156 1c | 8058 | 64 | 30 |
| 8214 | 156 1c | 8058 | 65 | 30 |
| 4432 | 156 1c | 4276 | 66 | 30 |

| | | | | |
|---|---|---|---|---|
| 7079 | 156 1c | 6923 | 67 | 30 |
| 13660 | 156 1c | 13504 | 68 | 30 |
| 12150 | 156 1c | 11994 | 69 | 30 |
| | | | | |
| 1630 | 21900 | -20270 | 69 | 31 |
| 174 | 21900 | -21726 | 69 | 32 |
| 8214 | 21900 | -13686 | 69 | 33 |
| 8214 | 21900 | -13686 | 69 | 34 |
| 4432 | 21900 | -17468 | 69 | 35 |
| 7079 | 21900 | -14821 | 69 | 36 |
| 13660 | 21900 | -8240 | 69 | 37 |
| 12150 | 21900 | -9750 | 69 | 38 |
| | | | | |
| 174 | 1630 | -1456 | 69 | 39 |
| 8214 | 1630 | 6584 | 70 | 39 |
| 8214 | 1630 | 6584 | 71 | 39 |
| 4432 | 1630 | 2802 | 72 | 39 |
| 7079 | 1630 | 5449 | 73 | 39 |
| 13660 | 1630 | 12030 | 74 | 39 |
| 12150 | 1630 | 10520 | 75 | 39 |
| | | | | |
| 8214 | 174 | 8040 | 76 | 39 |
| 8214 | 174 | 8040 | 77 | 39 |
| 4432 | 174 | 4258 | 78 | 39 |
| 7079 | 174 | 6905 | 79 | 39 |
| 13660 | 174 | 13486 | 80 | 39 |
| 12150 | 174 | 11976 | 81 | 39 |
| | | | | |
| 8214 | 8214 | Same Date | 81 | 39 |
| 4432 | 8214 | -3782 | 81 | 40 |
| 7079 | 8214 | -1135 | 81 | 41 |
| 13660 | 8214 | 5446 | 82 | 41 |
| 12150 | 8214 | 3936 | 83 | 41 |
| | | | | |
| 4432 | 8214 | -3782 | 83 | 42 |
| 7079 | 8214 | -1135 | 83 | 43 |
| 13660 | 8214 | 5446 | 84 | 43 |
| 12150 | 8214 | 3936 | 85 | 43 |
| | | | | |
| 7079 | 4432 | 2647 | 86 | 43 |
| 13660 | 4432 | 9228 | 87 | 43 |
| 12150 | 4432 | 7718 | 88 | 43 |
| | | | | |
| 13660 | 7079 | 6581 | 89 | 43 |
| 12150 | 7079 | 5071 | 90 | 43 |
| | | | | |
| 12150 | 13660 | -1510 | 90 | 44 |

S Statistic = 90 - 44 = 46

| Tied Group | Value | Members |
|---|---|---|
| 1 | 8214 | 2 |

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |

| | |
|---|---|
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 2 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 2 time periods with multiple data

---

A = 18
B = 36
C = 0
D = 0
E = 2
F = 4
a = 10608
b = 36720
c = 544
Group Variance = 586.348
Z-Score = 1.85838
Comparison Level at 95% confidence level = 1.65463 (upward trend)
**1.85838 > 1.65463 indicating an upward trend**

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RWF-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 38600 M6 | 39100 | Same Date | 0 | 0 |
| 34300 | 39100 | -4800 | 0 | 1 |
| 35000 | 39100 | -4100 | 0 | 2 |
| 33900 | 39100 | -5200 | 0 | 3 |
| 31200 | 39100 | -7900 | 0 | 4 |
| 44400 1c | 39100 | 5300 | 1 | 4 |
| 39000 1c | 39100 | -100 | 1 | 5 |
| 32800 B | 39100 | -6300 | 1 | 6 |
| 25200 | 39100 | -13900 | 1 | 7 |
| 33600 | 39100 | -5500 | 1 | 8 |
| 24250 | 39100 | -14850 | 1 | 9 |
| 20160 | 39100 | -18940 | 1 | 10 |
| 29160 | 39100 | -9940 | 1 | 11 |
| 22400 | 39100 | -16700 | 1 | 12 |
| 19130 | 39100 | -19970 | 1 | 13 |
| | | | | |
| 34300 | 38600 M6 | -4300 | 1 | 14 |
| 35000 | 38600 M6 | -3600 | 1 | 15 |
| 33900 | 38600 M6 | -4700 | 1 | 16 |
| 31200 | 38600 M6 | -7400 | 1 | 17 |
| 44400 1c | 38600 M6 | 5800 | 2 | 17 |
| 39000 1c | 38600 M6 | 400 | 3 | 17 |
| 32800 B | 38600 M6 | -5800 | 3 | 18 |
| 25200 | 38600 M6 | -13400 | 3 | 19 |
| 33600 | 38600 M6 | -5000 | 3 | 20 |
| 24250 | 38600 M6 | -14350 | 3 | 21 |
| 20160 | 38600 M6 | -18440 | 3 | 22 |
| 29160 | 38600 M6 | -9440 | 3 | 23 |
| 22400 | 38600 M6 | -16200 | 3 | 24 |
| 19130 | 38600 M6 | -19470 | 3 | 25 |
| | | | | |
| 35000 | 34300 | 700 | 4 | 25 |
| 33900 | 34300 | -400 | 4 | 26 |
| 31200 | 34300 | -3100 | 4 | 27 |
| 44400 1c | 34300 | 10100 | 5 | 27 |
| 39000 1c | 34300 | 4700 | 6 | 27 |
| 32800 B | 34300 | -1500 | 6 | 28 |
| 25200 | 34300 | -9100 | 6 | 29 |
| 33600 | 34300 | -700 | 6 | 30 |
| 24250 | 34300 | -10050 | 6 | 31 |
| 20160 | 34300 | -14140 | 6 | 32 |
| 29160 | 34300 | -5140 | 6 | 33 |
| 22400 | 34300 | -11900 | 6 | 34 |
| 19130 | 34300 | -15170 | 6 | 35 |
| | | | | |
| 33900 | 35000 | -1100 | 6 | 36 |
| 31200 | 35000 | -3800 | 6 | 37 |

| | | | | |
|---|---|---|---|---|
| 44400 1c | 35000 | 9400 | 7 | 37 |
| 39000 1c | 35000 | 4000 | 8 | 37 |
| 32800 B | 35000 | -2200 | 8 | 38 |
| 25200 | 35000 | -9800 | 8 | 39 |
| 33600 | 35000 | -1400 | 8 | 40 |
| 24250 | 35000 | -10750 | 8 | 41 |
| 20160 | 35000 | -14840 | 8 | 42 |
| 29160 | 35000 | -5840 | 8 | 43 |
| 22400 | 35000 | -12600 | 8 | 44 |
| 19130 | 35000 | -15870 | 8 | 45 |
| | | | | |
| 31200 | 33900 | -2700 | 8 | 46 |
| 44400 1c | 33900 | 10500 | 9 | 46 |
| 39000 1c | 33900 | 5100 | 10 | 46 |
| 32800 B | 33900 | -1100 | 10 | 47 |
| 25200 | 33900 | -8700 | 10 | 48 |
| 33600 | 33900 | -300 | 10 | 49 |
| 24250 | 33900 | -9650 | 10 | 50 |
| 20160 | 33900 | -13740 | 10 | 51 |
| 29160 | 33900 | -4740 | 10 | 52 |
| 22400 | 33900 | -11500 | 10 | 53 |
| 19130 | 33900 | -14770 | 10 | 54 |
| | | | | |
| 44400 1c | 31200 | 13200 | 11 | 54 |
| 39000 1c | 31200 | 7800 | 12 | 54 |
| 32800 B | 31200 | 1600 | 13 | 54 |
| 25200 | 31200 | -6000 | 13 | 55 |
| 33600 | 31200 | 2400 | 14 | 55 |
| 24250 | 31200 | -6950 | 14 | 56 |
| 20160 | 31200 | -11040 | 14 | 57 |
| 29160 | 31200 | -2040 | 14 | 58 |
| 22400 | 31200 | -8800 | 14 | 59 |
| 19130 | 31200 | -12070 | 14 | 60 |
| | | | | |
| 39000 1c | 44400 1c | -5400 | 14 | 61 |
| 32800 B | 44400 1c | -11600 | 14 | 62 |
| 25200 | 44400 1c | -19200 | 14 | 63 |
| 33600 | 44400 1c | -10800 | 14 | 64 |
| 24250 | 44400 1c | -20150 | 14 | 65 |
| 20160 | 44400 1c | -24240 | 14 | 66 |
| 29160 | 44400 1c | -15240 | 14 | 67 |
| 22400 | 44400 1c | -22000 | 14 | 68 |
| 19130 | 44400 1c | -25270 | 14 | 69 |
| | | | | |
| 32800 B | 39000 1c | -6200 | 14 | 70 |
| 25200 | 39000 1c | -13800 | 14 | 71 |
| 33600 | 39000 1c | -5400 | 14 | 72 |
| 24250 | 39000 1c | -14750 | 14 | 73 |
| 20160 | 39000 1c | -18840 | 14 | 74 |
| 29160 | 39000 1c | -9840 | 14 | 75 |
| 22400 | 39000 1c | -16600 | 14 | 76 |
| 19130 | 39000 1c | -19870 | 14 | 77 |
| | | | | |
| 25200 | 32800 B | -7600 | 14 | 78 |
| 33600 | 32800 B | 800 | 15 | 78 |
| 24250 | 32800 B | -8550 | 15 | 79 |
| 20160 | 32800 B | -12640 | 15 | 80 |

| | | | | |
|---|---|---|---|---|
| 29160 | 32800 B | -3640 | 15 | 81 |
| 22400 | 32800 B | -10400 | 15 | 82 |
| 19130 | 32800 B | -13670 | 15 | 83 |
| | | | | |
| 33600 | 25200 | 8400 | 16 | 83 |
| 24250 | 25200 | -950 | 16 | 84 |
| 20160 | 25200 | -5040 | 16 | 85 |
| 29160 | 25200 | 3960 | 17 | 85 |
| 22400 | 25200 | -2800 | 17 | 86 |
| 19130 | 25200 | -6070 | 17 | 87 |
| | | | | |
| 24250 | 33600 | -9350 | 17 | 88 |
| 20160 | 33600 | -13440 | 17 | 89 |
| 29160 | 33600 | -4440 | 17 | 90 |
| 22400 | 33600 | -11200 | 17 | 91 |
| 19130 | 33600 | -14470 | 17 | 92 |
| | | | | |
| 20160 | 24250 | -4090 | 17 | 93 |
| 29160 | 24250 | 4910 | 18 | 93 |
| 22400 | 24250 | -1850 | 18 | 94 |
| 19130 | 24250 | -5120 | 18 | 95 |
| | | | | |
| 29160 | 20160 | 9000 | 19 | 95 |
| 22400 | 20160 | 2240 | 20 | 95 |
| 19130 | 20160 | -1030 | 20 | 96 |
| | | | | |
| 22400 | 29160 | -6760 | 20 | 97 |
| 19130 | 29160 | -10030 | 20 | 98 |
| | | | | |
| 19130 | 22400 | -3270 | 20 | 99 |

S Statistic = 20 - 99 = -79

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 0
B = 18
C = 0

D = 0
E = 0
F = 2
a = 8880
b = 30240
c = 480
Group Variance = 492.333
Z-Score = -3.51532
Comparison Level at 95% confidence level = 1.65463 (upward trend)
-3.51532 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RWG-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 4.7 J1c3c | ND<5 U2c | Same Date | 0 | 0 |
| ND<5 U | ND<5 U2c | 0 | 0 | 0 |
| 194 | ND<5 U2c | 189 | 1 | 0 |
| 2.9 J | ND<5 U2c | -2.1 | 1 | 1 |
| 9.8 J | ND<5 U2c | 4.8 | 2 | 1 |
| ND<5 U1c | ND<5 U2c | 0 | 2 | 1 |
| ND<5 U1c | ND<5 U2c | 0 | 2 | 1 |
| ND<5 U | 4.7 J1c3c | 0.3 | 3 | 1 |
| 194 | 4.7 J1c3c | 189.3 | 4 | 1 |
| 2.9 J | 4.7 J1c3c | -1.8 | 4 | 2 |
| 9.8 J | 4.7 J1c3c | 5.1 | 5 | 2 |
| ND<5 U1c | 4.7 J1c3c | 0.3 | 6 | 2 |
| ND<5 U1c | 4.7 J1c3c | 0.3 | 7 | 2 |
| 194 | ND<5 U | 189 | 8 | 2 |
| 2.9 J | ND<5 U | -2.1 | 8 | 3 |
| 9.8 J | ND<5 U | 4.8 | 9 | 3 |
| ND<5 U1c | ND<5 U | 0 | 9 | 3 |
| ND<5 U1c | ND<5 U | 0 | 9 | 3 |
| 2.9 J | 194 | -191.1 | 9 | 4 |
| 9.8 J | 194 | -184.2 | 9 | 5 |
| ND<5 U1c | 194 | -189 | 9 | 6 |
| ND<5 U1c | 194 | -189 | 9 | 7 |
| 9.8 J | 2.9 J | 6.9 | 10 | 7 |
| ND<5 U1c | 2.9 J | 2.1 | 11 | 7 |
| ND<5 U1c | 2.9 J | 2.1 | 12 | 7 |
| ND<5 U1c | 9.8 J | -4.8 | 12 | 8 |
| ND<5 U1c | 9.8 J | -4.8 | 12 | 9 |
| ND<5 U1c | ND<5 U1c | 0 | 12 | 9 |

S Statistic = 12 - 9 = 3

| Tied Group | Value | Members |
|---|---|---|
| 1 | 5 | 4 |

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |

6/1/2020 1
9/1/2020 1
11/1/2020 1
There are 1 time periods with multiple data

---

A = 156
B = 18
C = 24
D = 0
E = 12
F = 2
a = 1176
b = 3024
c = 112
Group Variance = 55.881
Z-Score = 0.267546
Comparison Level at 95% confidence level = 1.65463 (upward trend)
0.267546 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RWH-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 3880 | 367 | Same Date | 0 | 0 |
| 60600 1c | 367 | 60233 | 1 | 0 |
| 2600 | 367 | 2233 | 2 | 0 |
| 19300 | 367 | 18933 | 3 | 0 |
| 48.9 | 367 | -318.1 | 3 | 1 |
| 5330 | 367 | 4963 | 4 | 1 |
| 1310 | 367 | 943 | 5 | 1 |
| 3400 | 367 | 3033 | 6 | 1 |
| 6670 | 367 | 6303 | 7 | 1 |
| 3270 | 367 | 2903 | 8 | 1 |
| 2468 | 367 | 2101 | 9 | 1 |
| 5340 | 367 | 4973 | 10 | 1 |
| 17390 | 367 | 17023 | 11 | 1 |
| 8314 | 367 | 7947 | 12 | 1 |
| 153900 | 367 | 153533 | 13 | 1 |
| | | | | |
| 60600 1c | 3880 | 56720 | 14 | 1 |
| 2600 | 3880 | -1280 | 14 | 2 |
| 19300 | 3880 | 15420 | 15 | 2 |
| 48.9 | 3880 | -3831.1 | 15 | 3 |
| 5330 | 3880 | 1450 | 16 | 3 |
| 1310 | 3880 | -2570 | 16 | 4 |
| 3400 | 3880 | -480 | 16 | 5 |
| 6670 | 3880 | 2790 | 17 | 5 |
| 3270 | 3880 | -610 | 17 | 6 |
| 2468 | 3880 | -1412 | 17 | 7 |
| 5340 | 3880 | 1460 | 18 | 7 |
| 17390 | 3880 | 13510 | 19 | 7 |
| 8314 | 3880 | 4434 | 20 | 7 |
| 153900 | 3880 | 150020 | 21 | 7 |
| | | | | |
| 2600 | 60600 1c | -58000 | 21 | 8 |
| 19300 | 60600 1c | -41300 | 21 | 9 |
| 48.9 | 60600 1c | -60551.1 | 21 | 10 |
| 5330 | 60600 1c | -55270 | 21 | 11 |
| 1310 | 60600 1c | -59290 | 21 | 12 |
| 3400 | 60600 1c | -57200 | 21 | 13 |
| 6670 | 60600 1c | -53930 | 21 | 14 |
| 3270 | 60600 1c | -57330 | 21 | 15 |
| 2468 | 60600 1c | -58132 | 21 | 16 |
| 5340 | 60600 1c | -55260 | 21 | 17 |
| 17390 | 60600 1c | -43210 | 21 | 18 |
| 8314 | 60600 1c | -52286 | 21 | 19 |
| 153900 | 60600 1c | 93300 | 22 | 19 |
| | | | | |
| 19300 | 2600 | 16700 | 23 | 19 |
| 48.9 | 2600 | -2551.1 | 23 | 20 |

| | | | | |
|---|---|---|---|---|
| 5330 | 2600 | 2730 | 24 | 20 |
| 1310 | 2600 | -1290 | 24 | 21 |
| 3400 | 2600 | 800 | 25 | 21 |
| 6670 | 2600 | 4070 | 26 | 21 |
| 3270 | 2600 | 670 | 27 | 21 |
| 2468 | 2600 | -132 | 27 | 22 |
| 5340 | 2600 | 2740 | 28 | 22 |
| 17390 | 2600 | 14790 | 29 | 22 |
| 8314 | 2600 | 5714 | 30 | 22 |
| 153900 | 2600 | 151300 | 31 | 22 |
| | | | | |
| 48.9 | 19300 | -19251.1 | 31 | 23 |
| 5330 | 19300 | -13970 | 31 | 24 |
| 1310 | 19300 | -17990 | 31 | 25 |
| 3400 | 19300 | -15900 | 31 | 26 |
| 6670 | 19300 | -12630 | 31 | 27 |
| 3270 | 19300 | -16030 | 31 | 28 |
| 2468 | 19300 | -16832 | 31 | 29 |
| 5340 | 19300 | -13960 | 31 | 30 |
| 17390 | 19300 | -1910 | 31 | 31 |
| 8314 | 19300 | -10986 | 31 | 32 |
| 153900 | 19300 | 134600 | 32 | 32 |
| | | | | |
| 5330 | 48.9 | 5281.1 | 33 | 32 |
| 1310 | 48.9 | 1261.1 | 34 | 32 |
| 3400 | 48.9 | 3351.1 | 35 | 32 |
| 6670 | 48.9 | 6621.1 | 36 | 32 |
| 3270 | 48.9 | 3221.1 | 37 | 32 |
| 2468 | 48.9 | 2419.1 | 38 | 32 |
| 5340 | 48.9 | 5291.1 | 39 | 32 |
| 17390 | 48.9 | 17341.1 | 40 | 32 |
| 8314 | 48.9 | 8265.1 | 41 | 32 |
| 153900 | 48.9 | 153851 | 42 | 32 |
| | | | | |
| 1310 | 5330 | -4020 | 42 | 33 |
| 3400 | 5330 | -1930 | 42 | 34 |
| 6670 | 5330 | 1340 | 43 | 34 |
| 3270 | 5330 | -2060 | 43 | 35 |
| 2468 | 5330 | -2862 | 43 | 36 |
| 5340 | 5330 | 10 | 44 | 36 |
| 17390 | 5330 | 12060 | 45 | 36 |
| 8314 | 5330 | 2984 | 46 | 36 |
| 153900 | 5330 | 148570 | 47 | 36 |
| | | | | |
| 3400 | 1310 | 2090 | 48 | 36 |
| 6670 | 1310 | 5360 | 49 | 36 |
| 3270 | 1310 | 1960 | 50 | 36 |
| 2468 | 1310 | 1158 | 51 | 36 |
| 5340 | 1310 | 4030 | 52 | 36 |
| 17390 | 1310 | 16080 | 53 | 36 |
| 8314 | 1310 | 7004 | 54 | 36 |
| 153900 | 1310 | 152590 | 55 | 36 |
| | | | | |
| 6670 | 3400 | 3270 | 56 | 36 |
| 3270 | 3400 | -130 | 56 | 37 |
| 2468 | 3400 | -932 | 56 | 38 |
| 5340 | 3400 | 1940 | 57 | 38 |

| | | | | |
|---|---|---|---|---|
| 17390 | 3400 | 13990 | 58 | 38 |
| 8314 | 3400 | 4914 | 59 | 38 |
| 153900 | 3400 | 150500 | 60 | 38 |
| | | | | |
| 3270 | 6670 | -3400 | 60 | 39 |
| 2468 | 6670 | -4202 | 60 | 40 |
| 5340 | 6670 | -1330 | 60 | 41 |
| 17390 | 6670 | 10720 | 61 | 41 |
| 8314 | 6670 | 1644 | 62 | 41 |
| 153900 | 6670 | 147230 | 63 | 41 |
| | | | | |
| 2468 | 3270 | -802 | 63 | 42 |
| 5340 | 3270 | 2070 | 64 | 42 |
| 17390 | 3270 | 14120 | 65 | 42 |
| 8314 | 3270 | 5044 | 66 | 42 |
| 153900 | 3270 | 150630 | 67 | 42 |
| | | | | |
| 5340 | 2468 | 2872 | 68 | 42 |
| 17390 | 2468 | 14922 | 69 | 42 |
| 8314 | 2468 | 5846 | 70 | 42 |
| 153900 | 2468 | 151432 | 71 | 42 |
| | | | | |
| 17390 | 5340 | 12050 | 72 | 42 |
| 8314 | 5340 | 2974 | 73 | 42 |
| 153900 | 5340 | 148560 | 74 | 42 |
| | | | | |
| 8314 | 17390 | -9076 | 74 | 43 |
| 153900 | 17390 | 136510 | 75 | 43 |
| | | | | |
| 153900 | 8314 | 145586 | 76 | 43 |

S Statistic = 76 - 43 = 33

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 0
B = 18
C = 0

D = 0
E = 0
F = 2
a = 8880
b = 30240
c = 480
Group Variance = 492.333
Z-Score = 1.44218
Comparison Level at 95% confidence level = 1.65463 (upward trend)
1.44218 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RWI-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 27500 | 25800 | Same Date | 0 | 0 |
| 26200 1c | 25800 | 400 | 1 | 0 |
| 32400 | 25800 | 6600 | 2 | 0 |
| 1510 | 25800 | -24290 | 2 | 1 |
| 211 | 25800 | -25589 | 2 | 2 |
| 2 J | 25800 | -25798 | 2 | 3 |
| 24300 | 25800 | -1500 | 2 | 4 |
| 17540 | 25800 | -8260 | 2 | 5 |
| 82.62 | 25800 | -25717.4 | 2 | 6 |
| | | | | |
| 26200 1c | 27500 | -1300 | 2 | 7 |
| 32400 | 27500 | 4900 | 3 | 7 |
| 1510 | 27500 | -25990 | 3 | 8 |
| 211 | 27500 | -27289 | 3 | 9 |
| 2 J | 27500 | -27498 | 3 | 10 |
| 24300 | 27500 | -3200 | 3 | 11 |
| 17540 | 27500 | -9960 | 3 | 12 |
| 82.62 | 27500 | -27417.4 | 3 | 13 |
| | | | | |
| 32400 | 26200 1c | 6200 | 4 | 13 |
| 1510 | 26200 1c | -24690 | 4 | 14 |
| 211 | 26200 1c | -25989 | 4 | 15 |
| 2 J | 26200 1c | -26198 | 4 | 16 |
| 24300 | 26200 1c | -1900 | 4 | 17 |
| 17540 | 26200 1c | -8660 | 4 | 18 |
| 82.62 | 26200 1c | -26117.4 | 4 | 19 |
| | | | | |
| 1510 | 32400 | -30890 | 4 | 20 |
| 211 | 32400 | -32189 | 4 | 21 |
| 2 J | 32400 | -32398 | 4 | 22 |
| 24300 | 32400 | -8100 | 4 | 23 |
| 17540 | 32400 | -14860 | 4 | 24 |
| 82.62 | 32400 | -32317.4 | 4 | 25 |
| | | | | |
| 211 | 1510 | -1299 | 4 | 26 |
| 2 J | 1510 | -1508 | 4 | 27 |
| 24300 | 1510 | 22790 | 5 | 27 |
| 17540 | 1510 | 16030 | 6 | 27 |
| 82.62 | 1510 | -1427.38 | 6 | 28 |
| | | | | |
| 2 J | 211 | -209 | 6 | 29 |
| 24300 | 211 | 24089 | 7 | 29 |
| 17540 | 211 | 17329 | 8 | 29 |
| 82.62 | 211 | -128.38 | 8 | 30 |
| | | | | |
| 24300 | 2 J | 24298 | 9 | 30 |
| 17540 | 2 J | 17538 | 10 | 30 |

| | | | | |
|---|---|---|---|---|
| 82.62 | 2 J | 80.62 | 11 | 30 |
| 17540 | 24300 | -6760 | 11 | 31 |
| 82.62 | 24300 | -24217.4 | 11 | 32 |
| 82.62 | 17540 | -17457.4 | 11 | 33 |

S Statistic = 11 - 33 = -22

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 11/1/2021 | 1 |
| 3/1/2022 | 1 |
| 3/1/2023 | 1 |
| 3/1/2024 | 1 |

There are 1 time periods with multiple data

A = 0
B = 18
C = 0
D = 0
E = 0
F = 2
a = 2250
b = 6480
c = 180
Group Variance = 124
Z-Score = -1.88586
Comparison Level at 95% confidence level = 1.65463 (upward trend)
-1.88586 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RWJ-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 42.7 | ND<5 U1c | Same Date | 0 | 0 |
| 27.3 1c | ND<5 U1c | 22.3 | 1 | 0 |
| 8.3 J | ND<5 U1c | 3.3 | 2 | 0 |
| ND<5 U | ND<5 U1c | 0 | 2 | 0 |
| 4 J | ND<5 U1c | -1 | 2 | 1 |
| 2.6 J | ND<5 U1c | -2.4 | 2 | 2 |
| ND<5 U | ND<5 U1c | 0 | 2 | 2 |
| ND<5 U | ND<5 U1c | 0 | 2 | 2 |
| 38.2 | ND<5 U1c | 33.2 | 3 | 2 |
| ND<10 U | ND<5 U1c | 5 | 4 | 2 |
| ND<5 U | ND<5 U1c | 0 | 4 | 2 |
| ND<5 U | ND<5 U1c | 0 | 4 | 2 |
| 3.539 J | ND<5 U1c | -1.461 | 4 | 3 |
| 19.81 | ND<5 U1c | 14.81 | 5 | 3 |
| ND<5 U | ND<5 U1c | 0 | 5 | 3 |
| | | | | |
| 27.3 1c | 42.7 | -15.4 | 5 | 4 |
| 8.3 J | 42.7 | -34.4 | 5 | 5 |
| ND<5 U | 42.7 | -37.7 | 5 | 6 |
| 4 J | 42.7 | -38.7 | 5 | 7 |
| 2.6 J | 42.7 | -40.1 | 5 | 8 |
| ND<5 U | 42.7 | -37.7 | 5 | 9 |
| ND<5 U | 42.7 | -37.7 | 5 | 10 |
| 38.2 | 42.7 | -4.5 | 5 | 11 |
| ND<10 U | 42.7 | -32.7 | 5 | 12 |
| ND<5 U | 42.7 | -37.7 | 5 | 13 |
| ND<5 U | 42.7 | -37.7 | 5 | 14 |
| 3.539 J | 42.7 | -39.161 | 5 | 15 |
| 19.81 | 42.7 | -22.89 | 5 | 16 |
| ND<5 U | 42.7 | -37.7 | 5 | 17 |
| | | | | |
| 8.3 J | 27.3 1c | -19 | 5 | 18 |
| ND<5 U | 27.3 1c | -22.3 | 5 | 19 |
| 4 J | 27.3 1c | -23.3 | 5 | 20 |
| 2.6 J | 27.3 1c | -24.7 | 5 | 21 |
| ND<5 U | 27.3 1c | -22.3 | 5 | 22 |
| ND<5 U | 27.3 1c | -22.3 | 5 | 23 |
| 38.2 | 27.3 1c | 10.9 | 6 | 23 |
| ND<10 U | 27.3 1c | -17.3 | 6 | 24 |
| ND<5 U | 27.3 1c | -22.3 | 6 | 25 |
| ND<5 U | 27.3 1c | -22.3 | 6 | 26 |
| 3.539 J | 27.3 1c | -23.761 | 6 | 27 |
| 19.81 | 27.3 1c | -7.49 | 6 | 28 |
| ND<5 U | 27.3 1c | -22.3 | 6 | 29 |
| | | | | |
| ND<5 U | 8.3 J | -3.3 | 6 | 30 |
| 4 J | 8.3 J | -4.3 | 6 | 31 |

| | | | | |
|---|---|---|---|---|
| 2.6 J | 8.3 J | -5.7 | 6 | 32 |
| ND<5 U | 8.3 J | -3.3 | 6 | 33 |
| ND<5 U | 8.3 J | -3.3 | 6 | 34 |
| 38.2 | 8.3 J | 29.9 | 7 | 34 |
| ND<10 U | 8.3 J | 1.7 | 8 | 34 |
| ND<5 U | 8.3 J | -3.3 | 8 | 35 |
| ND<5 U | 8.3 J | -3.3 | 8 | 36 |
| 3.539 J | 8.3 J | -4.761 | 8 | 37 |
| 19.81 | 8.3 J | 11.51 | 9 | 37 |
| ND<5 U | 8.3 J | -3.3 | 9 | 38 |
| | | | | |
| 4 J | ND<5 U | -1 | 9 | 39 |
| 2.6 J | ND<5 U | -2.4 | 9 | 40 |
| ND<5 U | ND<5 U | 0 | 9 | 40 |
| ND<5 U | ND<5 U | 0 | 9 | 40 |
| 38.2 | ND<5 U | 33.2 | 10 | 40 |
| ND<10 U | ND<5 U | 5 | 11 | 40 |
| ND<5 U | ND<5 U | 0 | 11 | 40 |
| ND<5 U | ND<5 U | 0 | 11 | 40 |
| 3.539 J | ND<5 U | -1.461 | 11 | 41 |
| 19.81 | ND<5 U | 14.81 | 12 | 41 |
| ND<5 U | ND<5 U | 0 | 12 | 41 |
| | | | | |
| 2.6 J | 4 J | -1.4 | 12 | 42 |
| ND<5 U | 4 J | 1 | 13 | 42 |
| ND<5 U | 4 J | 1 | 14 | 42 |
| 38.2 | 4 J | 34.2 | 15 | 42 |
| ND<10 U | 4 J | 6 | 16 | 42 |
| ND<5 U | 4 J | 1 | 17 | 42 |
| ND<5 U | 4 J | 1 | 18 | 42 |
| 3.539 J | 4 J | -0.461 | 18 | 43 |
| 19.81 | 4 J | 15.81 | 19 | 43 |
| ND<5 U | 4 J | 1 | 20 | 43 |
| | | | | |
| ND<5 U | 2.6 J | 2.4 | 21 | 43 |
| ND<5 U | 2.6 J | 2.4 | 22 | 43 |
| 38.2 | 2.6 J | 35.6 | 23 | 43 |
| ND<10 U | 2.6 J | 7.4 | 24 | 43 |
| ND<5 U | 2.6 J | 2.4 | 25 | 43 |
| ND<5 U | 2.6 J | 2.4 | 26 | 43 |
| 3.539 J | 2.6 J | 0.939 | 27 | 43 |
| 19.81 | 2.6 J | 17.21 | 28 | 43 |
| ND<5 U | 2.6 J | 2.4 | 29 | 43 |
| | | | | |
| ND<5 U | ND<5 U | 0 | 29 | 43 |
| 38.2 | ND<5 U | 33.2 | 30 | 43 |
| ND<10 U | ND<5 U | 5 | 31 | 43 |
| ND<5 U | ND<5 U | 0 | 31 | 43 |
| ND<5 U | ND<5 U | 0 | 31 | 43 |
| 3.539 J | ND<5 U | -1.461 | 31 | 44 |
| 19.81 | ND<5 U | 14.81 | 32 | 44 |
| ND<5 U | ND<5 U | 0 | 32 | 44 |
| | | | | |
| 38.2 | ND<5 U | 33.2 | 33 | 44 |
| ND<10 U | ND<5 U | 5 | 34 | 44 |
| ND<5 U | ND<5 U | 0 | 34 | 44 |
| ND<5 U | ND<5 U | 0 | 34 | 44 |

| | | | | |
|---|---|---|---|---|
| 3.539 J | ND<5 U | -1.461 | 34 | 45 |
| 19.81 | ND<5 U | 14.81 | 35 | 45 |
| ND<5 U | ND<5 U | 0 | 35 | 45 |
| | | | | |
| ND<10 U | 38.2 | -28.2 | 35 | 46 |
| ND<5 U | 38.2 | -33.2 | 35 | 47 |
| ND<5 U | 38.2 | -33.2 | 35 | 48 |
| 3.539 J | 38.2 | -34.661 | 35 | 49 |
| 19.81 | 38.2 | -18.39 | 35 | 50 |
| ND<5 U | 38.2 | -33.2 | 35 | 51 |
| | | | | |
| ND<5 U | ND<10 U | -5 | 35 | 52 |
| ND<5 U | ND<10 U | -5 | 35 | 53 |
| 3.539 J | ND<10 U | -6.461 | 35 | 54 |
| 19.81 | ND<10 U | 9.81 | 36 | 54 |
| ND<5 U | ND<10 U | -5 | 36 | 55 |
| | | | | |
| ND<5 U | ND<5 U | 0 | 36 | 55 |
| 3.539 J | ND<5 U | -1.461 | 36 | 56 |
| 19.81 | ND<5 U | 14.81 | 37 | 56 |
| ND<5 U | ND<5 U | 0 | 37 | 56 |
| | | | | |
| 3.539 J | ND<5 U | -1.461 | 37 | 57 |
| 19.81 | ND<5 U | 14.81 | 38 | 57 |
| ND<5 U | ND<5 U | 0 | 38 | 57 |
| | | | | |
| 19.81 | 3.539 J | 16.271 | 39 | 57 |
| ND<5 U | 3.539 J | 1.461 | 40 | 57 |
| | | | | |
| ND<5 U | 19.81 | -14.81 | 40 | 58 |

S Statistic = 40 - 58 = -18

| Tied Group | Value | Members |
|---|---|---|
| 1 | 5 | 7 |

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 798
B = 18

C = 210
D = 0
E = 42
F = 2
a = 8880
b = 30240
c = 480
Group Variance = 448.175
Z-Score = -0.803018
Comparison Level at 95% confidence level = 1.65463 (upward trend)
-0.803018 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RWK-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 6710 M61c2c | 9130 M6 | Same Date | 0 | 0 |
| 19200 1c | 9130 M6 | 10070 | 1 | 0 |
| 20600 | 9130 M6 | 11470 | 2 | 0 |
| 16400 | 9130 M6 | 7270 | 3 | 0 |
| 10400 | 9130 M6 | 1270 | 4 | 0 |
| 16800 | 9130 M6 | 7670 | 5 | 0 |
| 18100 MH | 9130 M6 | 8970 | 6 | 0 |
| 22200 | 9130 M6 | 13070 | 7 | 0 |
| 18500 | 9130 M6 | 9370 | 8 | 0 |
| 22300 | 9130 M6 | 13170 | 9 | 0 |
| 24170 | 9130 M6 | 15040 | 10 | 0 |
| 24920 | 9130 M6 | 15790 | 11 | 0 |
| 21550 | 9130 M6 | 12420 | 12 | 0 |
| 18610 | 9130 M6 | 9480 | 13 | 0 |
| 20750 | 9130 M6 | 11620 | 14 | 0 |
| | | | | |
| 19200 1c | 6710 M61c2c | 12490 | 15 | 0 |
| 20600 | 6710 M61c2c | 13890 | 16 | 0 |
| 16400 | 6710 M61c2c | 9690 | 17 | 0 |
| 10400 | 6710 M61c2c | 3690 | 18 | 0 |
| 16800 | 6710 M61c2c | 10090 | 19 | 0 |
| 18100 MH | 6710 M61c2c | 11390 | 20 | 0 |
| 22200 | 6710 M61c2c | 15490 | 21 | 0 |
| 18500 | 6710 M61c2c | 11790 | 22 | 0 |
| 22300 | 6710 M61c2c | 15590 | 23 | 0 |
| 24170 | 6710 M61c2c | 17460 | 24 | 0 |
| 24920 | 6710 M61c2c | 18210 | 25 | 0 |
| 21550 | 6710 M61c2c | 14840 | 26 | 0 |
| 18610 | 6710 M61c2c | 11900 | 27 | 0 |
| 20750 | 6710 M61c2c | 14040 | 28 | 0 |
| | | | | |
| 20600 | 19200 1c | 1400 | 29 | 0 |
| 16400 | 19200 1c | -2800 | 29 | 1 |
| 10400 | 19200 1c | -8800 | 29 | 2 |
| 16800 | 19200 1c | -2400 | 29 | 3 |
| 18100 MH | 19200 1c | -1100 | 29 | 4 |
| 22200 | 19200 1c | 3000 | 30 | 4 |
| 18500 | 19200 1c | -700 | 30 | 5 |
| 22300 | 19200 1c | 3100 | 31 | 5 |
| 24170 | 19200 1c | 4970 | 32 | 5 |
| 24920 | 19200 1c | 5720 | 33 | 5 |
| 21550 | 19200 1c | 2350 | 34 | 5 |
| 18610 | 19200 1c | -590 | 34 | 6 |
| 20750 | 19200 1c | 1550 | 35 | 6 |
| | | | | |
| 16400 | 20600 | -4200 | 35 | 7 |
| 10400 | 20600 | -10200 | 35 | 8 |

| | | | | |
|---|---|---|---|---|
| 16800 | 20600 | -3800 | 35 | 9 |
| 18100 MH | 20600 | -2500 | 35 | 10 |
| 22200 | 20600 | 1600 | 36 | 10 |
| 18500 | 20600 | -2100 | 36 | 11 |
| 22300 | 20600 | 1700 | 37 | 11 |
| 24170 | 20600 | 3570 | 38 | 11 |
| 24920 | 20600 | 4320 | 39 | 11 |
| 21550 | 20600 | 950 | 40 | 11 |
| 18610 | 20600 | -1990 | 40 | 12 |
| 20750 | 20600 | 150 | 41 | 12 |
| | | | | |
| 10400 | 16400 | -6000 | 41 | 13 |
| 16800 | 16400 | 400 | 42 | 13 |
| 18100 MH | 16400 | 1700 | 43 | 13 |
| 22200 | 16400 | 5800 | 44 | 13 |
| 18500 | 16400 | 2100 | 45 | 13 |
| 22300 | 16400 | 5900 | 46 | 13 |
| 24170 | 16400 | 7770 | 47 | 13 |
| 24920 | 16400 | 8520 | 48 | 13 |
| 21550 | 16400 | 5150 | 49 | 13 |
| 18610 | 16400 | 2210 | 50 | 13 |
| 20750 | 16400 | 4350 | 51 | 13 |
| | | | | |
| 16800 | 10400 | 6400 | 52 | 13 |
| 18100 MH | 10400 | 7700 | 53 | 13 |
| 22200 | 10400 | 11800 | 54 | 13 |
| 18500 | 10400 | 8100 | 55 | 13 |
| 22300 | 10400 | 11900 | 56 | 13 |
| 24170 | 10400 | 13770 | 57 | 13 |
| 24920 | 10400 | 14520 | 58 | 13 |
| 21550 | 10400 | 11150 | 59 | 13 |
| 18610 | 10400 | 8210 | 60 | 13 |
| 20750 | 10400 | 10350 | 61 | 13 |
| | | | | |
| 18100 MH | 16800 | 1300 | 62 | 13 |
| 22200 | 16800 | 5400 | 63 | 13 |
| 18500 | 16800 | 1700 | 64 | 13 |
| 22300 | 16800 | 5500 | 65 | 13 |
| 24170 | 16800 | 7370 | 66 | 13 |
| 24920 | 16800 | 8120 | 67 | 13 |
| 21550 | 16800 | 4750 | 68 | 13 |
| 18610 | 16800 | 1810 | 69 | 13 |
| 20750 | 16800 | 3950 | 70 | 13 |
| | | | | |
| 22200 | 18100 MH | 4100 | 71 | 13 |
| 18500 | 18100 MH | 400 | 72 | 13 |
| 22300 | 18100 MH | 4200 | 73 | 13 |
| 24170 | 18100 MH | 6070 | 74 | 13 |
| 24920 | 18100 MH | 6820 | 75 | 13 |
| 21550 | 18100 MH | 3450 | 76 | 13 |
| 18610 | 18100 MH | 510 | 77 | 13 |
| 20750 | 18100 MH | 2650 | 78 | 13 |
| | | | | |
| 18500 | 22200 | -3700 | 78 | 14 |
| 22300 | 22200 | 100 | 79 | 14 |
| 24170 | 22200 | 1970 | 80 | 14 |
| 24920 | 22200 | 2720 | 81 | 14 |

| | | | | |
|---|---|---|---|---|
| 21550 | 22200 | -650 | 81 | 15 |
| 18610 | 22200 | -3590 | 81 | 16 |
| 20750 | 22200 | -1450 | 81 | 17 |
| | | | | |
| 22300 | 18500 | 3800 | 82 | 17 |
| 24170 | 18500 | 5670 | 83 | 17 |
| 24920 | 18500 | 6420 | 84 | 17 |
| 21550 | 18500 | 3050 | 85 | 17 |
| 18610 | 18500 | 110 | 86 | 17 |
| 20750 | 18500 | 2250 | 87 | 17 |
| | | | | |
| 24170 | 22300 | 1870 | 88 | 17 |
| 24920 | 22300 | 2620 | 89 | 17 |
| 21550 | 22300 | -750 | 89 | 18 |
| 18610 | 22300 | -3690 | 89 | 19 |
| 20750 | 22300 | -1550 | 89 | 20 |
| | | | | |
| 24920 | 24170 | 750 | 90 | 20 |
| 21550 | 24170 | -2620 | 90 | 21 |
| 18610 | 24170 | -5560 | 90 | 22 |
| 20750 | 24170 | -3420 | 90 | 23 |
| | | | | |
| 21550 | 24920 | -3370 | 90 | 24 |
| 18610 | 24920 | -6310 | 90 | 25 |
| 20750 | 24920 | -4170 | 90 | 26 |
| | | | | |
| 18610 | 21550 | -2940 | 90 | 27 |
| 20750 | 21550 | -800 | 90 | 28 |
| | | | | |
| 20750 | 18610 | 2140 | 91 | 28 |

S Statistic = 91 - 28 = 63

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 0
B = 18
C = 0

D = 0
E = 0
F = 2
a = 8880
b = 30240
c = 480
Group Variance = 492.333
Z-Score = 2.79423
Comparison Level at 95% confidence level = 1.65463 (upward trend)
**2.79423 > 1.65463 indicating an upward trend**

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RWL-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 8480 1c | 6280 | Same Date | 0 | 0 |
| 9180 | 6280 | 2900 | 1 | 0 |
| 15500 | 6280 | 9220 | 2 | 0 |
| 861 | 6280 | -5419 | 2 | 1 |
| 16100 | 6280 | 9820 | 3 | 1 |
| 15000 MH | 6280 | 8720 | 4 | 1 |
| 14200 | 6280 | 7920 | 5 | 1 |
| 16000 | 6280 | 9720 | 6 | 1 |
| 14900 | 6280 | 8620 | 7 | 1 |
| 12500 | 6280 | 6220 | 8 | 1 |
| 11470 | 6280 | 5190 | 9 | 1 |
| 19240 | 6280 | 12960 | 10 | 1 |
| 6219 | 6280 | -61 | 10 | 2 |
| 3047 | 6280 | -3233 | 10 | 3 |
| 24050 | 6280 | 17770 | 11 | 3 |
| | | | | |
| 9180 | 8480 1c | 700 | 12 | 3 |
| 15500 | 8480 1c | 7020 | 13 | 3 |
| 861 | 8480 1c | -7619 | 13 | 4 |
| 16100 | 8480 1c | 7620 | 14 | 4 |
| 15000 MH | 8480 1c | 6520 | 15 | 4 |
| 14200 | 8480 1c | 5720 | 16 | 4 |
| 16000 | 8480 1c | 7520 | 17 | 4 |
| 14900 | 8480 1c | 6420 | 18 | 4 |
| 12500 | 8480 1c | 4020 | 19 | 4 |
| 11470 | 8480 1c | 2990 | 20 | 4 |
| 19240 | 8480 1c | 10760 | 21 | 4 |
| 6219 | 8480 1c | -2261 | 21 | 5 |
| 3047 | 8480 1c | -5433 | 21 | 6 |
| 24050 | 8480 1c | 15570 | 22 | 6 |
| | | | | |
| 15500 | 9180 | 6320 | 23 | 6 |
| 861 | 9180 | -8319 | 23 | 7 |
| 16100 | 9180 | 6920 | 24 | 7 |
| 15000 MH | 9180 | 5820 | 25 | 7 |
| 14200 | 9180 | 5020 | 26 | 7 |
| 16000 | 9180 | 6820 | 27 | 7 |
| 14900 | 9180 | 5720 | 28 | 7 |
| 12500 | 9180 | 3320 | 29 | 7 |
| 11470 | 9180 | 2290 | 30 | 7 |
| 19240 | 9180 | 10060 | 31 | 7 |
| 6219 | 9180 | -2961 | 31 | 8 |
| 3047 | 9180 | -6133 | 31 | 9 |
| 24050 | 9180 | 14870 | 32 | 9 |
| | | | | |
| 861 | 15500 | -14639 | 32 | 10 |
| 16100 | 15500 | 600 | 33 | 10 |

| | | | | |
|---|---|---|---|---|
| 15000 MH | 15500 | -500 | 33 | 11 |
| 14200 | 15500 | -1300 | 33 | 12 |
| 16000 | 15500 | 500 | 34 | 12 |
| 14900 | 15500 | -600 | 34 | 13 |
| 12500 | 15500 | -3000 | 34 | 14 |
| 11470 | 15500 | -4030 | 34 | 15 |
| 19240 | 15500 | 3740 | 35 | 15 |
| 6219 | 15500 | -9281 | 35 | 16 |
| 3047 | 15500 | -12453 | 35 | 17 |
| 24050 | 15500 | 8550 | 36 | 17 |
| | | | | |
| 16100 | 861 | 15239 | 37 | 17 |
| 15000 MH | 861 | 14139 | 38 | 17 |
| 14200 | 861 | 13339 | 39 | 17 |
| 16000 | 861 | 15139 | 40 | 17 |
| 14900 | 861 | 14039 | 41 | 17 |
| 12500 | 861 | 11639 | 42 | 17 |
| 11470 | 861 | 10609 | 43 | 17 |
| 19240 | 861 | 18379 | 44 | 17 |
| 6219 | 861 | 5358 | 45 | 17 |
| 3047 | 861 | 2186 | 46 | 17 |
| 24050 | 861 | 23189 | 47 | 17 |
| | | | | |
| 15000 MH | 16100 | -1100 | 47 | 18 |
| 14200 | 16100 | -1900 | 47 | 19 |
| 16000 | 16100 | -100 | 47 | 20 |
| 14900 | 16100 | -1200 | 47 | 21 |
| 12500 | 16100 | -3600 | 47 | 22 |
| 11470 | 16100 | -4630 | 47 | 23 |
| 19240 | 16100 | 3140 | 48 | 23 |
| 6219 | 16100 | -9881 | 48 | 24 |
| 3047 | 16100 | -13053 | 48 | 25 |
| 24050 | 16100 | 7950 | 49 | 25 |
| | | | | |
| 14200 | 15000 MH | -800 | 49 | 26 |
| 16000 | 15000 MH | 1000 | 50 | 26 |
| 14900 | 15000 MH | -100 | 50 | 27 |
| 12500 | 15000 MH | -2500 | 50 | 28 |
| 11470 | 15000 MH | -3530 | 50 | 29 |
| 19240 | 15000 MH | 4240 | 51 | 29 |
| 6219 | 15000 MH | -8781 | 51 | 30 |
| 3047 | 15000 MH | -11953 | 51 | 31 |
| 24050 | 15000 MH | 9050 | 52 | 31 |
| | | | | |
| 16000 | 14200 | 1800 | 53 | 31 |
| 14900 | 14200 | 700 | 54 | 31 |
| 12500 | 14200 | -1700 | 54 | 32 |
| 11470 | 14200 | -2730 | 54 | 33 |
| 19240 | 14200 | 5040 | 55 | 33 |
| 6219 | 14200 | -7981 | 55 | 34 |
| 3047 | 14200 | -11153 | 55 | 35 |
| 24050 | 14200 | 9850 | 56 | 35 |
| | | | | |
| 14900 | 16000 | -1100 | 56 | 36 |
| 12500 | 16000 | -3500 | 56 | 37 |
| 11470 | 16000 | -4530 | 56 | 38 |
| 19240 | 16000 | 3240 | 57 | 38 |

| | | | | |
|---|---|---|---|---|
| 6219 | 16000 | -9781 | 57 | 39 |
| 3047 | 16000 | -12953 | 57 | 40 |
| 24050 | 16000 | 8050 | 58 | 40 |
| | | | | |
| 12500 | 14900 | -2400 | 58 | 41 |
| 11470 | 14900 | -3430 | 58 | 42 |
| 19240 | 14900 | 4340 | 59 | 42 |
| 6219 | 14900 | -8681 | 59 | 43 |
| 3047 | 14900 | -11853 | 59 | 44 |
| 24050 | 14900 | 9150 | 60 | 44 |
| | | | | |
| 11470 | 12500 | -1030 | 60 | 45 |
| 19240 | 12500 | 6740 | 61 | 45 |
| 6219 | 12500 | -6281 | 61 | 46 |
| 3047 | 12500 | -9453 | 61 | 47 |
| 24050 | 12500 | 11550 | 62 | 47 |
| | | | | |
| 19240 | 11470 | 7770 | 63 | 47 |
| 6219 | 11470 | -5251 | 63 | 48 |
| 3047 | 11470 | -8423 | 63 | 49 |
| 24050 | 11470 | 12580 | 64 | 49 |
| | | | | |
| 6219 | 19240 | -13021 | 64 | 50 |
| 3047 | 19240 | -16193 | 64 | 51 |
| 24050 | 19240 | 4810 | 65 | 51 |
| | | | | |
| 3047 | 6219 | -3172 | 65 | 52 |
| 24050 | 6219 | 17831 | 66 | 52 |
| | | | | |
| 24050 | 3047 | 21003 | 67 | 52 |

S Statistic = 67 - 52 = 15

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 0
B = 18
C = 0

D = 0
E = 0
F = 2
a = 8880
b = 30240
c = 480
Group Variance = 492.333
Z-Score = 0.630955
Comparison Level at 95% confidence level = 1.65463 (upward trend)
0.630955 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RWM-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 6 J | 10.5 | Same Date | 0 | 0 |
| 4 J | 10.5 | -6.5 | 0 | 1 |
| 11.6 | 10.5 | 1.1 | 1 | 1 |
| 4.8 J | 10.5 | -5.7 | 1 | 2 |
| 21.8 | 10.5 | 11.3 | 2 | 2 |
| 7.8 J2c | 10.5 | -2.7 | 2 | 3 |
| 10.6 | 10.5 | 0.1 | 3 | 3 |
| | | | | |
| 4 J | 6 J | -2 | 3 | 4 |
| 11.6 | 6 J | 5.6 | 4 | 4 |
| 4.8 J | 6 J | -1.2 | 4 | 5 |
| 21.8 | 6 J | 15.8 | 5 | 5 |
| 7.8 J2c | 6 J | 1.8 | 6 | 5 |
| 10.6 | 6 J | 4.6 | 7 | 5 |
| | | | | |
| 11.6 | 4 J | 7.6 | 8 | 5 |
| 4.8 J | 4 J | 0.8 | 9 | 5 |
| 21.8 | 4 J | 17.8 | 10 | 5 |
| 7.8 J2c | 4 J | 3.8 | 11 | 5 |
| 10.6 | 4 J | 6.6 | 12 | 5 |
| | | | | |
| 4.8 J | 11.6 | -6.8 | 12 | 6 |
| 21.8 | 11.6 | 10.2 | 13 | 6 |
| 7.8 J2c | 11.6 | -3.8 | 13 | 7 |
| 10.6 | 11.6 | -1 | 13 | 8 |
| | | | | |
| 21.8 | 4.8 J | 17 | 14 | 8 |
| 7.8 J2c | 4.8 J | 3 | 15 | 8 |
| 10.6 | 4.8 J | 5.8 | 16 | 8 |
| | | | | |
| 7.8 J2c | 21.8 | -14 | 16 | 9 |
| 10.6 | 21.8 | -11.2 | 16 | 10 |
| | | | | |
| 10.6 | 7.8 J2c | 2.8 | 17 | 10 |

S Statistic = 17 - 10 = 7

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |

9/1/2020 1
11/1/2020 1
There are 1 time periods with multiple data

---

A = 0
B = 18
C = 0
D = 0
E = 0
F = 2
a = 1176
b = 3024
c = 112
Group Variance = 64.3333
Z-Score = 0.748054
Comparison Level at 95% confidence level = 1.65463 (upward trend)
0.748054 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RWN-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 978000 | 1.02e+006 | Same Date | 0 | 0 |
| 964000 | 1.02e+006 | -56000 | 0 | 1 |
| 943000 | 1.02e+006 | -77000 | 0 | 2 |
| 1.17e+006 ML | 1.02e+006 | 150000 | 1 | 2 |
| 884000 | 1.02e+006 | -136000 | 1 | 3 |
| 1.14e+006 | 1.02e+006 | 120000 | 2 | 3 |
| 709000 1c | 1.02e+006 | -311000 | 2 | 4 |
| 745000 | 1.02e+006 | -275000 | 2 | 5 |
| 548000 | 1.02e+006 | -472000 | 2 | 6 |
| 546700 | 1.02e+006 | -473300 | 2 | 7 |
| 662200 | 1.02e+006 | -357800 | 2 | 8 |
| | | | | |
| 964000 | 978000 | -14000 | 2 | 9 |
| 943000 | 978000 | -35000 | 2 | 10 |
| 1.17e+006 ML | 978000 | 192000 | 3 | 10 |
| 884000 | 978000 | -94000 | 3 | 11 |
| 1.14e+006 | 978000 | 162000 | 4 | 11 |
| 709000 1c | 978000 | -269000 | 4 | 12 |
| 745000 | 978000 | -233000 | 4 | 13 |
| 548000 | 978000 | -430000 | 4 | 14 |
| 546700 | 978000 | -431300 | 4 | 15 |
| 662200 | 978000 | -315800 | 4 | 16 |
| | | | | |
| 943000 | 964000 | -21000 | 4 | 17 |
| 1.17e+006 ML | 964000 | 206000 | 5 | 17 |
| 884000 | 964000 | -80000 | 5 | 18 |
| 1.14e+006 | 964000 | 176000 | 6 | 18 |
| 709000 1c | 964000 | -255000 | 6 | 19 |
| 745000 | 964000 | -219000 | 6 | 20 |
| 548000 | 964000 | -416000 | 6 | 21 |
| 546700 | 964000 | -417300 | 6 | 22 |
| 662200 | 964000 | -301800 | 6 | 23 |
| | | | | |
| 1.17e+006 ML | 943000 | 227000 | 7 | 23 |
| 884000 | 943000 | -59000 | 7 | 24 |
| 1.14e+006 | 943000 | 197000 | 8 | 24 |
| 709000 1c | 943000 | -234000 | 8 | 25 |
| 745000 | 943000 | -198000 | 8 | 26 |
| 548000 | 943000 | -395000 | 8 | 27 |
| 546700 | 943000 | -396300 | 8 | 28 |
| 662200 | 943000 | -280800 | 8 | 29 |
| | | | | |
| 884000 | 1.17e+006 ML | -286000 | 8 | 30 |
| 1.14e+006 | 1.17e+006 ML | -30000 | 8 | 31 |
| 709000 1c | 1.17e+006 ML | -461000 | 8 | 32 |
| 745000 | 1.17e+006 ML | -425000 | 8 | 33 |
| 548000 | 1.17e+006 ML | -622000 | 8 | 34 |

| | | | | |
|---|---|---|---|---|
| 546700 | 1.17e+006 ML | -623300 | 8 | 35 |
| 662200 | 1.17e+006 ML | -507800 | 8 | 36 |
| | | | | |
| 1.14e+006 | 884000 | 256000 | 9 | 36 |
| 709000 1c | 884000 | -175000 | 9 | 37 |
| 745000 | 884000 | -139000 | 9 | 38 |
| 548000 | 884000 | -336000 | 9 | 39 |
| 546700 | 884000 | -337300 | 9 | 40 |
| 662200 | 884000 | -221800 | 9 | 41 |
| | | | | |
| 709000 1c | 1.14e+006 | -431000 | 9 | 42 |
| 745000 | 1.14e+006 | -395000 | 9 | 43 |
| 548000 | 1.14e+006 | -592000 | 9 | 44 |
| 546700 | 1.14e+006 | -593300 | 9 | 45 |
| 662200 | 1.14e+006 | -477800 | 9 | 46 |
| | | | | |
| 745000 | 709000 1c | 36000 | 10 | 46 |
| 548000 | 709000 1c | -161000 | 10 | 47 |
| 546700 | 709000 1c | -162300 | 10 | 48 |
| 662200 | 709000 1c | -46800 | 10 | 49 |
| | | | | |
| 548000 | 745000 | -197000 | 10 | 50 |
| 546700 | 745000 | -198300 | 10 | 51 |
| 662200 | 745000 | -82800 | 10 | 52 |
| | | | | |
| 546700 | 548000 | -1300 | 10 | 53 |
| 662200 | 548000 | 114200 | 11 | 53 |
| | | | | |
| 662200 | 546700 | 115500 | 12 | 53 |

S Statistic = 12 - 53 = -41

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 3/1/2022 | 1 |
| 3/1/2023 | 1 |
| 3/1/2024 | 1 |

There are 1 time periods with multiple data

A = 0
B = 18
C = 0
D = 0
E = 0
F = 2
a = 3828
b = 11880

c = 264
Group Variance = 211.667
Z-Score = -2.74937
Comparison Level at 95% confidence level = 1.65463 (upward trend)
-2.74937 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RWO-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 2660 2c | 3200 1c4c | Same Date | 0 | 0 |
| 6790 1c | 3200 1c4c | 3590 | 1 | 0 |
| 3720 | 3200 1c4c | 520 | 2 | 0 |
| 6220 | 3200 1c4c | 3020 | 3 | 0 |
| 11100 | 3200 1c4c | 7900 | 4 | 0 |
| 5030 3c | 3200 1c4c | 1830 | 5 | 0 |
| 2750 | 3200 1c4c | -450 | 5 | 1 |
| 1130 | 3200 1c4c | -2070 | 5 | 2 |
| 694 | 3200 1c4c | -2506 | 5 | 3 |
| 397 | 3200 1c4c | -2803 | 5 | 4 |
| 49.32 | 3200 1c4c | -3150.68 | 5 | 5 |
| ND<5 U | 3200 1c4c | -3195 | 5 | 6 |
| ND<5 U | 3200 1c4c | -3195 | 5 | 7 |
| ND<5 U | 3200 1c4c | -3195 | 5 | 8 |
| ND<250 U | 3200 1c4c | -2950 | 5 | 9 |
| | | | | |
| 6790 1c | 2660 2c | 4130 | 6 | 9 |
| 3720 | 2660 2c | 1060 | 7 | 9 |
| 6220 | 2660 2c | 3560 | 8 | 9 |
| 11100 | 2660 2c | 8440 | 9 | 9 |
| 5030 3c | 2660 2c | 2370 | 10 | 9 |
| 2750 | 2660 2c | 90 | 11 | 9 |
| 1130 | 2660 2c | -1530 | 11 | 10 |
| 694 | 2660 2c | -1966 | 11 | 11 |
| 397 | 2660 2c | -2263 | 11 | 12 |
| 49.32 | 2660 2c | -2610.68 | 11 | 13 |
| ND<5 U | 2660 2c | -2655 | 11 | 14 |
| ND<5 U | 2660 2c | -2655 | 11 | 15 |
| ND<5 U | 2660 2c | -2655 | 11 | 16 |
| ND<250 U | 2660 2c | -2410 | 11 | 17 |
| | | | | |
| 3720 | 6790 1c | -3070 | 11 | 18 |
| 6220 | 6790 1c | -570 | 11 | 19 |
| 11100 | 6790 1c | 4310 | 12 | 19 |
| 5030 3c | 6790 1c | -1760 | 12 | 20 |
| 2750 | 6790 1c | -4040 | 12 | 21 |
| 1130 | 6790 1c | -5660 | 12 | 22 |
| 694 | 6790 1c | -6096 | 12 | 23 |
| 397 | 6790 1c | -6393 | 12 | 24 |
| 49.32 | 6790 1c | -6740.68 | 12 | 25 |
| ND<5 U | 6790 1c | -6785 | 12 | 26 |
| ND<5 U | 6790 1c | -6785 | 12 | 27 |
| ND<5 U | 6790 1c | -6785 | 12 | 28 |
| ND<250 U | 6790 1c | -6540 | 12 | 29 |
| | | | | |
| 6220 | 3720 | 2500 | 13 | 29 |
| 11100 | 3720 | 7380 | 14 | 29 |

| | | | | |
|---|---|---|---|---|
| 5030 3c | 3720 | 1310 | 15 | 29 |
| 2750 | 3720 | -970 | 15 | 30 |
| 1130 | 3720 | -2590 | 15 | 31 |
| 694 | 3720 | -3026 | 15 | 32 |
| 397 | 3720 | -3323 | 15 | 33 |
| 49.32 | 3720 | -3670.68 | 15 | 34 |
| ND<5 U | 3720 | -3715 | 15 | 35 |
| ND<5 U | 3720 | -3715 | 15 | 36 |
| ND<5 U | 3720 | -3715 | 15 | 37 |
| ND<250 U | 3720 | -3470 | 15 | 38 |
| | | | | |
| 11100 | 6220 | 4880 | 16 | 38 |
| 5030 3c | 6220 | -1190 | 16 | 39 |
| 2750 | 6220 | -3470 | 16 | 40 |
| 1130 | 6220 | -5090 | 16 | 41 |
| 694 | 6220 | -5526 | 16 | 42 |
| 397 | 6220 | -5823 | 16 | 43 |
| 49.32 | 6220 | -6170.68 | 16 | 44 |
| ND<5 U | 6220 | -6215 | 16 | 45 |
| ND<5 U | 6220 | -6215 | 16 | 46 |
| ND<5 U | 6220 | -6215 | 16 | 47 |
| ND<250 U | 6220 | -5970 | 16 | 48 |
| | | | | |
| 5030 3c | 11100 | -6070 | 16 | 49 |
| 2750 | 11100 | -8350 | 16 | 50 |
| 1130 | 11100 | -9970 | 16 | 51 |
| 694 | 11100 | -10406 | 16 | 52 |
| 397 | 11100 | -10703 | 16 | 53 |
| 49.32 | 11100 | -11050.7 | 16 | 54 |
| ND<5 U | 11100 | -11095 | 16 | 55 |
| ND<5 U | 11100 | -11095 | 16 | 56 |
| ND<5 U | 11100 | -11095 | 16 | 57 |
| ND<250 U | 11100 | -10850 | 16 | 58 |
| | | | | |
| 2750 | 5030 3c | -2280 | 16 | 59 |
| 1130 | 5030 3c | -3900 | 16 | 60 |
| 694 | 5030 3c | -4336 | 16 | 61 |
| 397 | 5030 3c | -4633 | 16 | 62 |
| 49.32 | 5030 3c | -4980.68 | 16 | 63 |
| ND<5 U | 5030 3c | -5025 | 16 | 64 |
| ND<5 U | 5030 3c | -5025 | 16 | 65 |
| ND<5 U | 5030 3c | -5025 | 16 | 66 |
| ND<250 U | 5030 3c | -4780 | 16 | 67 |
| | | | | |
| 1130 | 2750 | -1620 | 16 | 68 |
| 694 | 2750 | -2056 | 16 | 69 |
| 397 | 2750 | -2353 | 16 | 70 |
| 49.32 | 2750 | -2700.68 | 16 | 71 |
| ND<5 U | 2750 | -2745 | 16 | 72 |
| ND<5 U | 2750 | -2745 | 16 | 73 |
| ND<5 U | 2750 | -2745 | 16 | 74 |
| ND<250 U | 2750 | -2500 | 16 | 75 |
| | | | | |
| 694 | 1130 | -436 | 16 | 76 |
| 397 | 1130 | -733 | 16 | 77 |
| 49.32 | 1130 | -1080.68 | 16 | 78 |
| ND<5 U | 1130 | -1125 | 16 | 79 |

| | | | | |
|---|---|---|---|---|
| ND<5 U | 1130 | -1125 | 16 | 80 |
| ND<5 U | 1130 | -1125 | 16 | 81 |
| ND<250 U | 1130 | -880 | 16 | 82 |
| | | | | |
| 397 | 694 | -297 | 16 | 83 |
| 49.32 | 694 | -644.68 | 16 | 84 |
| ND<5 U | 694 | -689 | 16 | 85 |
| ND<5 U | 694 | -689 | 16 | 86 |
| ND<5 U | 694 | -689 | 16 | 87 |
| ND<250 U | 694 | -444 | 16 | 88 |
| | | | | |
| 49.32 | 397 | -347.68 | 16 | 89 |
| ND<5 U | 397 | -392 | 16 | 90 |
| ND<5 U | 397 | -392 | 16 | 91 |
| ND<5 U | 397 | -392 | 16 | 92 |
| ND<250 U | 397 | -147 | 16 | 93 |
| | | | | |
| ND<5 U | 49.32 | -44.32 | 16 | 94 |
| ND<5 U | 49.32 | -44.32 | 16 | 95 |
| ND<5 U | 49.32 | -44.32 | 16 | 96 |
| ND<250 U | 49.32 | 200.68 | 17 | 96 |
| | | | | |
| ND<5 U | ND<5 U | 0 | 17 | 96 |
| ND<5 U | ND<5 U | 0 | 17 | 96 |
| ND<250 U | ND<5 U | 245 | 18 | 96 |
| | | | | |
| ND<5 U | ND<5 U | 0 | 18 | 96 |
| ND<250 U | ND<5 U | 245 | 19 | 96 |
| | | | | |
| ND<250 U | ND<5 U | 245 | 20 | 96 |

S Statistic = 20 - 96 = -76

| Tied Group | Value | Members |
|---|---|---|
| 1 | 5 | 3 |

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 66
B = 18

C = 6
D = 0
E = 6
F = 2
a = 8880
b = 30240
c = 480
Group Variance = 488.692
Z-Score = -3.39269
Comparison Level at 95% confidence level = 1.65463 (upward trend)
-3.39269 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RWQ-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 148 | 146 | Same Date | 0 | 0 |
| 147 1c | 146 | 1 | 1 | 0 |
| 182 | 146 | 36 | 2 | 0 |
| 194 | 146 | 48 | 3 | 0 |
| 149 | 146 | 3 | 4 | 0 |
| 162 3c | 146 | 16 | 5 | 0 |
| 152 | 146 | 6 | 6 | 0 |
| 158 | 146 | 12 | 7 | 0 |
| 166 | 146 | 20 | 8 | 0 |
| 239 | 146 | 93 | 9 | 0 |
| 133.8 | 146 | -12.2 | 9 | 1 |
| 94.51 | 146 | -51.49 | 9 | 2 |
| 116.6 | 146 | -29.4 | 9 | 3 |
| 153.7 | 146 | 7.7 | 10 | 3 |
| 211.7 | 146 | 65.7 | 11 | 3 |
| | | | | |
| 147 1c | 148 | -1 | 11 | 4 |
| 182 | 148 | 34 | 12 | 4 |
| 194 | 148 | 46 | 13 | 4 |
| 149 | 148 | 1 | 14 | 4 |
| 162 3c | 148 | 14 | 15 | 4 |
| 152 | 148 | 4 | 16 | 4 |
| 158 | 148 | 10 | 17 | 4 |
| 166 | 148 | 18 | 18 | 4 |
| 239 | 148 | 91 | 19 | 4 |
| 133.8 | 148 | -14.2 | 19 | 5 |
| 94.51 | 148 | -53.49 | 19 | 6 |
| 116.6 | 148 | -31.4 | 19 | 7 |
| 153.7 | 148 | 5.7 | 20 | 7 |
| 211.7 | 148 | 63.7 | 21 | 7 |
| | | | | |
| 182 | 147 1c | 35 | 22 | 7 |
| 194 | 147 1c | 47 | 23 | 7 |
| 149 | 147 1c | 2 | 24 | 7 |
| 162 3c | 147 1c | 15 | 25 | 7 |
| 152 | 147 1c | 5 | 26 | 7 |
| 158 | 147 1c | 11 | 27 | 7 |
| 166 | 147 1c | 19 | 28 | 7 |
| 239 | 147 1c | 92 | 29 | 7 |
| 133.8 | 147 1c | -13.2 | 29 | 8 |
| 94.51 | 147 1c | -52.49 | 29 | 9 |
| 116.6 | 147 1c | -30.4 | 29 | 10 |
| 153.7 | 147 1c | 6.7 | 30 | 10 |
| 211.7 | 147 1c | 64.7 | 31 | 10 |
| | | | | |
| 194 | 182 | 12 | 32 | 10 |
| 149 | 182 | -33 | 32 | 11 |

| | | | | |
|---|---|---|---|---|
| 162 3c | 182 | -20 | 32 | 12 |
| 152 | 182 | -30 | 32 | 13 |
| 158 | 182 | -24 | 32 | 14 |
| 166 | 182 | -16 | 32 | 15 |
| 239 | 182 | 57 | 33 | 15 |
| 133.8 | 182 | -48.2 | 33 | 16 |
| 94.51 | 182 | -87.49 | 33 | 17 |
| 116.6 | 182 | -65.4 | 33 | 18 |
| 153.7 | 182 | -28.3 | 33 | 19 |
| 211.7 | 182 | 29.7 | 34 | 19 |
| | | | | |
| 149 | 194 | -45 | 34 | 20 |
| 162 3c | 194 | -32 | 34 | 21 |
| 152 | 194 | -42 | 34 | 22 |
| 158 | 194 | -36 | 34 | 23 |
| 166 | 194 | -28 | 34 | 24 |
| 239 | 194 | 45 | 35 | 24 |
| 133.8 | 194 | -60.2 | 35 | 25 |
| 94.51 | 194 | -99.49 | 35 | 26 |
| 116.6 | 194 | -77.4 | 35 | 27 |
| 153.7 | 194 | -40.3 | 35 | 28 |
| 211.7 | 194 | 17.7 | 36 | 28 |
| | | | | |
| 162 3c | 149 | 13 | 37 | 28 |
| 152 | 149 | 3 | 38 | 28 |
| 158 | 149 | 9 | 39 | 28 |
| 166 | 149 | 17 | 40 | 28 |
| 239 | 149 | 90 | 41 | 28 |
| 133.8 | 149 | -15.2 | 41 | 29 |
| 94.51 | 149 | -54.49 | 41 | 30 |
| 116.6 | 149 | -32.4 | 41 | 31 |
| 153.7 | 149 | 4.7 | 42 | 31 |
| 211.7 | 149 | 62.7 | 43 | 31 |
| | | | | |
| 152 | 162 3c | -10 | 43 | 32 |
| 158 | 162 3c | -4 | 43 | 33 |
| 166 | 162 3c | 4 | 44 | 33 |
| 239 | 162 3c | 77 | 45 | 33 |
| 133.8 | 162 3c | -28.2 | 45 | 34 |
| 94.51 | 162 3c | -67.49 | 45 | 35 |
| 116.6 | 162 3c | -45.4 | 45 | 36 |
| 153.7 | 162 3c | -8.3 | 45 | 37 |
| 211.7 | 162 3c | 49.7 | 46 | 37 |
| | | | | |
| 158 | 152 | 6 | 47 | 37 |
| 166 | 152 | 14 | 48 | 37 |
| 239 | 152 | 87 | 49 | 37 |
| 133.8 | 152 | -18.2 | 49 | 38 |
| 94.51 | 152 | -57.49 | 49 | 39 |
| 116.6 | 152 | -35.4 | 49 | 40 |
| 153.7 | 152 | 1.7 | 50 | 40 |
| 211.7 | 152 | 59.7 | 51 | 40 |
| | | | | |
| 166 | 158 | 8 | 52 | 40 |
| 239 | 158 | 81 | 53 | 40 |
| 133.8 | 158 | -24.2 | 53 | 41 |
| 94.51 | 158 | -63.49 | 53 | 42 |

| | | | | |
|---|---|---|---|---|
| 116.6 | 158 | -41.4 | 53 | 43 |
| 153.7 | 158 | -4.3 | 53 | 44 |
| 211.7 | 158 | 53.7 | 54 | 44 |
| | | | | |
| 239 | 166 | 73 | 55 | 44 |
| 133.8 | 166 | -32.2 | 55 | 45 |
| 94.51 | 166 | -71.49 | 55 | 46 |
| 116.6 | 166 | -49.4 | 55 | 47 |
| 153.7 | 166 | -12.3 | 55 | 48 |
| 211.7 | 166 | 45.7 | 56 | 48 |
| | | | | |
| 133.8 | 239 | -105.2 | 56 | 49 |
| 94.51 | 239 | -144.49 | 56 | 50 |
| 116.6 | 239 | -122.4 | 56 | 51 |
| 153.7 | 239 | -85.3 | 56 | 52 |
| 211.7 | 239 | -27.3 | 56 | 53 |
| | | | | |
| 94.51 | 133.8 | -39.29 | 56 | 54 |
| 116.6 | 133.8 | -17.2 | 56 | 55 |
| 153.7 | 133.8 | 19.9 | 57 | 55 |
| 211.7 | 133.8 | 77.9 | 58 | 55 |
| | | | | |
| 116.6 | 94.51 | 22.09 | 59 | 55 |
| 153.7 | 94.51 | 59.19 | 60 | 55 |
| 211.7 | 94.51 | 117.19 | 61 | 55 |
| | | | | |
| 153.7 | 116.6 | 37.1 | 62 | 55 |
| 211.7 | 116.6 | 95.1 | 63 | 55 |
| | | | | |
| 211.7 | 153.7 | 58 | 64 | 55 |

S Statistic = 64 - 55 = 9

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 0
B = 18
C = 0

D = 0
E = 0
F = 2
a = 8880
b = 30240
c = 480
Group Variance = 492.333
Z-Score = 0.360546
Comparison Level at 95% confidence level = 1.65463 (upward trend)
0.360546 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RWR-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 213000 2c | 214000 1c4c | Same Date | 0 | 0 |
| 245000 M61c2c | 214000 1c4c | 31000 | 1 | 0 |
| 320000 | 214000 1c4c | 106000 | 2 | 0 |
| 344000 | 214000 1c4c | 130000 | 3 | 0 |
| 327000 | 214000 1c4c | 113000 | 4 | 0 |
| 326000 | 214000 1c4c | 112000 | 5 | 0 |
| 293000 MH1c | 214000 1c4c | 79000 | 6 | 0 |
| 269000 P6 | 214000 1c4c | 55000 | 7 | 0 |
| 298000 | 214000 1c4c | 84000 | 8 | 0 |
| 267000 | 214000 1c4c | 53000 | 9 | 0 |
| 205000 | 214000 1c4c | -9000 | 9 | 1 |
| 233900 | 214000 1c4c | 19900 | 10 | 1 |
| 243900 | 214000 1c4c | 29900 | 11 | 1 |
| 280800 | 214000 1c4c | 66800 | 12 | 1 |
| 455600 | 214000 1c4c | 241600 | 13 | 1 |
| | | | | |
| 245000 M61c2c | 213000 2c | 32000 | 14 | 1 |
| 320000 | 213000 2c | 107000 | 15 | 1 |
| 344000 | 213000 2c | 131000 | 16 | 1 |
| 327000 | 213000 2c | 114000 | 17 | 1 |
| 326000 | 213000 2c | 113000 | 18 | 1 |
| 293000 MH1c | 213000 2c | 80000 | 19 | 1 |
| 269000 P6 | 213000 2c | 56000 | 20 | 1 |
| 298000 | 213000 2c | 85000 | 21 | 1 |
| 267000 | 213000 2c | 54000 | 22 | 1 |
| 205000 | 213000 2c | -8000 | 22 | 2 |
| 233900 | 213000 2c | 20900 | 23 | 2 |
| 243900 | 213000 2c | 30900 | 24 | 2 |
| 280800 | 213000 2c | 67800 | 25 | 2 |
| 455600 | 213000 2c | 242600 | 26 | 2 |
| | | | | |
| 320000 | 245000 M61c2c | 75000 | 27 | 2 |
| 344000 | 245000 M61c2c | 99000 | 28 | 2 |
| 327000 | 245000 M61c2c | 82000 | 29 | 2 |
| 326000 | 245000 M61c2c | 81000 | 30 | 2 |
| 293000 MH1c | 245000 M61c2c | 48000 | 31 | 2 |
| 269000 P6 | 245000 M61c2c | 24000 | 32 | 2 |
| 298000 | 245000 M61c2c | 53000 | 33 | 2 |
| 267000 | 245000 M61c2c | 22000 | 34 | 2 |
| 205000 | 245000 M61c2c | -40000 | 34 | 3 |
| 233900 | 245000 M61c2c | -11100 | 34 | 4 |
| 243900 | 245000 M61c2c | -1100 | 34 | 5 |
| 280800 | 245000 M61c2c | 35800 | 35 | 5 |
| 455600 | 245000 M61c2c | 210600 | 36 | 5 |
| | | | | |
| 344000 | 320000 | 24000 | 37 | 5 |
| 327000 | 320000 | 7000 | 38 | 5 |

| | | | | |
|---|---|---|---|---|
| 326000 | 320000 | 6000 | 39 | 5 |
| 293000 MH1c | 320000 | -27000 | 39 | 6 |
| 269000 P6 | 320000 | -51000 | 39 | 7 |
| 298000 | 320000 | -22000 | 39 | 8 |
| 267000 | 320000 | -53000 | 39 | 9 |
| 205000 | 320000 | -115000 | 39 | 10 |
| 233900 | 320000 | -86100 | 39 | 11 |
| 243900 | 320000 | -76100 | 39 | 12 |
| 280800 | 320000 | -39200 | 39 | 13 |
| 455600 | 320000 | 135600 | 40 | 13 |
| | | | | |
| 327000 | 344000 | -17000 | 40 | 14 |
| 326000 | 344000 | -18000 | 40 | 15 |
| 293000 MH1c | 344000 | -51000 | 40 | 16 |
| 269000 P6 | 344000 | -75000 | 40 | 17 |
| 298000 | 344000 | -46000 | 40 | 18 |
| 267000 | 344000 | -77000 | 40 | 19 |
| 205000 | 344000 | -139000 | 40 | 20 |
| 233900 | 344000 | -110100 | 40 | 21 |
| 243900 | 344000 | -100100 | 40 | 22 |
| 280800 | 344000 | -63200 | 40 | 23 |
| 455600 | 344000 | 111600 | 41 | 23 |
| | | | | |
| 326000 | 327000 | -1000 | 41 | 24 |
| 293000 MH1c | 327000 | -34000 | 41 | 25 |
| 269000 P6 | 327000 | -58000 | 41 | 26 |
| 298000 | 327000 | -29000 | 41 | 27 |
| 267000 | 327000 | -60000 | 41 | 28 |
| 205000 | 327000 | -122000 | 41 | 29 |
| 233900 | 327000 | -93100 | 41 | 30 |
| 243900 | 327000 | -83100 | 41 | 31 |
| 280800 | 327000 | -46200 | 41 | 32 |
| 455600 | 327000 | 128600 | 42 | 32 |
| | | | | |
| 293000 MH1c | 326000 | -33000 | 42 | 33 |
| 269000 P6 | 326000 | -57000 | 42 | 34 |
| 298000 | 326000 | -28000 | 42 | 35 |
| 267000 | 326000 | -59000 | 42 | 36 |
| 205000 | 326000 | -121000 | 42 | 37 |
| 233900 | 326000 | -92100 | 42 | 38 |
| 243900 | 326000 | -82100 | 42 | 39 |
| 280800 | 326000 | -45200 | 42 | 40 |
| 455600 | 326000 | 129600 | 43 | 40 |
| | | | | |
| 269000 P6 | 293000 MH1c | -24000 | 43 | 41 |
| 298000 | 293000 MH1c | 5000 | 44 | 41 |
| 267000 | 293000 MH1c | -26000 | 44 | 42 |
| 205000 | 293000 MH1c | -88000 | 44 | 43 |
| 233900 | 293000 MH1c | -59100 | 44 | 44 |
| 243900 | 293000 MH1c | -49100 | 44 | 45 |
| 280800 | 293000 MH1c | -12200 | 44 | 46 |
| 455600 | 293000 MH1c | 162600 | 45 | 46 |
| | | | | |
| 298000 | 269000 P6 | 29000 | 46 | 46 |
| 267000 | 269000 P6 | -2000 | 46 | 47 |
| 205000 | 269000 P6 | -64000 | 46 | 48 |
| 233900 | 269000 P6 | -35100 | 46 | 49 |

| | | | | |
|---|---|---|---|---|
| 243900 | 269000 P6 | -25100 | 46 | 50 |
| 280800 | 269000 P6 | 11800 | 47 | 50 |
| 455600 | 269000 P6 | 186600 | 48 | 50 |
| | | | | |
| 267000 | 298000 | -31000 | 48 | 51 |
| 205000 | 298000 | -93000 | 48 | 52 |
| 233900 | 298000 | -64100 | 48 | 53 |
| 243900 | 298000 | -54100 | 48 | 54 |
| 280800 | 298000 | -17200 | 48 | 55 |
| 455600 | 298000 | 157600 | 49 | 55 |
| | | | | |
| 205000 | 267000 | -62000 | 49 | 56 |
| 233900 | 267000 | -33100 | 49 | 57 |
| 243900 | 267000 | -23100 | 49 | 58 |
| 280800 | 267000 | 13800 | 50 | 58 |
| 455600 | 267000 | 188600 | 51 | 58 |
| | | | | |
| 233900 | 205000 | 28900 | 52 | 58 |
| 243900 | 205000 | 38900 | 53 | 58 |
| 280800 | 205000 | 75800 | 54 | 58 |
| 455600 | 205000 | 250600 | 55 | 58 |
| | | | | |
| 243900 | 233900 | 10000 | 56 | 58 |
| 280800 | 233900 | 46900 | 57 | 58 |
| 455600 | 233900 | 221700 | 58 | 58 |
| | | | | |
| 280800 | 243900 | 36900 | 59 | 58 |
| 455600 | 243900 | 211700 | 60 | 58 |
| | | | | |
| 455600 | 280800 | 174800 | 61 | 58 |

S Statistic = 61 - 58 = 3

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 0
B = 18
C = 0

D = 0
E = 0
F = 2
a = 8880
b = 30240
c = 480
Group Variance = 492.333
Z-Score = 0.0901364
Comparison Level at 95% confidence level = 1.65463 (upward trend)
0.0901364 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RWS-MWS

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 10100 | 9740 | Same Date | 0 | 0 |
| 1980 1c | 9740 | -7760 | 0 | 1 |
| 2970 | 9740 | -6770 | 0 | 2 |
| 19100 | 9740 | 9360 | 1 | 2 |
| 954000 | 9740 | 944260 | 2 | 2 |
| 60300 MH | 9740 | 50560 | 3 | 2 |
| 7260 | 9740 | -2480 | 3 | 3 |
| 116000 | 9740 | 106260 | 4 | 3 |
| 36700 | 9740 | 26960 | 5 | 3 |
| 97500 | 9740 | 87760 | 6 | 3 |
| 22290 | 9740 | 12550 | 7 | 3 |
| 158800 | 9740 | 149060 | 8 | 3 |
| 62160 | 9740 | 52420 | 9 | 3 |
| 167200 | 9740 | 157460 | 10 | 3 |
| 166800 | 9740 | 157060 | 11 | 3 |
| | | | | |
| 1980 1c | 10100 | -8120 | 11 | 4 |
| 2970 | 10100 | -7130 | 11 | 5 |
| 19100 | 10100 | 9000 | 12 | 5 |
| 954000 | 10100 | 943900 | 13 | 5 |
| 60300 MH | 10100 | 50200 | 14 | 5 |
| 7260 | 10100 | -2840 | 14 | 6 |
| 116000 | 10100 | 105900 | 15 | 6 |
| 36700 | 10100 | 26600 | 16 | 6 |
| 97500 | 10100 | 87400 | 17 | 6 |
| 22290 | 10100 | 12190 | 18 | 6 |
| 158800 | 10100 | 148700 | 19 | 6 |
| 62160 | 10100 | 52060 | 20 | 6 |
| 167200 | 10100 | 157100 | 21 | 6 |
| 166800 | 10100 | 156700 | 22 | 6 |
| | | | | |
| 2970 | 1980 1c | 990 | 23 | 6 |
| 19100 | 1980 1c | 17120 | 24 | 6 |
| 954000 | 1980 1c | 952020 | 25 | 6 |
| 60300 MH | 1980 1c | 58320 | 26 | 6 |
| 7260 | 1980 1c | 5280 | 27 | 6 |
| 116000 | 1980 1c | 114020 | 28 | 6 |
| 36700 | 1980 1c | 34720 | 29 | 6 |
| 97500 | 1980 1c | 95520 | 30 | 6 |
| 22290 | 1980 1c | 20310 | 31 | 6 |
| 158800 | 1980 1c | 156820 | 32 | 6 |
| 62160 | 1980 1c | 60180 | 33 | 6 |
| 167200 | 1980 1c | 165220 | 34 | 6 |
| 166800 | 1980 1c | 164820 | 35 | 6 |
| | | | | |
| 19100 | 2970 | 16130 | 36 | 6 |
| 954000 | 2970 | 951030 | 37 | 6 |

| | | | | |
|---|---|---|---|---|
| 60300 MH | 2970 | 57330 | 38 | 6 |
| 7260 | 2970 | 4290 | 39 | 6 |
| 116000 | 2970 | 113030 | 40 | 6 |
| 36700 | 2970 | 33730 | 41 | 6 |
| 97500 | 2970 | 94530 | 42 | 6 |
| 22290 | 2970 | 19320 | 43 | 6 |
| 158800 | 2970 | 155830 | 44 | 6 |
| 62160 | 2970 | 59190 | 45 | 6 |
| 167200 | 2970 | 164230 | 46 | 6 |
| 166800 | 2970 | 163830 | 47 | 6 |
| | | | | |
| 954000 | 19100 | 934900 | 48 | 6 |
| 60300 MH | 19100 | 41200 | 49 | 6 |
| 7260 | 19100 | -11840 | 49 | 7 |
| 116000 | 19100 | 96900 | 50 | 7 |
| 36700 | 19100 | 17600 | 51 | 7 |
| 97500 | 19100 | 78400 | 52 | 7 |
| 22290 | 19100 | 3190 | 53 | 7 |
| 158800 | 19100 | 139700 | 54 | 7 |
| 62160 | 19100 | 43060 | 55 | 7 |
| 167200 | 19100 | 148100 | 56 | 7 |
| 166800 | 19100 | 147700 | 57 | 7 |
| | | | | |
| 60300 MH | 954000 | -893700 | 57 | 8 |
| 7260 | 954000 | -946740 | 57 | 9 |
| 116000 | 954000 | -838000 | 57 | 10 |
| 36700 | 954000 | -917300 | 57 | 11 |
| 97500 | 954000 | -856500 | 57 | 12 |
| 22290 | 954000 | -931710 | 57 | 13 |
| 158800 | 954000 | -795200 | 57 | 14 |
| 62160 | 954000 | -891840 | 57 | 15 |
| 167200 | 954000 | -786800 | 57 | 16 |
| 166800 | 954000 | -787200 | 57 | 17 |
| | | | | |
| 7260 | 60300 MH | -53040 | 57 | 18 |
| 116000 | 60300 MH | 55700 | 58 | 18 |
| 36700 | 60300 MH | -23600 | 58 | 19 |
| 97500 | 60300 MH | 37200 | 59 | 19 |
| 22290 | 60300 MH | -38010 | 59 | 20 |
| 158800 | 60300 MH | 98500 | 60 | 20 |
| 62160 | 60300 MH | 1860 | 61 | 20 |
| 167200 | 60300 MH | 106900 | 62 | 20 |
| 166800 | 60300 MH | 106500 | 63 | 20 |
| | | | | |
| 116000 | 7260 | 108740 | 64 | 20 |
| 36700 | 7260 | 29440 | 65 | 20 |
| 97500 | 7260 | 90240 | 66 | 20 |
| 22290 | 7260 | 15030 | 67 | 20 |
| 158800 | 7260 | 151540 | 68 | 20 |
| 62160 | 7260 | 54900 | 69 | 20 |
| 167200 | 7260 | 159940 | 70 | 20 |
| 166800 | 7260 | 159540 | 71 | 20 |
| | | | | |
| 36700 | 116000 | -79300 | 71 | 21 |
| 97500 | 116000 | -18500 | 71 | 22 |
| 22290 | 116000 | -93710 | 71 | 23 |
| 158800 | 116000 | 42800 | 72 | 23 |

| | | | | |
|---|---|---|---|---|
| 62160 | 116000 | -53840 | 72 | 24 |
| 167200 | 116000 | 51200 | 73 | 24 |
| 166800 | 116000 | 50800 | 74 | 24 |
| | | | | |
| 97500 | 36700 | 60800 | 75 | 24 |
| 22290 | 36700 | -14410 | 75 | 25 |
| 158800 | 36700 | 122100 | 76 | 25 |
| 62160 | 36700 | 25460 | 77 | 25 |
| 167200 | 36700 | 130500 | 78 | 25 |
| 166800 | 36700 | 130100 | 79 | 25 |
| | | | | |
| 22290 | 97500 | -75210 | 79 | 26 |
| 158800 | 97500 | 61300 | 80 | 26 |
| 62160 | 97500 | -35340 | 80 | 27 |
| 167200 | 97500 | 69700 | 81 | 27 |
| 166800 | 97500 | 69300 | 82 | 27 |
| | | | | |
| 158800 | 22290 | 136510 | 83 | 27 |
| 62160 | 22290 | 39870 | 84 | 27 |
| 167200 | 22290 | 144910 | 85 | 27 |
| 166800 | 22290 | 144510 | 86 | 27 |
| | | | | |
| 62160 | 158800 | -96640 | 86 | 28 |
| 167200 | 158800 | 8400 | 87 | 28 |
| 166800 | 158800 | 8000 | 88 | 28 |
| | | | | |
| 167200 | 62160 | 105040 | 89 | 28 |
| 166800 | 62160 | 104640 | 90 | 28 |
| | | | | |
| 166800 | 167200 | -400 | 90 | 29 |

S Statistic = 90 - 29 = 61

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 0
B = 18
C = 0

D = 0
E = 0
F = 2
a = 8880
b = 30240
c = 480
Group Variance = 492.333
Z-Score = 2.70409
Comparison Level at 95% confidence level = 1.65463 (upward trend)
**2.70409 > 1.65463 indicating an upward trend**

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RW01-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 0.51 J | 194 | -193.49 | 0 | 1 |
| 145 | 194 | -49 | 0 | 2 |
| ND<1.5 U | 194 | -192.5 | 0 | 3 |
| 37.5 | 194 | -156.5 | 0 | 4 |
| 2.4 J | 194 | -191.6 | 0 | 5 |
| 16.5 | 194 | -177.5 | 0 | 6 |
| 250 | 194 | 56 | 1 | 6 |
| ND<1.5 U | 194 | -192.5 | 1 | 7 |
| ND<1.5 U | 194 | -192.5 | 1 | 8 |
| 5.8 | 194 | -188.2 | 1 | 9 |
| 24.4 | 194 | -169.6 | 1 | 10 |
| 19.4 | 194 | -174.6 | 1 | 11 |
| 20.6 1c2c | 194 | -173.4 | 1 | 12 |
| 8.8 | 194 | -185.2 | 1 | 13 |
| 49.3 | 194 | -144.7 | 1 | 14 |
| 117 | 194 | -77 | 1 | 15 |
| ND<1.5 U | 194 | -192.5 | 1 | 16 |
| 162 | 194 | -32 | 1 | 17 |
| 277 | 194 | 83 | 2 | 17 |
| 322 | 194 | 128 | 3 | 17 |
| 565 M1 | 194 | 371 | 4 | 17 |
| 574.1 | 194 | 380.1 | 5 | 17 |
| 318.2 | 194 | 124.2 | 6 | 17 |
| | | | | |
| 145 | 0.51 J | 144.49 | 7 | 17 |
| ND<1.5 U | 0.51 J | 0.99 | 8 | 17 |
| 37.5 | 0.51 J | 36.99 | 9 | 17 |
| 2.4 J | 0.51 J | 1.89 | 10 | 17 |
| 16.5 | 0.51 J | 15.99 | 11 | 17 |
| 250 | 0.51 J | 249.49 | 12 | 17 |
| ND<1.5 U | 0.51 J | 0.99 | 13 | 17 |
| ND<1.5 U | 0.51 J | 0.99 | 14 | 17 |
| 5.8 | 0.51 J | 5.29 | 15 | 17 |
| 24.4 | 0.51 J | 23.89 | 16 | 17 |
| 19.4 | 0.51 J | 18.89 | 17 | 17 |
| 20.6 1c2c | 0.51 J | 20.09 | 18 | 17 |
| 8.8 | 0.51 J | 8.29 | 19 | 17 |
| 49.3 | 0.51 J | 48.79 | 20 | 17 |
| 117 | 0.51 J | 116.49 | 21 | 17 |
| ND<1.5 U | 0.51 J | 0.99 | 22 | 17 |
| 162 | 0.51 J | 161.49 | 23 | 17 |
| 277 | 0.51 J | 276.49 | 24 | 17 |
| 322 | 0.51 J | 321.49 | 25 | 17 |
| 565 M1 | 0.51 J | 564.49 | 26 | 17 |
| 574.1 | 0.51 J | 573.59 | 27 | 17 |
| 318.2 | 0.51 J | 317.69 | 28 | 17 |

| | | | | |
|---|---|---|---|---|
| ND<1.5 U | 145 | -143.5 | 28 | 18 |
| 37.5 | 145 | -107.5 | 28 | 19 |
| 2.4 J | 145 | -142.6 | 28 | 20 |
| 16.5 | 145 | -128.5 | 28 | 21 |
| 250 | 145 | 105 | 29 | 21 |
| ND<1.5 U | 145 | -143.5 | 29 | 22 |
| ND<1.5 U | 145 | -143.5 | 29 | 23 |
| 5.8 | 145 | -139.2 | 29 | 24 |
| 24.4 | 145 | -120.6 | 29 | 25 |
| 19.4 | 145 | -125.6 | 29 | 26 |
| 20.6 1c2c | 145 | -124.4 | 29 | 27 |
| 8.8 | 145 | -136.2 | 29 | 28 |
| 49.3 | 145 | -95.7 | 29 | 29 |
| 117 | 145 | -28 | 29 | 30 |
| ND<1.5 U | 145 | -143.5 | 29 | 31 |
| 162 | 145 | 17 | 30 | 31 |
| 277 | 145 | 132 | 31 | 31 |
| 322 | 145 | 177 | 32 | 31 |
| 565 M1 | 145 | 420 | 33 | 31 |
| 574.1 | 145 | 429.1 | 34 | 31 |
| 318.2 | 145 | 173.2 | 35 | 31 |
| | | | | |
| 37.5 | ND<1.5 U | 36 | 36 | 31 |
| 2.4 J | ND<1.5 U | 0.9 | 37 | 31 |
| 16.5 | ND<1.5 U | 15 | 38 | 31 |
| 250 | ND<1.5 U | 248.5 | 39 | 31 |
| ND<1.5 U | ND<1.5 U | 0 | 39 | 31 |
| ND<1.5 U | ND<1.5 U | 0 | 39 | 31 |
| 5.8 | ND<1.5 U | 4.3 | 40 | 31 |
| 24.4 | ND<1.5 U | 22.9 | 41 | 31 |
| 19.4 | ND<1.5 U | 17.9 | 42 | 31 |
| 20.6 1c2c | ND<1.5 U | 19.1 | 43 | 31 |
| 8.8 | ND<1.5 U | 7.3 | 44 | 31 |
| 49.3 | ND<1.5 U | 47.8 | 45 | 31 |
| 117 | ND<1.5 U | 115.5 | 46 | 31 |
| ND<1.5 U | ND<1.5 U | 0 | 46 | 31 |
| 162 | ND<1.5 U | 160.5 | 47 | 31 |
| 277 | ND<1.5 U | 275.5 | 48 | 31 |
| 322 | ND<1.5 U | 320.5 | 49 | 31 |
| 565 M1 | ND<1.5 U | 563.5 | 50 | 31 |
| 574.1 | ND<1.5 U | 572.6 | 51 | 31 |
| 318.2 | ND<1.5 U | 316.7 | 52 | 31 |
| | | | | |
| 2.4 J | 37.5 | -35.1 | 52 | 32 |
| 16.5 | 37.5 | -21 | 52 | 33 |
| 250 | 37.5 | 212.5 | 53 | 33 |
| ND<1.5 U | 37.5 | -36 | 53 | 34 |
| ND<1.5 U | 37.5 | -36 | 53 | 35 |
| 5.8 | 37.5 | -31.7 | 53 | 36 |
| 24.4 | 37.5 | -13.1 | 53 | 37 |
| 19.4 | 37.5 | -18.1 | 53 | 38 |
| 20.6 1c2c | 37.5 | -16.9 | 53 | 39 |
| 8.8 | 37.5 | -28.7 | 53 | 40 |
| 49.3 | 37.5 | 11.8 | 54 | 40 |
| 117 | 37.5 | 79.5 | 55 | 40 |
| ND<1.5 U | 37.5 | -36 | 55 | 41 |
| 162 | 37.5 | 124.5 | 56 | 41 |

| | | | | |
|---|---|---|---|---|
| 277 | 37.5 | 239.5 | 57 | 41 |
| 322 | 37.5 | 284.5 | 58 | 41 |
| 565 M1 | 37.5 | 527.5 | 59 | 41 |
| 574.1 | 37.5 | 536.6 | 60 | 41 |
| 318.2 | 37.5 | 280.7 | 61 | 41 |
| | | | | |
| 16.5 | 2.4 J | 14.1 | 62 | 41 |
| 250 | 2.4 J | 247.6 | 63 | 41 |
| ND<1.5 U | 2.4 J | -0.9 | 63 | 42 |
| ND<1.5 U | 2.4 J | -0.9 | 63 | 43 |
| 5.8 | 2.4 J | 3.4 | 64 | 43 |
| 24.4 | 2.4 J | 22 | 65 | 43 |
| 19.4 | 2.4 J | 17 | 66 | 43 |
| 20.6 1c2c | 2.4 J | 18.2 | 67 | 43 |
| 8.8 | 2.4 J | 6.4 | 68 | 43 |
| 49.3 | 2.4 J | 46.9 | 69 | 43 |
| 117 | 2.4 J | 114.6 | 70 | 43 |
| ND<1.5 U | 2.4 J | -0.9 | 70 | 44 |
| 162 | 2.4 J | 159.6 | 71 | 44 |
| 277 | 2.4 J | 274.6 | 72 | 44 |
| 322 | 2.4 J | 319.6 | 73 | 44 |
| 565 M1 | 2.4 J | 562.6 | 74 | 44 |
| 574.1 | 2.4 J | 571.7 | 75 | 44 |
| 318.2 | 2.4 J | 315.8 | 76 | 44 |
| | | | | |
| 250 | 16.5 | 233.5 | 77 | 44 |
| ND<1.5 U | 16.5 | -15 | 77 | 45 |
| ND<1.5 U | 16.5 | -15 | 77 | 46 |
| 5.8 | 16.5 | -10.7 | 77 | 47 |
| 24.4 | 16.5 | 7.9 | 78 | 47 |
| 19.4 | 16.5 | 2.9 | 79 | 47 |
| 20.6 1c2c | 16.5 | 4.1 | 80 | 47 |
| 8.8 | 16.5 | -7.7 | 80 | 48 |
| 49.3 | 16.5 | 32.8 | 81 | 48 |
| 117 | 16.5 | 100.5 | 82 | 48 |
| ND<1.5 U | 16.5 | -15 | 82 | 49 |
| 162 | 16.5 | 145.5 | 83 | 49 |
| 277 | 16.5 | 260.5 | 84 | 49 |
| 322 | 16.5 | 305.5 | 85 | 49 |
| 565 M1 | 16.5 | 548.5 | 86 | 49 |
| 574.1 | 16.5 | 557.6 | 87 | 49 |
| 318.2 | 16.5 | 301.7 | 88 | 49 |
| | | | | |
| ND<1.5 U | 250 | -248.5 | 88 | 50 |
| ND<1.5 U | 250 | -248.5 | 88 | 51 |
| 5.8 | 250 | -244.2 | 88 | 52 |
| 24.4 | 250 | -225.6 | 88 | 53 |
| 19.4 | 250 | -230.6 | 88 | 54 |
| 20.6 1c2c | 250 | -229.4 | 88 | 55 |
| 8.8 | 250 | -241.2 | 88 | 56 |
| 49.3 | 250 | -200.7 | 88 | 57 |
| 117 | 250 | -133 | 88 | 58 |
| ND<1.5 U | 250 | -248.5 | 88 | 59 |
| 162 | 250 | -88 | 88 | 60 |
| 277 | 250 | 27 | 89 | 60 |
| 322 | 250 | 72 | 90 | 60 |
| 565 M1 | 250 | 315 | 91 | 60 |

| | | | | |
|---|---|---|---|---|
| 574.1 | 250 | 324.1 | 92 | 60 |
| 318.2 | 250 | 68.2 | 93 | 60 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 93 | 60 |
| 5.8 | ND<1.5 U | 4.3 | 94 | 60 |
| 24.4 | ND<1.5 U | 22.9 | 95 | 60 |
| 19.4 | ND<1.5 U | 17.9 | 96 | 60 |
| 20.6 1c2c | ND<1.5 U | 19.1 | 97 | 60 |
| 8.8 | ND<1.5 U | 7.3 | 98 | 60 |
| 49.3 | ND<1.5 U | 47.8 | 99 | 60 |
| 117 | ND<1.5 U | 115.5 | 100 | 60 |
| ND<1.5 U | ND<1.5 U | 0 | 100 | 60 |
| 162 | ND<1.5 U | 160.5 | 101 | 60 |
| 277 | ND<1.5 U | 275.5 | 102 | 60 |
| 322 | ND<1.5 U | 320.5 | 103 | 60 |
| 565 M1 | ND<1.5 U | 563.5 | 104 | 60 |
| 574.1 | ND<1.5 U | 572.6 | 105 | 60 |
| 318.2 | ND<1.5 U | 316.7 | 106 | 60 |
| | | | | |
| 5.8 | ND<1.5 U | Same Date | 106 | 60 |
| 24.4 | ND<1.5 U | 22.9 | 107 | 60 |
| 19.4 | ND<1.5 U | 17.9 | 108 | 60 |
| 20.6 1c2c | ND<1.5 U | 19.1 | 109 | 60 |
| 8.8 | ND<1.5 U | 7.3 | 110 | 60 |
| 49.3 | ND<1.5 U | 47.8 | 111 | 60 |
| 117 | ND<1.5 U | 115.5 | 112 | 60 |
| ND<1.5 U | ND<1.5 U | 0 | 112 | 60 |
| 162 | ND<1.5 U | 160.5 | 113 | 60 |
| 277 | ND<1.5 U | 275.5 | 114 | 60 |
| 322 | ND<1.5 U | 320.5 | 115 | 60 |
| 565 M1 | ND<1.5 U | 563.5 | 116 | 60 |
| 574.1 | ND<1.5 U | 572.6 | 117 | 60 |
| 318.2 | ND<1.5 U | 316.7 | 118 | 60 |
| | | | | |
| 24.4 | 5.8 | 18.6 | 119 | 60 |
| 19.4 | 5.8 | 13.6 | 120 | 60 |
| 20.6 1c2c | 5.8 | 14.8 | 121 | 60 |
| 8.8 | 5.8 | 3 | 122 | 60 |
| 49.3 | 5.8 | 43.5 | 123 | 60 |
| 117 | 5.8 | 111.2 | 124 | 60 |
| ND<1.5 U | 5.8 | -4.3 | 124 | 61 |
| 162 | 5.8 | 156.2 | 125 | 61 |
| 277 | 5.8 | 271.2 | 126 | 61 |
| 322 | 5.8 | 316.2 | 127 | 61 |
| 565 M1 | 5.8 | 559.2 | 128 | 61 |
| 574.1 | 5.8 | 568.3 | 129 | 61 |
| 318.2 | 5.8 | 312.4 | 130 | 61 |
| | | | | |
| 19.4 | 24.4 | Same Date | 130 | 61 |
| 20.6 1c2c | 24.4 | -3.8 | 130 | 62 |
| 8.8 | 24.4 | -15.6 | 130 | 63 |
| 49.3 | 24.4 | 24.9 | 131 | 63 |
| 117 | 24.4 | 92.6 | 132 | 63 |
| ND<1.5 U | 24.4 | -22.9 | 132 | 64 |
| 162 | 24.4 | 137.6 | 133 | 64 |
| 277 | 24.4 | 252.6 | 134 | 64 |
| 322 | 24.4 | 297.6 | 135 | 64 |

| | | | | |
|---|---|---|---|---|
| 565 M1 | 24.4 | 540.6 | 136 | 64 |
| 574.1 | 24.4 | 549.7 | 137 | 64 |
| 318.2 | 24.4 | 293.8 | 138 | 64 |
| | | | | |
| 20.6 1c2c | 19.4 | 1.2 | 139 | 64 |
| 8.8 | 19.4 | -10.6 | 139 | 65 |
| 49.3 | 19.4 | 29.9 | 140 | 65 |
| 117 | 19.4 | 97.6 | 141 | 65 |
| ND<1.5 U | 19.4 | -17.9 | 141 | 66 |
| 162 | 19.4 | 142.6 | 142 | 66 |
| 277 | 19.4 | 257.6 | 143 | 66 |
| 322 | 19.4 | 302.6 | 144 | 66 |
| 565 M1 | 19.4 | 545.6 | 145 | 66 |
| 574.1 | 19.4 | 554.7 | 146 | 66 |
| 318.2 | 19.4 | 298.8 | 147 | 66 |
| | | | | |
| 8.8 | 20.6 1c2c | -11.8 | 147 | 67 |
| 49.3 | 20.6 1c2c | 28.7 | 148 | 67 |
| 117 | 20.6 1c2c | 96.4 | 149 | 67 |
| ND<1.5 U | 20.6 1c2c | -19.1 | 149 | 68 |
| 162 | 20.6 1c2c | 141.4 | 150 | 68 |
| 277 | 20.6 1c2c | 256.4 | 151 | 68 |
| 322 | 20.6 1c2c | 301.4 | 152 | 68 |
| 565 M1 | 20.6 1c2c | 544.4 | 153 | 68 |
| 574.1 | 20.6 1c2c | 553.5 | 154 | 68 |
| 318.2 | 20.6 1c2c | 297.6 | 155 | 68 |
| | | | | |
| 49.3 | 8.8 | 40.5 | 156 | 68 |
| 117 | 8.8 | 108.2 | 157 | 68 |
| ND<1.5 U | 8.8 | -7.3 | 157 | 69 |
| 162 | 8.8 | 153.2 | 158 | 69 |
| 277 | 8.8 | 268.2 | 159 | 69 |
| 322 | 8.8 | 313.2 | 160 | 69 |
| 565 M1 | 8.8 | 556.2 | 161 | 69 |
| 574.1 | 8.8 | 565.3 | 162 | 69 |
| 318.2 | 8.8 | 309.4 | 163 | 69 |
| | | | | |
| 117 | 49.3 | 67.7 | 164 | 69 |
| ND<1.5 U | 49.3 | -47.8 | 164 | 70 |
| 162 | 49.3 | 112.7 | 165 | 70 |
| 277 | 49.3 | 227.7 | 166 | 70 |
| 322 | 49.3 | 272.7 | 167 | 70 |
| 565 M1 | 49.3 | 515.7 | 168 | 70 |
| 574.1 | 49.3 | 524.8 | 169 | 70 |
| 318.2 | 49.3 | 268.9 | 170 | 70 |
| | | | | |
| ND<1.5 U | 117 | -115.5 | 170 | 71 |
| 162 | 117 | 45 | 171 | 71 |
| 277 | 117 | 160 | 172 | 71 |
| 322 | 117 | 205 | 173 | 71 |
| 565 M1 | 117 | 448 | 174 | 71 |
| 574.1 | 117 | 457.1 | 175 | 71 |
| 318.2 | 117 | 201.2 | 176 | 71 |
| | | | | |
| 162 | ND<1.5 U | 160.5 | 177 | 71 |
| 277 | ND<1.5 U | 275.5 | 178 | 71 |
| 322 | ND<1.5 U | 320.5 | 179 | 71 |

| | | | | |
|---|---|---|---|---|
| 565 M1 | ND<1.5 U | 563.5 | 180 | 71 |
| 574.1 | ND<1.5 U | 572.6 | 181 | 71 |
| 318.2 | ND<1.5 U | 316.7 | 182 | 71 |
| | | | | |
| 277 | 162 | 115 | 183 | 71 |
| 322 | 162 | 160 | 184 | 71 |
| 565 M1 | 162 | 403 | 185 | 71 |
| 574.1 | 162 | 412.1 | 186 | 71 |
| 318.2 | 162 | 156.2 | 187 | 71 |
| | | | | |
| 322 | 277 | 45 | 188 | 71 |
| 565 M1 | 277 | 288 | 189 | 71 |
| 574.1 | 277 | 297.1 | 190 | 71 |
| 318.2 | 277 | 41.2 | 191 | 71 |
| | | | | |
| 565 M1 | 322 | 243 | 192 | 71 |
| 574.1 | 322 | 252.1 | 193 | 71 |
| 318.2 | 322 | -3.8 | 193 | 72 |
| | | | | |
| 574.1 | 565 M1 | 9.1 | 194 | 72 |
| 318.2 | 565 M1 | -246.8 | 194 | 73 |
| | | | | |
| 318.2 | 574.1 | -255.9 | 194 | 74 |

S Statistic = 194 - 74 = 120

| Tied Group | Value | Members |
|---|---|---|
| 1 | 1.5 | 4 |

| Time Period | Observations |
|---|---|
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |

There are 2 time periods with multiple data

A = 156
B = 36

C = 24
D = 0
E = 12
F = 4
a = 29256
b = 109296
c = 1104
Group Variance = 1614.71
Z-Score = 2.96142
Comparison Level at 95% confidence level = -1.65463 (downward trend)
2.96142 >= -1.65463 indicating no evidence of a downward trend

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RW02-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 3 J | 511 | -508 | 0 | 1 |
| 2.4 J | 511 | -508.6 | 0 | 2 |
| ND<1.5 U | 511 | -509.5 | 0 | 3 |
| 2.3 J | 511 | -508.7 | 0 | 4 |
| 14.5 | 511 | -496.5 | 0 | 5 |
| 3 | 511 | -508 | 0 | 6 |
| 79.9 | 511 | -431.1 | 0 | 7 |
| 18 | 511 | -493 | 0 | 8 |
| 98.3 | 511 | -412.7 | 0 | 9 |
| 92.2 | 511 | -418.8 | 0 | 10 |
| 803 | 511 | 292 | 1 | 10 |
| 785 | 511 | 274 | 2 | 10 |
| 873 2c | 511 | 362 | 3 | 10 |
| 277 | 511 | -234 | 3 | 11 |
| 136 | 511 | -375 | 3 | 12 |
| 398 | 511 | -113 | 3 | 13 |
| 0.69 J | 511 | -510.31 | 3 | 14 |
| 208 | 511 | -303 | 3 | 15 |
| 0.58 J | 511 | -510.42 | 3 | 16 |
| ND<0.5 U | 511 | -510.5 | 3 | 17 |
| ND<1 U | 511 | -510 | 3 | 18 |
| 17.42 | 511 | -493.58 | 3 | 19 |
| 192.8 | 511 | -318.2 | 3 | 20 |
| | | | | |
| 2.4 J | 3 J | -0.6 | 3 | 21 |
| ND<1.5 U | 3 J | -1.5 | 3 | 22 |
| 2.3 J | 3 J | -0.7 | 3 | 23 |
| 14.5 | 3 J | 11.5 | 4 | 23 |
| 3 | 3 J | 0 | 4 | 23 |
| 79.9 | 3 J | 76.9 | 5 | 23 |
| 18 | 3 J | 15 | 6 | 23 |
| 98.3 | 3 J | 95.3 | 7 | 23 |
| 92.2 | 3 J | 89.2 | 8 | 23 |
| 803 | 3 J | 800 | 9 | 23 |
| 785 | 3 J | 782 | 10 | 23 |
| 873 2c | 3 J | 870 | 11 | 23 |
| 277 | 3 J | 274 | 12 | 23 |
| 136 | 3 J | 133 | 13 | 23 |
| 398 | 3 J | 395 | 14 | 23 |
| 0.69 J | 3 J | -2.31 | 14 | 24 |
| 208 | 3 J | 205 | 15 | 24 |
| 0.58 J | 3 J | -2.42 | 15 | 25 |
| ND<0.5 U | 3 J | -2.5 | 15 | 26 |
| ND<1 U | 3 J | -2 | 15 | 27 |
| 17.42 | 3 J | 14.42 | 16 | 27 |
| 192.8 | 3 J | 189.8 | 17 | 27 |

| | | | | |
|---|---|---|---|---|
| ND<1.5 U | 2.4 J | -0.9 | 17 | 28 |
| 2.3 J | 2.4 J | -0.1 | 17 | 29 |
| 14.5 | 2.4 J | 12.1 | 18 | 29 |
| 3 | 2.4 J | 0.6 | 19 | 29 |
| 79.9 | 2.4 J | 77.5 | 20 | 29 |
| 18 | 2.4 J | 15.6 | 21 | 29 |
| 98.3 | 2.4 J | 95.9 | 22 | 29 |
| 92.2 | 2.4 J | 89.8 | 23 | 29 |
| 803 | 2.4 J | 800.6 | 24 | 29 |
| 785 | 2.4 J | 782.6 | 25 | 29 |
| 873 2c | 2.4 J | 870.6 | 26 | 29 |
| 277 | 2.4 J | 274.6 | 27 | 29 |
| 136 | 2.4 J | 133.6 | 28 | 29 |
| 398 | 2.4 J | 395.6 | 29 | 29 |
| 0.69 J | 2.4 J | -1.71 | 29 | 30 |
| 208 | 2.4 J | 205.6 | 30 | 30 |
| 0.58 J | 2.4 J | -1.82 | 30 | 31 |
| ND<0.5 U | 2.4 J | -1.9 | 30 | 32 |
| ND<1 U | 2.4 J | -1.4 | 30 | 33 |
| 17.42 | 2.4 J | 15.02 | 31 | 33 |
| 192.8 | 2.4 J | 190.4 | 32 | 33 |
| | | | | |
| 2.3 J | ND<1.5 U | 0.8 | 33 | 33 |
| 14.5 | ND<1.5 U | 13 | 34 | 33 |
| 3 | ND<1.5 U | 1.5 | 35 | 33 |
| 79.9 | ND<1.5 U | 78.4 | 36 | 33 |
| 18 | ND<1.5 U | 16.5 | 37 | 33 |
| 98.3 | ND<1.5 U | 96.8 | 38 | 33 |
| 92.2 | ND<1.5 U | 90.7 | 39 | 33 |
| 803 | ND<1.5 U | 801.5 | 40 | 33 |
| 785 | ND<1.5 U | 783.5 | 41 | 33 |
| 873 2c | ND<1.5 U | 871.5 | 42 | 33 |
| 277 | ND<1.5 U | 275.5 | 43 | 33 |
| 136 | ND<1.5 U | 134.5 | 44 | 33 |
| 398 | ND<1.5 U | 396.5 | 45 | 33 |
| 0.69 J | ND<1.5 U | -0.81 | 45 | 34 |
| 208 | ND<1.5 U | 206.5 | 46 | 34 |
| 0.58 J | ND<1.5 U | -0.92 | 46 | 35 |
| ND<0.5 U | ND<1.5 U | -1 | 46 | 36 |
| ND<1 U | ND<1.5 U | -0.5 | 46 | 37 |
| 17.42 | ND<1.5 U | 15.92 | 47 | 37 |
| 192.8 | ND<1.5 U | 191.3 | 48 | 37 |
| | | | | |
| 14.5 | 2.3 J | 12.2 | 49 | 37 |
| 3 | 2.3 J | 0.7 | 50 | 37 |
| 79.9 | 2.3 J | 77.6 | 51 | 37 |
| 18 | 2.3 J | 15.7 | 52 | 37 |
| 98.3 | 2.3 J | 96 | 53 | 37 |
| 92.2 | 2.3 J | 89.9 | 54 | 37 |
| 803 | 2.3 J | 800.7 | 55 | 37 |
| 785 | 2.3 J | 782.7 | 56 | 37 |
| 873 2c | 2.3 J | 870.7 | 57 | 37 |
| 277 | 2.3 J | 274.7 | 58 | 37 |
| 136 | 2.3 J | 133.7 | 59 | 37 |
| 398 | 2.3 J | 395.7 | 60 | 37 |
| 0.69 J | 2.3 J | -1.61 | 60 | 38 |
| 208 | 2.3 J | 205.7 | 61 | 38 |

| | | | | |
|---|---|---|---|---|
| 0.58 J | 2.3 J | -1.72 | 61 | 39 |
| ND<0.5 U | 2.3 J | -1.8 | 61 | 40 |
| ND<1 U | 2.3 J | -1.3 | 61 | 41 |
| 17.42 | 2.3 J | 15.12 | 62 | 41 |
| 192.8 | 2.3 J | 190.5 | 63 | 41 |
| | | | | |
| 3 | 14.5 | -11.5 | 63 | 42 |
| 79.9 | 14.5 | 65.4 | 64 | 42 |
| 18 | 14.5 | 3.5 | 65 | 42 |
| 98.3 | 14.5 | 83.8 | 66 | 42 |
| 92.2 | 14.5 | 77.7 | 67 | 42 |
| 803 | 14.5 | 788.5 | 68 | 42 |
| 785 | 14.5 | 770.5 | 69 | 42 |
| 873 2c | 14.5 | 858.5 | 70 | 42 |
| 277 | 14.5 | 262.5 | 71 | 42 |
| 136 | 14.5 | 121.5 | 72 | 42 |
| 398 | 14.5 | 383.5 | 73 | 42 |
| 0.69 J | 14.5 | -13.81 | 73 | 43 |
| 208 | 14.5 | 193.5 | 74 | 43 |
| 0.58 J | 14.5 | -13.92 | 74 | 44 |
| ND<0.5 U | 14.5 | -14 | 74 | 45 |
| ND<1 U | 14.5 | -13.5 | 74 | 46 |
| 17.42 | 14.5 | 2.92 | 75 | 46 |
| 192.8 | 14.5 | 178.3 | 76 | 46 |
| | | | | |
| 79.9 | 3 | 76.9 | 77 | 46 |
| 18 | 3 | 15 | 78 | 46 |
| 98.3 | 3 | 95.3 | 79 | 46 |
| 92.2 | 3 | 89.2 | 80 | 46 |
| 803 | 3 | 800 | 81 | 46 |
| 785 | 3 | 782 | 82 | 46 |
| 873 2c | 3 | 870 | 83 | 46 |
| 277 | 3 | 274 | 84 | 46 |
| 136 | 3 | 133 | 85 | 46 |
| 398 | 3 | 395 | 86 | 46 |
| 0.69 J | 3 | -2.31 | 86 | 47 |
| 208 | 3 | 205 | 87 | 47 |
| 0.58 J | 3 | -2.42 | 87 | 48 |
| ND<0.5 U | 3 | -2.5 | 87 | 49 |
| ND<1 U | 3 | -2 | 87 | 50 |
| 17.42 | 3 | 14.42 | 88 | 50 |
| 192.8 | 3 | 189.8 | 89 | 50 |
| | | | | |
| 18 | 79.9 | -61.9 | 89 | 51 |
| 98.3 | 79.9 | 18.4 | 90 | 51 |
| 92.2 | 79.9 | 12.3 | 91 | 51 |
| 803 | 79.9 | 723.1 | 92 | 51 |
| 785 | 79.9 | 705.1 | 93 | 51 |
| 873 2c | 79.9 | 793.1 | 94 | 51 |
| 277 | 79.9 | 197.1 | 95 | 51 |
| 136 | 79.9 | 56.1 | 96 | 51 |
| 398 | 79.9 | 318.1 | 97 | 51 |
| 0.69 J | 79.9 | -79.21 | 97 | 52 |
| 208 | 79.9 | 128.1 | 98 | 52 |
| 0.58 J | 79.9 | -79.32 | 98 | 53 |
| ND<0.5 U | 79.9 | -79.4 | 98 | 54 |
| ND<1 U | 79.9 | -78.9 | 98 | 55 |

| | | | | |
|---|---|---|---|---|
| 17.42 | 79.9 | -62.48 | 98 | 56 |
| 192.8 | 79.9 | 112.9 | 99 | 56 |
| | | | | |
| 98.3 | 18 | 80.3 | 100 | 56 |
| 92.2 | 18 | 74.2 | 101 | 56 |
| 803 | 18 | 785 | 102 | 56 |
| 785 | 18 | 767 | 103 | 56 |
| 873 2c | 18 | 855 | 104 | 56 |
| 277 | 18 | 259 | 105 | 56 |
| 136 | 18 | 118 | 106 | 56 |
| 398 | 18 | 380 | 107 | 56 |
| 0.69 J | 18 | -17.31 | 107 | 57 |
| 208 | 18 | 190 | 108 | 57 |
| 0.58 J | 18 | -17.42 | 108 | 58 |
| ND<0.5 U | 18 | -17.5 | 108 | 59 |
| ND<1 U | 18 | -17 | 108 | 60 |
| 17.42 | 18 | -0.58 | 108 | 61 |
| 192.8 | 18 | 174.8 | 109 | 61 |
| | | | | |
| 92.2 | 98.3 | Same Date | 109 | 61 |
| 803 | 98.3 | 704.7 | 110 | 61 |
| 785 | 98.3 | 686.7 | 111 | 61 |
| 873 2c | 98.3 | 774.7 | 112 | 61 |
| 277 | 98.3 | 178.7 | 113 | 61 |
| 136 | 98.3 | 37.7 | 114 | 61 |
| 398 | 98.3 | 299.7 | 115 | 61 |
| 0.69 J | 98.3 | -97.61 | 115 | 62 |
| 208 | 98.3 | 109.7 | 116 | 62 |
| 0.58 J | 98.3 | -97.72 | 116 | 63 |
| ND<0.5 U | 98.3 | -97.8 | 116 | 64 |
| ND<1 U | 98.3 | -97.3 | 116 | 65 |
| 17.42 | 98.3 | -80.88 | 116 | 66 |
| 192.8 | 98.3 | 94.5 | 117 | 66 |
| | | | | |
| 803 | 92.2 | 710.8 | 118 | 66 |
| 785 | 92.2 | 692.8 | 119 | 66 |
| 873 2c | 92.2 | 780.8 | 120 | 66 |
| 277 | 92.2 | 184.8 | 121 | 66 |
| 136 | 92.2 | 43.8 | 122 | 66 |
| 398 | 92.2 | 305.8 | 123 | 66 |
| 0.69 J | 92.2 | -91.51 | 123 | 67 |
| 208 | 92.2 | 115.8 | 124 | 67 |
| 0.58 J | 92.2 | -91.62 | 124 | 68 |
| ND<0.5 U | 92.2 | -91.7 | 124 | 69 |
| ND<1 U | 92.2 | -91.2 | 124 | 70 |
| 17.42 | 92.2 | -74.78 | 124 | 71 |
| 192.8 | 92.2 | 100.6 | 125 | 71 |
| | | | | |
| 785 | 803 | Same Date | 125 | 71 |
| 873 2c | 803 | 70 | 126 | 71 |
| 277 | 803 | -526 | 126 | 72 |
| 136 | 803 | -667 | 126 | 73 |
| 398 | 803 | -405 | 126 | 74 |
| 0.69 J | 803 | -802.31 | 126 | 75 |
| 208 | 803 | -595 | 126 | 76 |
| 0.58 J | 803 | -802.42 | 126 | 77 |
| ND<0.5 U | 803 | -802.5 | 126 | 78 |

| | | | | |
|---|---|---|---|---|
| ND<1 U | 803 | -802 | 126 | 79 |
| 17.42 | 803 | -785.58 | 126 | 80 |
| 192.8 | 803 | -610.2 | 126 | 81 |
| | | | | |
| 873 2c | 785 | 88 | 127 | 81 |
| 277 | 785 | -508 | 127 | 82 |
| 136 | 785 | -649 | 127 | 83 |
| 398 | 785 | -387 | 127 | 84 |
| 0.69 J | 785 | -784.31 | 127 | 85 |
| 208 | 785 | -577 | 127 | 86 |
| 0.58 J | 785 | -784.42 | 127 | 87 |
| ND<0.5 U | 785 | -784.5 | 127 | 88 |
| ND<1 U | 785 | -784 | 127 | 89 |
| 17.42 | 785 | -767.58 | 127 | 90 |
| 192.8 | 785 | -592.2 | 127 | 91 |
| | | | | |
| 277 | 873 2c | -596 | 127 | 92 |
| 136 | 873 2c | -737 | 127 | 93 |
| 398 | 873 2c | -475 | 127 | 94 |
| 0.69 J | 873 2c | -872.31 | 127 | 95 |
| 208 | 873 2c | -665 | 127 | 96 |
| 0.58 J | 873 2c | -872.42 | 127 | 97 |
| ND<0.5 U | 873 2c | -872.5 | 127 | 98 |
| ND<1 U | 873 2c | -872 | 127 | 99 |
| 17.42 | 873 2c | -855.58 | 127 | 100 |
| 192.8 | 873 2c | -680.2 | 127 | 101 |
| | | | | |
| 136 | 277 | -141 | 127 | 102 |
| 398 | 277 | 121 | 128 | 102 |
| 0.69 J | 277 | -276.31 | 128 | 103 |
| 208 | 277 | -69 | 128 | 104 |
| 0.58 J | 277 | -276.42 | 128 | 105 |
| ND<0.5 U | 277 | -276.5 | 128 | 106 |
| ND<1 U | 277 | -276 | 128 | 107 |
| 17.42 | 277 | -259.58 | 128 | 108 |
| 192.8 | 277 | -84.2 | 128 | 109 |
| | | | | |
| 398 | 136 | 262 | 129 | 109 |
| 0.69 J | 136 | -135.31 | 129 | 110 |
| 208 | 136 | 72 | 130 | 110 |
| 0.58 J | 136 | -135.42 | 130 | 111 |
| ND<0.5 U | 136 | -135.5 | 130 | 112 |
| ND<1 U | 136 | -135 | 130 | 113 |
| 17.42 | 136 | -118.58 | 130 | 114 |
| 192.8 | 136 | 56.8 | 131 | 114 |
| | | | | |
| 0.69 J | 398 | -397.31 | 131 | 115 |
| 208 | 398 | -190 | 131 | 116 |
| 0.58 J | 398 | -397.42 | 131 | 117 |
| ND<0.5 U | 398 | -397.5 | 131 | 118 |
| ND<1 U | 398 | -397 | 131 | 119 |
| 17.42 | 398 | -380.58 | 131 | 120 |
| 192.8 | 398 | -205.2 | 131 | 121 |
| | | | | |
| 208 | 0.69 J | 207.31 | 132 | 121 |
| 0.58 J | 0.69 J | -0.11 | 132 | 122 |
| ND<0.5 U | 0.69 J | -0.19 | 132 | 123 |

| | | | | |
|---|---|---|---|---|
| ND<1 U | 0.69 J | 0.31 | 133 | 123 |
| 17.42 | 0.69 J | 16.73 | 134 | 123 |
| 192.8 | 0.69 J | 192.11 | 135 | 123 |
| | | | | |
| 0.58 J | 208 | -207.42 | 135 | 124 |
| ND<0.5 U | 208 | -207.5 | 135 | 125 |
| ND<1 U | 208 | -207 | 135 | 126 |
| 17.42 | 208 | -190.58 | 135 | 127 |
| 192.8 | 208 | -15.2 | 135 | 128 |
| | | | | |
| ND<0.5 U | 0.58 J | -0.08 | 135 | 129 |
| ND<1 U | 0.58 J | 0.42 | 136 | 129 |
| 17.42 | 0.58 J | 16.84 | 137 | 129 |
| 192.8 | 0.58 J | 192.22 | 138 | 129 |
| | | | | |
| ND<1 U | ND<0.5 U | 0.5 | 139 | 129 |
| 17.42 | ND<0.5 U | 16.92 | 140 | 129 |
| 192.8 | ND<0.5 U | 192.3 | 141 | 129 |
| | | | | |
| 17.42 | ND<1 U | 16.42 | 142 | 129 |
| 192.8 | ND<1 U | 191.8 | 143 | 129 |
| | | | | |
| 192.8 | 17.42 | 175.38 | 144 | 129 |

S Statistic = 144 - 129 = 15

| Tied Group | Value | Members |
|---|---|---|
| 1 | 3 | 2 |

| Time Period | Observations |
|---|---|
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |

There are 2 time periods with multiple data

A = 18
B = 36

C = 0
D = 0
E = 2
F = 4
a = 29256
b = 109296
c = 1104
Group Variance = 1622.34
Z-Score = 0.347582
Comparison Level at 95% confidence level = -1.65463 (downward trend)
0.347582 >= -1.65463 indicating no evidence of a downward trend

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RW03R-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 147.8 | 9.595 | 138.205 | 1 | 0 |
| 233.8 | 9.595 | 224.205 | 2 | 0 |
| ND<0.1 U | 9.595 | -9.495 | 2 | 1 |
| ND<5 U | 9.595 | -4.595 | 2 | 2 |
| | | | | |
| 233.8 | 147.8 | 86 | 3 | 2 |
| ND<0.1 U | 147.8 | -147.7 | 3 | 3 |
| ND<5 U | 147.8 | -142.8 | 3 | 4 |
| | | | | |
| ND<0.1 U | 233.8 | -233.7 | 3 | 5 |
| ND<5 U | 233.8 | -228.8 | 3 | 6 |
| | | | | |
| ND<5 U | ND<0.1 U | 4.9 | 4 | 6 |

S Statistic = 4 - 6 = -2

Comparing at 95% confidence level (downward trend)

Probability of obtaining S >= 2 is 0.408

S > 0 or 0.408 > 0.05 indicating no evidence of a downward trend

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RW05-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 17.5 | 1.9 J | 15.6 | 1 | 0 |
| 19.3 | 1.9 J | 17.4 | 2 | 0 |
| 3.7 | 1.9 J | 1.8 | 3 | 0 |
| 4.2 | 1.9 J | 2.3 | 4 | 0 |
| 4.9 | 1.9 J | 3 | 5 | 0 |
| 2.7 J | 1.9 J | 0.8 | 6 | 0 |
| 2.2 J | 1.9 J | 0.3 | 7 | 0 |
| 2.6 J | 1.9 J | 0.7 | 8 | 0 |
| 1.3 J | 1.9 J | -0.6 | 8 | 1 |
| ND<1.5 U | 1.9 J | -0.4 | 8 | 2 |
| 1.7 J1c | 1.9 J | -0.2 | 8 | 3 |
| ND<1.5 U2c | 1.9 J | -0.4 | 8 | 4 |
| 1930 | 1.9 J | 1928.1 | 9 | 4 |
| | | | | |
| 19.3 | 17.5 | 1.8 | 10 | 4 |
| 3.7 | 17.5 | -13.8 | 10 | 5 |
| 4.2 | 17.5 | -13.3 | 10 | 6 |
| 4.9 | 17.5 | -12.6 | 10 | 7 |
| 2.7 J | 17.5 | -14.8 | 10 | 8 |
| 2.2 J | 17.5 | -15.3 | 10 | 9 |
| 2.6 J | 17.5 | -14.9 | 10 | 10 |
| 1.3 J | 17.5 | -16.2 | 10 | 11 |
| ND<1.5 U | 17.5 | -16 | 10 | 12 |
| 1.7 J1c | 17.5 | -15.8 | 10 | 13 |
| ND<1.5 U2c | 17.5 | -16 | 10 | 14 |
| 1930 | 17.5 | 1912.5 | 11 | 14 |
| | | | | |
| 3.7 | 19.3 | -15.6 | 11 | 15 |
| 4.2 | 19.3 | -15.1 | 11 | 16 |
| 4.9 | 19.3 | -14.4 | 11 | 17 |
| 2.7 J | 19.3 | -16.6 | 11 | 18 |
| 2.2 J | 19.3 | -17.1 | 11 | 19 |
| 2.6 J | 19.3 | -16.7 | 11 | 20 |
| 1.3 J | 19.3 | -18 | 11 | 21 |
| ND<1.5 U | 19.3 | -17.8 | 11 | 22 |
| 1.7 J1c | 19.3 | -17.6 | 11 | 23 |
| ND<1.5 U2c | 19.3 | -17.8 | 11 | 24 |
| 1930 | 19.3 | 1910.7 | 12 | 24 |
| | | | | |
| 4.2 | 3.7 | 0.5 | 13 | 24 |
| 4.9 | 3.7 | 1.2 | 14 | 24 |
| 2.7 J | 3.7 | -1 | 14 | 25 |
| 2.2 J | 3.7 | -1.5 | 14 | 26 |
| 2.6 J | 3.7 | -1.1 | 14 | 27 |
| 1.3 J | 3.7 | -2.4 | 14 | 28 |
| ND<1.5 U | 3.7 | -2.2 | 14 | 29 |
| 1.7 J1c | 3.7 | -2 | 14 | 30 |

| | | | | |
|---|---|---|---|---|
| ND<1.5 U2c | 3.7 | -2.2 | 14 | 31 |
| 1930 | 3.7 | 1926.3 | 15 | 31 |
| | | | | |
| 4.9 | 4.2 | 0.7 | 16 | 31 |
| 2.7 J | 4.2 | -1.5 | 16 | 32 |
| 2.2 J | 4.2 | -2 | 16 | 33 |
| 2.6 J | 4.2 | -1.6 | 16 | 34 |
| 1.3 J | 4.2 | -2.9 | 16 | 35 |
| ND<1.5 U | 4.2 | -2.7 | 16 | 36 |
| 1.7 J1c | 4.2 | -2.5 | 16 | 37 |
| ND<1.5 U2c | 4.2 | -2.7 | 16 | 38 |
| 1930 | 4.2 | 1925.8 | 17 | 38 |
| | | | | |
| 2.7 J | 4.9 | -2.2 | 17 | 39 |
| 2.2 J | 4.9 | -2.7 | 17 | 40 |
| 2.6 J | 4.9 | -2.3 | 17 | 41 |
| 1.3 J | 4.9 | -3.6 | 17 | 42 |
| ND<1.5 U | 4.9 | -3.4 | 17 | 43 |
| 1.7 J1c | 4.9 | -3.2 | 17 | 44 |
| ND<1.5 U2c | 4.9 | -3.4 | 17 | 45 |
| 1930 | 4.9 | 1925.1 | 18 | 45 |
| | | | | |
| 2.2 J | 2.7 J | -0.5 | 18 | 46 |
| 2.6 J | 2.7 J | -0.1 | 18 | 47 |
| 1.3 J | 2.7 J | -1.4 | 18 | 48 |
| ND<1.5 U | 2.7 J | -1.2 | 18 | 49 |
| 1.7 J1c | 2.7 J | -1 | 18 | 50 |
| ND<1.5 U2c | 2.7 J | -1.2 | 18 | 51 |
| 1930 | 2.7 J | 1927.3 | 19 | 51 |
| | | | | |
| 2.6 J | 2.2 J | 0.4 | 20 | 51 |
| 1.3 J | 2.2 J | -0.9 | 20 | 52 |
| ND<1.5 U | 2.2 J | -0.7 | 20 | 53 |
| 1.7 J1c | 2.2 J | -0.5 | 20 | 54 |
| ND<1.5 U2c | 2.2 J | -0.7 | 20 | 55 |
| 1930 | 2.2 J | 1927.8 | 21 | 55 |
| | | | | |
| 1.3 J | 2.6 J | -1.3 | 21 | 56 |
| ND<1.5 U | 2.6 J | -1.1 | 21 | 57 |
| 1.7 J1c | 2.6 J | -0.9 | 21 | 58 |
| ND<1.5 U2c | 2.6 J | -1.1 | 21 | 59 |
| 1930 | 2.6 J | 1927.4 | 22 | 59 |
| | | | | |
| ND<1.5 U | 1.3 J | 0.2 | 23 | 59 |
| 1.7 J1c | 1.3 J | 0.4 | 24 | 59 |
| ND<1.5 U2c | 1.3 J | 0.2 | 25 | 59 |
| 1930 | 1.3 J | 1928.7 | 26 | 59 |
| | | | | |
| 1.7 J1c | ND<1.5 U | 0.2 | 27 | 59 |
| ND<1.5 U2c | ND<1.5 U | 0 | 27 | 59 |
| 1930 | ND<1.5 U | 1928.5 | 28 | 59 |
| | | | | |
| ND<1.5 U2c | 1.7 J1c | Same Date | 28 | 59 |
| 1930 | 1.7 J1c | 1928.3 | 29 | 59 |
| | | | | |
| 1930 | ND<1.5 U2c | 1928.5 | 30 | 59 |

S Statistic = 30 - 59 = -29

| Tied Group | Value | Members |
|---|---|---|
| 1 | 1.5 | 2 |

| Time Period | Observations |
|---|---|
| 6/1/2017 | 1 |
| 7/1/2017 | 1 |
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 6/1/2020 | 1 |

There are 1 time periods with multiple data

A = 18
B = 18
C = 0
D = 0
E = 2
F = 2
a = 6006
b = 19656
c = 364
Group Variance = 331.678
Z-Score = -1.53745
Comparison Level at 95% confidence level = -1.65463 (downward trend)
-1.53745 >= -1.65463 indicating no evidence of a downward trend

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RW05R-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 2570 2c | 2590 1c3c | Same Date | 0 | 0 |
| 2820 2c | 2590 1c3c | 230 | 1 | 0 |
| 2700 | 2590 1c3c | 110 | 2 | 0 |
| 1960 | 2590 1c3c | -630 | 2 | 1 |
| 1650 | 2590 1c3c | -940 | 2 | 2 |
| 1790 | 2590 1c3c | -800 | 2 | 3 |
| 1570 | 2590 1c3c | -1020 | 2 | 4 |
| 1470 | 2590 1c3c | -1120 | 2 | 5 |
| 1660 | 2590 1c3c | -930 | 2 | 6 |
| 1243 | 2590 1c3c | -1347 | 2 | 7 |
| 1178 | 2590 1c3c | -1412 | 2 | 8 |
| 1451 | 2590 1c3c | -1139 | 2 | 9 |
| 1622 | 2590 1c3c | -968 | 2 | 10 |
| 1996 | 2590 1c3c | -594 | 2 | 11 |
| | | | | |
| 2820 2c | 2570 2c | 250 | 3 | 11 |
| 2700 | 2570 2c | 130 | 4 | 11 |
| 1960 | 2570 2c | -610 | 4 | 12 |
| 1650 | 2570 2c | -920 | 4 | 13 |
| 1790 | 2570 2c | -780 | 4 | 14 |
| 1570 | 2570 2c | -1000 | 4 | 15 |
| 1470 | 2570 2c | -1100 | 4 | 16 |
| 1660 | 2570 2c | -910 | 4 | 17 |
| 1243 | 2570 2c | -1327 | 4 | 18 |
| 1178 | 2570 2c | -1392 | 4 | 19 |
| 1451 | 2570 2c | -1119 | 4 | 20 |
| 1622 | 2570 2c | -948 | 4 | 21 |
| 1996 | 2570 2c | -574 | 4 | 22 |
| | | | | |
| 2700 | 2820 2c | -120 | 4 | 23 |
| 1960 | 2820 2c | -860 | 4 | 24 |
| 1650 | 2820 2c | -1170 | 4 | 25 |
| 1790 | 2820 2c | -1030 | 4 | 26 |
| 1570 | 2820 2c | -1250 | 4 | 27 |
| 1470 | 2820 2c | -1350 | 4 | 28 |
| 1660 | 2820 2c | -1160 | 4 | 29 |
| 1243 | 2820 2c | -1577 | 4 | 30 |
| 1178 | 2820 2c | -1642 | 4 | 31 |
| 1451 | 2820 2c | -1369 | 4 | 32 |
| 1622 | 2820 2c | -1198 | 4 | 33 |
| 1996 | 2820 2c | -824 | 4 | 34 |
| | | | | |
| 1960 | 2700 | -740 | 4 | 35 |
| 1650 | 2700 | -1050 | 4 | 36 |
| 1790 | 2700 | -910 | 4 | 37 |
| 1570 | 2700 | -1130 | 4 | 38 |
| 1470 | 2700 | -1230 | 4 | 39 |

| | | | | |
|---|---|---|---|---|
| 1660 | 2700 | -1040 | 4 | 40 |
| 1243 | 2700 | -1457 | 4 | 41 |
| 1178 | 2700 | -1522 | 4 | 42 |
| 1451 | 2700 | -1249 | 4 | 43 |
| 1622 | 2700 | -1078 | 4 | 44 |
| 1996 | 2700 | -704 | 4 | 45 |
| | | | | |
| 1650 | 1960 | -310 | 4 | 46 |
| 1790 | 1960 | -170 | 4 | 47 |
| 1570 | 1960 | -390 | 4 | 48 |
| 1470 | 1960 | -490 | 4 | 49 |
| 1660 | 1960 | -300 | 4 | 50 |
| 1243 | 1960 | -717 | 4 | 51 |
| 1178 | 1960 | -782 | 4 | 52 |
| 1451 | 1960 | -509 | 4 | 53 |
| 1622 | 1960 | -338 | 4 | 54 |
| 1996 | 1960 | 36 | 5 | 54 |
| | | | | |
| 1790 | 1650 | 140 | 6 | 54 |
| 1570 | 1650 | -80 | 6 | 55 |
| 1470 | 1650 | -180 | 6 | 56 |
| 1660 | 1650 | 10 | 7 | 56 |
| 1243 | 1650 | -407 | 7 | 57 |
| 1178 | 1650 | -472 | 7 | 58 |
| 1451 | 1650 | -199 | 7 | 59 |
| 1622 | 1650 | -28 | 7 | 60 |
| 1996 | 1650 | 346 | 8 | 60 |
| | | | | |
| 1570 | 1790 | -220 | 8 | 61 |
| 1470 | 1790 | -320 | 8 | 62 |
| 1660 | 1790 | -130 | 8 | 63 |
| 1243 | 1790 | -547 | 8 | 64 |
| 1178 | 1790 | -612 | 8 | 65 |
| 1451 | 1790 | -339 | 8 | 66 |
| 1622 | 1790 | -168 | 8 | 67 |
| 1996 | 1790 | 206 | 9 | 67 |
| | | | | |
| 1470 | 1570 | -100 | 9 | 68 |
| 1660 | 1570 | 90 | 10 | 68 |
| 1243 | 1570 | -327 | 10 | 69 |
| 1178 | 1570 | -392 | 10 | 70 |
| 1451 | 1570 | -119 | 10 | 71 |
| 1622 | 1570 | 52 | 11 | 71 |
| 1996 | 1570 | 426 | 12 | 71 |
| | | | | |
| 1660 | 1470 | 190 | 13 | 71 |
| 1243 | 1470 | -227 | 13 | 72 |
| 1178 | 1470 | -292 | 13 | 73 |
| 1451 | 1470 | -19 | 13 | 74 |
| 1622 | 1470 | 152 | 14 | 74 |
| 1996 | 1470 | 526 | 15 | 74 |
| | | | | |
| 1243 | 1660 | -417 | 15 | 75 |
| 1178 | 1660 | -482 | 15 | 76 |
| 1451 | 1660 | -209 | 15 | 77 |
| 1622 | 1660 | -38 | 15 | 78 |
| 1996 | 1660 | 336 | 16 | 78 |

| | | | | |
|---|---|---|---|---|
| 1178 | 1243 | -65 | 16 | 79 |
| 1451 | 1243 | 208 | 17 | 79 |
| 1622 | 1243 | 379 | 18 | 79 |
| 1996 | 1243 | 753 | 19 | 79 |
| | | | | |
| 1451 | 1178 | 273 | 20 | 79 |
| 1622 | 1178 | 444 | 21 | 79 |
| 1996 | 1178 | 818 | 22 | 79 |
| | | | | |
| 1622 | 1451 | 171 | 23 | 79 |
| 1996 | 1451 | 545 | 24 | 79 |
| | | | | |
| 1996 | 1622 | 374 | 25 | 79 |

S Statistic = 25 - 79 = -54

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 0
B = 18
C = 0
D = 0
E = 0
F = 2
a = 7350
b = 24570
c = 420
Group Variance = 407.333
Z-Score = -2.62604
Comparison Level at 95% confidence level = -1.65463 (downward trend)
**-2.62604 < -1.65463 indicating a downward trend**

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RW06-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 9.2 | 12.5 | -3.3 | 0 | 1 |
| 14 | 12.5 | 1.5 | 1 | 1 |
| 20.4 | 12.5 | 7.9 | 2 | 1 |
| 14.3 | 12.5 | 1.8 | 3 | 1 |
| 10.2 | 12.5 | -2.3 | 3 | 2 |
| 10.1 | 12.5 | -2.4 | 3 | 3 |
| 4.5 | 12.5 | -8 | 3 | 4 |
| 4.2 | 12.5 | -8.3 | 3 | 5 |
| 5.4 | 12.5 | -7.1 | 3 | 6 |
| 7.1 | 12.5 | -5.4 | 3 | 7 |
| 8.4 | 12.5 | -4.1 | 3 | 8 |
| 89.2 | 12.5 | 76.7 | 4 | 8 |
| ND<1.5 U | 12.5 | -11 | 4 | 9 |
| 629 | 12.5 | 616.5 | 5 | 9 |
| 934 1c | 12.5 | 921.5 | 6 | 9 |
| 876 2c | 12.5 | 863.5 | 7 | 9 |
| 885 | 12.5 | 872.5 | 8 | 9 |
| 903 | 12.5 | 890.5 | 9 | 9 |
| 793 | 12.5 | 780.5 | 10 | 9 |
| 673 | 12.5 | 660.5 | 11 | 9 |
| 690 | 12.5 | 677.5 | 12 | 9 |
| 582 | 12.5 | 569.5 | 13 | 9 |
| 530 | 12.5 | 517.5 | 14 | 9 |
| 0.66 J | 12.5 | -11.84 | 14 | 10 |
| 616 | 12.5 | 603.5 | 15 | 10 |
| 604 | 12.5 | 591.5 | 16 | 10 |
| 626 | 12.5 | 613.5 | 17 | 10 |
| 610.6 | 12.5 | 598.1 | 18 | 10 |
| 570.7 | 12.5 | 558.2 | 19 | 10 |
| | | | | |
| 14 | 9.2 | 4.8 | 20 | 10 |
| 20.4 | 9.2 | 11.2 | 21 | 10 |
| 14.3 | 9.2 | 5.1 | 22 | 10 |
| 10.2 | 9.2 | 1 | 23 | 10 |
| 10.1 | 9.2 | 0.9 | 24 | 10 |
| 4.5 | 9.2 | -4.7 | 24 | 11 |
| 4.2 | 9.2 | -5 | 24 | 12 |
| 5.4 | 9.2 | -3.8 | 24 | 13 |
| 7.1 | 9.2 | -2.1 | 24 | 14 |
| 8.4 | 9.2 | -0.8 | 24 | 15 |
| 89.2 | 9.2 | 80 | 25 | 15 |
| ND<1.5 U | 9.2 | -7.7 | 25 | 16 |
| 629 | 9.2 | 619.8 | 26 | 16 |
| 934 1c | 9.2 | 924.8 | 27 | 16 |
| 876 2c | 9.2 | 866.8 | 28 | 16 |
| 885 | 9.2 | 875.8 | 29 | 16 |
| 903 | 9.2 | 893.8 | 30 | 16 |

| | | | | |
|---|---|---|---|---|
| 793 | 9.2 | 783.8 | 31 | 16 |
| 673 | 9.2 | 663.8 | 32 | 16 |
| 690 | 9.2 | 680.8 | 33 | 16 |
| 582 | 9.2 | 572.8 | 34 | 16 |
| 530 | 9.2 | 520.8 | 35 | 16 |
| 0.66 J | 9.2 | -8.54 | 35 | 17 |
| 616 | 9.2 | 606.8 | 36 | 17 |
| 604 | 9.2 | 594.8 | 37 | 17 |
| 626 | 9.2 | 616.8 | 38 | 17 |
| 610.6 | 9.2 | 601.4 | 39 | 17 |
| 570.7 | 9.2 | 561.5 | 40 | 17 |
| | | | | |
| 20.4 | 14 | 6.4 | 41 | 17 |
| 14.3 | 14 | 0.3 | 42 | 17 |
| 10.2 | 14 | -3.8 | 42 | 18 |
| 10.1 | 14 | -3.9 | 42 | 19 |
| 4.5 | 14 | -9.5 | 42 | 20 |
| 4.2 | 14 | -9.8 | 42 | 21 |
| 5.4 | 14 | -8.6 | 42 | 22 |
| 7.1 | 14 | -6.9 | 42 | 23 |
| 8.4 | 14 | -5.6 | 42 | 24 |
| 89.2 | 14 | 75.2 | 43 | 24 |
| ND<1.5 U | 14 | -12.5 | 43 | 25 |
| 629 | 14 | 615 | 44 | 25 |
| 934 1c | 14 | 920 | 45 | 25 |
| 876 2c | 14 | 862 | 46 | 25 |
| 885 | 14 | 871 | 47 | 25 |
| 903 | 14 | 889 | 48 | 25 |
| 793 | 14 | 779 | 49 | 25 |
| 673 | 14 | 659 | 50 | 25 |
| 690 | 14 | 676 | 51 | 25 |
| 582 | 14 | 568 | 52 | 25 |
| 530 | 14 | 516 | 53 | 25 |
| 0.66 J | 14 | -13.34 | 53 | 26 |
| 616 | 14 | 602 | 54 | 26 |
| 604 | 14 | 590 | 55 | 26 |
| 626 | 14 | 612 | 56 | 26 |
| 610.6 | 14 | 596.6 | 57 | 26 |
| 570.7 | 14 | 556.7 | 58 | 26 |
| | | | | |
| 14.3 | 20.4 | -6.1 | 58 | 27 |
| 10.2 | 20.4 | -10.2 | 58 | 28 |
| 10.1 | 20.4 | -10.3 | 58 | 29 |
| 4.5 | 20.4 | -15.9 | 58 | 30 |
| 4.2 | 20.4 | -16.2 | 58 | 31 |
| 5.4 | 20.4 | -15 | 58 | 32 |
| 7.1 | 20.4 | -13.3 | 58 | 33 |
| 8.4 | 20.4 | -12 | 58 | 34 |
| 89.2 | 20.4 | 68.8 | 59 | 34 |
| ND<1.5 U | 20.4 | -18.9 | 59 | 35 |
| 629 | 20.4 | 608.6 | 60 | 35 |
| 934 1c | 20.4 | 913.6 | 61 | 35 |
| 876 2c | 20.4 | 855.6 | 62 | 35 |
| 885 | 20.4 | 864.6 | 63 | 35 |
| 903 | 20.4 | 882.6 | 64 | 35 |
| 793 | 20.4 | 772.6 | 65 | 35 |
| 673 | 20.4 | 652.6 | 66 | 35 |

| | | | | |
|---|---|---|---|---|
| 690 | 20.4 | 669.6 | 67 | 35 |
| 582 | 20.4 | 561.6 | 68 | 35 |
| 530 | 20.4 | 509.6 | 69 | 35 |
| 0.66 J | 20.4 | -19.74 | 69 | 36 |
| 616 | 20.4 | 595.6 | 70 | 36 |
| 604 | 20.4 | 583.6 | 71 | 36 |
| 626 | 20.4 | 605.6 | 72 | 36 |
| 610.6 | 20.4 | 590.2 | 73 | 36 |
| 570.7 | 20.4 | 550.3 | 74 | 36 |
| | | | | |
| 10.2 | 14.3 | -4.1 | 74 | 37 |
| 10.1 | 14.3 | -4.2 | 74 | 38 |
| 4.5 | 14.3 | -9.8 | 74 | 39 |
| 4.2 | 14.3 | -10.1 | 74 | 40 |
| 5.4 | 14.3 | -8.9 | 74 | 41 |
| 7.1 | 14.3 | -7.2 | 74 | 42 |
| 8.4 | 14.3 | -5.9 | 74 | 43 |
| 89.2 | 14.3 | 74.9 | 75 | 43 |
| ND<1.5 U | 14.3 | -12.8 | 75 | 44 |
| 629 | 14.3 | 614.7 | 76 | 44 |
| 934 1c | 14.3 | 919.7 | 77 | 44 |
| 876 2c | 14.3 | 861.7 | 78 | 44 |
| 885 | 14.3 | 870.7 | 79 | 44 |
| 903 | 14.3 | 888.7 | 80 | 44 |
| 793 | 14.3 | 778.7 | 81 | 44 |
| 673 | 14.3 | 658.7 | 82 | 44 |
| 690 | 14.3 | 675.7 | 83 | 44 |
| 582 | 14.3 | 567.7 | 84 | 44 |
| 530 | 14.3 | 515.7 | 85 | 44 |
| 0.66 J | 14.3 | -13.64 | 85 | 45 |
| 616 | 14.3 | 601.7 | 86 | 45 |
| 604 | 14.3 | 589.7 | 87 | 45 |
| 626 | 14.3 | 611.7 | 88 | 45 |
| 610.6 | 14.3 | 596.3 | 89 | 45 |
| 570.7 | 14.3 | 556.4 | 90 | 45 |
| | | | | |
| 10.1 | 10.2 | -0.1 | 90 | 46 |
| 4.5 | 10.2 | -5.7 | 90 | 47 |
| 4.2 | 10.2 | -6 | 90 | 48 |
| 5.4 | 10.2 | -4.8 | 90 | 49 |
| 7.1 | 10.2 | -3.1 | 90 | 50 |
| 8.4 | 10.2 | -1.8 | 90 | 51 |
| 89.2 | 10.2 | 79 | 91 | 51 |
| ND<1.5 U | 10.2 | -8.7 | 91 | 52 |
| 629 | 10.2 | 618.8 | 92 | 52 |
| 934 1c | 10.2 | 923.8 | 93 | 52 |
| 876 2c | 10.2 | 865.8 | 94 | 52 |
| 885 | 10.2 | 874.8 | 95 | 52 |
| 903 | 10.2 | 892.8 | 96 | 52 |
| 793 | 10.2 | 782.8 | 97 | 52 |
| 673 | 10.2 | 662.8 | 98 | 52 |
| 690 | 10.2 | 679.8 | 99 | 52 |
| 582 | 10.2 | 571.8 | 100 | 52 |
| 530 | 10.2 | 519.8 | 101 | 52 |
| 0.66 J | 10.2 | -9.54 | 101 | 53 |
| 616 | 10.2 | 605.8 | 102 | 53 |
| 604 | 10.2 | 593.8 | 103 | 53 |

| | | | | |
|---|---|---|---|---|
| 626 | 10.2 | 615.8 | 104 | 53 |
| 610.6 | 10.2 | 600.4 | 105 | 53 |
| 570.7 | 10.2 | 560.5 | 106 | 53 |
| | | | | |
| 4.5 | 10.1 | -5.6 | 106 | 54 |
| 4.2 | 10.1 | -5.9 | 106 | 55 |
| 5.4 | 10.1 | -4.7 | 106 | 56 |
| 7.1 | 10.1 | -3 | 106 | 57 |
| 8.4 | 10.1 | -1.7 | 106 | 58 |
| 89.2 | 10.1 | 79.1 | 107 | 58 |
| ND<1.5 U | 10.1 | -8.6 | 107 | 59 |
| 629 | 10.1 | 618.9 | 108 | 59 |
| 934 1c | 10.1 | 923.9 | 109 | 59 |
| 876 2c | 10.1 | 865.9 | 110 | 59 |
| 885 | 10.1 | 874.9 | 111 | 59 |
| 903 | 10.1 | 892.9 | 112 | 59 |
| 793 | 10.1 | 782.9 | 113 | 59 |
| 673 | 10.1 | 662.9 | 114 | 59 |
| 690 | 10.1 | 679.9 | 115 | 59 |
| 582 | 10.1 | 571.9 | 116 | 59 |
| 530 | 10.1 | 519.9 | 117 | 59 |
| 0.66 J | 10.1 | -9.44 | 117 | 60 |
| 616 | 10.1 | 605.9 | 118 | 60 |
| 604 | 10.1 | 593.9 | 119 | 60 |
| 626 | 10.1 | 615.9 | 120 | 60 |
| 610.6 | 10.1 | 600.5 | 121 | 60 |
| 570.7 | 10.1 | 560.6 | 122 | 60 |
| | | | | |
| 4.2 | 4.5 | -0.3 | 122 | 61 |
| 5.4 | 4.5 | 0.9 | 123 | 61 |
| 7.1 | 4.5 | 2.6 | 124 | 61 |
| 8.4 | 4.5 | 3.9 | 125 | 61 |
| 89.2 | 4.5 | 84.7 | 126 | 61 |
| ND<1.5 U | 4.5 | -3 | 126 | 62 |
| 629 | 4.5 | 624.5 | 127 | 62 |
| 934 1c | 4.5 | 929.5 | 128 | 62 |
| 876 2c | 4.5 | 871.5 | 129 | 62 |
| 885 | 4.5 | 880.5 | 130 | 62 |
| 903 | 4.5 | 898.5 | 131 | 62 |
| 793 | 4.5 | 788.5 | 132 | 62 |
| 673 | 4.5 | 668.5 | 133 | 62 |
| 690 | 4.5 | 685.5 | 134 | 62 |
| 582 | 4.5 | 577.5 | 135 | 62 |
| 530 | 4.5 | 525.5 | 136 | 62 |
| 0.66 J | 4.5 | -3.84 | 136 | 63 |
| 616 | 4.5 | 611.5 | 137 | 63 |
| 604 | 4.5 | 599.5 | 138 | 63 |
| 626 | 4.5 | 621.5 | 139 | 63 |
| 610.6 | 4.5 | 606.1 | 140 | 63 |
| 570.7 | 4.5 | 566.2 | 141 | 63 |
| | | | | |
| 5.4 | 4.2 | 1.2 | 142 | 63 |
| 7.1 | 4.2 | 2.9 | 143 | 63 |
| 8.4 | 4.2 | 4.2 | 144 | 63 |
| 89.2 | 4.2 | 85 | 145 | 63 |
| ND<1.5 U | 4.2 | -2.7 | 145 | 64 |
| 629 | 4.2 | 624.8 | 146 | 64 |

| | | | | |
|---|---|---|---|---|
| 934 1c | 4.2 | 929.8 | 147 | 64 |
| 876 2c | 4.2 | 871.8 | 148 | 64 |
| 885 | 4.2 | 880.8 | 149 | 64 |
| 903 | 4.2 | 898.8 | 150 | 64 |
| 793 | 4.2 | 788.8 | 151 | 64 |
| 673 | 4.2 | 668.8 | 152 | 64 |
| 690 | 4.2 | 685.8 | 153 | 64 |
| 582 | 4.2 | 577.8 | 154 | 64 |
| 530 | 4.2 | 525.8 | 155 | 64 |
| 0.66 J | 4.2 | -3.54 | 155 | 65 |
| 616 | 4.2 | 611.8 | 156 | 65 |
| 604 | 4.2 | 599.8 | 157 | 65 |
| 626 | 4.2 | 621.8 | 158 | 65 |
| 610.6 | 4.2 | 606.4 | 159 | 65 |
| 570.7 | 4.2 | 566.5 | 160 | 65 |
| | | | | |
| 7.1 | 5.4 | 1.7 | 161 | 65 |
| 8.4 | 5.4 | 3 | 162 | 65 |
| 89.2 | 5.4 | 83.8 | 163 | 65 |
| ND<1.5 U | 5.4 | -3.9 | 163 | 66 |
| 629 | 5.4 | 623.6 | 164 | 66 |
| 934 1c | 5.4 | 928.6 | 165 | 66 |
| 876 2c | 5.4 | 870.6 | 166 | 66 |
| 885 | 5.4 | 879.6 | 167 | 66 |
| 903 | 5.4 | 897.6 | 168 | 66 |
| 793 | 5.4 | 787.6 | 169 | 66 |
| 673 | 5.4 | 667.6 | 170 | 66 |
| 690 | 5.4 | 684.6 | 171 | 66 |
| 582 | 5.4 | 576.6 | 172 | 66 |
| 530 | 5.4 | 524.6 | 173 | 66 |
| 0.66 J | 5.4 | -4.74 | 173 | 67 |
| 616 | 5.4 | 610.6 | 174 | 67 |
| 604 | 5.4 | 598.6 | 175 | 67 |
| 626 | 5.4 | 620.6 | 176 | 67 |
| 610.6 | 5.4 | 605.2 | 177 | 67 |
| 570.7 | 5.4 | 565.3 | 178 | 67 |
| | | | | |
| 8.4 | 7.1 | 1.3 | 179 | 67 |
| 89.2 | 7.1 | 82.1 | 180 | 67 |
| ND<1.5 U | 7.1 | -5.6 | 180 | 68 |
| 629 | 7.1 | 621.9 | 181 | 68 |
| 934 1c | 7.1 | 926.9 | 182 | 68 |
| 876 2c | 7.1 | 868.9 | 183 | 68 |
| 885 | 7.1 | 877.9 | 184 | 68 |
| 903 | 7.1 | 895.9 | 185 | 68 |
| 793 | 7.1 | 785.9 | 186 | 68 |
| 673 | 7.1 | 665.9 | 187 | 68 |
| 690 | 7.1 | 682.9 | 188 | 68 |
| 582 | 7.1 | 574.9 | 189 | 68 |
| 530 | 7.1 | 522.9 | 190 | 68 |
| 0.66 J | 7.1 | -6.44 | 190 | 69 |
| 616 | 7.1 | 608.9 | 191 | 69 |
| 604 | 7.1 | 596.9 | 192 | 69 |
| 626 | 7.1 | 618.9 | 193 | 69 |
| 610.6 | 7.1 | 603.5 | 194 | 69 |
| 570.7 | 7.1 | 563.6 | 195 | 69 |

| | | | | |
|---|---|---|---|---|
| 89.2 | 8.4 | 80.8 | 196 | 69 |
| ND<1.5 U | 8.4 | -6.9 | 196 | 70 |
| 629 | 8.4 | 620.6 | 197 | 70 |
| 934 1c | 8.4 | 925.6 | 198 | 70 |
| 876 2c | 8.4 | 867.6 | 199 | 70 |
| 885 | 8.4 | 876.6 | 200 | 70 |
| 903 | 8.4 | 894.6 | 201 | 70 |
| 793 | 8.4 | 784.6 | 202 | 70 |
| 673 | 8.4 | 664.6 | 203 | 70 |
| 690 | 8.4 | 681.6 | 204 | 70 |
| 582 | 8.4 | 573.6 | 205 | 70 |
| 530 | 8.4 | 521.6 | 206 | 70 |
| 0.66 J | 8.4 | -7.74 | 206 | 71 |
| 616 | 8.4 | 607.6 | 207 | 71 |
| 604 | 8.4 | 595.6 | 208 | 71 |
| 626 | 8.4 | 617.6 | 209 | 71 |
| 610.6 | 8.4 | 602.2 | 210 | 71 |
| 570.7 | 8.4 | 562.3 | 211 | 71 |
| | | | | |
| ND<1.5 U | 89.2 | -87.7 | 211 | 72 |
| 629 | 89.2 | 539.8 | 212 | 72 |
| 934 1c | 89.2 | 844.8 | 213 | 72 |
| 876 2c | 89.2 | 786.8 | 214 | 72 |
| 885 | 89.2 | 795.8 | 215 | 72 |
| 903 | 89.2 | 813.8 | 216 | 72 |
| 793 | 89.2 | 703.8 | 217 | 72 |
| 673 | 89.2 | 583.8 | 218 | 72 |
| 690 | 89.2 | 600.8 | 219 | 72 |
| 582 | 89.2 | 492.8 | 220 | 72 |
| 530 | 89.2 | 440.8 | 221 | 72 |
| 0.66 J | 89.2 | -88.54 | 221 | 73 |
| 616 | 89.2 | 526.8 | 222 | 73 |
| 604 | 89.2 | 514.8 | 223 | 73 |
| 626 | 89.2 | 536.8 | 224 | 73 |
| 610.6 | 89.2 | 521.4 | 225 | 73 |
| 570.7 | 89.2 | 481.5 | 226 | 73 |
| | | | | |
| 629 | ND<1.5 U | 627.5 | 227 | 73 |
| 934 1c | ND<1.5 U | 932.5 | 228 | 73 |
| 876 2c | ND<1.5 U | 874.5 | 229 | 73 |
| 885 | ND<1.5 U | 883.5 | 230 | 73 |
| 903 | ND<1.5 U | 901.5 | 231 | 73 |
| 793 | ND<1.5 U | 791.5 | 232 | 73 |
| 673 | ND<1.5 U | 671.5 | 233 | 73 |
| 690 | ND<1.5 U | 688.5 | 234 | 73 |
| 582 | ND<1.5 U | 580.5 | 235 | 73 |
| 530 | ND<1.5 U | 528.5 | 236 | 73 |
| 0.66 J | ND<1.5 U | -0.84 | 236 | 74 |
| 616 | ND<1.5 U | 614.5 | 237 | 74 |
| 604 | ND<1.5 U | 602.5 | 238 | 74 |
| 626 | ND<1.5 U | 624.5 | 239 | 74 |
| 610.6 | ND<1.5 U | 609.1 | 240 | 74 |
| 570.7 | ND<1.5 U | 569.2 | 241 | 74 |
| | | | | |
| 934 1c | 629 | 305 | 242 | 74 |
| 876 2c | 629 | 247 | 243 | 74 |
| 885 | 629 | 256 | 244 | 74 |

| | | | | |
|---|---|---|---|---|
| 903 | 629 | 274 | 245 | 74 |
| 793 | 629 | 164 | 246 | 74 |
| 673 | 629 | 44 | 247 | 74 |
| 690 | 629 | 61 | 248 | 74 |
| 582 | 629 | -47 | 248 | 75 |
| 530 | 629 | -99 | 248 | 76 |
| 0.66 J | 629 | -628.34 | 248 | 77 |
| 616 | 629 | -13 | 248 | 78 |
| 604 | 629 | -25 | 248 | 79 |
| 626 | 629 | -3 | 248 | 80 |
| 610.6 | 629 | -18.4 | 248 | 81 |
| 570.7 | 629 | -58.3 | 248 | 82 |
| | | | | |
| 876 2c | 934 1c | Same Date | 248 | 82 |
| 885 | 934 1c | -49 | 248 | 83 |
| 903 | 934 1c | -31 | 248 | 84 |
| 793 | 934 1c | -141 | 248 | 85 |
| 673 | 934 1c | -261 | 248 | 86 |
| 690 | 934 1c | -244 | 248 | 87 |
| 582 | 934 1c | -352 | 248 | 88 |
| 530 | 934 1c | -404 | 248 | 89 |
| 0.66 J | 934 1c | -933.34 | 248 | 90 |
| 616 | 934 1c | -318 | 248 | 91 |
| 604 | 934 1c | -330 | 248 | 92 |
| 626 | 934 1c | -308 | 248 | 93 |
| 610.6 | 934 1c | -323.4 | 248 | 94 |
| 570.7 | 934 1c | -363.3 | 248 | 95 |
| | | | | |
| 885 | 876 2c | 9 | 249 | 95 |
| 903 | 876 2c | 27 | 250 | 95 |
| 793 | 876 2c | -83 | 250 | 96 |
| 673 | 876 2c | -203 | 250 | 97 |
| 690 | 876 2c | -186 | 250 | 98 |
| 582 | 876 2c | -294 | 250 | 99 |
| 530 | 876 2c | -346 | 250 | 100 |
| 0.66 J | 876 2c | -875.34 | 250 | 101 |
| 616 | 876 2c | -260 | 250 | 102 |
| 604 | 876 2c | -272 | 250 | 103 |
| 626 | 876 2c | -250 | 250 | 104 |
| 610.6 | 876 2c | -265.4 | 250 | 105 |
| 570.7 | 876 2c | -305.3 | 250 | 106 |
| | | | | |
| 903 | 885 | Same Date | 250 | 106 |
| 793 | 885 | -92 | 250 | 107 |
| 673 | 885 | -212 | 250 | 108 |
| 690 | 885 | -195 | 250 | 109 |
| 582 | 885 | -303 | 250 | 110 |
| 530 | 885 | -355 | 250 | 111 |
| 0.66 J | 885 | -884.34 | 250 | 112 |
| 616 | 885 | -269 | 250 | 113 |
| 604 | 885 | -281 | 250 | 114 |
| 626 | 885 | -259 | 250 | 115 |
| 610.6 | 885 | -274.4 | 250 | 116 |
| 570.7 | 885 | -314.3 | 250 | 117 |
| | | | | |
| 793 | 903 | -110 | 250 | 118 |
| 673 | 903 | -230 | 250 | 119 |

| | | | | |
|---|---|---|---|---|
| 690 | 903 | -213 | 250 | 120 |
| 582 | 903 | -321 | 250 | 121 |
| 530 | 903 | -373 | 250 | 122 |
| 0.66 J | 903 | -902.34 | 250 | 123 |
| 616 | 903 | -287 | 250 | 124 |
| 604 | 903 | -299 | 250 | 125 |
| 626 | 903 | -277 | 250 | 126 |
| 610.6 | 903 | -292.4 | 250 | 127 |
| 570.7 | 903 | -332.3 | 250 | 128 |
| | | | | |
| 673 | 793 | -120 | 250 | 129 |
| 690 | 793 | -103 | 250 | 130 |
| 582 | 793 | -211 | 250 | 131 |
| 530 | 793 | -263 | 250 | 132 |
| 0.66 J | 793 | -792.34 | 250 | 133 |
| 616 | 793 | -177 | 250 | 134 |
| 604 | 793 | -189 | 250 | 135 |
| 626 | 793 | -167 | 250 | 136 |
| 610.6 | 793 | -182.4 | 250 | 137 |
| 570.7 | 793 | -222.3 | 250 | 138 |
| | | | | |
| 690 | 673 | 17 | 251 | 138 |
| 582 | 673 | -91 | 251 | 139 |
| 530 | 673 | -143 | 251 | 140 |
| 0.66 J | 673 | -672.34 | 251 | 141 |
| 616 | 673 | -57 | 251 | 142 |
| 604 | 673 | -69 | 251 | 143 |
| 626 | 673 | -47 | 251 | 144 |
| 610.6 | 673 | -62.4 | 251 | 145 |
| 570.7 | 673 | -102.3 | 251 | 146 |
| | | | | |
| 582 | 690 | -108 | 251 | 147 |
| 530 | 690 | -160 | 251 | 148 |
| 0.66 J | 690 | -689.34 | 251 | 149 |
| 616 | 690 | -74 | 251 | 150 |
| 604 | 690 | -86 | 251 | 151 |
| 626 | 690 | -64 | 251 | 152 |
| 610.6 | 690 | -79.4 | 251 | 153 |
| 570.7 | 690 | -119.3 | 251 | 154 |
| | | | | |
| 530 | 582 | -52 | 251 | 155 |
| 0.66 J | 582 | -581.34 | 251 | 156 |
| 616 | 582 | 34 | 252 | 156 |
| 604 | 582 | 22 | 253 | 156 |
| 626 | 582 | 44 | 254 | 156 |
| 610.6 | 582 | 28.6 | 255 | 156 |
| 570.7 | 582 | -11.3 | 255 | 157 |
| | | | | |
| 0.66 J | 530 | -529.34 | 255 | 158 |
| 616 | 530 | 86 | 256 | 158 |
| 604 | 530 | 74 | 257 | 158 |
| 626 | 530 | 96 | 258 | 158 |
| 610.6 | 530 | 80.6 | 259 | 158 |
| 570.7 | 530 | 40.7 | 260 | 158 |
| | | | | |
| 616 | 0.66 J | 615.34 | 261 | 158 |
| 604 | 0.66 J | 603.34 | 262 | 158 |

| | | | | |
|---|---|---|---|---|
| 626 | 0.66 J | 625.34 | 263 | 158 |
| 610.6 | 0.66 J | 609.94 | 264 | 158 |
| 570.7 | 0.66 J | 570.04 | 265 | 158 |
| | | | | |
| 604 | 616 | -12 | 265 | 159 |
| 626 | 616 | 10 | 266 | 159 |
| 610.6 | 616 | -5.4 | 266 | 160 |
| 570.7 | 616 | -45.3 | 266 | 161 |
| | | | | |
| 626 | 604 | 22 | 267 | 161 |
| 610.6 | 604 | 6.6 | 268 | 161 |
| 570.7 | 604 | -33.3 | 268 | 162 |
| | | | | |
| 610.6 | 626 | -15.4 | 268 | 163 |
| 570.7 | 626 | -55.3 | 268 | 164 |
| | | | | |
| 570.7 | 610.6 | -39.9 | 268 | 165 |

S Statistic = 268 - 165 = 103

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 2/1/2017 | 1 |
| 3/1/2017 | 1 |
| 4/1/2017 | 1 |
| 5/1/2017 | 1 |
| 6/1/2017 | 1 |
| 7/1/2017 | 1 |
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |

There are 2 time periods with multiple data

A = 0
B = 36
C = 0

D = 0
E = 0
F = 4
a = 56550
b = 219240
c = 1740
Group Variance = 3139.67
Z-Score = 1.82036
Comparison Level at 95% confidence level = -1.65463 (downward trend)
1.82036 >= -1.65463 indicating no evidence of a downward trend

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RW07-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 4.6 | 1.2 J | 3.4 | 1 | 0 |
| ND<1.5 U | 1.2 J | 0.3 | 2 | 0 |
| 1.1 J | 1.2 J | -0.1 | 2 | 1 |
| 0.91 J | 1.2 J | -0.29 | 2 | 2 |
| 1.2 J | 1.2 J | 0 | 2 | 2 |
| 1 J | 1.2 J | -0.2 | 2 | 3 |
| 11 | 1.2 J | 9.8 | 3 | 3 |
| ND<1.5 U | 1.2 J | 0.3 | 4 | 3 |
| 5.1 | 1.2 J | 3.9 | 5 | 3 |
| 1.7 J | 1.2 J | 0.5 | 6 | 3 |
| ND<1.5 U | 1.2 J | 0.3 | 7 | 3 |
| 1.3 J | 1.2 J | 0.1 | 8 | 3 |
| 52.9 | 1.2 J | 51.7 | 9 | 3 |
| 28.7 | 1.2 J | 27.5 | 10 | 3 |
| 32.3 | 1.2 J | 31.1 | 11 | 3 |
| 29.5 | 1.2 J | 28.3 | 12 | 3 |
| 445 | 1.2 J | 443.8 | 13 | 3 |
| 453 | 1.2 J | 451.8 | 14 | 3 |
| 48.7 | 1.2 J | 47.5 | 15 | 3 |
| 38.1 | 1.2 J | 36.9 | 16 | 3 |
| 36 | 1.2 J | 34.8 | 17 | 3 |
| 1.7 J | 1.2 J | 0.5 | 18 | 3 |
| 49.1 | 1.2 J | 47.9 | 19 | 3 |
| 107 | 1.2 J | 105.8 | 20 | 3 |
| 42.71 | 1.2 J | 41.51 | 21 | 3 |
| 0.7383 | 1.2 J | -0.4617 | 21 | 4 |
| 26.94 | 1.2 J | 25.74 | 22 | 4 |
| 1.523 | 1.2 J | 0.323 | 23 | 4 |
| 8.475 | 1.2 J | 7.275 | 24 | 4 |
| | | | | |
| ND<1.5 U | 4.6 | -3.1 | 24 | 5 |
| 1.1 J | 4.6 | -3.5 | 24 | 6 |
| 0.91 J | 4.6 | -3.69 | 24 | 7 |
| 1.2 J | 4.6 | -3.4 | 24 | 8 |
| 1 J | 4.6 | -3.6 | 24 | 9 |
| 11 | 4.6 | 6.4 | 25 | 9 |
| ND<1.5 U | 4.6 | -3.1 | 25 | 10 |
| 5.1 | 4.6 | 0.5 | 26 | 10 |
| 1.7 J | 4.6 | -2.9 | 26 | 11 |
| ND<1.5 U | 4.6 | -3.1 | 26 | 12 |
| 1.3 J | 4.6 | -3.3 | 26 | 13 |
| 52.9 | 4.6 | 48.3 | 27 | 13 |
| 28.7 | 4.6 | 24.1 | 28 | 13 |
| 32.3 | 4.6 | 27.7 | 29 | 13 |
| 29.5 | 4.6 | 24.9 | 30 | 13 |
| 445 | 4.6 | 440.4 | 31 | 13 |
| 453 | 4.6 | 448.4 | 32 | 13 |

| | | | | |
|---|---|---|---|---|
| 48.7 | 4.6 | 44.1 | 33 | 13 |
| 38.1 | 4.6 | 33.5 | 34 | 13 |
| 36 | 4.6 | 31.4 | 35 | 13 |
| 1.7 J | 4.6 | -2.9 | 35 | 14 |
| 49.1 | 4.6 | 44.5 | 36 | 14 |
| 107 | 4.6 | 102.4 | 37 | 14 |
| 42.71 | 4.6 | 38.11 | 38 | 14 |
| 0.7383 | 4.6 | -3.8617 | 38 | 15 |
| 26.94 | 4.6 | 22.34 | 39 | 15 |
| 1.523 | 4.6 | -3.077 | 39 | 16 |
| 8.475 | 4.6 | 3.875 | 40 | 16 |
| | | | | |
| 1.1 J | ND<1.5 U | -0.4 | 40 | 17 |
| 0.91 J | ND<1.5 U | -0.59 | 40 | 18 |
| 1.2 J | ND<1.5 U | -0.3 | 40 | 19 |
| 1 J | ND<1.5 U | -0.5 | 40 | 20 |
| 11 | ND<1.5 U | 9.5 | 41 | 20 |
| ND<1.5 U | ND<1.5 U | 0 | 41 | 20 |
| 5.1 | ND<1.5 U | 3.6 | 42 | 20 |
| 1.7 J | ND<1.5 U | 0.2 | 43 | 20 |
| ND<1.5 U | ND<1.5 U | 0 | 43 | 20 |
| 1.3 J | ND<1.5 U | -0.2 | 43 | 21 |
| 52.9 | ND<1.5 U | 51.4 | 44 | 21 |
| 28.7 | ND<1.5 U | 27.2 | 45 | 21 |
| 32.3 | ND<1.5 U | 30.8 | 46 | 21 |
| 29.5 | ND<1.5 U | 28 | 47 | 21 |
| 445 | ND<1.5 U | 443.5 | 48 | 21 |
| 453 | ND<1.5 U | 451.5 | 49 | 21 |
| 48.7 | ND<1.5 U | 47.2 | 50 | 21 |
| 38.1 | ND<1.5 U | 36.6 | 51 | 21 |
| 36 | ND<1.5 U | 34.5 | 52 | 21 |
| 1.7 J | ND<1.5 U | 0.2 | 53 | 21 |
| 49.1 | ND<1.5 U | 47.6 | 54 | 21 |
| 107 | ND<1.5 U | 105.5 | 55 | 21 |
| 42.71 | ND<1.5 U | 41.21 | 56 | 21 |
| 0.7383 | ND<1.5 U | -0.7617 | 56 | 22 |
| 26.94 | ND<1.5 U | 25.44 | 57 | 22 |
| 1.523 | ND<1.5 U | 0.023 | 58 | 22 |
| 8.475 | ND<1.5 U | 6.975 | 59 | 22 |
| | | | | |
| 0.91 J | 1.1 J | -0.19 | 59 | 23 |
| 1.2 J | 1.1 J | 0.1 | 60 | 23 |
| 1 J | 1.1 J | -0.1 | 60 | 24 |
| 11 | 1.1 J | 9.9 | 61 | 24 |
| ND<1.5 U | 1.1 J | 0.4 | 62 | 24 |
| 5.1 | 1.1 J | 4 | 63 | 24 |
| 1.7 J | 1.1 J | 0.6 | 64 | 24 |
| ND<1.5 U | 1.1 J | 0.4 | 65 | 24 |
| 1.3 J | 1.1 J | 0.2 | 66 | 24 |
| 52.9 | 1.1 J | 51.8 | 67 | 24 |
| 28.7 | 1.1 J | 27.6 | 68 | 24 |
| 32.3 | 1.1 J | 31.2 | 69 | 24 |
| 29.5 | 1.1 J | 28.4 | 70 | 24 |
| 445 | 1.1 J | 443.9 | 71 | 24 |
| 453 | 1.1 J | 451.9 | 72 | 24 |
| 48.7 | 1.1 J | 47.6 | 73 | 24 |
| 38.1 | 1.1 J | 37 | 74 | 24 |

| | | | | |
|---|---|---|---|---|
| 36 | 1.1 J | 34.9 | 75 | 24 |
| 1.7 J | 1.1 J | 0.6 | 76 | 24 |
| 49.1 | 1.1 J | 48 | 77 | 24 |
| 107 | 1.1 J | 105.9 | 78 | 24 |
| 42.71 | 1.1 J | 41.61 | 79 | 24 |
| 0.7383 | 1.1 J | -0.3617 | 79 | 25 |
| 26.94 | 1.1 J | 25.84 | 80 | 25 |
| 1.523 | 1.1 J | 0.423 | 81 | 25 |
| 8.475 | 1.1 J | 7.375 | 82 | 25 |
| | | | | |
| 1.2 J | 0.91 J | 0.29 | 83 | 25 |
| 1 J | 0.91 J | 0.09 | 84 | 25 |
| 11 | 0.91 J | 10.09 | 85 | 25 |
| ND<1.5 U | 0.91 J | 0.59 | 86 | 25 |
| 5.1 | 0.91 J | 4.19 | 87 | 25 |
| 1.7 J | 0.91 J | 0.79 | 88 | 25 |
| ND<1.5 U | 0.91 J | 0.59 | 89 | 25 |
| 1.3 J | 0.91 J | 0.39 | 90 | 25 |
| 52.9 | 0.91 J | 51.99 | 91 | 25 |
| 28.7 | 0.91 J | 27.79 | 92 | 25 |
| 32.3 | 0.91 J | 31.39 | 93 | 25 |
| 29.5 | 0.91 J | 28.59 | 94 | 25 |
| 445 | 0.91 J | 444.09 | 95 | 25 |
| 453 | 0.91 J | 452.09 | 96 | 25 |
| 48.7 | 0.91 J | 47.79 | 97 | 25 |
| 38.1 | 0.91 J | 37.19 | 98 | 25 |
| 36 | 0.91 J | 35.09 | 99 | 25 |
| 1.7 J | 0.91 J | 0.79 | 100 | 25 |
| 49.1 | 0.91 J | 48.19 | 101 | 25 |
| 107 | 0.91 J | 106.09 | 102 | 25 |
| 42.71 | 0.91 J | 41.8 | 103 | 25 |
| 0.7383 | 0.91 J | -0.1717 | 103 | 26 |
| 26.94 | 0.91 J | 26.03 | 104 | 26 |
| 1.523 | 0.91 J | 0.613 | 105 | 26 |
| 8.475 | 0.91 J | 7.565 | 106 | 26 |
| | | | | |
| 1 J | 1.2 J | -0.2 | 106 | 27 |
| 11 | 1.2 J | 9.8 | 107 | 27 |
| ND<1.5 U | 1.2 J | 0.3 | 108 | 27 |
| 5.1 | 1.2 J | 3.9 | 109 | 27 |
| 1.7 J | 1.2 J | 0.5 | 110 | 27 |
| ND<1.5 U | 1.2 J | 0.3 | 111 | 27 |
| 1.3 J | 1.2 J | 0.1 | 112 | 27 |
| 52.9 | 1.2 J | 51.7 | 113 | 27 |
| 28.7 | 1.2 J | 27.5 | 114 | 27 |
| 32.3 | 1.2 J | 31.1 | 115 | 27 |
| 29.5 | 1.2 J | 28.3 | 116 | 27 |
| 445 | 1.2 J | 443.8 | 117 | 27 |
| 453 | 1.2 J | 451.8 | 118 | 27 |
| 48.7 | 1.2 J | 47.5 | 119 | 27 |
| 38.1 | 1.2 J | 36.9 | 120 | 27 |
| 36 | 1.2 J | 34.8 | 121 | 27 |
| 1.7 J | 1.2 J | 0.5 | 122 | 27 |
| 49.1 | 1.2 J | 47.9 | 123 | 27 |
| 107 | 1.2 J | 105.8 | 124 | 27 |
| 42.71 | 1.2 J | 41.51 | 125 | 27 |
| 0.7383 | 1.2 J | -0.4617 | 125 | 28 |

| | | | | |
|---|---|---|---|---|
| 26.94 | 1.2 J | 25.74 | 126 | 28 |
| 1.523 | 1.2 J | 0.323 | 127 | 28 |
| 8.475 | 1.2 J | 7.275 | 128 | 28 |
| | | | | |
| 11 | 1 J | 10 | 129 | 28 |
| ND<1.5 U | 1 J | 0.5 | 130 | 28 |
| 5.1 | 1 J | 4.1 | 131 | 28 |
| 1.7 J | 1 J | 0.7 | 132 | 28 |
| ND<1.5 U | 1 J | 0.5 | 133 | 28 |
| 1.3 J | 1 J | 0.3 | 134 | 28 |
| 52.9 | 1 J | 51.9 | 135 | 28 |
| 28.7 | 1 J | 27.7 | 136 | 28 |
| 32.3 | 1 J | 31.3 | 137 | 28 |
| 29.5 | 1 J | 28.5 | 138 | 28 |
| 445 | 1 J | 444 | 139 | 28 |
| 453 | 1 J | 452 | 140 | 28 |
| 48.7 | 1 J | 47.7 | 141 | 28 |
| 38.1 | 1 J | 37.1 | 142 | 28 |
| 36 | 1 J | 35 | 143 | 28 |
| 1.7 J | 1 J | 0.7 | 144 | 28 |
| 49.1 | 1 J | 48.1 | 145 | 28 |
| 107 | 1 J | 106 | 146 | 28 |
| 42.71 | 1 J | 41.71 | 147 | 28 |
| 0.7383 | 1 J | -0.2617 | 147 | 29 |
| 26.94 | 1 J | 25.94 | 148 | 29 |
| 1.523 | 1 J | 0.523 | 149 | 29 |
| 8.475 | 1 J | 7.475 | 150 | 29 |
| | | | | |
| ND<1.5 U | 11 | -9.5 | 150 | 30 |
| 5.1 | 11 | -5.9 | 150 | 31 |
| 1.7 J | 11 | -9.3 | 150 | 32 |
| ND<1.5 U | 11 | -9.5 | 150 | 33 |
| 1.3 J | 11 | -9.7 | 150 | 34 |
| 52.9 | 11 | 41.9 | 151 | 34 |
| 28.7 | 11 | 17.7 | 152 | 34 |
| 32.3 | 11 | 21.3 | 153 | 34 |
| 29.5 | 11 | 18.5 | 154 | 34 |
| 445 | 11 | 434 | 155 | 34 |
| 453 | 11 | 442 | 156 | 34 |
| 48.7 | 11 | 37.7 | 157 | 34 |
| 38.1 | 11 | 27.1 | 158 | 34 |
| 36 | 11 | 25 | 159 | 34 |
| 1.7 J | 11 | -9.3 | 159 | 35 |
| 49.1 | 11 | 38.1 | 160 | 35 |
| 107 | 11 | 96 | 161 | 35 |
| 42.71 | 11 | 31.71 | 162 | 35 |
| 0.7383 | 11 | -10.2617 | 162 | 36 |
| 26.94 | 11 | 15.94 | 163 | 36 |
| 1.523 | 11 | -9.477 | 163 | 37 |
| 8.475 | 11 | -2.525 | 163 | 38 |
| | | | | |
| 5.1 | ND<1.5 U | 3.6 | 164 | 38 |
| 1.7 J | ND<1.5 U | 0.2 | 165 | 38 |
| ND<1.5 U | ND<1.5 U | 0 | 165 | 38 |
| 1.3 J | ND<1.5 U | -0.2 | 165 | 39 |
| 52.9 | ND<1.5 U | 51.4 | 166 | 39 |
| 28.7 | ND<1.5 U | 27.2 | 167 | 39 |

| | | | | |
|---|---|---|---|---|
| 32.3 | ND<1.5 U | 30.8 | 168 | 39 |
| 29.5 | ND<1.5 U | 28 | 169 | 39 |
| 445 | ND<1.5 U | 443.5 | 170 | 39 |
| 453 | ND<1.5 U | 451.5 | 171 | 39 |
| 48.7 | ND<1.5 U | 47.2 | 172 | 39 |
| 38.1 | ND<1.5 U | 36.6 | 173 | 39 |
| 36 | ND<1.5 U | 34.5 | 174 | 39 |
| 1.7 J | ND<1.5 U | 0.2 | 175 | 39 |
| 49.1 | ND<1.5 U | 47.6 | 176 | 39 |
| 107 | ND<1.5 U | 105.5 | 177 | 39 |
| 42.71 | ND<1.5 U | 41.21 | 178 | 39 |
| 0.7383 | ND<1.5 U | -0.7617 | 178 | 40 |
| 26.94 | ND<1.5 U | 25.44 | 179 | 40 |
| 1.523 | ND<1.5 U | 0.023 | 180 | 40 |
| 8.475 | ND<1.5 U | 6.975 | 181 | 40 |
| | | | | |
| 1.7 J | 5.1 | -3.4 | 181 | 41 |
| ND<1.5 U | 5.1 | -3.6 | 181 | 42 |
| 1.3 J | 5.1 | -3.8 | 181 | 43 |
| 52.9 | 5.1 | 47.8 | 182 | 43 |
| 28.7 | 5.1 | 23.6 | 183 | 43 |
| 32.3 | 5.1 | 27.2 | 184 | 43 |
| 29.5 | 5.1 | 24.4 | 185 | 43 |
| 445 | 5.1 | 439.9 | 186 | 43 |
| 453 | 5.1 | 447.9 | 187 | 43 |
| 48.7 | 5.1 | 43.6 | 188 | 43 |
| 38.1 | 5.1 | 33 | 189 | 43 |
| 36 | 5.1 | 30.9 | 190 | 43 |
| 1.7 J | 5.1 | -3.4 | 190 | 44 |
| 49.1 | 5.1 | 44 | 191 | 44 |
| 107 | 5.1 | 101.9 | 192 | 44 |
| 42.71 | 5.1 | 37.61 | 193 | 44 |
| 0.7383 | 5.1 | -4.3617 | 193 | 45 |
| 26.94 | 5.1 | 21.84 | 194 | 45 |
| 1.523 | 5.1 | -3.577 | 194 | 46 |
| 8.475 | 5.1 | 3.375 | 195 | 46 |
| | | | | |
| ND<1.5 U | 1.7 J | -0.2 | 195 | 47 |
| 1.3 J | 1.7 J | -0.4 | 195 | 48 |
| 52.9 | 1.7 J | 51.2 | 196 | 48 |
| 28.7 | 1.7 J | 27 | 197 | 48 |
| 32.3 | 1.7 J | 30.6 | 198 | 48 |
| 29.5 | 1.7 J | 27.8 | 199 | 48 |
| 445 | 1.7 J | 443.3 | 200 | 48 |
| 453 | 1.7 J | 451.3 | 201 | 48 |
| 48.7 | 1.7 J | 47 | 202 | 48 |
| 38.1 | 1.7 J | 36.4 | 203 | 48 |
| 36 | 1.7 J | 34.3 | 204 | 48 |
| 1.7 J | 1.7 J | 0 | 204 | 48 |
| 49.1 | 1.7 J | 47.4 | 205 | 48 |
| 107 | 1.7 J | 105.3 | 206 | 48 |
| 42.71 | 1.7 J | 41.01 | 207 | 48 |
| 0.7383 | 1.7 J | -0.9617 | 207 | 49 |
| 26.94 | 1.7 J | 25.24 | 208 | 49 |
| 1.523 | 1.7 J | -0.177 | 208 | 50 |
| 8.475 | 1.7 J | 6.775 | 209 | 50 |

| | | | | |
|---|---|---|---|---|
| 1.3 J | ND<1.5 U | -0.2 | 209 | 51 |
| 52.9 | ND<1.5 U | 51.4 | 210 | 51 |
| 28.7 | ND<1.5 U | 27.2 | 211 | 51 |
| 32.3 | ND<1.5 U | 30.8 | 212 | 51 |
| 29.5 | ND<1.5 U | 28 | 213 | 51 |
| 445 | ND<1.5 U | 443.5 | 214 | 51 |
| 453 | ND<1.5 U | 451.5 | 215 | 51 |
| 48.7 | ND<1.5 U | 47.2 | 216 | 51 |
| 38.1 | ND<1.5 U | 36.6 | 217 | 51 |
| 36 | ND<1.5 U | 34.5 | 218 | 51 |
| 1.7 J | ND<1.5 U | 0.2 | 219 | 51 |
| 49.1 | ND<1.5 U | 47.6 | 220 | 51 |
| 107 | ND<1.5 U | 105.5 | 221 | 51 |
| 42.71 | ND<1.5 U | 41.21 | 222 | 51 |
| 0.7383 | ND<1.5 U | -0.7617 | 222 | 52 |
| 26.94 | ND<1.5 U | 25.44 | 223 | 52 |
| 1.523 | ND<1.5 U | 0.023 | 224 | 52 |
| 8.475 | ND<1.5 U | 6.975 | 225 | 52 |
| | | | | |
| 52.9 | 1.3 J | 51.6 | 226 | 52 |
| 28.7 | 1.3 J | 27.4 | 227 | 52 |
| 32.3 | 1.3 J | 31 | 228 | 52 |
| 29.5 | 1.3 J | 28.2 | 229 | 52 |
| 445 | 1.3 J | 443.7 | 230 | 52 |
| 453 | 1.3 J | 451.7 | 231 | 52 |
| 48.7 | 1.3 J | 47.4 | 232 | 52 |
| 38.1 | 1.3 J | 36.8 | 233 | 52 |
| 36 | 1.3 J | 34.7 | 234 | 52 |
| 1.7 J | 1.3 J | 0.4 | 235 | 52 |
| 49.1 | 1.3 J | 47.8 | 236 | 52 |
| 107 | 1.3 J | 105.7 | 237 | 52 |
| 42.71 | 1.3 J | 41.41 | 238 | 52 |
| 0.7383 | 1.3 J | -0.5617 | 238 | 53 |
| 26.94 | 1.3 J | 25.64 | 239 | 53 |
| 1.523 | 1.3 J | 0.223 | 240 | 53 |
| 8.475 | 1.3 J | 7.175 | 241 | 53 |
| | | | | |
| 28.7 | 52.9 | -24.2 | 241 | 54 |
| 32.3 | 52.9 | -20.6 | 241 | 55 |
| 29.5 | 52.9 | -23.4 | 241 | 56 |
| 445 | 52.9 | 392.1 | 242 | 56 |
| 453 | 52.9 | 400.1 | 243 | 56 |
| 48.7 | 52.9 | -4.2 | 243 | 57 |
| 38.1 | 52.9 | -14.8 | 243 | 58 |
| 36 | 52.9 | -16.9 | 243 | 59 |
| 1.7 J | 52.9 | -51.2 | 243 | 60 |
| 49.1 | 52.9 | -3.8 | 243 | 61 |
| 107 | 52.9 | 54.1 | 244 | 61 |
| 42.71 | 52.9 | -10.19 | 244 | 62 |
| 0.7383 | 52.9 | -52.1617 | 244 | 63 |
| 26.94 | 52.9 | -25.96 | 244 | 64 |
| 1.523 | 52.9 | -51.377 | 244 | 65 |
| 8.475 | 52.9 | -44.425 | 244 | 66 |
| | | | | |
| 32.3 | 28.7 | 3.6 | 245 | 66 |
| 29.5 | 28.7 | 0.8 | 246 | 66 |
| 445 | 28.7 | 416.3 | 247 | 66 |

| | | | | |
|---|---|---|---|---|
| 453 | 28.7 | 424.3 | 248 | 66 |
| 48.7 | 28.7 | 20 | 249 | 66 |
| 38.1 | 28.7 | 9.4 | 250 | 66 |
| 36 | 28.7 | 7.3 | 251 | 66 |
| 1.7 J | 28.7 | -27 | 251 | 67 |
| 49.1 | 28.7 | 20.4 | 252 | 67 |
| 107 | 28.7 | 78.3 | 253 | 67 |
| 42.71 | 28.7 | 14.01 | 254 | 67 |
| 0.7383 | 28.7 | -27.9617 | 254 | 68 |
| 26.94 | 28.7 | -1.76 | 254 | 69 |
| 1.523 | 28.7 | -27.177 | 254 | 70 |
| 8.475 | 28.7 | -20.225 | 254 | 71 |
| | | | | |
| 29.5 | 32.3 | Same Date | 254 | 71 |
| 445 | 32.3 | 412.7 | 255 | 71 |
| 453 | 32.3 | 420.7 | 256 | 71 |
| 48.7 | 32.3 | 16.4 | 257 | 71 |
| 38.1 | 32.3 | 5.8 | 258 | 71 |
| 36 | 32.3 | 3.7 | 259 | 71 |
| 1.7 J | 32.3 | -30.6 | 259 | 72 |
| 49.1 | 32.3 | 16.8 | 260 | 72 |
| 107 | 32.3 | 74.7 | 261 | 72 |
| 42.71 | 32.3 | 10.41 | 262 | 72 |
| 0.7383 | 32.3 | -31.5617 | 262 | 73 |
| 26.94 | 32.3 | -5.36 | 262 | 74 |
| 1.523 | 32.3 | -30.777 | 262 | 75 |
| 8.475 | 32.3 | -23.825 | 262 | 76 |
| | | | | |
| 445 | 29.5 | 415.5 | 263 | 76 |
| 453 | 29.5 | 423.5 | 264 | 76 |
| 48.7 | 29.5 | 19.2 | 265 | 76 |
| 38.1 | 29.5 | 8.6 | 266 | 76 |
| 36 | 29.5 | 6.5 | 267 | 76 |
| 1.7 J | 29.5 | -27.8 | 267 | 77 |
| 49.1 | 29.5 | 19.6 | 268 | 77 |
| 107 | 29.5 | 77.5 | 269 | 77 |
| 42.71 | 29.5 | 13.21 | 270 | 77 |
| 0.7383 | 29.5 | -28.7617 | 270 | 78 |
| 26.94 | 29.5 | -2.56 | 270 | 79 |
| 1.523 | 29.5 | -27.977 | 270 | 80 |
| 8.475 | 29.5 | -21.025 | 270 | 81 |
| | | | | |
| 453 | 445 | Same Date | 270 | 81 |
| 48.7 | 445 | -396.3 | 270 | 82 |
| 38.1 | 445 | -406.9 | 270 | 83 |
| 36 | 445 | -409 | 270 | 84 |
| 1.7 J | 445 | -443.3 | 270 | 85 |
| 49.1 | 445 | -395.9 | 270 | 86 |
| 107 | 445 | -338 | 270 | 87 |
| 42.71 | 445 | -402.29 | 270 | 88 |
| 0.7383 | 445 | -444.262 | 270 | 89 |
| 26.94 | 445 | -418.06 | 270 | 90 |
| 1.523 | 445 | -443.477 | 270 | 91 |
| 8.475 | 445 | -436.525 | 270 | 92 |
| | | | | |
| 48.7 | 453 | -404.3 | 270 | 93 |
| 38.1 | 453 | -414.9 | 270 | 94 |

| | | | | |
|---|---|---|---|---|
| 36 | 453 | -417 | 270 | 95 |
| 1.7 J | 453 | -451.3 | 270 | 96 |
| 49.1 | 453 | -403.9 | 270 | 97 |
| 107 | 453 | -346 | 270 | 98 |
| 42.71 | 453 | -410.29 | 270 | 99 |
| 0.7383 | 453 | -452.262 | 270 | 100 |
| 26.94 | 453 | -426.06 | 270 | 101 |
| 1.523 | 453 | -451.477 | 270 | 102 |
| 8.475 | 453 | -444.525 | 270 | 103 |
| | | | | |
| 38.1 | 48.7 | -10.6 | 270 | 104 |
| 36 | 48.7 | -12.7 | 270 | 105 |
| 1.7 J | 48.7 | -47 | 270 | 106 |
| 49.1 | 48.7 | 0.4 | 271 | 106 |
| 107 | 48.7 | 58.3 | 272 | 106 |
| 42.71 | 48.7 | -5.99 | 272 | 107 |
| 0.7383 | 48.7 | -47.9617 | 272 | 108 |
| 26.94 | 48.7 | -21.76 | 272 | 109 |
| 1.523 | 48.7 | -47.177 | 272 | 110 |
| 8.475 | 48.7 | -40.225 | 272 | 111 |
| | | | | |
| 36 | 38.1 | -2.1 | 272 | 112 |
| 1.7 J | 38.1 | -36.4 | 272 | 113 |
| 49.1 | 38.1 | 11 | 273 | 113 |
| 107 | 38.1 | 68.9 | 274 | 113 |
| 42.71 | 38.1 | 4.61 | 275 | 113 |
| 0.7383 | 38.1 | -37.3617 | 275 | 114 |
| 26.94 | 38.1 | -11.16 | 275 | 115 |
| 1.523 | 38.1 | -36.577 | 275 | 116 |
| 8.475 | 38.1 | -29.625 | 275 | 117 |
| | | | | |
| 1.7 J | 36 | -34.3 | 275 | 118 |
| 49.1 | 36 | 13.1 | 276 | 118 |
| 107 | 36 | 71 | 277 | 118 |
| 42.71 | 36 | 6.71 | 278 | 118 |
| 0.7383 | 36 | -35.2617 | 278 | 119 |
| 26.94 | 36 | -9.06 | 278 | 120 |
| 1.523 | 36 | -34.477 | 278 | 121 |
| 8.475 | 36 | -27.525 | 278 | 122 |
| | | | | |
| 49.1 | 1.7 J | 47.4 | 279 | 122 |
| 107 | 1.7 J | 105.3 | 280 | 122 |
| 42.71 | 1.7 J | 41.01 | 281 | 122 |
| 0.7383 | 1.7 J | -0.9617 | 281 | 123 |
| 26.94 | 1.7 J | 25.24 | 282 | 123 |
| 1.523 | 1.7 J | -0.177 | 282 | 124 |
| 8.475 | 1.7 J | 6.775 | 283 | 124 |
| | | | | |
| 107 | 49.1 | 57.9 | 284 | 124 |
| 42.71 | 49.1 | -6.39 | 284 | 125 |
| 0.7383 | 49.1 | -48.3617 | 284 | 126 |
| 26.94 | 49.1 | -22.16 | 284 | 127 |
| 1.523 | 49.1 | -47.577 | 284 | 128 |
| 8.475 | 49.1 | -40.625 | 284 | 129 |
| | | | | |
| 42.71 | 107 | -64.29 | 284 | 130 |
| 0.7383 | 107 | -106.262 | 284 | 131 |

| | | | | |
|---|---|---|---|---|
| 26.94 | 107 | -80.06 | 284 | 132 |
| 1.523 | 107 | -105.477 | 284 | 133 |
| 8.475 | 107 | -98.525 | 284 | 134 |
| | | | | |
| 0.7383 | 42.71 | -41.9717 | 284 | 135 |
| 26.94 | 42.71 | -15.77 | 284 | 136 |
| 1.523 | 42.71 | -41.187 | 284 | 137 |
| 8.475 | 42.71 | -34.235 | 284 | 138 |
| | | | | |
| 26.94 | 0.7383 | 26.2017 | 285 | 138 |
| 1.523 | 0.7383 | 0.7847 | 286 | 138 |
| 8.475 | 0.7383 | 7.7367 | 287 | 138 |
| | | | | |
| 1.523 | 26.94 | -25.417 | 287 | 139 |
| 8.475 | 26.94 | -18.465 | 287 | 140 |
| | | | | |
| 8.475 | 1.523 | 6.952 | 288 | 140 |

S Statistic = 288 - 140 = 148

| Tied Group | Value | Members |
|---|---|---|
| 1 | 1.2 | 2 |
| 2 | 1.5 | 3 |
| 3 | 1.7 | 2 |

| Time Period | Observations |
|---|---|
| 2/1/2017 | 1 |
| 3/1/2017 | 1 |
| 4/1/2017 | 1 |
| 5/1/2017 | 1 |
| 6/1/2017 | 1 |
| 7/1/2017 | 1 |
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 2 time periods with multiple data

A = 102
B = 36
C = 6
D = 0
E = 10
F = 4
a = 56550
b = 219240
c = 1740
Group Variance = 3134.02
Z-Score = 2.62583
Comparison Level at 95% confidence level = -1.65463 (downward trend)
2.62583 >= -1.65463 indicating no evidence of a downward trend

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RW08-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 0.39 J | 0.49 J | -0.1 | 0 | 1 |
| ND<1.5 U | 0.49 J | 1.01 | 1 | 1 |
| 1.5 J | 0.49 J | 1.01 | 2 | 1 |
| 0.48 J | 0.49 J | -0.01 | 2 | 2 |
| 1.3 J | 0.49 J | 0.81 | 3 | 2 |
| 0.86 J | 0.49 J | 0.37 | 4 | 2 |
| 0.77 J | 0.49 J | 0.28 | 5 | 2 |
| ND<1.5 U | 0.49 J | 1.01 | 6 | 2 |
| 0.88 J | 0.49 J | 0.39 | 7 | 2 |
| 1.8 J | 0.49 J | 1.31 | 8 | 2 |
| ND<1.5 U | 0.49 J | 1.01 | 9 | 2 |
| 6.2 | 0.49 J | 5.71 | 10 | 2 |
| 14.1 | 0.49 J | 13.61 | 11 | 2 |
| 0.92 J1c | 0.49 J | 0.43 | 12 | 2 |
| 0.34 J1c | 0.49 J | -0.15 | 12 | 3 |
| ND<1.5 U2c | 0.49 J | 1.01 | 13 | 3 |
| ND<1.5 U | 0.49 J | 1.01 | 14 | 3 |
| ND<1.5 U | 0.49 J | 1.01 | 15 | 3 |
| ND<1.5 U | 0.49 J | 1.01 | 16 | 3 |
| 0.59 J | 0.49 J | 0.1 | 17 | 3 |
| ND<1.5 U | 0.49 J | 1.01 | 18 | 3 |
| 0.47 J | 0.49 J | -0.02 | 18 | 4 |
| 0.39 J | 0.49 J | -0.1 | 18 | 5 |
| 0.56 J | 0.49 J | 0.07 | 19 | 5 |
| 0.38 J | 0.49 J | -0.11 | 19 | 6 |
| ND<100 U | 0.49 J | 99.51 | 20 | 6 |
| ND<0.1 U | 0.49 J | -0.39 | 20 | 7 |
| 12 | 0.49 J | 11.51 | 21 | 7 |
| | | | | |
| ND<1.5 U | 0.39 J | 1.11 | 22 | 7 |
| 1.5 J | 0.39 J | 1.11 | 23 | 7 |
| 0.48 J | 0.39 J | 0.09 | 24 | 7 |
| 1.3 J | 0.39 J | 0.91 | 25 | 7 |
| 0.86 J | 0.39 J | 0.47 | 26 | 7 |
| 0.77 J | 0.39 J | 0.38 | 27 | 7 |
| ND<1.5 U | 0.39 J | 1.11 | 28 | 7 |
| 0.88 J | 0.39 J | 0.49 | 29 | 7 |
| 1.8 J | 0.39 J | 1.41 | 30 | 7 |
| ND<1.5 U | 0.39 J | 1.11 | 31 | 7 |
| 6.2 | 0.39 J | 5.81 | 32 | 7 |
| 14.1 | 0.39 J | 13.71 | 33 | 7 |
| 0.92 J1c | 0.39 J | 0.53 | 34 | 7 |
| 0.34 J1c | 0.39 J | -0.05 | 34 | 8 |
| ND<1.5 U2c | 0.39 J | 1.11 | 35 | 8 |
| ND<1.5 U | 0.39 J | 1.11 | 36 | 8 |
| ND<1.5 U | 0.39 J | 1.11 | 37 | 8 |
| ND<1.5 U | 0.39 J | 1.11 | 38 | 8 |

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|---|---|---|---|---|
| 0.59 J | 0.39 J | 0.2 | 39 | 8 |
| ND<1.5 U | 0.39 J | 1.11 | 40 | 8 |
| 0.47 J | 0.39 J | 0.08 | 41 | 8 |
| 0.39 J | 0.39 J | 0 | 41 | 8 |
| 0.56 J | 0.39 J | 0.17 | 42 | 8 |
| 0.38 J | 0.39 J | -0.01 | 42 | 9 |
| ND<100 U | 0.39 J | 99.61 | 43 | 9 |
| ND<0.1 U | 0.39 J | -0.29 | 43 | 10 |
| 12 | 0.39 J | 11.61 | 44 | 10 |
| | | | | |
| 1.5 J | ND<1.5 U | 0 | 44 | 10 |
| 0.48 J | ND<1.5 U | -1.02 | 44 | 11 |
| 1.3 J | ND<1.5 U | -0.2 | 44 | 12 |
| 0.86 J | ND<1.5 U | -0.64 | 44 | 13 |
| 0.77 J | ND<1.5 U | -0.73 | 44 | 14 |
| ND<1.5 U | ND<1.5 U | 0 | 44 | 14 |
| 0.88 J | ND<1.5 U | -0.62 | 44 | 15 |
| 1.8 J | ND<1.5 U | 0.3 | 45 | 15 |
| ND<1.5 U | ND<1.5 U | 0 | 45 | 15 |
| 6.2 | ND<1.5 U | 4.7 | 46 | 15 |
| 14.1 | ND<1.5 U | 12.6 | 47 | 15 |
| 0.92 J1c | ND<1.5 U | -0.58 | 47 | 16 |
| 0.34 J1c | ND<1.5 U | -1.16 | 47 | 17 |
| ND<1.5 U2c | ND<1.5 U | 0 | 47 | 17 |
| ND<1.5 U | ND<1.5 U | 0 | 47 | 17 |
| ND<1.5 U | ND<1.5 U | 0 | 47 | 17 |
| ND<1.5 U | ND<1.5 U | 0 | 47 | 17 |
| 0.59 J | ND<1.5 U | -0.91 | 47 | 18 |
| ND<1.5 U | ND<1.5 U | 0 | 47 | 18 |
| 0.47 J | ND<1.5 U | -1.03 | 47 | 19 |
| 0.39 J | ND<1.5 U | -1.11 | 47 | 20 |
| 0.56 J | ND<1.5 U | -0.94 | 47 | 21 |
| 0.38 J | ND<1.5 U | -1.12 | 47 | 22 |
| ND<100 U | ND<1.5 U | 98.5 | 48 | 22 |
| ND<0.1 U | ND<1.5 U | -1.4 | 48 | 23 |
| 12 | ND<1.5 U | 10.5 | 49 | 23 |
| | | | | |
| 0.48 J | 1.5 J | -1.02 | 49 | 24 |
| 1.3 J | 1.5 J | -0.2 | 49 | 25 |
| 0.86 J | 1.5 J | -0.64 | 49 | 26 |
| 0.77 J | 1.5 J | -0.73 | 49 | 27 |
| ND<1.5 U | 1.5 J | 0 | 49 | 27 |
| 0.88 J | 1.5 J | -0.62 | 49 | 28 |
| 1.8 J | 1.5 J | 0.3 | 50 | 28 |
| ND<1.5 U | 1.5 J | 0 | 50 | 28 |
| 6.2 | 1.5 J | 4.7 | 51 | 28 |
| 14.1 | 1.5 J | 12.6 | 52 | 28 |
| 0.92 J1c | 1.5 J | -0.58 | 52 | 29 |
| 0.34 J1c | 1.5 J | -1.16 | 52 | 30 |
| ND<1.5 U2c | 1.5 J | 0 | 52 | 30 |
| ND<1.5 U | 1.5 J | 0 | 52 | 30 |
| ND<1.5 U | 1.5 J | 0 | 52 | 30 |
| ND<1.5 U | 1.5 J | 0 | 52 | 30 |
| 0.59 J | 1.5 J | -0.91 | 52 | 31 |
| ND<1.5 U | 1.5 J | 0 | 52 | 31 |
| 0.47 J | 1.5 J | -1.03 | 52 | 32 |
| 0.39 J | 1.5 J | -1.11 | 52 | 33 |

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|---|---|---|---|---|
| 0.56 J | 1.5 J | -0.94 | 52 | 34 |
| 0.38 J | 1.5 J | -1.12 | 52 | 35 |
| ND<100 U | 1.5 J | 98.5 | 53 | 35 |
| ND<0.1 U | 1.5 J | -1.4 | 53 | 36 |
| 12 | 1.5 J | 10.5 | 54 | 36 |
| | | | | |
| 1.3 J | 0.48 J | 0.82 | 55 | 36 |
| 0.86 J | 0.48 J | 0.38 | 56 | 36 |
| 0.77 J | 0.48 J | 0.29 | 57 | 36 |
| ND<1.5 U | 0.48 J | 1.02 | 58 | 36 |
| 0.88 J | 0.48 J | 0.4 | 59 | 36 |
| 1.8 J | 0.48 J | 1.32 | 60 | 36 |
| ND<1.5 U | 0.48 J | 1.02 | 61 | 36 |
| 6.2 | 0.48 J | 5.72 | 62 | 36 |
| 14.1 | 0.48 J | 13.62 | 63 | 36 |
| 0.92 J1c | 0.48 J | 0.44 | 64 | 36 |
| 0.34 J1c | 0.48 J | -0.14 | 64 | 37 |
| ND<1.5 U2c | 0.48 J | 1.02 | 65 | 37 |
| ND<1.5 U | 0.48 J | 1.02 | 66 | 37 |
| ND<1.5 U | 0.48 J | 1.02 | 67 | 37 |
| ND<1.5 U | 0.48 J | 1.02 | 68 | 37 |
| 0.59 J | 0.48 J | 0.11 | 69 | 37 |
| ND<1.5 U | 0.48 J | 1.02 | 70 | 37 |
| 0.47 J | 0.48 J | -0.01 | 70 | 38 |
| 0.39 J | 0.48 J | -0.09 | 70 | 39 |
| 0.56 J | 0.48 J | 0.08 | 71 | 39 |
| 0.38 J | 0.48 J | -0.1 | 71 | 40 |
| ND<100 U | 0.48 J | 99.52 | 72 | 40 |
| ND<0.1 U | 0.48 J | -0.38 | 72 | 41 |
| 12 | 0.48 J | 11.52 | 73 | 41 |
| | | | | |
| 0.86 J | 1.3 J | -0.44 | 73 | 42 |
| 0.77 J | 1.3 J | -0.53 | 73 | 43 |
| ND<1.5 U | 1.3 J | 0.2 | 74 | 43 |
| 0.88 J | 1.3 J | -0.42 | 74 | 44 |
| 1.8 J | 1.3 J | 0.5 | 75 | 44 |
| ND<1.5 U | 1.3 J | 0.2 | 76 | 44 |
| 6.2 | 1.3 J | 4.9 | 77 | 44 |
| 14.1 | 1.3 J | 12.8 | 78 | 44 |
| 0.92 J1c | 1.3 J | -0.38 | 78 | 45 |
| 0.34 J1c | 1.3 J | -0.96 | 78 | 46 |
| ND<1.5 U2c | 1.3 J | 0.2 | 79 | 46 |
| ND<1.5 U | 1.3 J | 0.2 | 80 | 46 |
| ND<1.5 U | 1.3 J | 0.2 | 81 | 46 |
| ND<1.5 U | 1.3 J | 0.2 | 82 | 46 |
| 0.59 J | 1.3 J | -0.71 | 82 | 47 |
| ND<1.5 U | 1.3 J | 0.2 | 83 | 47 |
| 0.47 J | 1.3 J | -0.83 | 83 | 48 |
| 0.39 J | 1.3 J | -0.91 | 83 | 49 |
| 0.56 J | 1.3 J | -0.74 | 83 | 50 |
| 0.38 J | 1.3 J | -0.92 | 83 | 51 |
| ND<100 U | 1.3 J | 98.7 | 84 | 51 |
| ND<0.1 U | 1.3 J | -1.2 | 84 | 52 |
| 12 | 1.3 J | 10.7 | 85 | 52 |
| | | | | |
| 0.77 J | 0.86 J | -0.09 | 85 | 53 |
| ND<1.5 U | 0.86 J | 0.64 | 86 | 53 |

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|---|---|---|---|---|
| 0.88 J | 0.86 J | 0.02 | 87 | 53 |
| 1.8 J | 0.86 J | 0.94 | 88 | 53 |
| ND<1.5 U | 0.86 J | 0.64 | 89 | 53 |
| 6.2 | 0.86 J | 5.34 | 90 | 53 |
| 14.1 | 0.86 J | 13.24 | 91 | 53 |
| 0.92 J1c | 0.86 J | 0.06 | 92 | 53 |
| 0.34 J1c | 0.86 J | -0.52 | 92 | 54 |
| ND<1.5 U2c | 0.86 J | 0.64 | 93 | 54 |
| ND<1.5 U | 0.86 J | 0.64 | 94 | 54 |
| ND<1.5 U | 0.86 J | 0.64 | 95 | 54 |
| ND<1.5 U | 0.86 J | 0.64 | 96 | 54 |
| 0.59 J | 0.86 J | -0.27 | 96 | 55 |
| ND<1.5 U | 0.86 J | 0.64 | 97 | 55 |
| 0.47 J | 0.86 J | -0.39 | 97 | 56 |
| 0.39 J | 0.86 J | -0.47 | 97 | 57 |
| 0.56 J | 0.86 J | -0.3 | 97 | 58 |
| 0.38 J | 0.86 J | -0.48 | 97 | 59 |
| ND<100 U | 0.86 J | 99.14 | 98 | 59 |
| ND<0.1 U | 0.86 J | -0.76 | 98 | 60 |
| 12 | 0.86 J | 11.14 | 99 | 60 |
| | | | | |
| ND<1.5 U | 0.77 J | 0.73 | 100 | 60 |
| 0.88 J | 0.77 J | 0.11 | 101 | 60 |
| 1.8 J | 0.77 J | 1.03 | 102 | 60 |
| ND<1.5 U | 0.77 J | 0.73 | 103 | 60 |
| 6.2 | 0.77 J | 5.43 | 104 | 60 |
| 14.1 | 0.77 J | 13.33 | 105 | 60 |
| 0.92 J1c | 0.77 J | 0.15 | 106 | 60 |
| 0.34 J1c | 0.77 J | -0.43 | 106 | 61 |
| ND<1.5 U2c | 0.77 J | 0.73 | 107 | 61 |
| ND<1.5 U | 0.77 J | 0.73 | 108 | 61 |
| ND<1.5 U | 0.77 J | 0.73 | 109 | 61 |
| ND<1.5 U | 0.77 J | 0.73 | 110 | 61 |
| 0.59 J | 0.77 J | -0.18 | 110 | 62 |
| ND<1.5 U | 0.77 J | 0.73 | 111 | 62 |
| 0.47 J | 0.77 J | -0.3 | 111 | 63 |
| 0.39 J | 0.77 J | -0.38 | 111 | 64 |
| 0.56 J | 0.77 J | -0.21 | 111 | 65 |
| 0.38 J | 0.77 J | -0.39 | 111 | 66 |
| ND<100 U | 0.77 J | 99.23 | 112 | 66 |
| ND<0.1 U | 0.77 J | -0.67 | 112 | 67 |
| 12 | 0.77 J | 11.23 | 113 | 67 |
| | | | | |
| 0.88 J | ND<1.5 U | -0.62 | 113 | 68 |
| 1.8 J | ND<1.5 U | 0.3 | 114 | 68 |
| ND<1.5 U | ND<1.5 U | 0 | 114 | 68 |
| 6.2 | ND<1.5 U | 4.7 | 115 | 68 |
| 14.1 | ND<1.5 U | 12.6 | 116 | 68 |
| 0.92 J1c | ND<1.5 U | -0.58 | 116 | 69 |
| 0.34 J1c | ND<1.5 U | -1.16 | 116 | 70 |
| ND<1.5 U2c | ND<1.5 U | 0 | 116 | 70 |
| ND<1.5 U | ND<1.5 U | 0 | 116 | 70 |
| ND<1.5 U | ND<1.5 U | 0 | 116 | 70 |
| ND<1.5 U | ND<1.5 U | 0 | 116 | 70 |
| 0.59 J | ND<1.5 U | -0.91 | 116 | 71 |
| ND<1.5 U | ND<1.5 U | 0 | 116 | 71 |
| 0.47 J | ND<1.5 U | -1.03 | 116 | 72 |

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|---|---|---|---|---|
| 0.39 J | ND<1.5 U | -1.11 | 116 | 73 |
| 0.56 J | ND<1.5 U | -0.94 | 116 | 74 |
| 0.38 J | ND<1.5 U | -1.12 | 116 | 75 |
| ND<100 U | ND<1.5 U | 98.5 | 117 | 75 |
| ND<0.1 U | ND<1.5 U | -1.4 | 117 | 76 |
| 12 | ND<1.5 U | 10.5 | 118 | 76 |
| | | | | |
| 1.8 J | 0.88 J | 0.92 | 119 | 76 |
| ND<1.5 U | 0.88 J | 0.62 | 120 | 76 |
| 6.2 | 0.88 J | 5.32 | 121 | 76 |
| 14.1 | 0.88 J | 13.22 | 122 | 76 |
| 0.92 J1c | 0.88 J | 0.04 | 123 | 76 |
| 0.34 J1c | 0.88 J | -0.54 | 123 | 77 |
| ND<1.5 U2c | 0.88 J | 0.62 | 124 | 77 |
| ND<1.5 U | 0.88 J | 0.62 | 125 | 77 |
| ND<1.5 U | 0.88 J | 0.62 | 126 | 77 |
| ND<1.5 U | 0.88 J | 0.62 | 127 | 77 |
| 0.59 J | 0.88 J | -0.29 | 127 | 78 |
| ND<1.5 U | 0.88 J | 0.62 | 128 | 78 |
| 0.47 J | 0.88 J | -0.41 | 128 | 79 |
| 0.39 J | 0.88 J | -0.49 | 128 | 80 |
| 0.56 J | 0.88 J | -0.32 | 128 | 81 |
| 0.38 J | 0.88 J | -0.5 | 128 | 82 |
| ND<100 U | 0.88 J | 99.12 | 129 | 82 |
| ND<0.1 U | 0.88 J | -0.78 | 129 | 83 |
| 12 | 0.88 J | 11.12 | 130 | 83 |
| | | | | |
| ND<1.5 U | 1.8 J | -0.3 | 130 | 84 |
| 6.2 | 1.8 J | 4.4 | 131 | 84 |
| 14.1 | 1.8 J | 12.3 | 132 | 84 |
| 0.92 J1c | 1.8 J | -0.88 | 132 | 85 |
| 0.34 J1c | 1.8 J | -1.46 | 132 | 86 |
| ND<1.5 U2c | 1.8 J | -0.3 | 132 | 87 |
| ND<1.5 U | 1.8 J | -0.3 | 132 | 88 |
| ND<1.5 U | 1.8 J | -0.3 | 132 | 89 |
| ND<1.5 U | 1.8 J | -0.3 | 132 | 90 |
| 0.59 J | 1.8 J | -1.21 | 132 | 91 |
| ND<1.5 U | 1.8 J | -0.3 | 132 | 92 |
| 0.47 J | 1.8 J | -1.33 | 132 | 93 |
| 0.39 J | 1.8 J | -1.41 | 132 | 94 |
| 0.56 J | 1.8 J | -1.24 | 132 | 95 |
| 0.38 J | 1.8 J | -1.42 | 132 | 96 |
| ND<100 U | 1.8 J | 98.2 | 133 | 96 |
| ND<0.1 U | 1.8 J | -1.7 | 133 | 97 |
| 12 | 1.8 J | 10.2 | 134 | 97 |
| | | | | |
| 6.2 | ND<1.5 U | 4.7 | 135 | 97 |
| 14.1 | ND<1.5 U | 12.6 | 136 | 97 |
| 0.92 J1c | ND<1.5 U | -0.58 | 136 | 98 |
| 0.34 J1c | ND<1.5 U | -1.16 | 136 | 99 |
| ND<1.5 U2c | ND<1.5 U | 0 | 136 | 99 |
| ND<1.5 U | ND<1.5 U | 0 | 136 | 99 |
| ND<1.5 U | ND<1.5 U | 0 | 136 | 99 |
| ND<1.5 U | ND<1.5 U | 0 | 136 | 99 |
| 0.59 J | ND<1.5 U | -0.91 | 136 | 100 |
| ND<1.5 U | ND<1.5 U | 0 | 136 | 100 |
| 0.47 J | ND<1.5 U | -1.03 | 136 | 101 |

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|---|---|---|---|---|
| 0.39 J | ND<1.5 U | -1.11 | 136 | 102 |
| 0.56 J | ND<1.5 U | -0.94 | 136 | 103 |
| 0.38 J | ND<1.5 U | -1.12 | 136 | 104 |
| ND<100 U | ND<1.5 U | 98.5 | 137 | 104 |
| ND<0.1 U | ND<1.5 U | -1.4 | 137 | 105 |
| 12 | ND<1.5 U | 10.5 | 138 | 105 |
| | | | | |
| 14.1 | 6.2 | 7.9 | 139 | 105 |
| 0.92 J1c | 6.2 | -5.28 | 139 | 106 |
| 0.34 J1c | 6.2 | -5.86 | 139 | 107 |
| ND<1.5 U2c | 6.2 | -4.7 | 139 | 108 |
| ND<1.5 U | 6.2 | -4.7 | 139 | 109 |
| ND<1.5 U | 6.2 | -4.7 | 139 | 110 |
| ND<1.5 U | 6.2 | -4.7 | 139 | 111 |
| 0.59 J | 6.2 | -5.61 | 139 | 112 |
| ND<1.5 U | 6.2 | -4.7 | 139 | 113 |
| 0.47 J | 6.2 | -5.73 | 139 | 114 |
| 0.39 J | 6.2 | -5.81 | 139 | 115 |
| 0.56 J | 6.2 | -5.64 | 139 | 116 |
| 0.38 J | 6.2 | -5.82 | 139 | 117 |
| ND<100 U | 6.2 | 93.8 | 140 | 117 |
| ND<0.1 U | 6.2 | -6.1 | 140 | 118 |
| 12 | 6.2 | 5.8 | 141 | 118 |
| | | | | |
| 0.92 J1c | 14.1 | -13.18 | 141 | 119 |
| 0.34 J1c | 14.1 | -13.76 | 141 | 120 |
| ND<1.5 U2c | 14.1 | -12.6 | 141 | 121 |
| ND<1.5 U | 14.1 | -12.6 | 141 | 122 |
| ND<1.5 U | 14.1 | -12.6 | 141 | 123 |
| ND<1.5 U | 14.1 | -12.6 | 141 | 124 |
| 0.59 J | 14.1 | -13.51 | 141 | 125 |
| ND<1.5 U | 14.1 | -12.6 | 141 | 126 |
| 0.47 J | 14.1 | -13.63 | 141 | 127 |
| 0.39 J | 14.1 | -13.71 | 141 | 128 |
| 0.56 J | 14.1 | -13.54 | 141 | 129 |
| 0.38 J | 14.1 | -13.72 | 141 | 130 |
| ND<100 U | 14.1 | 85.9 | 142 | 130 |
| ND<0.1 U | 14.1 | -14 | 142 | 131 |
| 12 | 14.1 | -2.1 | 142 | 132 |
| | | | | |
| 0.34 J1c | 0.92 J1c | -0.58 | 142 | 133 |
| ND<1.5 U2c | 0.92 J1c | 0.58 | 143 | 133 |
| ND<1.5 U | 0.92 J1c | 0.58 | 144 | 133 |
| ND<1.5 U | 0.92 J1c | 0.58 | 145 | 133 |
| ND<1.5 U | 0.92 J1c | 0.58 | 146 | 133 |
| 0.59 J | 0.92 J1c | -0.33 | 146 | 134 |
| ND<1.5 U | 0.92 J1c | 0.58 | 147 | 134 |
| 0.47 J | 0.92 J1c | -0.45 | 147 | 135 |
| 0.39 J | 0.92 J1c | -0.53 | 147 | 136 |
| 0.56 J | 0.92 J1c | -0.36 | 147 | 137 |
| 0.38 J | 0.92 J1c | -0.54 | 147 | 138 |
| ND<100 U | 0.92 J1c | 99.08 | 148 | 138 |
| ND<0.1 U | 0.92 J1c | -0.82 | 148 | 139 |
| 12 | 0.92 J1c | 11.08 | 149 | 139 |
| | | | | |
| ND<1.5 U2c | 0.34 J1c | Same Date | 149 | 139 |
| ND<1.5 U | 0.34 J1c | 1.16 | 150 | 139 |

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|---|---|---|---|---|
| ND<1.5 U | 0.34 J1c | 1.16 | 151 | 139 |
| ND<1.5 U | 0.34 J1c | 1.16 | 152 | 139 |
| 0.59 J | 0.34 J1c | 0.25 | 153 | 139 |
| ND<1.5 U | 0.34 J1c | 1.16 | 154 | 139 |
| 0.47 J | 0.34 J1c | 0.13 | 155 | 139 |
| 0.39 J | 0.34 J1c | 0.05 | 156 | 139 |
| 0.56 J | 0.34 J1c | 0.22 | 157 | 139 |
| 0.38 J | 0.34 J1c | 0.04 | 158 | 139 |
| ND<100 U | 0.34 J1c | 99.66 | 159 | 139 |
| ND<0.1 U | 0.34 J1c | -0.24 | 159 | 140 |
| 12 | 0.34 J1c | 11.66 | 160 | 140 |
| | | | | |
| ND<1.5 U | ND<1.5 U2c | 0 | 160 | 140 |
| ND<1.5 U | ND<1.5 U2c | 0 | 160 | 140 |
| ND<1.5 U | ND<1.5 U2c | 0 | 160 | 140 |
| 0.59 J | ND<1.5 U2c | -0.91 | 160 | 141 |
| ND<1.5 U | ND<1.5 U2c | 0 | 160 | 141 |
| 0.47 J | ND<1.5 U2c | -1.03 | 160 | 142 |
| 0.39 J | ND<1.5 U2c | -1.11 | 160 | 143 |
| 0.56 J | ND<1.5 U2c | -0.94 | 160 | 144 |
| 0.38 J | ND<1.5 U2c | -1.12 | 160 | 145 |
| ND<100 U | ND<1.5 U2c | 98.5 | 161 | 145 |
| ND<0.1 U | ND<1.5 U2c | -1.4 | 161 | 146 |
| 12 | ND<1.5 U2c | 10.5 | 162 | 146 |
| | | | | |
| ND<1.5 U | ND<1.5 U | Same Date | 162 | 146 |
| ND<1.5 U | ND<1.5 U | 0 | 162 | 146 |
| 0.59 J | ND<1.5 U | -0.91 | 162 | 147 |
| ND<1.5 U | ND<1.5 U | 0 | 162 | 147 |
| 0.47 J | ND<1.5 U | -1.03 | 162 | 148 |
| 0.39 J | ND<1.5 U | -1.11 | 162 | 149 |
| 0.56 J | ND<1.5 U | -0.94 | 162 | 150 |
| 0.38 J | ND<1.5 U | -1.12 | 162 | 151 |
| ND<100 U | ND<1.5 U | 98.5 | 163 | 151 |
| ND<0.1 U | ND<1.5 U | -1.4 | 163 | 152 |
| 12 | ND<1.5 U | 10.5 | 164 | 152 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 164 | 152 |
| 0.59 J | ND<1.5 U | -0.91 | 164 | 153 |
| ND<1.5 U | ND<1.5 U | 0 | 164 | 153 |
| 0.47 J | ND<1.5 U | -1.03 | 164 | 154 |
| 0.39 J | ND<1.5 U | -1.11 | 164 | 155 |
| 0.56 J | ND<1.5 U | -0.94 | 164 | 156 |
| 0.38 J | ND<1.5 U | -1.12 | 164 | 157 |
| ND<100 U | ND<1.5 U | 98.5 | 165 | 157 |
| ND<0.1 U | ND<1.5 U | -1.4 | 165 | 158 |
| 12 | ND<1.5 U | 10.5 | 166 | 158 |
| | | | | |
| 0.59 J | ND<1.5 U | -0.91 | 166 | 159 |
| ND<1.5 U | ND<1.5 U | 0 | 166 | 159 |
| 0.47 J | ND<1.5 U | -1.03 | 166 | 160 |
| 0.39 J | ND<1.5 U | -1.11 | 166 | 161 |
| 0.56 J | ND<1.5 U | -0.94 | 166 | 162 |
| 0.38 J | ND<1.5 U | -1.12 | 166 | 163 |
| ND<100 U | ND<1.5 U | 98.5 | 167 | 163 |
| ND<0.1 U | ND<1.5 U | -1.4 | 167 | 164 |
| 12 | ND<1.5 U | 10.5 | 168 | 164 |

| | | | | |
|---|---|---|---|---|
| ND<1.5 U | 0.59 J | 0.91 | 169 | 164 |
| 0.47 J | 0.59 J | -0.12 | 169 | 165 |
| 0.39 J | 0.59 J | -0.2 | 169 | 166 |
| 0.56 J | 0.59 J | -0.03 | 169 | 167 |
| 0.38 J | 0.59 J | -0.21 | 169 | 168 |
| ND<100 U | 0.59 J | 99.41 | 170 | 168 |
| ND<0.1 U | 0.59 J | -0.49 | 170 | 169 |
| 12 | 0.59 J | 11.41 | 171 | 169 |
| | | | | |
| 0.47 J | ND<1.5 U | -1.03 | 171 | 170 |
| 0.39 J | ND<1.5 U | -1.11 | 171 | 171 |
| 0.56 J | ND<1.5 U | -0.94 | 171 | 172 |
| 0.38 J | ND<1.5 U | -1.12 | 171 | 173 |
| ND<100 U | ND<1.5 U | 98.5 | 172 | 173 |
| ND<0.1 U | ND<1.5 U | -1.4 | 172 | 174 |
| 12 | ND<1.5 U | 10.5 | 173 | 174 |
| | | | | |
| 0.39 J | 0.47 J | -0.08 | 173 | 175 |
| 0.56 J | 0.47 J | 0.09 | 174 | 175 |
| 0.38 J | 0.47 J | -0.09 | 174 | 176 |
| ND<100 U | 0.47 J | 99.53 | 175 | 176 |
| ND<0.1 U | 0.47 J | -0.37 | 175 | 177 |
| 12 | 0.47 J | 11.53 | 176 | 177 |
| | | | | |
| 0.56 J | 0.39 J | 0.17 | 177 | 177 |
| 0.38 J | 0.39 J | -0.01 | 177 | 178 |
| ND<100 U | 0.39 J | 99.61 | 178 | 178 |
| ND<0.1 U | 0.39 J | -0.29 | 178 | 179 |
| 12 | 0.39 J | 11.61 | 179 | 179 |
| | | | | |
| 0.38 J | 0.56 J | -0.18 | 179 | 180 |
| ND<100 U | 0.56 J | 99.44 | 180 | 180 |
| ND<0.1 U | 0.56 J | -0.46 | 180 | 181 |
| 12 | 0.56 J | 11.44 | 181 | 181 |
| | | | | |
| ND<100 U | 0.38 J | 99.62 | 182 | 181 |
| ND<0.1 U | 0.38 J | -0.28 | 182 | 182 |
| 12 | 0.38 J | 11.62 | 183 | 182 |
| | | | | |
| ND<0.1 U | ND<100 U | -99.9 | 183 | 183 |
| 12 | ND<100 U | -88 | 183 | 184 |
| | | | | |
| 12 | ND<0.1 U | 11.9 | 184 | 184 |

S Statistic = 184 - 184 = 0

| Tied Group | Value | Members |
|---|---|---|
| 1 | 0.39 | 2 |
| 2 | 1.5 | 9 |

| Time Period | Observations |
|---|---|
| 2/1/2017 | 1 |
| 3/1/2017 | 1 |
| 4/1/2017 | 1 |
| 5/1/2017 | 1 |

| | |
|---|---|
| 6/1/2017 | 1 |
| 7/1/2017 | 1 |
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 3/1/2022 | 1 |
| 3/1/2023 | 1 |
| 3/1/2024 | 1 |

There are 2 time periods with multiple data

---

A = 1674
B = 36
C = 504
D = 0
E = 74
F = 4
a = 51156
b = 197316
c = 1624
Group Variance = 2747.18
Z-Score = 0
Comparison Level at 95% confidence level = -1.65463 (downward trend)
0 >= -1.65463 indicating no evidence of a downward trend

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RW09-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 4 | 3.1 | 0.9 | 1 | 0 |
| 5 | 3.1 | 1.9 | 2 | 0 |
| 11.1 | 3.1 | 8 | 3 | 0 |
| 8.1 | 3.1 | 5 | 4 | 0 |
| 12.9 | 3.1 | 9.8 | 5 | 0 |
| 18.5 | 3.1 | 15.4 | 6 | 0 |
| 9.1 | 3.1 | 6 | 7 | 0 |
| 12 | 3.1 | 8.9 | 8 | 0 |
| 8.8 | 3.1 | 5.7 | 9 | 0 |
| 7.7 | 3.1 | 4.6 | 10 | 0 |
| 2.1 J | 3.1 | -1 | 10 | 1 |
| 1.8 J | 3.1 | -1.3 | 10 | 2 |
| ND<1.5 U | 3.1 | -1.6 | 10 | 3 |
| 3.7 | 3.1 | 0.6 | 11 | 3 |
| 2 J2c | 3.1 | -1.1 | 11 | 4 |
| 5.3 1c | 3.1 | 2.2 | 12 | 4 |
| 3.8 | 3.1 | 0.7 | 13 | 4 |
| 4.7 | 3.1 | 1.6 | 14 | 4 |
| 5.6 1c | 3.1 | 2.5 | 15 | 4 |
| 4.2 B | 3.1 | 1.1 | 16 | 4 |
| 10.6 | 3.1 | 7.5 | 17 | 4 |
| 16.5 1c | 3.1 | 13.4 | 18 | 4 |
| 10.7 | 3.1 | 7.6 | 19 | 4 |
| 10.3 | 3.1 | 7.2 | 20 | 4 |
| 16 | 3.1 | 12.9 | 21 | 4 |
| ND<1 U | 3.1 | -2.1 | 21 | 5 |
| 11.5 | 3.1 | 8.4 | 22 | 5 |
| 6.329 | 3.1 | 3.229 | 23 | 5 |
| | | | | |
| 5 | 4 | 1 | 24 | 5 |
| 11.1 | 4 | 7.1 | 25 | 5 |
| 8.1 | 4 | 4.1 | 26 | 5 |
| 12.9 | 4 | 8.9 | 27 | 5 |
| 18.5 | 4 | 14.5 | 28 | 5 |
| 9.1 | 4 | 5.1 | 29 | 5 |
| 12 | 4 | 8 | 30 | 5 |
| 8.8 | 4 | 4.8 | 31 | 5 |
| 7.7 | 4 | 3.7 | 32 | 5 |
| 2.1 J | 4 | -1.9 | 32 | 6 |
| 1.8 J | 4 | -2.2 | 32 | 7 |
| ND<1.5 U | 4 | -2.5 | 32 | 8 |
| 3.7 | 4 | -0.3 | 32 | 9 |
| 2 J2c | 4 | -2 | 32 | 10 |
| 5.3 1c | 4 | 1.3 | 33 | 10 |
| 3.8 | 4 | -0.2 | 33 | 11 |
| 4.7 | 4 | 0.7 | 34 | 11 |
| 5.6 1c | 4 | 1.6 | 35 | 11 |

| | | | | |
|---|---|---|---|---|
| 4.2 B | 4 | 0.2 | 36 | 11 |
| 10.6 | 4 | 6.6 | 37 | 11 |
| 16.5 1c | 4 | 12.5 | 38 | 11 |
| 10.7 | 4 | 6.7 | 39 | 11 |
| 10.3 | 4 | 6.3 | 40 | 11 |
| 16 | 4 | 12 | 41 | 11 |
| ND<1 U | 4 | -3 | 41 | 12 |
| 11.5 | 4 | 7.5 | 42 | 12 |
| 6.329 | 4 | 2.329 | 43 | 12 |
| | | | | |
| 11.1 | 5 | 6.1 | 44 | 12 |
| 8.1 | 5 | 3.1 | 45 | 12 |
| 12.9 | 5 | 7.9 | 46 | 12 |
| 18.5 | 5 | 13.5 | 47 | 12 |
| 9.1 | 5 | 4.1 | 48 | 12 |
| 12 | 5 | 7 | 49 | 12 |
| 8.8 | 5 | 3.8 | 50 | 12 |
| 7.7 | 5 | 2.7 | 51 | 12 |
| 2.1 J | 5 | -2.9 | 51 | 13 |
| 1.8 J | 5 | -3.2 | 51 | 14 |
| ND<1.5 U | 5 | -3.5 | 51 | 15 |
| 3.7 | 5 | -1.3 | 51 | 16 |
| 2 J2c | 5 | -3 | 51 | 17 |
| 5.3 1c | 5 | 0.3 | 52 | 17 |
| 3.8 | 5 | -1.2 | 52 | 18 |
| 4.7 | 5 | -0.3 | 52 | 19 |
| 5.6 1c | 5 | 0.6 | 53 | 19 |
| 4.2 B | 5 | -0.8 | 53 | 20 |
| 10.6 | 5 | 5.6 | 54 | 20 |
| 16.5 1c | 5 | 11.5 | 55 | 20 |
| 10.7 | 5 | 5.7 | 56 | 20 |
| 10.3 | 5 | 5.3 | 57 | 20 |
| 16 | 5 | 11 | 58 | 20 |
| ND<1 U | 5 | -4 | 58 | 21 |
| 11.5 | 5 | 6.5 | 59 | 21 |
| 6.329 | 5 | 1.329 | 60 | 21 |
| | | | | |
| 8.1 | 11.1 | -3 | 60 | 22 |
| 12.9 | 11.1 | 1.8 | 61 | 22 |
| 18.5 | 11.1 | 7.4 | 62 | 22 |
| 9.1 | 11.1 | -2 | 62 | 23 |
| 12 | 11.1 | 0.9 | 63 | 23 |
| 8.8 | 11.1 | -2.3 | 63 | 24 |
| 7.7 | 11.1 | -3.4 | 63 | 25 |
| 2.1 J | 11.1 | -9 | 63 | 26 |
| 1.8 J | 11.1 | -9.3 | 63 | 27 |
| ND<1.5 U | 11.1 | -9.6 | 63 | 28 |
| 3.7 | 11.1 | -7.4 | 63 | 29 |
| 2 J2c | 11.1 | -9.1 | 63 | 30 |
| 5.3 1c | 11.1 | -5.8 | 63 | 31 |
| 3.8 | 11.1 | -7.3 | 63 | 32 |
| 4.7 | 11.1 | -6.4 | 63 | 33 |
| 5.6 1c | 11.1 | -5.5 | 63 | 34 |
| 4.2 B | 11.1 | -6.9 | 63 | 35 |
| 10.6 | 11.1 | -0.5 | 63 | 36 |
| 16.5 1c | 11.1 | 5.4 | 64 | 36 |
| 10.7 | 11.1 | -0.4 | 64 | 37 |

| | | | | |
|---|---|---|---|---|
| 10.3 | 11.1 | -0.8 | 64 | 38 |
| 16 | 11.1 | 4.9 | 65 | 38 |
| ND<1 U | 11.1 | -10.1 | 65 | 39 |
| 11.5 | 11.1 | 0.4 | 66 | 39 |
| 6.329 | 11.1 | -4.771 | 66 | 40 |
| | | | | |
| 12.9 | 8.1 | 4.8 | 67 | 40 |
| 18.5 | 8.1 | 10.4 | 68 | 40 |
| 9.1 | 8.1 | 1 | 69 | 40 |
| 12 | 8.1 | 3.9 | 70 | 40 |
| 8.8 | 8.1 | 0.7 | 71 | 40 |
| 7.7 | 8.1 | -0.4 | 71 | 41 |
| 2.1 J | 8.1 | -6 | 71 | 42 |
| 1.8 J | 8.1 | -6.3 | 71 | 43 |
| ND<1.5 U | 8.1 | -6.6 | 71 | 44 |
| 3.7 | 8.1 | -4.4 | 71 | 45 |
| 2 J2c | 8.1 | -6.1 | 71 | 46 |
| 5.3 1c | 8.1 | -2.8 | 71 | 47 |
| 3.8 | 8.1 | -4.3 | 71 | 48 |
| 4.7 | 8.1 | -3.4 | 71 | 49 |
| 5.6 1c | 8.1 | -2.5 | 71 | 50 |
| 4.2 B | 8.1 | -3.9 | 71 | 51 |
| 10.6 | 8.1 | 2.5 | 72 | 51 |
| 16.5 1c | 8.1 | 8.4 | 73 | 51 |
| 10.7 | 8.1 | 2.6 | 74 | 51 |
| 10.3 | 8.1 | 2.2 | 75 | 51 |
| 16 | 8.1 | 7.9 | 76 | 51 |
| ND<1 U | 8.1 | -7.1 | 76 | 52 |
| 11.5 | 8.1 | 3.4 | 77 | 52 |
| 6.329 | 8.1 | -1.771 | 77 | 53 |
| | | | | |
| 18.5 | 12.9 | 5.6 | 78 | 53 |
| 9.1 | 12.9 | -3.8 | 78 | 54 |
| 12 | 12.9 | -0.9 | 78 | 55 |
| 8.8 | 12.9 | -4.1 | 78 | 56 |
| 7.7 | 12.9 | -5.2 | 78 | 57 |
| 2.1 J | 12.9 | -10.8 | 78 | 58 |
| 1.8 J | 12.9 | -11.1 | 78 | 59 |
| ND<1.5 U | 12.9 | -11.4 | 78 | 60 |
| 3.7 | 12.9 | -9.2 | 78 | 61 |
| 2 J2c | 12.9 | -10.9 | 78 | 62 |
| 5.3 1c | 12.9 | -7.6 | 78 | 63 |
| 3.8 | 12.9 | -9.1 | 78 | 64 |
| 4.7 | 12.9 | -8.2 | 78 | 65 |
| 5.6 1c | 12.9 | -7.3 | 78 | 66 |
| 4.2 B | 12.9 | -8.7 | 78 | 67 |
| 10.6 | 12.9 | -2.3 | 78 | 68 |
| 16.5 1c | 12.9 | 3.6 | 79 | 68 |
| 10.7 | 12.9 | -2.2 | 79 | 69 |
| 10.3 | 12.9 | -2.6 | 79 | 70 |
| 16 | 12.9 | 3.1 | 80 | 70 |
| ND<1 U | 12.9 | -11.9 | 80 | 71 |
| 11.5 | 12.9 | -1.4 | 80 | 72 |
| 6.329 | 12.9 | -6.571 | 80 | 73 |
| | | | | |
| 9.1 | 18.5 | -9.4 | 80 | 74 |
| 12 | 18.5 | -6.5 | 80 | 75 |

| | | | | |
|---|---|---|---|---|
| 8.8 | 18.5 | -9.7 | 80 | 76 |
| 7.7 | 18.5 | -10.8 | 80 | 77 |
| 2.1 J | 18.5 | -16.4 | 80 | 78 |
| 1.8 J | 18.5 | -16.7 | 80 | 79 |
| ND<1.5 U | 18.5 | -17 | 80 | 80 |
| 3.7 | 18.5 | -14.8 | 80 | 81 |
| 2 J2c | 18.5 | -16.5 | 80 | 82 |
| 5.3 1c | 18.5 | -13.2 | 80 | 83 |
| 3.8 | 18.5 | -14.7 | 80 | 84 |
| 4.7 | 18.5 | -13.8 | 80 | 85 |
| 5.6 1c | 18.5 | -12.9 | 80 | 86 |
| 4.2 B | 18.5 | -14.3 | 80 | 87 |
| 10.6 | 18.5 | -7.9 | 80 | 88 |
| 16.5 1c | 18.5 | -2 | 80 | 89 |
| 10.7 | 18.5 | -7.8 | 80 | 90 |
| 10.3 | 18.5 | -8.2 | 80 | 91 |
| 16 | 18.5 | -2.5 | 80 | 92 |
| ND<1 U | 18.5 | -17.5 | 80 | 93 |
| 11.5 | 18.5 | -7 | 80 | 94 |
| 6.329 | 18.5 | -12.171 | 80 | 95 |
| | | | | |
| 12 | 9.1 | 2.9 | 81 | 95 |
| 8.8 | 9.1 | -0.3 | 81 | 96 |
| 7.7 | 9.1 | -1.4 | 81 | 97 |
| 2.1 J | 9.1 | -7 | 81 | 98 |
| 1.8 J | 9.1 | -7.3 | 81 | 99 |
| ND<1.5 U | 9.1 | -7.6 | 81 | 100 |
| 3.7 | 9.1 | -5.4 | 81 | 101 |
| 2 J2c | 9.1 | -7.1 | 81 | 102 |
| 5.3 1c | 9.1 | -3.8 | 81 | 103 |
| 3.8 | 9.1 | -5.3 | 81 | 104 |
| 4.7 | 9.1 | -4.4 | 81 | 105 |
| 5.6 1c | 9.1 | -3.5 | 81 | 106 |
| 4.2 B | 9.1 | -4.9 | 81 | 107 |
| 10.6 | 9.1 | 1.5 | 82 | 107 |
| 16.5 1c | 9.1 | 7.4 | 83 | 107 |
| 10.7 | 9.1 | 1.6 | 84 | 107 |
| 10.3 | 9.1 | 1.2 | 85 | 107 |
| 16 | 9.1 | 6.9 | 86 | 107 |
| ND<1 U | 9.1 | -8.1 | 86 | 108 |
| 11.5 | 9.1 | 2.4 | 87 | 108 |
| 6.329 | 9.1 | -2.771 | 87 | 109 |
| | | | | |
| 8.8 | 12 | -3.2 | 87 | 110 |
| 7.7 | 12 | -4.3 | 87 | 111 |
| 2.1 J | 12 | -9.9 | 87 | 112 |
| 1.8 J | 12 | -10.2 | 87 | 113 |
| ND<1.5 U | 12 | -10.5 | 87 | 114 |
| 3.7 | 12 | -8.3 | 87 | 115 |
| 2 J2c | 12 | -10 | 87 | 116 |
| 5.3 1c | 12 | -6.7 | 87 | 117 |
| 3.8 | 12 | -8.2 | 87 | 118 |
| 4.7 | 12 | -7.3 | 87 | 119 |
| 5.6 1c | 12 | -6.4 | 87 | 120 |
| 4.2 B | 12 | -7.8 | 87 | 121 |
| 10.6 | 12 | -1.4 | 87 | 122 |
| 16.5 1c | 12 | 4.5 | 88 | 122 |

| | | | | |
|---|---|---|---|---|
| 10.7 | 12 | -1.3 | 88 | 123 |
| 10.3 | 12 | -1.7 | 88 | 124 |
| 16 | 12 | 4 | 89 | 124 |
| ND<1 U | 12 | -11 | 89 | 125 |
| 11.5 | 12 | -0.5 | 89 | 126 |
| 6.329 | 12 | -5.671 | 89 | 127 |
| | | | | |
| 7.7 | 8.8 | -1.1 | 89 | 128 |
| 2.1 J | 8.8 | -6.7 | 89 | 129 |
| 1.8 J | 8.8 | -7 | 89 | 130 |
| ND<1.5 U | 8.8 | -7.3 | 89 | 131 |
| 3.7 | 8.8 | -5.1 | 89 | 132 |
| 2 J2c | 8.8 | -6.8 | 89 | 133 |
| 5.3 1c | 8.8 | -3.5 | 89 | 134 |
| 3.8 | 8.8 | -5 | 89 | 135 |
| 4.7 | 8.8 | -4.1 | 89 | 136 |
| 5.6 1c | 8.8 | -3.2 | 89 | 137 |
| 4.2 B | 8.8 | -4.6 | 89 | 138 |
| 10.6 | 8.8 | 1.8 | 90 | 138 |
| 16.5 1c | 8.8 | 7.7 | 91 | 138 |
| 10.7 | 8.8 | 1.9 | 92 | 138 |
| 10.3 | 8.8 | 1.5 | 93 | 138 |
| 16 | 8.8 | 7.2 | 94 | 138 |
| ND<1 U | 8.8 | -7.8 | 94 | 139 |
| 11.5 | 8.8 | 2.7 | 95 | 139 |
| 6.329 | 8.8 | -2.471 | 95 | 140 |
| | | | | |
| 2.1 J | 7.7 | -5.6 | 95 | 141 |
| 1.8 J | 7.7 | -5.9 | 95 | 142 |
| ND<1.5 U | 7.7 | -6.2 | 95 | 143 |
| 3.7 | 7.7 | -4 | 95 | 144 |
| 2 J2c | 7.7 | -5.7 | 95 | 145 |
| 5.3 1c | 7.7 | -2.4 | 95 | 146 |
| 3.8 | 7.7 | -3.9 | 95 | 147 |
| 4.7 | 7.7 | -3 | 95 | 148 |
| 5.6 1c | 7.7 | -2.1 | 95 | 149 |
| 4.2 B | 7.7 | -3.5 | 95 | 150 |
| 10.6 | 7.7 | 2.9 | 96 | 150 |
| 16.5 1c | 7.7 | 8.8 | 97 | 150 |
| 10.7 | 7.7 | 3 | 98 | 150 |
| 10.3 | 7.7 | 2.6 | 99 | 150 |
| 16 | 7.7 | 8.3 | 100 | 150 |
| ND<1 U | 7.7 | -6.7 | 100 | 151 |
| 11.5 | 7.7 | 3.8 | 101 | 151 |
| 6.329 | 7.7 | -1.371 | 101 | 152 |
| | | | | |
| 1.8 J | 2.1 J | -0.3 | 101 | 153 |
| ND<1.5 U | 2.1 J | -0.6 | 101 | 154 |
| 3.7 | 2.1 J | 1.6 | 102 | 154 |
| 2 J2c | 2.1 J | -0.1 | 102 | 155 |
| 5.3 1c | 2.1 J | 3.2 | 103 | 155 |
| 3.8 | 2.1 J | 1.7 | 104 | 155 |
| 4.7 | 2.1 J | 2.6 | 105 | 155 |
| 5.6 1c | 2.1 J | 3.5 | 106 | 155 |
| 4.2 B | 2.1 J | 2.1 | 107 | 155 |
| 10.6 | 2.1 J | 8.5 | 108 | 155 |
| 16.5 1c | 2.1 J | 14.4 | 109 | 155 |

| | | | | |
|---|---|---|---|---|
| 10.7 | 2.1 J | 8.6 | 110 | 155 |
| 10.3 | 2.1 J | 8.2 | 111 | 155 |
| 16 | 2.1 J | 13.9 | 112 | 155 |
| ND<1 U | 2.1 J | -1.1 | 112 | 156 |
| 11.5 | 2.1 J | 9.4 | 113 | 156 |
| 6.329 | 2.1 J | 4.229 | 114 | 156 |
| | | | | |
| ND<1.5 U | 1.8 J | -0.3 | 114 | 157 |
| 3.7 | 1.8 J | 1.9 | 115 | 157 |
| 2 J2c | 1.8 J | 0.2 | 116 | 157 |
| 5.3 1c | 1.8 J | 3.5 | 117 | 157 |
| 3.8 | 1.8 J | 2 | 118 | 157 |
| 4.7 | 1.8 J | 2.9 | 119 | 157 |
| 5.6 1c | 1.8 J | 3.8 | 120 | 157 |
| 4.2 B | 1.8 J | 2.4 | 121 | 157 |
| 10.6 | 1.8 J | 8.8 | 122 | 157 |
| 16.5 1c | 1.8 J | 14.7 | 123 | 157 |
| 10.7 | 1.8 J | 8.9 | 124 | 157 |
| 10.3 | 1.8 J | 8.5 | 125 | 157 |
| 16 | 1.8 J | 14.2 | 126 | 157 |
| ND<1 U | 1.8 J | -0.8 | 126 | 158 |
| 11.5 | 1.8 J | 9.7 | 127 | 158 |
| 6.329 | 1.8 J | 4.529 | 128 | 158 |
| | | | | |
| 3.7 | ND<1.5 U | 2.2 | 129 | 158 |
| 2 J2c | ND<1.5 U | 0.5 | 130 | 158 |
| 5.3 1c | ND<1.5 U | 3.8 | 131 | 158 |
| 3.8 | ND<1.5 U | 2.3 | 132 | 158 |
| 4.7 | ND<1.5 U | 3.2 | 133 | 158 |
| 5.6 1c | ND<1.5 U | 4.1 | 134 | 158 |
| 4.2 B | ND<1.5 U | 2.7 | 135 | 158 |
| 10.6 | ND<1.5 U | 9.1 | 136 | 158 |
| 16.5 1c | ND<1.5 U | 15 | 137 | 158 |
| 10.7 | ND<1.5 U | 9.2 | 138 | 158 |
| 10.3 | ND<1.5 U | 8.8 | 139 | 158 |
| 16 | ND<1.5 U | 14.5 | 140 | 158 |
| ND<1 U | ND<1.5 U | -0.5 | 140 | 159 |
| 11.5 | ND<1.5 U | 10 | 141 | 159 |
| 6.329 | ND<1.5 U | 4.829 | 142 | 159 |
| | | | | |
| 2 J2c | 3.7 | -1.7 | 142 | 160 |
| 5.3 1c | 3.7 | 1.6 | 143 | 160 |
| 3.8 | 3.7 | 0.1 | 144 | 160 |
| 4.7 | 3.7 | 1 | 145 | 160 |
| 5.6 1c | 3.7 | 1.9 | 146 | 160 |
| 4.2 B | 3.7 | 0.5 | 147 | 160 |
| 10.6 | 3.7 | 6.9 | 148 | 160 |
| 16.5 1c | 3.7 | 12.8 | 149 | 160 |
| 10.7 | 3.7 | 7 | 150 | 160 |
| 10.3 | 3.7 | 6.6 | 151 | 160 |
| 16 | 3.7 | 12.3 | 152 | 160 |
| ND<1 U | 3.7 | -2.7 | 152 | 161 |
| 11.5 | 3.7 | 7.8 | 153 | 161 |
| 6.329 | 3.7 | 2.629 | 154 | 161 |
| | | | | |
| 5.3 1c | 2 J2c | Same Date | 154 | 161 |
| 3.8 | 2 J2c | 1.8 | 155 | 161 |

| | | | | |
|---|---|---|---|---|
| 4.7 | 2 J2c | 2.7 | 156 | 161 |
| 5.6 1c | 2 J2c | 3.6 | 157 | 161 |
| 4.2 B | 2 J2c | 2.2 | 158 | 161 |
| 10.6 | 2 J2c | 8.6 | 159 | 161 |
| 16.5 1c | 2 J2c | 14.5 | 160 | 161 |
| 10.7 | 2 J2c | 8.7 | 161 | 161 |
| 10.3 | 2 J2c | 8.3 | 162 | 161 |
| 16 | 2 J2c | 14 | 163 | 161 |
| ND<1 U | 2 J2c | -1 | 163 | 162 |
| 11.5 | 2 J2c | 9.5 | 164 | 162 |
| 6.329 | 2 J2c | 4.329 | 165 | 162 |
| | | | | |
| 3.8 | 5.3 1c | -1.5 | 165 | 163 |
| 4.7 | 5.3 1c | -0.6 | 165 | 164 |
| 5.6 1c | 5.3 1c | 0.3 | 166 | 164 |
| 4.2 B | 5.3 1c | -1.1 | 166 | 165 |
| 10.6 | 5.3 1c | 5.3 | 167 | 165 |
| 16.5 1c | 5.3 1c | 11.2 | 168 | 165 |
| 10.7 | 5.3 1c | 5.4 | 169 | 165 |
| 10.3 | 5.3 1c | 5 | 170 | 165 |
| 16 | 5.3 1c | 10.7 | 171 | 165 |
| ND<1 U | 5.3 1c | -4.3 | 171 | 166 |
| 11.5 | 5.3 1c | 6.2 | 172 | 166 |
| 6.329 | 5.3 1c | 1.029 | 173 | 166 |
| | | | | |
| 4.7 | 3.8 | Same Date | 173 | 166 |
| 5.6 1c | 3.8 | 1.8 | 174 | 166 |
| 4.2 B | 3.8 | 0.4 | 175 | 166 |
| 10.6 | 3.8 | 6.8 | 176 | 166 |
| 16.5 1c | 3.8 | 12.7 | 177 | 166 |
| 10.7 | 3.8 | 6.9 | 178 | 166 |
| 10.3 | 3.8 | 6.5 | 179 | 166 |
| 16 | 3.8 | 12.2 | 180 | 166 |
| ND<1 U | 3.8 | -2.8 | 180 | 167 |
| 11.5 | 3.8 | 7.7 | 181 | 167 |
| 6.329 | 3.8 | 2.529 | 182 | 167 |
| | | | | |
| 5.6 1c | 4.7 | 0.9 | 183 | 167 |
| 4.2 B | 4.7 | -0.5 | 183 | 168 |
| 10.6 | 4.7 | 5.9 | 184 | 168 |
| 16.5 1c | 4.7 | 11.8 | 185 | 168 |
| 10.7 | 4.7 | 6 | 186 | 168 |
| 10.3 | 4.7 | 5.6 | 187 | 168 |
| 16 | 4.7 | 11.3 | 188 | 168 |
| ND<1 U | 4.7 | -3.7 | 188 | 169 |
| 11.5 | 4.7 | 6.8 | 189 | 169 |
| 6.329 | 4.7 | 1.629 | 190 | 169 |
| | | | | |
| 4.2 B | 5.6 1c | -1.4 | 190 | 170 |
| 10.6 | 5.6 1c | 5 | 191 | 170 |
| 16.5 1c | 5.6 1c | 10.9 | 192 | 170 |
| 10.7 | 5.6 1c | 5.1 | 193 | 170 |
| 10.3 | 5.6 1c | 4.7 | 194 | 170 |
| 16 | 5.6 1c | 10.4 | 195 | 170 |
| ND<1 U | 5.6 1c | -4.6 | 195 | 171 |
| 11.5 | 5.6 1c | 5.9 | 196 | 171 |
| 6.329 | 5.6 1c | 0.729 | 197 | 171 |

| | | | | |
|---|---|---|---|---|
| 10.6 | 4.2 B | 6.4 | 198 | 171 |
| 16.5 1c | 4.2 B | 12.3 | 199 | 171 |
| 10.7 | 4.2 B | 6.5 | 200 | 171 |
| 10.3 | 4.2 B | 6.1 | 201 | 171 |
| 16 | 4.2 B | 11.8 | 202 | 171 |
| ND<1 U | 4.2 B | -3.2 | 202 | 172 |
| 11.5 | 4.2 B | 7.3 | 203 | 172 |
| 6.329 | 4.2 B | 2.129 | 204 | 172 |
| | | | | |
| 16.5 1c | 10.6 | 5.9 | 205 | 172 |
| 10.7 | 10.6 | 0.1 | 206 | 172 |
| 10.3 | 10.6 | -0.3 | 206 | 173 |
| 16 | 10.6 | 5.4 | 207 | 173 |
| ND<1 U | 10.6 | -9.6 | 207 | 174 |
| 11.5 | 10.6 | 0.9 | 208 | 174 |
| 6.329 | 10.6 | -4.271 | 208 | 175 |
| | | | | |
| 10.7 | 16.5 1c | -5.8 | 208 | 176 |
| 10.3 | 16.5 1c | -6.2 | 208 | 177 |
| 16 | 16.5 1c | -0.5 | 208 | 178 |
| ND<1 U | 16.5 1c | -15.5 | 208 | 179 |
| 11.5 | 16.5 1c | -5 | 208 | 180 |
| 6.329 | 16.5 1c | -10.171 | 208 | 181 |
| | | | | |
| 10.3 | 10.7 | -0.4 | 208 | 182 |
| 16 | 10.7 | 5.3 | 209 | 182 |
| ND<1 U | 10.7 | -9.7 | 209 | 183 |
| 11.5 | 10.7 | 0.8 | 210 | 183 |
| 6.329 | 10.7 | -4.371 | 210 | 184 |
| | | | | |
| 16 | 10.3 | 5.7 | 211 | 184 |
| ND<1 U | 10.3 | -9.3 | 211 | 185 |
| 11.5 | 10.3 | 1.2 | 212 | 185 |
| 6.329 | 10.3 | -3.971 | 212 | 186 |
| | | | | |
| ND<1 U | 16 | -15 | 212 | 187 |
| 11.5 | 16 | -4.5 | 212 | 188 |
| 6.329 | 16 | -9.671 | 212 | 189 |
| | | | | |
| 11.5 | ND<1 U | 10.5 | 213 | 189 |
| 6.329 | ND<1 U | 5.329 | 214 | 189 |
| | | | | |
| 6.329 | 11.5 | -5.171 | 214 | 190 |

S Statistic = 214 - 190 = 24

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 2/1/2017 | 1 |
| 3/1/2017 | 1 |
| 4/1/2017 | 1 |
| 5/1/2017 | 1 |
| 6/1/2017 | 1 |
| 7/1/2017 | 1 |

| | |
|---|---|
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 3/1/2022 | 1 |
| 3/1/2023 | 1 |
| 3/1/2024 | 1 |

There are 2 time periods with multiple data

---

A = 0
B = 36
C = 0
D = 0
E = 0
F = 4
a = 51156
b = 197316
c = 1624
Group Variance = 2840
Z-Score = 0.431587
Comparison Level at 95% confidence level = -1.65463 (downward trend)
0.431587 >= -1.65463 indicating no evidence of a downward trend

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RW10-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 446 | 455 | Same Date | 0 | 0 |
| ND<1.5 U | 455 | -453.5 | 0 | 1 |
| 198 | 455 | -257 | 0 | 2 |
| 2.5 J | 455 | -452.5 | 0 | 3 |
| 27.2 | 455 | -427.8 | 0 | 4 |
| 16.3 | 455 | -438.7 | 0 | 5 |
| ND<1.5 U | 455 | -453.5 | 0 | 6 |
| 17.7 | 455 | -437.3 | 0 | 7 |
| 24.6 | 455 | -430.4 | 0 | 8 |
| 63.7 | 455 | -391.3 | 0 | 9 |
| ND<1.5 U | 455 | -453.5 | 0 | 10 |
| ND<1.5 U | 455 | -453.5 | 0 | 11 |
| 44.4 | 455 | -410.6 | 0 | 12 |
| 44.7 | 455 | -410.3 | 0 | 13 |
| 10.8 | 455 | -444.2 | 0 | 14 |
| 0.38 J | 455 | -454.62 | 0 | 15 |
| 1.3 J | 455 | -453.7 | 0 | 16 |
| 3 B | 455 | -452 | 0 | 17 |
| 0.86 J | 455 | -454.14 | 0 | 18 |
| 8.4 1c | 455 | -446.6 | 0 | 19 |
| 13.9 | 455 | -441.1 | 0 | 20 |
| 0.67 J1c | 455 | -454.33 | 0 | 21 |
| 0.77 J1c | 455 | -454.23 | 0 | 22 |
| 0.55 J | 455 | -454.45 | 0 | 23 |
| 11.1 | 455 | -443.9 | 0 | 24 |
| 13.3 | 455 | -441.7 | 0 | 25 |
| 1.106 | 455 | -453.894 | 0 | 26 |
| 0.3548 | 455 | -454.645 | 0 | 27 |
| | | | | |
| ND<1.5 U | 446 | -444.5 | 0 | 28 |
| 198 | 446 | -248 | 0 | 29 |
| 2.5 J | 446 | -443.5 | 0 | 30 |
| 27.2 | 446 | -418.8 | 0 | 31 |
| 16.3 | 446 | -429.7 | 0 | 32 |
| ND<1.5 U | 446 | -444.5 | 0 | 33 |
| 17.7 | 446 | -428.3 | 0 | 34 |
| 24.6 | 446 | -421.4 | 0 | 35 |
| 63.7 | 446 | -382.3 | 0 | 36 |
| ND<1.5 U | 446 | -444.5 | 0 | 37 |
| ND<1.5 U | 446 | -444.5 | 0 | 38 |
| 44.4 | 446 | -401.6 | 0 | 39 |
| 44.7 | 446 | -401.3 | 0 | 40 |
| 10.8 | 446 | -435.2 | 0 | 41 |
| 0.38 J | 446 | -445.62 | 0 | 42 |
| 1.3 J | 446 | -444.7 | 0 | 43 |
| 3 B | 446 | -443 | 0 | 44 |
| 0.86 J | 446 | -445.14 | 0 | 45 |

| | | | | |
|---|---|---|---|---|
| 8.4 1c | 446 | -437.6 | 0 | 46 |
| 13.9 | 446 | -432.1 | 0 | 47 |
| 0.67 J1c | 446 | -445.33 | 0 | 48 |
| 0.77 J1c | 446 | -445.23 | 0 | 49 |
| 0.55 J | 446 | -445.45 | 0 | 50 |
| 11.1 | 446 | -434.9 | 0 | 51 |
| 13.3 | 446 | -432.7 | 0 | 52 |
| 1.106 | 446 | -444.894 | 0 | 53 |
| 0.3548 | 446 | -445.645 | 0 | 54 |
| | | | | |
| 198 | ND<1.5 U | 196.5 | 1 | 54 |
| 2.5 J | ND<1.5 U | 1 | 2 | 54 |
| 27.2 | ND<1.5 U | 25.7 | 3 | 54 |
| 16.3 | ND<1.5 U | 14.8 | 4 | 54 |
| ND<1.5 U | ND<1.5 U | 0 | 4 | 54 |
| 17.7 | ND<1.5 U | 16.2 | 5 | 54 |
| 24.6 | ND<1.5 U | 23.1 | 6 | 54 |
| 63.7 | ND<1.5 U | 62.2 | 7 | 54 |
| ND<1.5 U | ND<1.5 U | 0 | 7 | 54 |
| ND<1.5 U | ND<1.5 U | 0 | 7 | 54 |
| 44.4 | ND<1.5 U | 42.9 | 8 | 54 |
| 44.7 | ND<1.5 U | 43.2 | 9 | 54 |
| 10.8 | ND<1.5 U | 9.3 | 10 | 54 |
| 0.38 J | ND<1.5 U | -1.12 | 10 | 55 |
| 1.3 J | ND<1.5 U | -0.2 | 10 | 56 |
| 3 B | ND<1.5 U | 1.5 | 11 | 56 |
| 0.86 J | ND<1.5 U | -0.64 | 11 | 57 |
| 8.4 1c | ND<1.5 U | 6.9 | 12 | 57 |
| 13.9 | ND<1.5 U | 12.4 | 13 | 57 |
| 0.67 J1c | ND<1.5 U | -0.83 | 13 | 58 |
| 0.77 J1c | ND<1.5 U | -0.73 | 13 | 59 |
| 0.55 J | ND<1.5 U | -0.95 | 13 | 60 |
| 11.1 | ND<1.5 U | 9.6 | 14 | 60 |
| 13.3 | ND<1.5 U | 11.8 | 15 | 60 |
| 1.106 | ND<1.5 U | -0.394 | 15 | 61 |
| 0.3548 | ND<1.5 U | -1.1452 | 15 | 62 |
| | | | | |
| 2.5 J | 198 | -195.5 | 15 | 63 |
| 27.2 | 198 | -170.8 | 15 | 64 |
| 16.3 | 198 | -181.7 | 15 | 65 |
| ND<1.5 U | 198 | -196.5 | 15 | 66 |
| 17.7 | 198 | -180.3 | 15 | 67 |
| 24.6 | 198 | -173.4 | 15 | 68 |
| 63.7 | 198 | -134.3 | 15 | 69 |
| ND<1.5 U | 198 | -196.5 | 15 | 70 |
| ND<1.5 U | 198 | -196.5 | 15 | 71 |
| 44.4 | 198 | -153.6 | 15 | 72 |
| 44.7 | 198 | -153.3 | 15 | 73 |
| 10.8 | 198 | -187.2 | 15 | 74 |
| 0.38 J | 198 | -197.62 | 15 | 75 |
| 1.3 J | 198 | -196.7 | 15 | 76 |
| 3 B | 198 | -195 | 15 | 77 |
| 0.86 J | 198 | -197.14 | 15 | 78 |
| 8.4 1c | 198 | -189.6 | 15 | 79 |
| 13.9 | 198 | -184.1 | 15 | 80 |
| 0.67 J1c | 198 | -197.33 | 15 | 81 |
| 0.77 J1c | 198 | -197.23 | 15 | 82 |

| | | | | |
|---|---|---|---|---|
| 0.55 J | 198 | -197.45 | 15 | 83 |
| 11.1 | 198 | -186.9 | 15 | 84 |
| 13.3 | 198 | -184.7 | 15 | 85 |
| 1.106 | 198 | -196.894 | 15 | 86 |
| 0.3548 | 198 | -197.645 | 15 | 87 |
| | | | | |
| 27.2 | 2.5 J | 24.7 | 16 | 87 |
| 16.3 | 2.5 J | 13.8 | 17 | 87 |
| ND<1.5 U | 2.5 J | -1 | 17 | 88 |
| 17.7 | 2.5 J | 15.2 | 18 | 88 |
| 24.6 | 2.5 J | 22.1 | 19 | 88 |
| 63.7 | 2.5 J | 61.2 | 20 | 88 |
| ND<1.5 U | 2.5 J | -1 | 20 | 89 |
| ND<1.5 U | 2.5 J | -1 | 20 | 90 |
| 44.4 | 2.5 J | 41.9 | 21 | 90 |
| 44.7 | 2.5 J | 42.2 | 22 | 90 |
| 10.8 | 2.5 J | 8.3 | 23 | 90 |
| 0.38 J | 2.5 J | -2.12 | 23 | 91 |
| 1.3 J | 2.5 J | -1.2 | 23 | 92 |
| 3 B | 2.5 J | 0.5 | 24 | 92 |
| 0.86 J | 2.5 J | -1.64 | 24 | 93 |
| 8.4 1c | 2.5 J | 5.9 | 25 | 93 |
| 13.9 | 2.5 J | 11.4 | 26 | 93 |
| 0.67 J1c | 2.5 J | -1.83 | 26 | 94 |
| 0.77 J1c | 2.5 J | -1.73 | 26 | 95 |
| 0.55 J | 2.5 J | -1.95 | 26 | 96 |
| 11.1 | 2.5 J | 8.6 | 27 | 96 |
| 13.3 | 2.5 J | 10.8 | 28 | 96 |
| 1.106 | 2.5 J | -1.394 | 28 | 97 |
| 0.3548 | 2.5 J | -2.1452 | 28 | 98 |
| | | | | |
| 16.3 | 27.2 | -10.9 | 28 | 99 |
| ND<1.5 U | 27.2 | -25.7 | 28 | 100 |
| 17.7 | 27.2 | -9.5 | 28 | 101 |
| 24.6 | 27.2 | -2.6 | 28 | 102 |
| 63.7 | 27.2 | 36.5 | 29 | 102 |
| ND<1.5 U | 27.2 | -25.7 | 29 | 103 |
| ND<1.5 U | 27.2 | -25.7 | 29 | 104 |
| 44.4 | 27.2 | 17.2 | 30 | 104 |
| 44.7 | 27.2 | 17.5 | 31 | 104 |
| 10.8 | 27.2 | -16.4 | 31 | 105 |
| 0.38 J | 27.2 | -26.82 | 31 | 106 |
| 1.3 J | 27.2 | -25.9 | 31 | 107 |
| 3 B | 27.2 | -24.2 | 31 | 108 |
| 0.86 J | 27.2 | -26.34 | 31 | 109 |
| 8.4 1c | 27.2 | -18.8 | 31 | 110 |
| 13.9 | 27.2 | -13.3 | 31 | 111 |
| 0.67 J1c | 27.2 | -26.53 | 31 | 112 |
| 0.77 J1c | 27.2 | -26.43 | 31 | 113 |
| 0.55 J | 27.2 | -26.65 | 31 | 114 |
| 11.1 | 27.2 | -16.1 | 31 | 115 |
| 13.3 | 27.2 | -13.9 | 31 | 116 |
| 1.106 | 27.2 | -26.094 | 31 | 117 |
| 0.3548 | 27.2 | -26.8452 | 31 | 118 |
| | | | | |
| ND<1.5 U | 16.3 | -14.8 | 31 | 119 |
| 17.7 | 16.3 | 1.4 | 32 | 119 |

| | | | | |
|---|---|---|---|---|
| 24.6 | 16.3 | 8.3 | 33 | 119 |
| 63.7 | 16.3 | 47.4 | 34 | 119 |
| ND<1.5 U | 16.3 | -14.8 | 34 | 120 |
| ND<1.5 U | 16.3 | -14.8 | 34 | 121 |
| 44.4 | 16.3 | 28.1 | 35 | 121 |
| 44.7 | 16.3 | 28.4 | 36 | 121 |
| 10.8 | 16.3 | -5.5 | 36 | 122 |
| 0.38 J | 16.3 | -15.92 | 36 | 123 |
| 1.3 J | 16.3 | -15 | 36 | 124 |
| 3 B | 16.3 | -13.3 | 36 | 125 |
| 0.86 J | 16.3 | -15.44 | 36 | 126 |
| 8.4 1c | 16.3 | -7.9 | 36 | 127 |
| 13.9 | 16.3 | -2.4 | 36 | 128 |
| 0.67 J1c | 16.3 | -15.63 | 36 | 129 |
| 0.77 J1c | 16.3 | -15.53 | 36 | 130 |
| 0.55 J | 16.3 | -15.75 | 36 | 131 |
| 11.1 | 16.3 | -5.2 | 36 | 132 |
| 13.3 | 16.3 | -3 | 36 | 133 |
| 1.106 | 16.3 | -15.194 | 36 | 134 |
| 0.3548 | 16.3 | -15.9452 | 36 | 135 |
| | | | | |
| 17.7 | ND<1.5 U | 16.2 | 37 | 135 |
| 24.6 | ND<1.5 U | 23.1 | 38 | 135 |
| 63.7 | ND<1.5 U | 62.2 | 39 | 135 |
| ND<1.5 U | ND<1.5 U | 0 | 39 | 135 |
| ND<1.5 U | ND<1.5 U | 0 | 39 | 135 |
| 44.4 | ND<1.5 U | 42.9 | 40 | 135 |
| 44.7 | ND<1.5 U | 43.2 | 41 | 135 |
| 10.8 | ND<1.5 U | 9.3 | 42 | 135 |
| 0.38 J | ND<1.5 U | -1.12 | 42 | 136 |
| 1.3 J | ND<1.5 U | -0.2 | 42 | 137 |
| 3 B | ND<1.5 U | 1.5 | 43 | 137 |
| 0.86 J | ND<1.5 U | -0.64 | 43 | 138 |
| 8.4 1c | ND<1.5 U | 6.9 | 44 | 138 |
| 13.9 | ND<1.5 U | 12.4 | 45 | 138 |
| 0.67 J1c | ND<1.5 U | -0.83 | 45 | 139 |
| 0.77 J1c | ND<1.5 U | -0.73 | 45 | 140 |
| 0.55 J | ND<1.5 U | -0.95 | 45 | 141 |
| 11.1 | ND<1.5 U | 9.6 | 46 | 141 |
| 13.3 | ND<1.5 U | 11.8 | 47 | 141 |
| 1.106 | ND<1.5 U | -0.394 | 47 | 142 |
| 0.3548 | ND<1.5 U | -1.1452 | 47 | 143 |
| | | | | |
| 24.6 | 17.7 | 6.9 | 48 | 143 |
| 63.7 | 17.7 | 46 | 49 | 143 |
| ND<1.5 U | 17.7 | -16.2 | 49 | 144 |
| ND<1.5 U | 17.7 | -16.2 | 49 | 145 |
| 44.4 | 17.7 | 26.7 | 50 | 145 |
| 44.7 | 17.7 | 27 | 51 | 145 |
| 10.8 | 17.7 | -6.9 | 51 | 146 |
| 0.38 J | 17.7 | -17.32 | 51 | 147 |
| 1.3 J | 17.7 | -16.4 | 51 | 148 |
| 3 B | 17.7 | -14.7 | 51 | 149 |
| 0.86 J | 17.7 | -16.84 | 51 | 150 |
| 8.4 1c | 17.7 | -9.3 | 51 | 151 |
| 13.9 | 17.7 | -3.8 | 51 | 152 |
| 0.67 J1c | 17.7 | -17.03 | 51 | 153 |

| | | | | |
|---|---|---|---|---|
| 0.77 J1c | 17.7 | -16.93 | 51 | 154 |
| 0.55 J | 17.7 | -17.15 | 51 | 155 |
| 11.1 | 17.7 | -6.6 | 51 | 156 |
| 13.3 | 17.7 | -4.4 | 51 | 157 |
| 1.106 | 17.7 | -16.594 | 51 | 158 |
| 0.3548 | 17.7 | -17.3452 | 51 | 159 |
| | | | | |
| 63.7 | 24.6 | 39.1 | 52 | 159 |
| ND<1.5 U | 24.6 | -23.1 | 52 | 160 |
| ND<1.5 U | 24.6 | -23.1 | 52 | 161 |
| 44.4 | 24.6 | 19.8 | 53 | 161 |
| 44.7 | 24.6 | 20.1 | 54 | 161 |
| 10.8 | 24.6 | -13.8 | 54 | 162 |
| 0.38 J | 24.6 | -24.22 | 54 | 163 |
| 1.3 J | 24.6 | -23.3 | 54 | 164 |
| 3 B | 24.6 | -21.6 | 54 | 165 |
| 0.86 J | 24.6 | -23.74 | 54 | 166 |
| 8.4 1c | 24.6 | -16.2 | 54 | 167 |
| 13.9 | 24.6 | -10.7 | 54 | 168 |
| 0.67 J1c | 24.6 | -23.93 | 54 | 169 |
| 0.77 J1c | 24.6 | -23.83 | 54 | 170 |
| 0.55 J | 24.6 | -24.05 | 54 | 171 |
| 11.1 | 24.6 | -13.5 | 54 | 172 |
| 13.3 | 24.6 | -11.3 | 54 | 173 |
| 1.106 | 24.6 | -23.494 | 54 | 174 |
| 0.3548 | 24.6 | -24.2452 | 54 | 175 |
| | | | | |
| ND<1.5 U | 63.7 | -62.2 | 54 | 176 |
| ND<1.5 U | 63.7 | -62.2 | 54 | 177 |
| 44.4 | 63.7 | -19.3 | 54 | 178 |
| 44.7 | 63.7 | -19 | 54 | 179 |
| 10.8 | 63.7 | -52.9 | 54 | 180 |
| 0.38 J | 63.7 | -63.32 | 54 | 181 |
| 1.3 J | 63.7 | -62.4 | 54 | 182 |
| 3 B | 63.7 | -60.7 | 54 | 183 |
| 0.86 J | 63.7 | -62.84 | 54 | 184 |
| 8.4 1c | 63.7 | -55.3 | 54 | 185 |
| 13.9 | 63.7 | -49.8 | 54 | 186 |
| 0.67 J1c | 63.7 | -63.03 | 54 | 187 |
| 0.77 J1c | 63.7 | -62.93 | 54 | 188 |
| 0.55 J | 63.7 | -63.15 | 54 | 189 |
| 11.1 | 63.7 | -52.6 | 54 | 190 |
| 13.3 | 63.7 | -50.4 | 54 | 191 |
| 1.106 | 63.7 | -62.594 | 54 | 192 |
| 0.3548 | 63.7 | -63.3452 | 54 | 193 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 54 | 193 |
| 44.4 | ND<1.5 U | 42.9 | 55 | 193 |
| 44.7 | ND<1.5 U | 43.2 | 56 | 193 |
| 10.8 | ND<1.5 U | 9.3 | 57 | 193 |
| 0.38 J | ND<1.5 U | -1.12 | 57 | 194 |
| 1.3 J | ND<1.5 U | -0.2 | 57 | 195 |
| 3 B | ND<1.5 U | 1.5 | 58 | 195 |
| 0.86 J | ND<1.5 U | -0.64 | 58 | 196 |
| 8.4 1c | ND<1.5 U | 6.9 | 59 | 196 |
| 13.9 | ND<1.5 U | 12.4 | 60 | 196 |
| 0.67 J1c | ND<1.5 U | -0.83 | 60 | 197 |

| | | | | |
|---|---|---|---|---|
| 0.77 J1c | ND<1.5 U | -0.73 | 60 | 198 |
| 0.55 J | ND<1.5 U | -0.95 | 60 | 199 |
| 11.1 | ND<1.5 U | 9.6 | 61 | 199 |
| 13.3 | ND<1.5 U | 11.8 | 62 | 199 |
| 1.106 | ND<1.5 U | -0.394 | 62 | 200 |
| 0.3548 | ND<1.5 U | -1.1452 | 62 | 201 |
| | | | | |
| 44.4 | ND<1.5 U | 42.9 | 63 | 201 |
| 44.7 | ND<1.5 U | 43.2 | 64 | 201 |
| 10.8 | ND<1.5 U | 9.3 | 65 | 201 |
| 0.38 J | ND<1.5 U | -1.12 | 65 | 202 |
| 1.3 J | ND<1.5 U | -0.2 | 65 | 203 |
| 3 B | ND<1.5 U | 1.5 | 66 | 203 |
| 0.86 J | ND<1.5 U | -0.64 | 66 | 204 |
| 8.4 1c | ND<1.5 U | 6.9 | 67 | 204 |
| 13.9 | ND<1.5 U | 12.4 | 68 | 204 |
| 0.67 J1c | ND<1.5 U | -0.83 | 68 | 205 |
| 0.77 J1c | ND<1.5 U | -0.73 | 68 | 206 |
| 0.55 J | ND<1.5 U | -0.95 | 68 | 207 |
| 11.1 | ND<1.5 U | 9.6 | 69 | 207 |
| 13.3 | ND<1.5 U | 11.8 | 70 | 207 |
| 1.106 | ND<1.5 U | -0.394 | 70 | 208 |
| 0.3548 | ND<1.5 U | -1.1452 | 70 | 209 |
| | | | | |
| 44.7 | 44.4 | 0.3 | 71 | 209 |
| 10.8 | 44.4 | -33.6 | 71 | 210 |
| 0.38 J | 44.4 | -44.02 | 71 | 211 |
| 1.3 J | 44.4 | -43.1 | 71 | 212 |
| 3 B | 44.4 | -41.4 | 71 | 213 |
| 0.86 J | 44.4 | -43.54 | 71 | 214 |
| 8.4 1c | 44.4 | -36 | 71 | 215 |
| 13.9 | 44.4 | -30.5 | 71 | 216 |
| 0.67 J1c | 44.4 | -43.73 | 71 | 217 |
| 0.77 J1c | 44.4 | -43.63 | 71 | 218 |
| 0.55 J | 44.4 | -43.85 | 71 | 219 |
| 11.1 | 44.4 | -33.3 | 71 | 220 |
| 13.3 | 44.4 | -31.1 | 71 | 221 |
| 1.106 | 44.4 | -43.294 | 71 | 222 |
| 0.3548 | 44.4 | -44.0452 | 71 | 223 |
| | | | | |
| 10.8 | 44.7 | -33.9 | 71 | 224 |
| 0.38 J | 44.7 | -44.32 | 71 | 225 |
| 1.3 J | 44.7 | -43.4 | 71 | 226 |
| 3 B | 44.7 | -41.7 | 71 | 227 |
| 0.86 J | 44.7 | -43.84 | 71 | 228 |
| 8.4 1c | 44.7 | -36.3 | 71 | 229 |
| 13.9 | 44.7 | -30.8 | 71 | 230 |
| 0.67 J1c | 44.7 | -44.03 | 71 | 231 |
| 0.77 J1c | 44.7 | -43.93 | 71 | 232 |
| 0.55 J | 44.7 | -44.15 | 71 | 233 |
| 11.1 | 44.7 | -33.6 | 71 | 234 |
| 13.3 | 44.7 | -31.4 | 71 | 235 |
| 1.106 | 44.7 | -43.594 | 71 | 236 |
| 0.3548 | 44.7 | -44.3452 | 71 | 237 |
| | | | | |
| 0.38 J | 10.8 | -10.42 | 71 | 238 |
| 1.3 J | 10.8 | -9.5 | 71 | 239 |

| | | | | |
|---|---|---|---|---|
| 3 B | 10.8 | -7.8 | 71 | 240 |
| 0.86 J | 10.8 | -9.94 | 71 | 241 |
| 8.4 1c | 10.8 | -2.4 | 71 | 242 |
| 13.9 | 10.8 | 3.1 | 72 | 242 |
| 0.67 J1c | 10.8 | -10.13 | 72 | 243 |
| 0.77 J1c | 10.8 | -10.03 | 72 | 244 |
| 0.55 J | 10.8 | -10.25 | 72 | 245 |
| 11.1 | 10.8 | 0.3 | 73 | 245 |
| 13.3 | 10.8 | 2.5 | 74 | 245 |
| 1.106 | 10.8 | -9.694 | 74 | 246 |
| 0.3548 | 10.8 | -10.4452 | 74 | 247 |
| | | | | |
| 1.3 J | 0.38 J | Same Date | 74 | 247 |
| 3 B | 0.38 J | 2.62 | 75 | 247 |
| 0.86 J | 0.38 J | 0.48 | 76 | 247 |
| 8.4 1c | 0.38 J | 8.02 | 77 | 247 |
| 13.9 | 0.38 J | 13.52 | 78 | 247 |
| 0.67 J1c | 0.38 J | 0.29 | 79 | 247 |
| 0.77 J1c | 0.38 J | 0.39 | 80 | 247 |
| 0.55 J | 0.38 J | 0.17 | 81 | 247 |
| 11.1 | 0.38 J | 10.72 | 82 | 247 |
| 13.3 | 0.38 J | 12.92 | 83 | 247 |
| 1.106 | 0.38 J | 0.726 | 84 | 247 |
| 0.3548 | 0.38 J | -0.0252 | 84 | 248 |
| | | | | |
| 3 B | 1.3 J | 1.7 | 85 | 248 |
| 0.86 J | 1.3 J | -0.44 | 85 | 249 |
| 8.4 1c | 1.3 J | 7.1 | 86 | 249 |
| 13.9 | 1.3 J | 12.6 | 87 | 249 |
| 0.67 J1c | 1.3 J | -0.63 | 87 | 250 |
| 0.77 J1c | 1.3 J | -0.53 | 87 | 251 |
| 0.55 J | 1.3 J | -0.75 | 87 | 252 |
| 11.1 | 1.3 J | 9.8 | 88 | 252 |
| 13.3 | 1.3 J | 12 | 89 | 252 |
| 1.106 | 1.3 J | -0.194 | 89 | 253 |
| 0.3548 | 1.3 J | -0.9452 | 89 | 254 |
| | | | | |
| 0.86 J | 3 B | Same Date | 89 | 254 |
| 8.4 1c | 3 B | 5.4 | 90 | 254 |
| 13.9 | 3 B | 10.9 | 91 | 254 |
| 0.67 J1c | 3 B | -2.33 | 91 | 255 |
| 0.77 J1c | 3 B | -2.23 | 91 | 256 |
| 0.55 J | 3 B | -2.45 | 91 | 257 |
| 11.1 | 3 B | 8.1 | 92 | 257 |
| 13.3 | 3 B | 10.3 | 93 | 257 |
| 1.106 | 3 B | -1.894 | 93 | 258 |
| 0.3548 | 3 B | -2.6452 | 93 | 259 |
| | | | | |
| 8.4 1c | 0.86 J | 7.54 | 94 | 259 |
| 13.9 | 0.86 J | 13.04 | 95 | 259 |
| 0.67 J1c | 0.86 J | -0.19 | 95 | 260 |
| 0.77 J1c | 0.86 J | -0.09 | 95 | 261 |
| 0.55 J | 0.86 J | -0.31 | 95 | 262 |
| 11.1 | 0.86 J | 10.24 | 96 | 262 |
| 13.3 | 0.86 J | 12.44 | 97 | 262 |
| 1.106 | 0.86 J | 0.246 | 98 | 262 |
| 0.3548 | 0.86 J | -0.5052 | 98 | 263 |

| | | | | |
|---|---|---|---|---|
| 13.9 | 8.4 1c | 5.5 | 99 | 263 |
| 0.67 J1c | 8.4 1c | -7.73 | 99 | 264 |
| 0.77 J1c | 8.4 1c | -7.63 | 99 | 265 |
| 0.55 J | 8.4 1c | -7.85 | 99 | 266 |
| 11.1 | 8.4 1c | 2.7 | 100 | 266 |
| 13.3 | 8.4 1c | 4.9 | 101 | 266 |
| 1.106 | 8.4 1c | -7.294 | 101 | 267 |
| 0.3548 | 8.4 1c | -8.0452 | 101 | 268 |
| | | | | |
| 0.67 J1c | 13.9 | -13.23 | 101 | 269 |
| 0.77 J1c | 13.9 | -13.13 | 101 | 270 |
| 0.55 J | 13.9 | -13.35 | 101 | 271 |
| 11.1 | 13.9 | -2.8 | 101 | 272 |
| 13.3 | 13.9 | -0.6 | 101 | 273 |
| 1.106 | 13.9 | -12.794 | 101 | 274 |
| 0.3548 | 13.9 | -13.5452 | 101 | 275 |
| | | | | |
| 0.77 J1c | 0.67 J1c | 0.1 | 102 | 275 |
| 0.55 J | 0.67 J1c | -0.12 | 102 | 276 |
| 11.1 | 0.67 J1c | 10.43 | 103 | 276 |
| 13.3 | 0.67 J1c | 12.63 | 104 | 276 |
| 1.106 | 0.67 J1c | 0.436 | 105 | 276 |
| 0.3548 | 0.67 J1c | -0.3152 | 105 | 277 |
| | | | | |
| 0.55 J | 0.77 J1c | -0.22 | 105 | 278 |
| 11.1 | 0.77 J1c | 10.33 | 106 | 278 |
| 13.3 | 0.77 J1c | 12.53 | 107 | 278 |
| 1.106 | 0.77 J1c | 0.336 | 108 | 278 |
| 0.3548 | 0.77 J1c | -0.4152 | 108 | 279 |
| | | | | |
| 11.1 | 0.55 J | 10.55 | 109 | 279 |
| 13.3 | 0.55 J | 12.75 | 110 | 279 |
| 1.106 | 0.55 J | 0.556 | 111 | 279 |
| 0.3548 | 0.55 J | -0.1952 | 111 | 280 |
| | | | | |
| 13.3 | 11.1 | 2.2 | 112 | 280 |
| 1.106 | 11.1 | -9.994 | 112 | 281 |
| 0.3548 | 11.1 | -10.7452 | 112 | 282 |
| | | | | |
| 1.106 | 13.3 | -12.194 | 112 | 283 |
| 0.3548 | 13.3 | -12.9452 | 112 | 284 |
| | | | | |
| 0.3548 | 1.106 | -0.7512 | 112 | 285 |

S Statistic = 112 - 285 = -173

| Tied Group | Value | Members |
|---|---|---|
| 1 | 1.5 | 4 |

| Time Period | Observations |
|---|---|
| 2/1/2017 | 2 |
| 3/1/2017 | 1 |
| 4/1/2017 | 1 |
| 5/1/2017 | 1 |
| 6/1/2017 | 1 |

| | |
|---|---|
| 7/1/2017 | 1 |
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 3/1/2022 | 1 |
| 3/1/2023 | 1 |
| 3/1/2024 | 1 |

There are 3 time periods with multiple data

---

A = 156
B = 54
C = 24
D = 0
E = 12
F = 6
a = 51156
b = 197316
c = 1624
Group Variance = 2830.38
Z-Score = -3.233
Comparison Level at 95% confidence level = -1.65463 (downward trend)
**-3.233 < -1.65463 indicating a downward trend**

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RW11-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 1490 | 1690 | -200 | 0 | 1 |
| 1800 | 1690 | 110 | 1 | 1 |
| 2600 | 1690 | 910 | 2 | 1 |
| 218 | 1690 | -1472 | 2 | 2 |
| 518 | 1690 | -1172 | 2 | 3 |
| 163 | 1690 | -1527 | 2 | 4 |
| 274 | 1690 | -1416 | 2 | 5 |
| 125 | 1690 | -1565 | 2 | 6 |
| 1460 | 1690 | -230 | 2 | 7 |
| 1380 | 1690 | -310 | 2 | 8 |
| 1400 | 1690 | -290 | 2 | 9 |
| 1660 | 1690 | -30 | 2 | 10 |
| 4.7 | 1690 | -1685.3 | 2 | 11 |
| 133 | 1690 | -1557 | 2 | 12 |
| 98.9 2c | 1690 | -1591.1 | 2 | 13 |
| 885 1c | 1690 | -805 | 2 | 14 |
| 598 | 1690 | -1092 | 2 | 15 |
| 586 | 1690 | -1104 | 2 | 16 |
| 517 | 1690 | -1173 | 2 | 17 |
| 476 | 1690 | -1214 | 2 | 18 |
| 365 | 1690 | -1325 | 2 | 19 |
| 75.1 | 1690 | -1614.9 | 2 | 20 |
| 179 | 1690 | -1511 | 2 | 21 |
| 175 | 1690 | -1515 | 2 | 22 |
| 194 | 1690 | -1496 | 2 | 23 |
| 202.8 | 1690 | -1487.2 | 2 | 24 |
| 1.448 | 1690 | -1688.55 | 2 | 25 |
| | | | | |
| 1800 | 1490 | 310 | 3 | 25 |
| 2600 | 1490 | 1110 | 4 | 25 |
| 218 | 1490 | -1272 | 4 | 26 |
| 518 | 1490 | -972 | 4 | 27 |
| 163 | 1490 | -1327 | 4 | 28 |
| 274 | 1490 | -1216 | 4 | 29 |
| 125 | 1490 | -1365 | 4 | 30 |
| 1460 | 1490 | -30 | 4 | 31 |
| 1380 | 1490 | -110 | 4 | 32 |
| 1400 | 1490 | -90 | 4 | 33 |
| 1660 | 1490 | 170 | 5 | 33 |
| 4.7 | 1490 | -1485.3 | 5 | 34 |
| 133 | 1490 | -1357 | 5 | 35 |
| 98.9 2c | 1490 | -1391.1 | 5 | 36 |
| 885 1c | 1490 | -605 | 5 | 37 |
| 598 | 1490 | -892 | 5 | 38 |
| 586 | 1490 | -904 | 5 | 39 |
| 517 | 1490 | -973 | 5 | 40 |
| 476 | 1490 | -1014 | 5 | 41 |

| | | | | |
|---|---|---|---|---|
| 365 | 1490 | -1125 | 5 | 42 |
| 75.1 | 1490 | -1414.9 | 5 | 43 |
| 179 | 1490 | -1311 | 5 | 44 |
| 175 | 1490 | -1315 | 5 | 45 |
| 194 | 1490 | -1296 | 5 | 46 |
| 202.8 | 1490 | -1287.2 | 5 | 47 |
| 1.448 | 1490 | -1488.55 | 5 | 48 |
| | | | | |
| 2600 | 1800 | 800 | 6 | 48 |
| 218 | 1800 | -1582 | 6 | 49 |
| 518 | 1800 | -1282 | 6 | 50 |
| 163 | 1800 | -1637 | 6 | 51 |
| 274 | 1800 | -1526 | 6 | 52 |
| 125 | 1800 | -1675 | 6 | 53 |
| 1460 | 1800 | -340 | 6 | 54 |
| 1380 | 1800 | -420 | 6 | 55 |
| 1400 | 1800 | -400 | 6 | 56 |
| 1660 | 1800 | -140 | 6 | 57 |
| 4.7 | 1800 | -1795.3 | 6 | 58 |
| 133 | 1800 | -1667 | 6 | 59 |
| 98.9 2c | 1800 | -1701.1 | 6 | 60 |
| 885 1c | 1800 | -915 | 6 | 61 |
| 598 | 1800 | -1202 | 6 | 62 |
| 586 | 1800 | -1214 | 6 | 63 |
| 517 | 1800 | -1283 | 6 | 64 |
| 476 | 1800 | -1324 | 6 | 65 |
| 365 | 1800 | -1435 | 6 | 66 |
| 75.1 | 1800 | -1724.9 | 6 | 67 |
| 179 | 1800 | -1621 | 6 | 68 |
| 175 | 1800 | -1625 | 6 | 69 |
| 194 | 1800 | -1606 | 6 | 70 |
| 202.8 | 1800 | -1597.2 | 6 | 71 |
| 1.448 | 1800 | -1798.55 | 6 | 72 |
| | | | | |
| 218 | 2600 | -2382 | 6 | 73 |
| 518 | 2600 | -2082 | 6 | 74 |
| 163 | 2600 | -2437 | 6 | 75 |
| 274 | 2600 | -2326 | 6 | 76 |
| 125 | 2600 | -2475 | 6 | 77 |
| 1460 | 2600 | -1140 | 6 | 78 |
| 1380 | 2600 | -1220 | 6 | 79 |
| 1400 | 2600 | -1200 | 6 | 80 |
| 1660 | 2600 | -940 | 6 | 81 |
| 4.7 | 2600 | -2595.3 | 6 | 82 |
| 133 | 2600 | -2467 | 6 | 83 |
| 98.9 2c | 2600 | -2501.1 | 6 | 84 |
| 885 1c | 2600 | -1715 | 6 | 85 |
| 598 | 2600 | -2002 | 6 | 86 |
| 586 | 2600 | -2014 | 6 | 87 |
| 517 | 2600 | -2083 | 6 | 88 |
| 476 | 2600 | -2124 | 6 | 89 |
| 365 | 2600 | -2235 | 6 | 90 |
| 75.1 | 2600 | -2524.9 | 6 | 91 |
| 179 | 2600 | -2421 | 6 | 92 |
| 175 | 2600 | -2425 | 6 | 93 |
| 194 | 2600 | -2406 | 6 | 94 |
| 202.8 | 2600 | -2397.2 | 6 | 95 |

| | | | | |
|---|---|---|---|---|
| 1.448 | 2600 | -2598.55 | 6 | 96 |
| | | | | |
| 518 | 218 | 300 | 7 | 96 |
| 163 | 218 | -55 | 7 | 97 |
| 274 | 218 | 56 | 8 | 97 |
| 125 | 218 | -93 | 8 | 98 |
| 1460 | 218 | 1242 | 9 | 98 |
| 1380 | 218 | 1162 | 10 | 98 |
| 1400 | 218 | 1182 | 11 | 98 |
| 1660 | 218 | 1442 | 12 | 98 |
| 4.7 | 218 | -213.3 | 12 | 99 |
| 133 | 218 | -85 | 12 | 100 |
| 98.9 2c | 218 | -119.1 | 12 | 101 |
| 885 1c | 218 | 667 | 13 | 101 |
| 598 | 218 | 380 | 14 | 101 |
| 586 | 218 | 368 | 15 | 101 |
| 517 | 218 | 299 | 16 | 101 |
| 476 | 218 | 258 | 17 | 101 |
| 365 | 218 | 147 | 18 | 101 |
| 75.1 | 218 | -142.9 | 18 | 102 |
| 179 | 218 | -39 | 18 | 103 |
| 175 | 218 | -43 | 18 | 104 |
| 194 | 218 | -24 | 18 | 105 |
| 202.8 | 218 | -15.2 | 18 | 106 |
| 1.448 | 218 | -216.552 | 18 | 107 |
| | | | | |
| 163 | 518 | -355 | 18 | 108 |
| 274 | 518 | -244 | 18 | 109 |
| 125 | 518 | -393 | 18 | 110 |
| 1460 | 518 | 942 | 19 | 110 |
| 1380 | 518 | 862 | 20 | 110 |
| 1400 | 518 | 882 | 21 | 110 |
| 1660 | 518 | 1142 | 22 | 110 |
| 4.7 | 518 | -513.3 | 22 | 111 |
| 133 | 518 | -385 | 22 | 112 |
| 98.9 2c | 518 | -419.1 | 22 | 113 |
| 885 1c | 518 | 367 | 23 | 113 |
| 598 | 518 | 80 | 24 | 113 |
| 586 | 518 | 68 | 25 | 113 |
| 517 | 518 | -1 | 25 | 114 |
| 476 | 518 | -42 | 25 | 115 |
| 365 | 518 | -153 | 25 | 116 |
| 75.1 | 518 | -442.9 | 25 | 117 |
| 179 | 518 | -339 | 25 | 118 |
| 175 | 518 | -343 | 25 | 119 |
| 194 | 518 | -324 | 25 | 120 |
| 202.8 | 518 | -315.2 | 25 | 121 |
| 1.448 | 518 | -516.552 | 25 | 122 |
| | | | | |
| 274 | 163 | 111 | 26 | 122 |
| 125 | 163 | -38 | 26 | 123 |
| 1460 | 163 | 1297 | 27 | 123 |
| 1380 | 163 | 1217 | 28 | 123 |
| 1400 | 163 | 1237 | 29 | 123 |
| 1660 | 163 | 1497 | 30 | 123 |
| 4.7 | 163 | -158.3 | 30 | 124 |
| 133 | 163 | -30 | 30 | 125 |

| | | | | |
|---|---|---|---|---|
| 98.9 2c | 163 | -64.1 | 30 | 126 |
| 885 1c | 163 | 722 | 31 | 126 |
| 598 | 163 | 435 | 32 | 126 |
| 586 | 163 | 423 | 33 | 126 |
| 517 | 163 | 354 | 34 | 126 |
| 476 | 163 | 313 | 35 | 126 |
| 365 | 163 | 202 | 36 | 126 |
| 75.1 | 163 | -87.9 | 36 | 127 |
| 179 | 163 | 16 | 37 | 127 |
| 175 | 163 | 12 | 38 | 127 |
| 194 | 163 | 31 | 39 | 127 |
| 202.8 | 163 | 39.8 | 40 | 127 |
| 1.448 | 163 | -161.552 | 40 | 128 |
| | | | | |
| 125 | 274 | -149 | 40 | 129 |
| 1460 | 274 | 1186 | 41 | 129 |
| 1380 | 274 | 1106 | 42 | 129 |
| 1400 | 274 | 1126 | 43 | 129 |
| 1660 | 274 | 1386 | 44 | 129 |
| 4.7 | 274 | -269.3 | 44 | 130 |
| 133 | 274 | -141 | 44 | 131 |
| 98.9 2c | 274 | -175.1 | 44 | 132 |
| 885 1c | 274 | 611 | 45 | 132 |
| 598 | 274 | 324 | 46 | 132 |
| 586 | 274 | 312 | 47 | 132 |
| 517 | 274 | 243 | 48 | 132 |
| 476 | 274 | 202 | 49 | 132 |
| 365 | 274 | 91 | 50 | 132 |
| 75.1 | 274 | -198.9 | 50 | 133 |
| 179 | 274 | -95 | 50 | 134 |
| 175 | 274 | -99 | 50 | 135 |
| 194 | 274 | -80 | 50 | 136 |
| 202.8 | 274 | -71.2 | 50 | 137 |
| 1.448 | 274 | -272.552 | 50 | 138 |
| | | | | |
| 1460 | 125 | 1335 | 51 | 138 |
| 1380 | 125 | 1255 | 52 | 138 |
| 1400 | 125 | 1275 | 53 | 138 |
| 1660 | 125 | 1535 | 54 | 138 |
| 4.7 | 125 | -120.3 | 54 | 139 |
| 133 | 125 | 8 | 55 | 139 |
| 98.9 2c | 125 | -26.1 | 55 | 140 |
| 885 1c | 125 | 760 | 56 | 140 |
| 598 | 125 | 473 | 57 | 140 |
| 586 | 125 | 461 | 58 | 140 |
| 517 | 125 | 392 | 59 | 140 |
| 476 | 125 | 351 | 60 | 140 |
| 365 | 125 | 240 | 61 | 140 |
| 75.1 | 125 | -49.9 | 61 | 141 |
| 179 | 125 | 54 | 62 | 141 |
| 175 | 125 | 50 | 63 | 141 |
| 194 | 125 | 69 | 64 | 141 |
| 202.8 | 125 | 77.8 | 65 | 141 |
| 1.448 | 125 | -123.552 | 65 | 142 |
| | | | | |
| 1380 | 1460 | -80 | 65 | 143 |
| 1400 | 1460 | -60 | 65 | 144 |

| | | | | |
|---|---|---|---|---|
| 1660 | 1460 | 200 | 66 | 144 |
| 4.7 | 1460 | -1455.3 | 66 | 145 |
| 133 | 1460 | -1327 | 66 | 146 |
| 98.9 2c | 1460 | -1361.1 | 66 | 147 |
| 885 1c | 1460 | -575 | 66 | 148 |
| 598 | 1460 | -862 | 66 | 149 |
| 586 | 1460 | -874 | 66 | 150 |
| 517 | 1460 | -943 | 66 | 151 |
| 476 | 1460 | -984 | 66 | 152 |
| 365 | 1460 | -1095 | 66 | 153 |
| 75.1 | 1460 | -1384.9 | 66 | 154 |
| 179 | 1460 | -1281 | 66 | 155 |
| 175 | 1460 | -1285 | 66 | 156 |
| 194 | 1460 | -1266 | 66 | 157 |
| 202.8 | 1460 | -1257.2 | 66 | 158 |
| 1.448 | 1460 | -1458.55 | 66 | 159 |
| | | | | |
| 1400 | 1380 | 20 | 67 | 159 |
| 1660 | 1380 | 280 | 68 | 159 |
| 4.7 | 1380 | -1375.3 | 68 | 160 |
| 133 | 1380 | -1247 | 68 | 161 |
| 98.9 2c | 1380 | -1281.1 | 68 | 162 |
| 885 1c | 1380 | -495 | 68 | 163 |
| 598 | 1380 | -782 | 68 | 164 |
| 586 | 1380 | -794 | 68 | 165 |
| 517 | 1380 | -863 | 68 | 166 |
| 476 | 1380 | -904 | 68 | 167 |
| 365 | 1380 | -1015 | 68 | 168 |
| 75.1 | 1380 | -1304.9 | 68 | 169 |
| 179 | 1380 | -1201 | 68 | 170 |
| 175 | 1380 | -1205 | 68 | 171 |
| 194 | 1380 | -1186 | 68 | 172 |
| 202.8 | 1380 | -1177.2 | 68 | 173 |
| 1.448 | 1380 | -1378.55 | 68 | 174 |
| | | | | |
| 1660 | 1400 | 260 | 69 | 174 |
| 4.7 | 1400 | -1395.3 | 69 | 175 |
| 133 | 1400 | -1267 | 69 | 176 |
| 98.9 2c | 1400 | -1301.1 | 69 | 177 |
| 885 1c | 1400 | -515 | 69 | 178 |
| 598 | 1400 | -802 | 69 | 179 |
| 586 | 1400 | -814 | 69 | 180 |
| 517 | 1400 | -883 | 69 | 181 |
| 476 | 1400 | -924 | 69 | 182 |
| 365 | 1400 | -1035 | 69 | 183 |
| 75.1 | 1400 | -1324.9 | 69 | 184 |
| 179 | 1400 | -1221 | 69 | 185 |
| 175 | 1400 | -1225 | 69 | 186 |
| 194 | 1400 | -1206 | 69 | 187 |
| 202.8 | 1400 | -1197.2 | 69 | 188 |
| 1.448 | 1400 | -1398.55 | 69 | 189 |
| | | | | |
| 4.7 | 1660 | -1655.3 | 69 | 190 |
| 133 | 1660 | -1527 | 69 | 191 |
| 98.9 2c | 1660 | -1561.1 | 69 | 192 |
| 885 1c | 1660 | -775 | 69 | 193 |
| 598 | 1660 | -1062 | 69 | 194 |

| | | | | |
|---|---|---|---|---|
| 586 | 1660 | -1074 | 69 | 195 |
| 517 | 1660 | -1143 | 69 | 196 |
| 476 | 1660 | -1184 | 69 | 197 |
| 365 | 1660 | -1295 | 69 | 198 |
| 75.1 | 1660 | -1584.9 | 69 | 199 |
| 179 | 1660 | -1481 | 69 | 200 |
| 175 | 1660 | -1485 | 69 | 201 |
| 194 | 1660 | -1466 | 69 | 202 |
| 202.8 | 1660 | -1457.2 | 69 | 203 |
| 1.448 | 1660 | -1658.55 | 69 | 204 |
| | | | | |
| 133 | 4.7 | 128.3 | 70 | 204 |
| 98.9 2c | 4.7 | 94.2 | 71 | 204 |
| 885 1c | 4.7 | 880.3 | 72 | 204 |
| 598 | 4.7 | 593.3 | 73 | 204 |
| 586 | 4.7 | 581.3 | 74 | 204 |
| 517 | 4.7 | 512.3 | 75 | 204 |
| 476 | 4.7 | 471.3 | 76 | 204 |
| 365 | 4.7 | 360.3 | 77 | 204 |
| 75.1 | 4.7 | 70.4 | 78 | 204 |
| 179 | 4.7 | 174.3 | 79 | 204 |
| 175 | 4.7 | 170.3 | 80 | 204 |
| 194 | 4.7 | 189.3 | 81 | 204 |
| 202.8 | 4.7 | 198.1 | 82 | 204 |
| 1.448 | 4.7 | -3.252 | 82 | 205 |
| | | | | |
| 98.9 2c | 133 | -34.1 | 82 | 206 |
| 885 1c | 133 | 752 | 83 | 206 |
| 598 | 133 | 465 | 84 | 206 |
| 586 | 133 | 453 | 85 | 206 |
| 517 | 133 | 384 | 86 | 206 |
| 476 | 133 | 343 | 87 | 206 |
| 365 | 133 | 232 | 88 | 206 |
| 75.1 | 133 | -57.9 | 88 | 207 |
| 179 | 133 | 46 | 89 | 207 |
| 175 | 133 | 42 | 90 | 207 |
| 194 | 133 | 61 | 91 | 207 |
| 202.8 | 133 | 69.8 | 92 | 207 |
| 1.448 | 133 | -131.552 | 92 | 208 |
| | | | | |
| 885 1c | 98.9 2c | Same Date | 92 | 208 |
| 598 | 98.9 2c | 499.1 | 93 | 208 |
| 586 | 98.9 2c | 487.1 | 94 | 208 |
| 517 | 98.9 2c | 418.1 | 95 | 208 |
| 476 | 98.9 2c | 377.1 | 96 | 208 |
| 365 | 98.9 2c | 266.1 | 97 | 208 |
| 75.1 | 98.9 2c | -23.8 | 97 | 209 |
| 179 | 98.9 2c | 80.1 | 98 | 209 |
| 175 | 98.9 2c | 76.1 | 99 | 209 |
| 194 | 98.9 2c | 95.1 | 100 | 209 |
| 202.8 | 98.9 2c | 103.9 | 101 | 209 |
| 1.448 | 98.9 2c | -97.452 | 101 | 210 |
| | | | | |
| 598 | 885 1c | -287 | 101 | 211 |
| 586 | 885 1c | -299 | 101 | 212 |
| 517 | 885 1c | -368 | 101 | 213 |
| 476 | 885 1c | -409 | 101 | 214 |

| | | | | |
|---|---|---|---|---|
| 365 | 885 1c | -520 | 101 | 215 |
| 75.1 | 885 1c | -809.9 | 101 | 216 |
| 179 | 885 1c | -706 | 101 | 217 |
| 175 | 885 1c | -710 | 101 | 218 |
| 194 | 885 1c | -691 | 101 | 219 |
| 202.8 | 885 1c | -682.2 | 101 | 220 |
| 1.448 | 885 1c | -883.552 | 101 | 221 |
| | | | | |
| 586 | 598 | Same Date | 101 | 221 |
| 517 | 598 | -81 | 101 | 222 |
| 476 | 598 | -122 | 101 | 223 |
| 365 | 598 | -233 | 101 | 224 |
| 75.1 | 598 | -522.9 | 101 | 225 |
| 179 | 598 | -419 | 101 | 226 |
| 175 | 598 | -423 | 101 | 227 |
| 194 | 598 | -404 | 101 | 228 |
| 202.8 | 598 | -395.2 | 101 | 229 |
| 1.448 | 598 | -596.552 | 101 | 230 |
| | | | | |
| 517 | 586 | -69 | 101 | 231 |
| 476 | 586 | -110 | 101 | 232 |
| 365 | 586 | -221 | 101 | 233 |
| 75.1 | 586 | -510.9 | 101 | 234 |
| 179 | 586 | -407 | 101 | 235 |
| 175 | 586 | -411 | 101 | 236 |
| 194 | 586 | -392 | 101 | 237 |
| 202.8 | 586 | -383.2 | 101 | 238 |
| 1.448 | 586 | -584.552 | 101 | 239 |
| | | | | |
| 476 | 517 | -41 | 101 | 240 |
| 365 | 517 | -152 | 101 | 241 |
| 75.1 | 517 | -441.9 | 101 | 242 |
| 179 | 517 | -338 | 101 | 243 |
| 175 | 517 | -342 | 101 | 244 |
| 194 | 517 | -323 | 101 | 245 |
| 202.8 | 517 | -314.2 | 101 | 246 |
| 1.448 | 517 | -515.552 | 101 | 247 |
| | | | | |
| 365 | 476 | -111 | 101 | 248 |
| 75.1 | 476 | -400.9 | 101 | 249 |
| 179 | 476 | -297 | 101 | 250 |
| 175 | 476 | -301 | 101 | 251 |
| 194 | 476 | -282 | 101 | 252 |
| 202.8 | 476 | -273.2 | 101 | 253 |
| 1.448 | 476 | -474.552 | 101 | 254 |
| | | | | |
| 75.1 | 365 | -289.9 | 101 | 255 |
| 179 | 365 | -186 | 101 | 256 |
| 175 | 365 | -190 | 101 | 257 |
| 194 | 365 | -171 | 101 | 258 |
| 202.8 | 365 | -162.2 | 101 | 259 |
| 1.448 | 365 | -363.552 | 101 | 260 |
| | | | | |
| 179 | 75.1 | 103.9 | 102 | 260 |
| 175 | 75.1 | 99.9 | 103 | 260 |
| 194 | 75.1 | 118.9 | 104 | 260 |
| 202.8 | 75.1 | 127.7 | 105 | 260 |

| | | | | |
|---|---|---|---|---|
| 1.448 | 75.1 | -73.652 | 105 | 261 |
| | | | | |
| 175 | 179 | -4 | 105 | 262 |
| 194 | 179 | 15 | 106 | 262 |
| 202.8 | 179 | 23.8 | 107 | 262 |
| 1.448 | 179 | -177.552 | 107 | 263 |
| | | | | |
| 194 | 175 | 19 | 108 | 263 |
| 202.8 | 175 | 27.8 | 109 | 263 |
| 1.448 | 175 | -173.552 | 109 | 264 |
| | | | | |
| 202.8 | 194 | 8.8 | 110 | 264 |
| 1.448 | 194 | -192.552 | 110 | 265 |
| | | | | |
| 1.448 | 202.8 | -201.352 | 110 | 266 |

S Statistic = 110 - 266 = -156

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 2/1/2017 | 1 |
| 3/1/2017 | 1 |
| 4/1/2017 | 1 |
| 5/1/2017 | 1 |
| 6/1/2017 | 1 |
| 7/1/2017 | 1 |
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 3/1/2022 | 1 |
| 3/1/2023 | 1 |
| 3/1/2024 | 1 |

There are 2 time periods with multiple data

A = 0
B = 36
C = 0
D = 0
E = 0
F = 4
a = 46116

b = 176904
c = 1512
Group Variance = 2560
Z-Score = -3.06346
Comparison Level at 95% confidence level = -1.65463 (downward trend)
**-3.06346 < -1.65463 indicating a downward trend**

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RW12-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 3530 | 4740 | -1210 | 0 | 1 |
| 2730 | 4740 | -2010 | 0 | 2 |
| 3820 | 4740 | -920 | 0 | 3 |
| 2260 | 4740 | -2480 | 0 | 4 |
| 2730 | 4740 | -2010 | 0 | 5 |
| 2220 | 4740 | -2520 | 0 | 6 |
| 1820 | 4740 | -2920 | 0 | 7 |
| 1510 | 4740 | -3230 | 0 | 8 |
| 1380 | 4740 | -3360 | 0 | 9 |
| 1450 | 4740 | -3290 | 0 | 10 |
| 1270 | 4740 | -3470 | 0 | 11 |
| 121 | 4740 | -4619 | 0 | 12 |
| 134 | 4740 | -4606 | 0 | 13 |
| 86.3 | 4740 | -4653.7 | 0 | 14 |
| 768 | 4740 | -3972 | 0 | 15 |
| 755 | 4740 | -3985 | 0 | 16 |
| 1520 | 4740 | -3220 | 0 | 17 |
| 1500 | 4740 | -3240 | 0 | 18 |
| 1780 | 4740 | -2960 | 0 | 19 |
| 420 | 4740 | -4320 | 0 | 20 |
| 716 | 4740 | -4024 | 0 | 21 |
| 1080 | 4740 | -3660 | 0 | 22 |
| 1396 | 4740 | -3344 | 0 | 23 |
| 315 | 4740 | -4425 | 0 | 24 |
| 1100 | 4740 | -3640 | 0 | 25 |
| 289 | 4740 | -4451 | 0 | 26 |
| 1128 | 4740 | -3612 | 0 | 27 |
| | | | | |
| 2730 | 3530 | -800 | 0 | 28 |
| 3820 | 3530 | 290 | 1 | 28 |
| 2260 | 3530 | -1270 | 1 | 29 |
| 2730 | 3530 | -800 | 1 | 30 |
| 2220 | 3530 | -1310 | 1 | 31 |
| 1820 | 3530 | -1710 | 1 | 32 |
| 1510 | 3530 | -2020 | 1 | 33 |
| 1380 | 3530 | -2150 | 1 | 34 |
| 1450 | 3530 | -2080 | 1 | 35 |
| 1270 | 3530 | -2260 | 1 | 36 |
| 121 | 3530 | -3409 | 1 | 37 |
| 134 | 3530 | -3396 | 1 | 38 |
| 86.3 | 3530 | -3443.7 | 1 | 39 |
| 768 | 3530 | -2762 | 1 | 40 |
| 755 | 3530 | -2775 | 1 | 41 |
| 1520 | 3530 | -2010 | 1 | 42 |
| 1500 | 3530 | -2030 | 1 | 43 |
| 1780 | 3530 | -1750 | 1 | 44 |
| 420 | 3530 | -3110 | 1 | 45 |

| | | | | |
|---|---|---|---|---|
| 716 | 3530 | -2814 | 1 | 46 |
| 1080 | 3530 | -2450 | 1 | 47 |
| 1396 | 3530 | -2134 | 1 | 48 |
| 315 | 3530 | -3215 | 1 | 49 |
| 1100 | 3530 | -2430 | 1 | 50 |
| 289 | 3530 | -3241 | 1 | 51 |
| 1128 | 3530 | -2402 | 1 | 52 |
| | | | | |
| 3820 | 2730 | 1090 | 2 | 52 |
| 2260 | 2730 | -470 | 2 | 53 |
| 2730 | 2730 | 0 | 2 | 53 |
| 2220 | 2730 | -510 | 2 | 54 |
| 1820 | 2730 | -910 | 2 | 55 |
| 1510 | 2730 | -1220 | 2 | 56 |
| 1380 | 2730 | -1350 | 2 | 57 |
| 1450 | 2730 | -1280 | 2 | 58 |
| 1270 | 2730 | -1460 | 2 | 59 |
| 121 | 2730 | -2609 | 2 | 60 |
| 134 | 2730 | -2596 | 2 | 61 |
| 86.3 | 2730 | -2643.7 | 2 | 62 |
| 768 | 2730 | -1962 | 2 | 63 |
| 755 | 2730 | -1975 | 2 | 64 |
| 1520 | 2730 | -1210 | 2 | 65 |
| 1500 | 2730 | -1230 | 2 | 66 |
| 1780 | 2730 | -950 | 2 | 67 |
| 420 | 2730 | -2310 | 2 | 68 |
| 716 | 2730 | -2014 | 2 | 69 |
| 1080 | 2730 | -1650 | 2 | 70 |
| 1396 | 2730 | -1334 | 2 | 71 |
| 315 | 2730 | -2415 | 2 | 72 |
| 1100 | 2730 | -1630 | 2 | 73 |
| 289 | 2730 | -2441 | 2 | 74 |
| 1128 | 2730 | -1602 | 2 | 75 |
| | | | | |
| 2260 | 3820 | -1560 | 2 | 76 |
| 2730 | 3820 | -1090 | 2 | 77 |
| 2220 | 3820 | -1600 | 2 | 78 |
| 1820 | 3820 | -2000 | 2 | 79 |
| 1510 | 3820 | -2310 | 2 | 80 |
| 1380 | 3820 | -2440 | 2 | 81 |
| 1450 | 3820 | -2370 | 2 | 82 |
| 1270 | 3820 | -2550 | 2 | 83 |
| 121 | 3820 | -3699 | 2 | 84 |
| 134 | 3820 | -3686 | 2 | 85 |
| 86.3 | 3820 | -3733.7 | 2 | 86 |
| 768 | 3820 | -3052 | 2 | 87 |
| 755 | 3820 | -3065 | 2 | 88 |
| 1520 | 3820 | -2300 | 2 | 89 |
| 1500 | 3820 | -2320 | 2 | 90 |
| 1780 | 3820 | -2040 | 2 | 91 |
| 420 | 3820 | -3400 | 2 | 92 |
| 716 | 3820 | -3104 | 2 | 93 |
| 1080 | 3820 | -2740 | 2 | 94 |
| 1396 | 3820 | -2424 | 2 | 95 |
| 315 | 3820 | -3505 | 2 | 96 |
| 1100 | 3820 | -2720 | 2 | 97 |
| 289 | 3820 | -3531 | 2 | 98 |

| | | | | |
|---|---|---|---|---|
| 1128 | 3820 | -2692 | 2 | 99 |
| | | | | |
| 2730 | 2260 | 470 | 3 | 99 |
| 2220 | 2260 | -40 | 3 | 100 |
| 1820 | 2260 | -440 | 3 | 101 |
| 1510 | 2260 | -750 | 3 | 102 |
| 1380 | 2260 | -880 | 3 | 103 |
| 1450 | 2260 | -810 | 3 | 104 |
| 1270 | 2260 | -990 | 3 | 105 |
| 121 | 2260 | -2139 | 3 | 106 |
| 134 | 2260 | -2126 | 3 | 107 |
| 86.3 | 2260 | -2173.7 | 3 | 108 |
| 768 | 2260 | -1492 | 3 | 109 |
| 755 | 2260 | -1505 | 3 | 110 |
| 1520 | 2260 | -740 | 3 | 111 |
| 1500 | 2260 | -760 | 3 | 112 |
| 1780 | 2260 | -480 | 3 | 113 |
| 420 | 2260 | -1840 | 3 | 114 |
| 716 | 2260 | -1544 | 3 | 115 |
| 1080 | 2260 | -1180 | 3 | 116 |
| 1396 | 2260 | -864 | 3 | 117 |
| 315 | 2260 | -1945 | 3 | 118 |
| 1100 | 2260 | -1160 | 3 | 119 |
| 289 | 2260 | -1971 | 3 | 120 |
| 1128 | 2260 | -1132 | 3 | 121 |
| | | | | |
| 2220 | 2730 | -510 | 3 | 122 |
| 1820 | 2730 | -910 | 3 | 123 |
| 1510 | 2730 | -1220 | 3 | 124 |
| 1380 | 2730 | -1350 | 3 | 125 |
| 1450 | 2730 | -1280 | 3 | 126 |
| 1270 | 2730 | -1460 | 3 | 127 |
| 121 | 2730 | -2609 | 3 | 128 |
| 134 | 2730 | -2596 | 3 | 129 |
| 86.3 | 2730 | -2643.7 | 3 | 130 |
| 768 | 2730 | -1962 | 3 | 131 |
| 755 | 2730 | -1975 | 3 | 132 |
| 1520 | 2730 | -1210 | 3 | 133 |
| 1500 | 2730 | -1230 | 3 | 134 |
| 1780 | 2730 | -950 | 3 | 135 |
| 420 | 2730 | -2310 | 3 | 136 |
| 716 | 2730 | -2014 | 3 | 137 |
| 1080 | 2730 | -1650 | 3 | 138 |
| 1396 | 2730 | -1334 | 3 | 139 |
| 315 | 2730 | -2415 | 3 | 140 |
| 1100 | 2730 | -1630 | 3 | 141 |
| 289 | 2730 | -2441 | 3 | 142 |
| 1128 | 2730 | -1602 | 3 | 143 |
| | | | | |
| 1820 | 2220 | -400 | 3 | 144 |
| 1510 | 2220 | -710 | 3 | 145 |
| 1380 | 2220 | -840 | 3 | 146 |
| 1450 | 2220 | -770 | 3 | 147 |
| 1270 | 2220 | -950 | 3 | 148 |
| 121 | 2220 | -2099 | 3 | 149 |
| 134 | 2220 | -2086 | 3 | 150 |
| 86.3 | 2220 | -2133.7 | 3 | 151 |

| | | | | |
|---|---|---|---|---|
| 768 | 2220 | -1452 | 3 | 152 |
| 755 | 2220 | -1465 | 3 | 153 |
| 1520 | 2220 | -700 | 3 | 154 |
| 1500 | 2220 | -720 | 3 | 155 |
| 1780 | 2220 | -440 | 3 | 156 |
| 420 | 2220 | -1800 | 3 | 157 |
| 716 | 2220 | -1504 | 3 | 158 |
| 1080 | 2220 | -1140 | 3 | 159 |
| 1396 | 2220 | -824 | 3 | 160 |
| 315 | 2220 | -1905 | 3 | 161 |
| 1100 | 2220 | -1120 | 3 | 162 |
| 289 | 2220 | -1931 | 3 | 163 |
| 1128 | 2220 | -1092 | 3 | 164 |
| | | | | |
| 1510 | 1820 | -310 | 3 | 165 |
| 1380 | 1820 | -440 | 3 | 166 |
| 1450 | 1820 | -370 | 3 | 167 |
| 1270 | 1820 | -550 | 3 | 168 |
| 121 | 1820 | -1699 | 3 | 169 |
| 134 | 1820 | -1686 | 3 | 170 |
| 86.3 | 1820 | -1733.7 | 3 | 171 |
| 768 | 1820 | -1052 | 3 | 172 |
| 755 | 1820 | -1065 | 3 | 173 |
| 1520 | 1820 | -300 | 3 | 174 |
| 1500 | 1820 | -320 | 3 | 175 |
| 1780 | 1820 | -40 | 3 | 176 |
| 420 | 1820 | -1400 | 3 | 177 |
| 716 | 1820 | -1104 | 3 | 178 |
| 1080 | 1820 | -740 | 3 | 179 |
| 1396 | 1820 | -424 | 3 | 180 |
| 315 | 1820 | -1505 | 3 | 181 |
| 1100 | 1820 | -720 | 3 | 182 |
| 289 | 1820 | -1531 | 3 | 183 |
| 1128 | 1820 | -692 | 3 | 184 |
| | | | | |
| 1380 | 1510 | -130 | 3 | 185 |
| 1450 | 1510 | -60 | 3 | 186 |
| 1270 | 1510 | -240 | 3 | 187 |
| 121 | 1510 | -1389 | 3 | 188 |
| 134 | 1510 | -1376 | 3 | 189 |
| 86.3 | 1510 | -1423.7 | 3 | 190 |
| 768 | 1510 | -742 | 3 | 191 |
| 755 | 1510 | -755 | 3 | 192 |
| 1520 | 1510 | 10 | 4 | 192 |
| 1500 | 1510 | -10 | 4 | 193 |
| 1780 | 1510 | 270 | 5 | 193 |
| 420 | 1510 | -1090 | 5 | 194 |
| 716 | 1510 | -794 | 5 | 195 |
| 1080 | 1510 | -430 | 5 | 196 |
| 1396 | 1510 | -114 | 5 | 197 |
| 315 | 1510 | -1195 | 5 | 198 |
| 1100 | 1510 | -410 | 5 | 199 |
| 289 | 1510 | -1221 | 5 | 200 |
| 1128 | 1510 | -382 | 5 | 201 |
| | | | | |
| 1450 | 1380 | 70 | 6 | 201 |
| 1270 | 1380 | -110 | 6 | 202 |

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|---|---|---|---|---|
| 121 | 1380 | -1259 | 6 | 203 |
| 134 | 1380 | -1246 | 6 | 204 |
| 86.3 | 1380 | -1293.7 | 6 | 205 |
| 768 | 1380 | -612 | 6 | 206 |
| 755 | 1380 | -625 | 6 | 207 |
| 1520 | 1380 | 140 | 7 | 207 |
| 1500 | 1380 | 120 | 8 | 207 |
| 1780 | 1380 | 400 | 9 | 207 |
| 420 | 1380 | -960 | 9 | 208 |
| 716 | 1380 | -664 | 9 | 209 |
| 1080 | 1380 | -300 | 9 | 210 |
| 1396 | 1380 | 16 | 10 | 210 |
| 315 | 1380 | -1065 | 10 | 211 |
| 1100 | 1380 | -280 | 10 | 212 |
| 289 | 1380 | -1091 | 10 | 213 |
| 1128 | 1380 | -252 | 10 | 214 |
| | | | | |
| 1270 | 1450 | -180 | 10 | 215 |
| 121 | 1450 | -1329 | 10 | 216 |
| 134 | 1450 | -1316 | 10 | 217 |
| 86.3 | 1450 | -1363.7 | 10 | 218 |
| 768 | 1450 | -682 | 10 | 219 |
| 755 | 1450 | -695 | 10 | 220 |
| 1520 | 1450 | 70 | 11 | 220 |
| 1500 | 1450 | 50 | 12 | 220 |
| 1780 | 1450 | 330 | 13 | 220 |
| 420 | 1450 | -1030 | 13 | 221 |
| 716 | 1450 | -734 | 13 | 222 |
| 1080 | 1450 | -370 | 13 | 223 |
| 1396 | 1450 | -54 | 13 | 224 |
| 315 | 1450 | -1135 | 13 | 225 |
| 1100 | 1450 | -350 | 13 | 226 |
| 289 | 1450 | -1161 | 13 | 227 |
| 1128 | 1450 | -322 | 13 | 228 |
| | | | | |
| 121 | 1270 | -1149 | 13 | 229 |
| 134 | 1270 | -1136 | 13 | 230 |
| 86.3 | 1270 | -1183.7 | 13 | 231 |
| 768 | 1270 | -502 | 13 | 232 |
| 755 | 1270 | -515 | 13 | 233 |
| 1520 | 1270 | 250 | 14 | 233 |
| 1500 | 1270 | 230 | 15 | 233 |
| 1780 | 1270 | 510 | 16 | 233 |
| 420 | 1270 | -850 | 16 | 234 |
| 716 | 1270 | -554 | 16 | 235 |
| 1080 | 1270 | -190 | 16 | 236 |
| 1396 | 1270 | 126 | 17 | 236 |
| 315 | 1270 | -955 | 17 | 237 |
| 1100 | 1270 | -170 | 17 | 238 |
| 289 | 1270 | -981 | 17 | 239 |
| 1128 | 1270 | -142 | 17 | 240 |
| | | | | |
| 134 | 121 | 13 | 18 | 240 |
| 86.3 | 121 | -34.7 | 18 | 241 |
| 768 | 121 | 647 | 19 | 241 |
| 755 | 121 | 634 | 20 | 241 |
| 1520 | 121 | 1399 | 21 | 241 |

| | | | | |
|---|---|---|---|---|
| 1500 | 121 | 1379 | 22 | 241 |
| 1780 | 121 | 1659 | 23 | 241 |
| 420 | 121 | 299 | 24 | 241 |
| 716 | 121 | 595 | 25 | 241 |
| 1080 | 121 | 959 | 26 | 241 |
| 1396 | 121 | 1275 | 27 | 241 |
| 315 | 121 | 194 | 28 | 241 |
| 1100 | 121 | 979 | 29 | 241 |
| 289 | 121 | 168 | 30 | 241 |
| 1128 | 121 | 1007 | 31 | 241 |
| | | | | |
| 86.3 | 134 | -47.7 | 31 | 242 |
| 768 | 134 | 634 | 32 | 242 |
| 755 | 134 | 621 | 33 | 242 |
| 1520 | 134 | 1386 | 34 | 242 |
| 1500 | 134 | 1366 | 35 | 242 |
| 1780 | 134 | 1646 | 36 | 242 |
| 420 | 134 | 286 | 37 | 242 |
| 716 | 134 | 582 | 38 | 242 |
| 1080 | 134 | 946 | 39 | 242 |
| 1396 | 134 | 1262 | 40 | 242 |
| 315 | 134 | 181 | 41 | 242 |
| 1100 | 134 | 966 | 42 | 242 |
| 289 | 134 | 155 | 43 | 242 |
| 1128 | 134 | 994 | 44 | 242 |
| | | | | |
| 768 | 86.3 | 681.7 | 45 | 242 |
| 755 | 86.3 | 668.7 | 46 | 242 |
| 1520 | 86.3 | 1433.7 | 47 | 242 |
| 1500 | 86.3 | 1413.7 | 48 | 242 |
| 1780 | 86.3 | 1693.7 | 49 | 242 |
| 420 | 86.3 | 333.7 | 50 | 242 |
| 716 | 86.3 | 629.7 | 51 | 242 |
| 1080 | 86.3 | 993.7 | 52 | 242 |
| 1396 | 86.3 | 1309.7 | 53 | 242 |
| 315 | 86.3 | 228.7 | 54 | 242 |
| 1100 | 86.3 | 1013.7 | 55 | 242 |
| 289 | 86.3 | 202.7 | 56 | 242 |
| 1128 | 86.3 | 1041.7 | 57 | 242 |
| | | | | |
| 755 | 768 | Same Date | 57 | 242 |
| 1520 | 768 | 752 | 58 | 242 |
| 1500 | 768 | 732 | 59 | 242 |
| 1780 | 768 | 1012 | 60 | 242 |
| 420 | 768 | -348 | 60 | 243 |
| 716 | 768 | -52 | 60 | 244 |
| 1080 | 768 | 312 | 61 | 244 |
| 1396 | 768 | 628 | 62 | 244 |
| 315 | 768 | -453 | 62 | 245 |
| 1100 | 768 | 332 | 63 | 245 |
| 289 | 768 | -479 | 63 | 246 |
| 1128 | 768 | 360 | 64 | 246 |
| | | | | |
| 1520 | 755 | 765 | 65 | 246 |
| 1500 | 755 | 745 | 66 | 246 |
| 1780 | 755 | 1025 | 67 | 246 |
| 420 | 755 | -335 | 67 | 247 |

| | | | | |
|---|---|---|---|---|
| 716 | 755 | -39 | 67 | 248 |
| 1080 | 755 | 325 | 68 | 248 |
| 1396 | 755 | 641 | 69 | 248 |
| 315 | 755 | -440 | 69 | 249 |
| 1100 | 755 | 345 | 70 | 249 |
| 289 | 755 | -466 | 70 | 250 |
| 1128 | 755 | 373 | 71 | 250 |
| | | | | |
| 1500 | 1520 | Same Date | 71 | 250 |
| 1780 | 1520 | 260 | 72 | 250 |
| 420 | 1520 | -1100 | 72 | 251 |
| 716 | 1520 | -804 | 72 | 252 |
| 1080 | 1520 | -440 | 72 | 253 |
| 1396 | 1520 | -124 | 72 | 254 |
| 315 | 1520 | -1205 | 72 | 255 |
| 1100 | 1520 | -420 | 72 | 256 |
| 289 | 1520 | -1231 | 72 | 257 |
| 1128 | 1520 | -392 | 72 | 258 |
| | | | | |
| 1780 | 1500 | 280 | 73 | 258 |
| 420 | 1500 | -1080 | 73 | 259 |
| 716 | 1500 | -784 | 73 | 260 |
| 1080 | 1500 | -420 | 73 | 261 |
| 1396 | 1500 | -104 | 73 | 262 |
| 315 | 1500 | -1185 | 73 | 263 |
| 1100 | 1500 | -400 | 73 | 264 |
| 289 | 1500 | -1211 | 73 | 265 |
| 1128 | 1500 | -372 | 73 | 266 |
| | | | | |
| 420 | 1780 | -1360 | 73 | 267 |
| 716 | 1780 | -1064 | 73 | 268 |
| 1080 | 1780 | -700 | 73 | 269 |
| 1396 | 1780 | -384 | 73 | 270 |
| 315 | 1780 | -1465 | 73 | 271 |
| 1100 | 1780 | -680 | 73 | 272 |
| 289 | 1780 | -1491 | 73 | 273 |
| 1128 | 1780 | -652 | 73 | 274 |
| | | | | |
| 716 | 420 | 296 | 74 | 274 |
| 1080 | 420 | 660 | 75 | 274 |
| 1396 | 420 | 976 | 76 | 274 |
| 315 | 420 | -105 | 76 | 275 |
| 1100 | 420 | 680 | 77 | 275 |
| 289 | 420 | -131 | 77 | 276 |
| 1128 | 420 | 708 | 78 | 276 |
| | | | | |
| 1080 | 716 | 364 | 79 | 276 |
| 1396 | 716 | 680 | 80 | 276 |
| 315 | 716 | -401 | 80 | 277 |
| 1100 | 716 | 384 | 81 | 277 |
| 289 | 716 | -427 | 81 | 278 |
| 1128 | 716 | 412 | 82 | 278 |
| | | | | |
| 1396 | 1080 | 316 | 83 | 278 |
| 315 | 1080 | -765 | 83 | 279 |
| 1100 | 1080 | 20 | 84 | 279 |
| 289 | 1080 | -791 | 84 | 280 |

| | | | | |
|---|---|---|---|---|
| 1128 | 1080 | 48 | 85 | 280 |
| | | | | |
| 315 | 1396 | -1081 | 85 | 281 |
| 1100 | 1396 | -296 | 85 | 282 |
| 289 | 1396 | -1107 | 85 | 283 |
| 1128 | 1396 | -268 | 85 | 284 |
| | | | | |
| 1100 | 315 | 785 | 86 | 284 |
| 289 | 315 | -26 | 86 | 285 |
| 1128 | 315 | 813 | 87 | 285 |
| | | | | |
| 289 | 1100 | -811 | 87 | 286 |
| 1128 | 1100 | 28 | 88 | 286 |
| | | | | |
| 1128 | 289 | 839 | 89 | 286 |

S Statistic = 89 - 286 = -197

| Tied Group | Value | Members |
|---|---|---|
| 1 | 2730 | 2 |

| Time Period | Observations |
|---|---|
| 2/1/2017 | 1 |
| 3/1/2017 | 1 |
| 4/1/2017 | 1 |
| 5/1/2017 | 1 |
| 6/1/2017 | 1 |
| 7/1/2017 | 1 |
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 6/1/2020 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 2 time periods with multiple data

A = 18
B = 36
C = 0
D = 0
E = 2
F = 4

a = 46116
b = 176904
c = 1512
Group Variance = 2559.01
Z-Score = -3.87454
Comparison Level at 95% confidence level = -1.65463 (downward trend)
**-3.87454 < -1.65463 indicating a downward trend**

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RW13-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 66 | 31800 | -31734 | 0 | 1 |
| 28700 | 31800 | -3100 | 0 | 2 |
| 24500 | 31800 | -7300 | 0 | 3 |
| 44.2 | 31800 | -31755.8 | 0 | 4 |
| 1240 | 31800 | -30560 | 0 | 5 |
| 19400 | 31800 | -12400 | 0 | 6 |
| 21000 | 31800 | -10800 | 0 | 7 |
| 12.6 | 31800 | -31787.4 | 0 | 8 |
| 29200 | 31800 | -2600 | 0 | 9 |
| 26900 | 31800 | -4900 | 0 | 10 |
| 94.7 | 31800 | -31705.3 | 0 | 11 |
| 51.1 | 31800 | -31748.9 | 0 | 12 |
| 12.8 1c | 31800 | -31787.2 | 0 | 13 |
| 22500 | 31800 | -9300 | 0 | 14 |
| 24700 | 31800 | -7100 | 0 | 15 |
| 15.4 | 31800 | -31784.6 | 0 | 16 |
| 23900 ML | 31800 | -7900 | 0 | 17 |
| 6.1 | 31800 | -31793.9 | 0 | 18 |
| 26400 | 31800 | -5400 | 0 | 19 |
| 23700 | 31800 | -8100 | 0 | 20 |
| 35700 | 31800 | 3900 | 1 | 20 |
| 38540 | 31800 | 6740 | 2 | 20 |
| | | | | |
| 28700 | 66 | 28634 | 3 | 20 |
| 24500 | 66 | 24434 | 4 | 20 |
| 44.2 | 66 | -21.8 | 4 | 21 |
| 1240 | 66 | 1174 | 5 | 21 |
| 19400 | 66 | 19334 | 6 | 21 |
| 21000 | 66 | 20934 | 7 | 21 |
| 12.6 | 66 | -53.4 | 7 | 22 |
| 29200 | 66 | 29134 | 8 | 22 |
| 26900 | 66 | 26834 | 9 | 22 |
| 94.7 | 66 | 28.7 | 10 | 22 |
| 51.1 | 66 | -14.9 | 10 | 23 |
| 12.8 1c | 66 | -53.2 | 10 | 24 |
| 22500 | 66 | 22434 | 11 | 24 |
| 24700 | 66 | 24634 | 12 | 24 |
| 15.4 | 66 | -50.6 | 12 | 25 |
| 23900 ML | 66 | 23834 | 13 | 25 |
| 6.1 | 66 | -59.9 | 13 | 26 |
| 26400 | 66 | 26334 | 14 | 26 |
| 23700 | 66 | 23634 | 15 | 26 |
| 35700 | 66 | 35634 | 16 | 26 |
| 38540 | 66 | 38474 | 17 | 26 |
| | | | | |
| 24500 | 28700 | -4200 | 17 | 27 |
| 44.2 | 28700 | -28655.8 | 17 | 28 |

| | | | | |
|---|---|---|---|---|
| 1240 | 28700 | -27460 | 17 | 29 |
| 19400 | 28700 | -9300 | 17 | 30 |
| 21000 | 28700 | -7700 | 17 | 31 |
| 12.6 | 28700 | -28687.4 | 17 | 32 |
| 29200 | 28700 | 500 | 18 | 32 |
| 26900 | 28700 | -1800 | 18 | 33 |
| 94.7 | 28700 | -28605.3 | 18 | 34 |
| 51.1 | 28700 | -28648.9 | 18 | 35 |
| 12.8 1c | 28700 | -28687.2 | 18 | 36 |
| 22500 | 28700 | -6200 | 18 | 37 |
| 24700 | 28700 | -4000 | 18 | 38 |
| 15.4 | 28700 | -28684.6 | 18 | 39 |
| 23900 ML | 28700 | -4800 | 18 | 40 |
| 6.1 | 28700 | -28693.9 | 18 | 41 |
| 26400 | 28700 | -2300 | 18 | 42 |
| 23700 | 28700 | -5000 | 18 | 43 |
| 35700 | 28700 | 7000 | 19 | 43 |
| 38540 | 28700 | 9840 | 20 | 43 |
| | | | | |
| 44.2 | 24500 | -24455.8 | 20 | 44 |
| 1240 | 24500 | -23260 | 20 | 45 |
| 19400 | 24500 | -5100 | 20 | 46 |
| 21000 | 24500 | -3500 | 20 | 47 |
| 12.6 | 24500 | -24487.4 | 20 | 48 |
| 29200 | 24500 | 4700 | 21 | 48 |
| 26900 | 24500 | 2400 | 22 | 48 |
| 94.7 | 24500 | -24405.3 | 22 | 49 |
| 51.1 | 24500 | -24448.9 | 22 | 50 |
| 12.8 1c | 24500 | -24487.2 | 22 | 51 |
| 22500 | 24500 | -2000 | 22 | 52 |
| 24700 | 24500 | 200 | 23 | 52 |
| 15.4 | 24500 | -24484.6 | 23 | 53 |
| 23900 ML | 24500 | -600 | 23 | 54 |
| 6.1 | 24500 | -24493.9 | 23 | 55 |
| 26400 | 24500 | 1900 | 24 | 55 |
| 23700 | 24500 | -800 | 24 | 56 |
| 35700 | 24500 | 11200 | 25 | 56 |
| 38540 | 24500 | 14040 | 26 | 56 |
| | | | | |
| 1240 | 44.2 | 1195.8 | 27 | 56 |
| 19400 | 44.2 | 19355.8 | 28 | 56 |
| 21000 | 44.2 | 20955.8 | 29 | 56 |
| 12.6 | 44.2 | -31.6 | 29 | 57 |
| 29200 | 44.2 | 29155.8 | 30 | 57 |
| 26900 | 44.2 | 26855.8 | 31 | 57 |
| 94.7 | 44.2 | 50.5 | 32 | 57 |
| 51.1 | 44.2 | 6.9 | 33 | 57 |
| 12.8 1c | 44.2 | -31.4 | 33 | 58 |
| 22500 | 44.2 | 22455.8 | 34 | 58 |
| 24700 | 44.2 | 24655.8 | 35 | 58 |
| 15.4 | 44.2 | -28.8 | 35 | 59 |
| 23900 ML | 44.2 | 23855.8 | 36 | 59 |
| 6.1 | 44.2 | -38.1 | 36 | 60 |
| 26400 | 44.2 | 26355.8 | 37 | 60 |
| 23700 | 44.2 | 23655.8 | 38 | 60 |
| 35700 | 44.2 | 35655.8 | 39 | 60 |
| 38540 | 44.2 | 38495.8 | 40 | 60 |

| | | | | |
|---|---|---|---|---|
| 19400 | 1240 | 18160 | 41 | 60 |
| 21000 | 1240 | 19760 | 42 | 60 |
| 12.6 | 1240 | -1227.4 | 42 | 61 |
| 29200 | 1240 | 27960 | 43 | 61 |
| 26900 | 1240 | 25660 | 44 | 61 |
| 94.7 | 1240 | -1145.3 | 44 | 62 |
| 51.1 | 1240 | -1188.9 | 44 | 63 |
| 12.8 1c | 1240 | -1227.2 | 44 | 64 |
| 22500 | 1240 | 21260 | 45 | 64 |
| 24700 | 1240 | 23460 | 46 | 64 |
| 15.4 | 1240 | -1224.6 | 46 | 65 |
| 23900 ML | 1240 | 22660 | 47 | 65 |
| 6.1 | 1240 | -1233.9 | 47 | 66 |
| 26400 | 1240 | 25160 | 48 | 66 |
| 23700 | 1240 | 22460 | 49 | 66 |
| 35700 | 1240 | 34460 | 50 | 66 |
| 38540 | 1240 | 37300 | 51 | 66 |
| | | | | |
| 21000 | 19400 | 1600 | 52 | 66 |
| 12.6 | 19400 | -19387.4 | 52 | 67 |
| 29200 | 19400 | 9800 | 53 | 67 |
| 26900 | 19400 | 7500 | 54 | 67 |
| 94.7 | 19400 | -19305.3 | 54 | 68 |
| 51.1 | 19400 | -19348.9 | 54 | 69 |
| 12.8 1c | 19400 | -19387.2 | 54 | 70 |
| 22500 | 19400 | 3100 | 55 | 70 |
| 24700 | 19400 | 5300 | 56 | 70 |
| 15.4 | 19400 | -19384.6 | 56 | 71 |
| 23900 ML | 19400 | 4500 | 57 | 71 |
| 6.1 | 19400 | -19393.9 | 57 | 72 |
| 26400 | 19400 | 7000 | 58 | 72 |
| 23700 | 19400 | 4300 | 59 | 72 |
| 35700 | 19400 | 16300 | 60 | 72 |
| 38540 | 19400 | 19140 | 61 | 72 |
| | | | | |
| 12.6 | 21000 | -20987.4 | 61 | 73 |
| 29200 | 21000 | 8200 | 62 | 73 |
| 26900 | 21000 | 5900 | 63 | 73 |
| 94.7 | 21000 | -20905.3 | 63 | 74 |
| 51.1 | 21000 | -20948.9 | 63 | 75 |
| 12.8 1c | 21000 | -20987.2 | 63 | 76 |
| 22500 | 21000 | 1500 | 64 | 76 |
| 24700 | 21000 | 3700 | 65 | 76 |
| 15.4 | 21000 | -20984.6 | 65 | 77 |
| 23900 ML | 21000 | 2900 | 66 | 77 |
| 6.1 | 21000 | -20993.9 | 66 | 78 |
| 26400 | 21000 | 5400 | 67 | 78 |
| 23700 | 21000 | 2700 | 68 | 78 |
| 35700 | 21000 | 14700 | 69 | 78 |
| 38540 | 21000 | 17540 | 70 | 78 |
| | | | | |
| 29200 | 12.6 | 29187.4 | 71 | 78 |
| 26900 | 12.6 | 26887.4 | 72 | 78 |
| 94.7 | 12.6 | 82.1 | 73 | 78 |
| 51.1 | 12.6 | 38.5 | 74 | 78 |
| 12.8 1c | 12.6 | 0.2 | 75 | 78 |

| | | | | |
|---|---|---|---|---|
| 22500 | 12.6 | 22487.4 | 76 | 78 |
| 24700 | 12.6 | 24687.4 | 77 | 78 |
| 15.4 | 12.6 | 2.8 | 78 | 78 |
| 23900 ML | 12.6 | 23887.4 | 79 | 78 |
| 6.1 | 12.6 | -6.5 | 79 | 79 |
| 26400 | 12.6 | 26387.4 | 80 | 79 |
| 23700 | 12.6 | 23687.4 | 81 | 79 |
| 35700 | 12.6 | 35687.4 | 82 | 79 |
| 38540 | 12.6 | 38527.4 | 83 | 79 |
| | | | | |
| 26900 | 29200 | Same Date | 83 | 79 |
| 94.7 | 29200 | -29105.3 | 83 | 80 |
| 51.1 | 29200 | -29148.9 | 83 | 81 |
| 12.8 1c | 29200 | -29187.2 | 83 | 82 |
| 22500 | 29200 | -6700 | 83 | 83 |
| 24700 | 29200 | -4500 | 83 | 84 |
| 15.4 | 29200 | -29184.6 | 83 | 85 |
| 23900 ML | 29200 | -5300 | 83 | 86 |
| 6.1 | 29200 | -29193.9 | 83 | 87 |
| 26400 | 29200 | -2800 | 83 | 88 |
| 23700 | 29200 | -5500 | 83 | 89 |
| 35700 | 29200 | 6500 | 84 | 89 |
| 38540 | 29200 | 9340 | 85 | 89 |
| | | | | |
| 94.7 | 26900 | -26805.3 | 85 | 90 |
| 51.1 | 26900 | -26848.9 | 85 | 91 |
| 12.8 1c | 26900 | -26887.2 | 85 | 92 |
| 22500 | 26900 | -4400 | 85 | 93 |
| 24700 | 26900 | -2200 | 85 | 94 |
| 15.4 | 26900 | -26884.6 | 85 | 95 |
| 23900 ML | 26900 | -3000 | 85 | 96 |
| 6.1 | 26900 | -26893.9 | 85 | 97 |
| 26400 | 26900 | -500 | 85 | 98 |
| 23700 | 26900 | -3200 | 85 | 99 |
| 35700 | 26900 | 8800 | 86 | 99 |
| 38540 | 26900 | 11640 | 87 | 99 |
| | | | | |
| 51.1 | 94.7 | Same Date | 87 | 99 |
| 12.8 1c | 94.7 | -81.9 | 87 | 100 |
| 22500 | 94.7 | 22405.3 | 88 | 100 |
| 24700 | 94.7 | 24605.3 | 89 | 100 |
| 15.4 | 94.7 | -79.3 | 89 | 101 |
| 23900 ML | 94.7 | 23805.3 | 90 | 101 |
| 6.1 | 94.7 | -88.6 | 90 | 102 |
| 26400 | 94.7 | 26305.3 | 91 | 102 |
| 23700 | 94.7 | 23605.3 | 92 | 102 |
| 35700 | 94.7 | 35605.3 | 93 | 102 |
| 38540 | 94.7 | 38445.3 | 94 | 102 |
| | | | | |
| 12.8 1c | 51.1 | -38.3 | 94 | 103 |
| 22500 | 51.1 | 22448.9 | 95 | 103 |
| 24700 | 51.1 | 24648.9 | 96 | 103 |
| 15.4 | 51.1 | -35.7 | 96 | 104 |
| 23900 ML | 51.1 | 23848.9 | 97 | 104 |
| 6.1 | 51.1 | -45 | 97 | 105 |
| 26400 | 51.1 | 26348.9 | 98 | 105 |
| 23700 | 51.1 | 23648.9 | 99 | 105 |

| | | | | |
|---|---|---|---|---|
| 35700 | 51.1 | 35648.9 | 100 | 105 |
| 38540 | 51.1 | 38488.9 | 101 | 105 |
| | | | | |
| 22500 | 12.8 1c | 22487.2 | 102 | 105 |
| 24700 | 12.8 1c | 24687.2 | 103 | 105 |
| 15.4 | 12.8 1c | 2.6 | 104 | 105 |
| 23900 ML | 12.8 1c | 23887.2 | 105 | 105 |
| 6.1 | 12.8 1c | -6.7 | 105 | 106 |
| 26400 | 12.8 1c | 26387.2 | 106 | 106 |
| 23700 | 12.8 1c | 23687.2 | 107 | 106 |
| 35700 | 12.8 1c | 35687.2 | 108 | 106 |
| 38540 | 12.8 1c | 38527.2 | 109 | 106 |
| | | | | |
| 24700 | 22500 | 2200 | 110 | 106 |
| 15.4 | 22500 | -22484.6 | 110 | 107 |
| 23900 ML | 22500 | 1400 | 111 | 107 |
| 6.1 | 22500 | -22493.9 | 111 | 108 |
| 26400 | 22500 | 3900 | 112 | 108 |
| 23700 | 22500 | 1200 | 113 | 108 |
| 35700 | 22500 | 13200 | 114 | 108 |
| 38540 | 22500 | 16040 | 115 | 108 |
| | | | | |
| 15.4 | 24700 | -24684.6 | 115 | 109 |
| 23900 ML | 24700 | -800 | 115 | 110 |
| 6.1 | 24700 | -24693.9 | 115 | 111 |
| 26400 | 24700 | 1700 | 116 | 111 |
| 23700 | 24700 | -1000 | 116 | 112 |
| 35700 | 24700 | 11000 | 117 | 112 |
| 38540 | 24700 | 13840 | 118 | 112 |
| | | | | |
| 23900 ML | 15.4 | 23884.6 | 119 | 112 |
| 6.1 | 15.4 | -9.3 | 119 | 113 |
| 26400 | 15.4 | 26384.6 | 120 | 113 |
| 23700 | 15.4 | 23684.6 | 121 | 113 |
| 35700 | 15.4 | 35684.6 | 122 | 113 |
| 38540 | 15.4 | 38524.6 | 123 | 113 |
| | | | | |
| 6.1 | 23900 ML | -23893.9 | 123 | 114 |
| 26400 | 23900 ML | 2500 | 124 | 114 |
| 23700 | 23900 ML | -200 | 124 | 115 |
| 35700 | 23900 ML | 11800 | 125 | 115 |
| 38540 | 23900 ML | 14640 | 126 | 115 |
| | | | | |
| 26400 | 6.1 | 26393.9 | 127 | 115 |
| 23700 | 6.1 | 23693.9 | 128 | 115 |
| 35700 | 6.1 | 35693.9 | 129 | 115 |
| 38540 | 6.1 | 38533.9 | 130 | 115 |
| | | | | |
| 23700 | 26400 | -2700 | 130 | 116 |
| 35700 | 26400 | 9300 | 131 | 116 |
| 38540 | 26400 | 12140 | 132 | 116 |
| | | | | |
| 35700 | 23700 | 12000 | 133 | 116 |
| 38540 | 23700 | 14840 | 134 | 116 |
| | | | | |
| 38540 | 35700 | 2840 | 135 | 116 |

S Statistic = 135 - 116 = 19

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 3/1/2022 | 1 |
| 3/1/2023 | 1 |
| 3/1/2024 | 1 |

There are 2 time periods with multiple data

A = 0
B = 36
C = 0
D = 0
E = 0
F = 4
a = 25806
b = 95634
c = 1012
Group Variance = 1431.67
Z-Score = 0.47572
Comparison Level at 95% confidence level = -1.65463 (downward trend)
0.47572 >= -1.65463 indicating no evidence of a downward trend

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RW15-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| ND<1.5 U | 10.1 | -8.6 | 0 | 1 |
| ND<1.5 U | 10.1 | -8.6 | 0 | 2 |
| ND<1.5 U | 10.1 | -8.6 | 0 | 3 |
| 0.97 J | 10.1 | -9.13 | 0 | 4 |
| 1.6 J | 10.1 | -8.5 | 0 | 5 |
| ND<1.5 U | 10.1 | -8.6 | 0 | 6 |
| 15.3 | 10.1 | 5.2 | 1 | 6 |
| ND<1.5 U | 10.1 | -8.6 | 1 | 7 |
| 402 | 10.1 | 391.9 | 2 | 7 |
| 396 | 10.1 | 385.9 | 3 | 7 |
| 64.9 | 10.1 | 54.8 | 4 | 7 |
| 64.2 | 10.1 | 54.1 | 5 | 7 |
| 589 | 10.1 | 578.9 | 6 | 7 |
| 605 1c | 10.1 | 594.9 | 7 | 7 |
| 0.5 J | 10.1 | -9.6 | 7 | 8 |
| ND<1.5 U | 10.1 | -8.6 | 7 | 9 |
| 8 | 10.1 | -2.1 | 7 | 10 |
| 0.91 J | 10.1 | -9.19 | 7 | 11 |
| 43.6 | 10.1 | 33.5 | 8 | 11 |
| 169 | 10.1 | 158.9 | 9 | 11 |
| 407.8 | 10.1 | 397.7 | 10 | 11 |
| 4.679 | 10.1 | -5.421 | 10 | 12 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 10 | 12 |
| ND<1.5 U | ND<1.5 U | 0 | 10 | 12 |
| 0.97 J | ND<1.5 U | -0.53 | 10 | 13 |
| 1.6 J | ND<1.5 U | 0.1 | 11 | 13 |
| ND<1.5 U | ND<1.5 U | 0 | 11 | 13 |
| 15.3 | ND<1.5 U | 13.8 | 12 | 13 |
| ND<1.5 U | ND<1.5 U | 0 | 12 | 13 |
| 402 | ND<1.5 U | 400.5 | 13 | 13 |
| 396 | ND<1.5 U | 394.5 | 14 | 13 |
| 64.9 | ND<1.5 U | 63.4 | 15 | 13 |
| 64.2 | ND<1.5 U | 62.7 | 16 | 13 |
| 589 | ND<1.5 U | 587.5 | 17 | 13 |
| 605 1c | ND<1.5 U | 603.5 | 18 | 13 |
| 0.5 J | ND<1.5 U | -1 | 18 | 14 |
| ND<1.5 U | ND<1.5 U | 0 | 18 | 14 |
| 8 | ND<1.5 U | 6.5 | 19 | 14 |
| 0.91 J | ND<1.5 U | -0.59 | 19 | 15 |
| 43.6 | ND<1.5 U | 42.1 | 20 | 15 |
| 169 | ND<1.5 U | 167.5 | 21 | 15 |
| 407.8 | ND<1.5 U | 406.3 | 22 | 15 |
| 4.679 | ND<1.5 U | 3.179 | 23 | 15 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 23 | 15 |
| 0.97 J | ND<1.5 U | -0.53 | 23 | 16 |

| | | | | |
|---|---|---|---|---|
| 1.6 J | ND<1.5 U | 0.1 | 24 | 16 |
| ND<1.5 U | ND<1.5 U | 0 | 24 | 16 |
| 15.3 | ND<1.5 U | 13.8 | 25 | 16 |
| ND<1.5 U | ND<1.5 U | 0 | 25 | 16 |
| 402 | ND<1.5 U | 400.5 | 26 | 16 |
| 396 | ND<1.5 U | 394.5 | 27 | 16 |
| 64.9 | ND<1.5 U | 63.4 | 28 | 16 |
| 64.2 | ND<1.5 U | 62.7 | 29 | 16 |
| 589 | ND<1.5 U | 587.5 | 30 | 16 |
| 605 1c | ND<1.5 U | 603.5 | 31 | 16 |
| 0.5 J | ND<1.5 U | -1 | 31 | 17 |
| ND<1.5 U | ND<1.5 U | 0 | 31 | 17 |
| 8 | ND<1.5 U | 6.5 | 32 | 17 |
| 0.91 J | ND<1.5 U | -0.59 | 32 | 18 |
| 43.6 | ND<1.5 U | 42.1 | 33 | 18 |
| 169 | ND<1.5 U | 167.5 | 34 | 18 |
| 407.8 | ND<1.5 U | 406.3 | 35 | 18 |
| 4.679 | ND<1.5 U | 3.179 | 36 | 18 |
| | | | | |
| 0.97 J | ND<1.5 U | -0.53 | 36 | 19 |
| 1.6 J | ND<1.5 U | 0.1 | 37 | 19 |
| ND<1.5 U | ND<1.5 U | 0 | 37 | 19 |
| 15.3 | ND<1.5 U | 13.8 | 38 | 19 |
| ND<1.5 U | ND<1.5 U | 0 | 38 | 19 |
| 402 | ND<1.5 U | 400.5 | 39 | 19 |
| 396 | ND<1.5 U | 394.5 | 40 | 19 |
| 64.9 | ND<1.5 U | 63.4 | 41 | 19 |
| 64.2 | ND<1.5 U | 62.7 | 42 | 19 |
| 589 | ND<1.5 U | 587.5 | 43 | 19 |
| 605 1c | ND<1.5 U | 603.5 | 44 | 19 |
| 0.5 J | ND<1.5 U | -1 | 44 | 20 |
| ND<1.5 U | ND<1.5 U | 0 | 44 | 20 |
| 8 | ND<1.5 U | 6.5 | 45 | 20 |
| 0.91 J | ND<1.5 U | -0.59 | 45 | 21 |
| 43.6 | ND<1.5 U | 42.1 | 46 | 21 |
| 169 | ND<1.5 U | 167.5 | 47 | 21 |
| 407.8 | ND<1.5 U | 406.3 | 48 | 21 |
| 4.679 | ND<1.5 U | 3.179 | 49 | 21 |
| | | | | |
| 1.6 J | 0.97 J | 0.63 | 50 | 21 |
| ND<1.5 U | 0.97 J | 0.53 | 51 | 21 |
| 15.3 | 0.97 J | 14.33 | 52 | 21 |
| ND<1.5 U | 0.97 J | 0.53 | 53 | 21 |
| 402 | 0.97 J | 401.03 | 54 | 21 |
| 396 | 0.97 J | 395.03 | 55 | 21 |
| 64.9 | 0.97 J | 63.93 | 56 | 21 |
| 64.2 | 0.97 J | 63.23 | 57 | 21 |
| 589 | 0.97 J | 588.03 | 58 | 21 |
| 605 1c | 0.97 J | 604.03 | 59 | 21 |
| 0.5 J | 0.97 J | -0.47 | 59 | 22 |
| ND<1.5 U | 0.97 J | 0.53 | 60 | 22 |
| 8 | 0.97 J | 7.03 | 61 | 22 |
| 0.91 J | 0.97 J | -0.06 | 61 | 23 |
| 43.6 | 0.97 J | 42.63 | 62 | 23 |
| 169 | 0.97 J | 168.03 | 63 | 23 |
| 407.8 | 0.97 J | 406.83 | 64 | 23 |
| 4.679 | 0.97 J | 3.709 | 65 | 23 |

| | | | | |
|---|---|---|---|---|
| ND<1.5 U | 1.6 J | -0.1 | 65 | 24 |
| 15.3 | 1.6 J | 13.7 | 66 | 24 |
| ND<1.5 U | 1.6 J | -0.1 | 66 | 25 |
| 402 | 1.6 J | 400.4 | 67 | 25 |
| 396 | 1.6 J | 394.4 | 68 | 25 |
| 64.9 | 1.6 J | 63.3 | 69 | 25 |
| 64.2 | 1.6 J | 62.6 | 70 | 25 |
| 589 | 1.6 J | 587.4 | 71 | 25 |
| 605 1c | 1.6 J | 603.4 | 72 | 25 |
| 0.5 J | 1.6 J | -1.1 | 72 | 26 |
| ND<1.5 U | 1.6 J | -0.1 | 72 | 27 |
| 8 | 1.6 J | 6.4 | 73 | 27 |
| 0.91 J | 1.6 J | -0.69 | 73 | 28 |
| 43.6 | 1.6 J | 42 | 74 | 28 |
| 169 | 1.6 J | 167.4 | 75 | 28 |
| 407.8 | 1.6 J | 406.2 | 76 | 28 |
| 4.679 | 1.6 J | 3.079 | 77 | 28 |
| | | | | |
| 15.3 | ND<1.5 U | 13.8 | 78 | 28 |
| ND<1.5 U | ND<1.5 U | 0 | 78 | 28 |
| 402 | ND<1.5 U | 400.5 | 79 | 28 |
| 396 | ND<1.5 U | 394.5 | 80 | 28 |
| 64.9 | ND<1.5 U | 63.4 | 81 | 28 |
| 64.2 | ND<1.5 U | 62.7 | 82 | 28 |
| 589 | ND<1.5 U | 587.5 | 83 | 28 |
| 605 1c | ND<1.5 U | 603.5 | 84 | 28 |
| 0.5 J | ND<1.5 U | -1 | 84 | 29 |
| ND<1.5 U | ND<1.5 U | 0 | 84 | 29 |
| 8 | ND<1.5 U | 6.5 | 85 | 29 |
| 0.91 J | ND<1.5 U | -0.59 | 85 | 30 |
| 43.6 | ND<1.5 U | 42.1 | 86 | 30 |
| 169 | ND<1.5 U | 167.5 | 87 | 30 |
| 407.8 | ND<1.5 U | 406.3 | 88 | 30 |
| 4.679 | ND<1.5 U | 3.179 | 89 | 30 |
| | | | | |
| ND<1.5 U | 15.3 | -13.8 | 89 | 31 |
| 402 | 15.3 | 386.7 | 90 | 31 |
| 396 | 15.3 | 380.7 | 91 | 31 |
| 64.9 | 15.3 | 49.6 | 92 | 31 |
| 64.2 | 15.3 | 48.9 | 93 | 31 |
| 589 | 15.3 | 573.7 | 94 | 31 |
| 605 1c | 15.3 | 589.7 | 95 | 31 |
| 0.5 J | 15.3 | -14.8 | 95 | 32 |
| ND<1.5 U | 15.3 | -13.8 | 95 | 33 |
| 8 | 15.3 | -7.3 | 95 | 34 |
| 0.91 J | 15.3 | -14.39 | 95 | 35 |
| 43.6 | 15.3 | 28.3 | 96 | 35 |
| 169 | 15.3 | 153.7 | 97 | 35 |
| 407.8 | 15.3 | 392.5 | 98 | 35 |
| 4.679 | 15.3 | -10.621 | 98 | 36 |
| | | | | |
| 402 | ND<1.5 U | 400.5 | 99 | 36 |
| 396 | ND<1.5 U | 394.5 | 100 | 36 |
| 64.9 | ND<1.5 U | 63.4 | 101 | 36 |
| 64.2 | ND<1.5 U | 62.7 | 102 | 36 |
| 589 | ND<1.5 U | 587.5 | 103 | 36 |

| | | | | |
|---|---|---|---|---|
| 605 1c | ND<1.5 U | 603.5 | 104 | 36 |
| 0.5 J | ND<1.5 U | -1 | 104 | 37 |
| ND<1.5 U | ND<1.5 U | 0 | 104 | 37 |
| 8 | ND<1.5 U | 6.5 | 105 | 37 |
| 0.91 J | ND<1.5 U | -0.59 | 105 | 38 |
| 43.6 | ND<1.5 U | 42.1 | 106 | 38 |
| 169 | ND<1.5 U | 167.5 | 107 | 38 |
| 407.8 | ND<1.5 U | 406.3 | 108 | 38 |
| 4.679 | ND<1.5 U | 3.179 | 109 | 38 |
| | | | | |
| 396 | 402 | Same Date | 109 | 38 |
| 64.9 | 402 | -337.1 | 109 | 39 |
| 64.2 | 402 | -337.8 | 109 | 40 |
| 589 | 402 | 187 | 110 | 40 |
| 605 1c | 402 | 203 | 111 | 40 |
| 0.5 J | 402 | -401.5 | 111 | 41 |
| ND<1.5 U | 402 | -400.5 | 111 | 42 |
| 8 | 402 | -394 | 111 | 43 |
| 0.91 J | 402 | -401.09 | 111 | 44 |
| 43.6 | 402 | -358.4 | 111 | 45 |
| 169 | 402 | -233 | 111 | 46 |
| 407.8 | 402 | 5.8 | 112 | 46 |
| 4.679 | 402 | -397.321 | 112 | 47 |
| | | | | |
| 64.9 | 396 | -331.1 | 112 | 48 |
| 64.2 | 396 | -331.8 | 112 | 49 |
| 589 | 396 | 193 | 113 | 49 |
| 605 1c | 396 | 209 | 114 | 49 |
| 0.5 J | 396 | -395.5 | 114 | 50 |
| ND<1.5 U | 396 | -394.5 | 114 | 51 |
| 8 | 396 | -388 | 114 | 52 |
| 0.91 J | 396 | -395.09 | 114 | 53 |
| 43.6 | 396 | -352.4 | 114 | 54 |
| 169 | 396 | -227 | 114 | 55 |
| 407.8 | 396 | 11.8 | 115 | 55 |
| 4.679 | 396 | -391.321 | 115 | 56 |
| | | | | |
| 64.2 | 64.9 | Same Date | 115 | 56 |
| 589 | 64.9 | 524.1 | 116 | 56 |
| 605 1c | 64.9 | 540.1 | 117 | 56 |
| 0.5 J | 64.9 | -64.4 | 117 | 57 |
| ND<1.5 U | 64.9 | -63.4 | 117 | 58 |
| 8 | 64.9 | -56.9 | 117 | 59 |
| 0.91 J | 64.9 | -63.99 | 117 | 60 |
| 43.6 | 64.9 | -21.3 | 117 | 61 |
| 169 | 64.9 | 104.1 | 118 | 61 |
| 407.8 | 64.9 | 342.9 | 119 | 61 |
| 4.679 | 64.9 | -60.221 | 119 | 62 |
| | | | | |
| 589 | 64.2 | 524.8 | 120 | 62 |
| 605 1c | 64.2 | 540.8 | 121 | 62 |
| 0.5 J | 64.2 | -63.7 | 121 | 63 |
| ND<1.5 U | 64.2 | -62.7 | 121 | 64 |
| 8 | 64.2 | -56.2 | 121 | 65 |
| 0.91 J | 64.2 | -63.29 | 121 | 66 |
| 43.6 | 64.2 | -20.6 | 121 | 67 |
| 169 | 64.2 | 104.8 | 122 | 67 |

| | | | | |
|---|---|---|---|---|
| 407.8 | 64.2 | 343.6 | 123 | 67 |
| 4.679 | 64.2 | -59.521 | 123 | 68 |
| | | | | |
| 605 1c | 589 | 16 | 124 | 68 |
| 0.5 J | 589 | -588.5 | 124 | 69 |
| ND<1.5 U | 589 | -587.5 | 124 | 70 |
| 8 | 589 | -581 | 124 | 71 |
| 0.91 J | 589 | -588.09 | 124 | 72 |
| 43.6 | 589 | -545.4 | 124 | 73 |
| 169 | 589 | -420 | 124 | 74 |
| 407.8 | 589 | -181.2 | 124 | 75 |
| 4.679 | 589 | -584.321 | 124 | 76 |
| | | | | |
| 0.5 J | 605 1c | -604.5 | 124 | 77 |
| ND<1.5 U | 605 1c | -603.5 | 124 | 78 |
| 8 | 605 1c | -597 | 124 | 79 |
| 0.91 J | 605 1c | -604.09 | 124 | 80 |
| 43.6 | 605 1c | -561.4 | 124 | 81 |
| 169 | 605 1c | -436 | 124 | 82 |
| 407.8 | 605 1c | -197.2 | 124 | 83 |
| 4.679 | 605 1c | -600.321 | 124 | 84 |
| | | | | |
| ND<1.5 U | 0.5 J | 1 | 125 | 84 |
| 8 | 0.5 J | 7.5 | 126 | 84 |
| 0.91 J | 0.5 J | 0.41 | 127 | 84 |
| 43.6 | 0.5 J | 43.1 | 128 | 84 |
| 169 | 0.5 J | 168.5 | 129 | 84 |
| 407.8 | 0.5 J | 407.3 | 130 | 84 |
| 4.679 | 0.5 J | 4.179 | 131 | 84 |
| | | | | |
| 8 | ND<1.5 U | 6.5 | 132 | 84 |
| 0.91 J | ND<1.5 U | -0.59 | 132 | 85 |
| 43.6 | ND<1.5 U | 42.1 | 133 | 85 |
| 169 | ND<1.5 U | 167.5 | 134 | 85 |
| 407.8 | ND<1.5 U | 406.3 | 135 | 85 |
| 4.679 | ND<1.5 U | 3.179 | 136 | 85 |
| | | | | |
| 0.91 J | 8 | -7.09 | 136 | 86 |
| 43.6 | 8 | 35.6 | 137 | 86 |
| 169 | 8 | 161 | 138 | 86 |
| 407.8 | 8 | 399.8 | 139 | 86 |
| 4.679 | 8 | -3.321 | 139 | 87 |
| | | | | |
| 43.6 | 0.91 J | 42.69 | 140 | 87 |
| 169 | 0.91 J | 168.09 | 141 | 87 |
| 407.8 | 0.91 J | 406.89 | 142 | 87 |
| 4.679 | 0.91 J | 3.769 | 143 | 87 |
| | | | | |
| 169 | 43.6 | 125.4 | 144 | 87 |
| 407.8 | 43.6 | 364.2 | 145 | 87 |
| 4.679 | 43.6 | -38.921 | 145 | 88 |
| | | | | |
| 407.8 | 169 | 238.8 | 146 | 88 |
| 4.679 | 169 | -164.321 | 146 | 89 |
| | | | | |
| 4.679 | 407.8 | -403.121 | 146 | 90 |

S Statistic = 146 - 90 = 56

| Tied Group | Value | Members |
|---|---|---|
| 1 | 1.5 | 6 |

| Time Period | Observations |
|---|---|
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 3/1/2022 | 1 |
| 3/1/2023 | 1 |
| 3/1/2024 | 1 |

There are 2 time periods with multiple data

A = 510
B = 36
C = 120
D = 0
E = 30
F = 4
a = 25806
b = 95634
c = 1012
Group Variance = 1403.45
Z-Score = 1.46813
Comparison Level at 95% confidence level = -1.65463 (downward trend)
1.46813 >= -1.65463 indicating no evidence of a downward trend

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RW16-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 28.6 | 12.1 | 16.5 | 1 | 0 |
| 194 | 12.1 | 181.9 | 2 | 0 |
| 73.9 | 12.1 | 61.8 | 3 | 0 |
| 1.7 J | 12.1 | -10.4 | 3 | 1 |
| ND<1.5 U | 12.1 | -10.6 | 3 | 2 |
| ND<1.5 U | 12.1 | -10.6 | 3 | 3 |
| 1.9 J | 12.1 | -10.2 | 3 | 4 |
| 1.2 J | 12.1 | -10.9 | 3 | 5 |
| 1.1 J | 12.1 | -11 | 3 | 6 |
| ND<1.5 U | 12.1 | -10.6 | 3 | 7 |
| ND<1.5 U | 12.1 | -10.6 | 3 | 8 |
| ND<1.5 U | 12.1 | -10.6 | 3 | 9 |
| ND<1.5 U | 12.1 | -10.6 | 3 | 10 |
| ND<1.5 U | 12.1 | -10.6 | 3 | 11 |
| ND<1.5 U | 12.1 | -10.6 | 3 | 12 |
| ND<1.5 U | 12.1 | -10.6 | 3 | 13 |
| ND<1.5 U | 12.1 | -10.6 | 3 | 14 |
| 0.36 J | 12.1 | -11.74 | 3 | 15 |
| ND<1.5 U | 12.1 | -10.6 | 3 | 16 |
| ND<1.5 U | 12.1 | -10.6 | 3 | 17 |
| ND<1.5 U | 12.1 | -10.6 | 3 | 18 |
| 0.42 J | 12.1 | -11.68 | 3 | 19 |
| ND<1 U | 12.1 | -11.1 | 3 | 20 |
| ND<0.1 U | 12.1 | -12 | 3 | 21 |
| ND<0.1 U | 12.1 | -12 | 3 | 22 |
| | | | | |
| 194 | 28.6 | 165.4 | 4 | 22 |
| 73.9 | 28.6 | 45.3 | 5 | 22 |
| 1.7 J | 28.6 | -26.9 | 5 | 23 |
| ND<1.5 U | 28.6 | -27.1 | 5 | 24 |
| ND<1.5 U | 28.6 | -27.1 | 5 | 25 |
| 1.9 J | 28.6 | -26.7 | 5 | 26 |
| 1.2 J | 28.6 | -27.4 | 5 | 27 |
| 1.1 J | 28.6 | -27.5 | 5 | 28 |
| ND<1.5 U | 28.6 | -27.1 | 5 | 29 |
| ND<1.5 U | 28.6 | -27.1 | 5 | 30 |
| ND<1.5 U | 28.6 | -27.1 | 5 | 31 |
| ND<1.5 U | 28.6 | -27.1 | 5 | 32 |
| ND<1.5 U | 28.6 | -27.1 | 5 | 33 |
| ND<1.5 U | 28.6 | -27.1 | 5 | 34 |
| ND<1.5 U | 28.6 | -27.1 | 5 | 35 |
| ND<1.5 U | 28.6 | -27.1 | 5 | 36 |
| 0.36 J | 28.6 | -28.24 | 5 | 37 |
| ND<1.5 U | 28.6 | -27.1 | 5 | 38 |
| ND<1.5 U | 28.6 | -27.1 | 5 | 39 |
| ND<1.5 U | 28.6 | -27.1 | 5 | 40 |
| 0.42 J | 28.6 | -28.18 | 5 | 41 |

| | | | | |
|---|---|---|---|---|
| ND<1 U | 28.6 | -27.6 | 5 | 42 |
| ND<0.1 U | 28.6 | -28.5 | 5 | 43 |
| ND<0.1 U | 28.6 | -28.5 | 5 | 44 |
| | | | | |
| 73.9 | 194 | -120.1 | 5 | 45 |
| 1.7 J | 194 | -192.3 | 5 | 46 |
| ND<1.5 U | 194 | -192.5 | 5 | 47 |
| ND<1.5 U | 194 | -192.5 | 5 | 48 |
| 1.9 J | 194 | -192.1 | 5 | 49 |
| 1.2 J | 194 | -192.8 | 5 | 50 |
| 1.1 J | 194 | -192.9 | 5 | 51 |
| ND<1.5 U | 194 | -192.5 | 5 | 52 |
| ND<1.5 U | 194 | -192.5 | 5 | 53 |
| ND<1.5 U | 194 | -192.5 | 5 | 54 |
| ND<1.5 U | 194 | -192.5 | 5 | 55 |
| ND<1.5 U | 194 | -192.5 | 5 | 56 |
| ND<1.5 U | 194 | -192.5 | 5 | 57 |
| ND<1.5 U | 194 | -192.5 | 5 | 58 |
| ND<1.5 U | 194 | -192.5 | 5 | 59 |
| 0.36 J | 194 | -193.64 | 5 | 60 |
| ND<1.5 U | 194 | -192.5 | 5 | 61 |
| ND<1.5 U | 194 | -192.5 | 5 | 62 |
| ND<1.5 U | 194 | -192.5 | 5 | 63 |
| 0.42 J | 194 | -193.58 | 5 | 64 |
| ND<1 U | 194 | -193 | 5 | 65 |
| ND<0.1 U | 194 | -193.9 | 5 | 66 |
| ND<0.1 U | 194 | -193.9 | 5 | 67 |
| | | | | |
| 1.7 J | 73.9 | -72.2 | 5 | 68 |
| ND<1.5 U | 73.9 | -72.4 | 5 | 69 |
| ND<1.5 U | 73.9 | -72.4 | 5 | 70 |
| 1.9 J | 73.9 | -72 | 5 | 71 |
| 1.2 J | 73.9 | -72.7 | 5 | 72 |
| 1.1 J | 73.9 | -72.8 | 5 | 73 |
| ND<1.5 U | 73.9 | -72.4 | 5 | 74 |
| ND<1.5 U | 73.9 | -72.4 | 5 | 75 |
| ND<1.5 U | 73.9 | -72.4 | 5 | 76 |
| ND<1.5 U | 73.9 | -72.4 | 5 | 77 |
| ND<1.5 U | 73.9 | -72.4 | 5 | 78 |
| ND<1.5 U | 73.9 | -72.4 | 5 | 79 |
| ND<1.5 U | 73.9 | -72.4 | 5 | 80 |
| ND<1.5 U | 73.9 | -72.4 | 5 | 81 |
| 0.36 J | 73.9 | -73.54 | 5 | 82 |
| ND<1.5 U | 73.9 | -72.4 | 5 | 83 |
| ND<1.5 U | 73.9 | -72.4 | 5 | 84 |
| ND<1.5 U | 73.9 | -72.4 | 5 | 85 |
| 0.42 J | 73.9 | -73.48 | 5 | 86 |
| ND<1 U | 73.9 | -72.9 | 5 | 87 |
| ND<0.1 U | 73.9 | -73.8 | 5 | 88 |
| ND<0.1 U | 73.9 | -73.8 | 5 | 89 |
| | | | | |
| ND<1.5 U | 1.7 J | -0.2 | 5 | 90 |
| ND<1.5 U | 1.7 J | -0.2 | 5 | 91 |
| 1.9 J | 1.7 J | 0.2 | 6 | 91 |
| 1.2 J | 1.7 J | -0.5 | 6 | 92 |
| 1.1 J | 1.7 J | -0.6 | 6 | 93 |
| ND<1.5 U | 1.7 J | -0.2 | 6 | 94 |

| | | | | |
|---|---|---|---|---|
| ND<1.5 U | 1.7 J | -0.2 | 6 | 95 |
| ND<1.5 U | 1.7 J | -0.2 | 6 | 96 |
| ND<1.5 U | 1.7 J | -0.2 | 6 | 97 |
| ND<1.5 U | 1.7 J | -0.2 | 6 | 98 |
| ND<1.5 U | 1.7 J | -0.2 | 6 | 99 |
| ND<1.5 U | 1.7 J | -0.2 | 6 | 100 |
| ND<1.5 U | 1.7 J | -0.2 | 6 | 101 |
| 0.36 J | 1.7 J | -1.34 | 6 | 102 |
| ND<1.5 U | 1.7 J | -0.2 | 6 | 103 |
| ND<1.5 U | 1.7 J | -0.2 | 6 | 104 |
| ND<1.5 U | 1.7 J | -0.2 | 6 | 105 |
| 0.42 J | 1.7 J | -1.28 | 6 | 106 |
| ND<1 U | 1.7 J | -0.7 | 6 | 107 |
| ND<0.1 U | 1.7 J | -1.6 | 6 | 108 |
| ND<0.1 U | 1.7 J | -1.6 | 6 | 109 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 6 | 109 |
| 1.9 J | ND<1.5 U | 0.4 | 7 | 109 |
| 1.2 J | ND<1.5 U | -0.3 | 7 | 110 |
| 1.1 J | ND<1.5 U | -0.4 | 7 | 111 |
| ND<1.5 U | ND<1.5 U | 0 | 7 | 111 |
| ND<1.5 U | ND<1.5 U | 0 | 7 | 111 |
| ND<1.5 U | ND<1.5 U | 0 | 7 | 111 |
| ND<1.5 U | ND<1.5 U | 0 | 7 | 111 |
| ND<1.5 U | ND<1.5 U | 0 | 7 | 111 |
| ND<1.5 U | ND<1.5 U | 0 | 7 | 111 |
| ND<1.5 U | ND<1.5 U | 0 | 7 | 111 |
| ND<1.5 U | ND<1.5 U | 0 | 7 | 111 |
| 0.36 J | ND<1.5 U | -1.14 | 7 | 112 |
| ND<1.5 U | ND<1.5 U | 0 | 7 | 112 |
| ND<1.5 U | ND<1.5 U | 0 | 7 | 112 |
| ND<1.5 U | ND<1.5 U | 0 | 7 | 112 |
| 0.42 J | ND<1.5 U | -1.08 | 7 | 113 |
| ND<1 U | ND<1.5 U | -0.5 | 7 | 114 |
| ND<0.1 U | ND<1.5 U | -1.4 | 7 | 115 |
| ND<0.1 U | ND<1.5 U | -1.4 | 7 | 116 |
| | | | | |
| 1.9 J | ND<1.5 U | 0.4 | 8 | 116 |
| 1.2 J | ND<1.5 U | -0.3 | 8 | 117 |
| 1.1 J | ND<1.5 U | -0.4 | 8 | 118 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 118 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 118 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 118 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 118 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 118 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 118 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 118 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 118 |
| 0.36 J | ND<1.5 U | -1.14 | 8 | 119 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 119 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 119 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 119 |
| 0.42 J | ND<1.5 U | -1.08 | 8 | 120 |
| ND<1 U | ND<1.5 U | -0.5 | 8 | 121 |
| ND<0.1 U | ND<1.5 U | -1.4 | 8 | 122 |
| ND<0.1 U | ND<1.5 U | -1.4 | 8 | 123 |

| | | | | |
|---|---|---|---|---|
| 1.2 J | 1.9 J | -0.7 | 8 | 124 |
| 1.1 J | 1.9 J | -0.8 | 8 | 125 |
| ND<1.5 U | 1.9 J | -0.4 | 8 | 126 |
| ND<1.5 U | 1.9 J | -0.4 | 8 | 127 |
| ND<1.5 U | 1.9 J | -0.4 | 8 | 128 |
| ND<1.5 U | 1.9 J | -0.4 | 8 | 129 |
| ND<1.5 U | 1.9 J | -0.4 | 8 | 130 |
| ND<1.5 U | 1.9 J | -0.4 | 8 | 131 |
| ND<1.5 U | 1.9 J | -0.4 | 8 | 132 |
| ND<1.5 U | 1.9 J | -0.4 | 8 | 133 |
| 0.36 J | 1.9 J | -1.54 | 8 | 134 |
| ND<1.5 U | 1.9 J | -0.4 | 8 | 135 |
| ND<1.5 U | 1.9 J | -0.4 | 8 | 136 |
| ND<1.5 U | 1.9 J | -0.4 | 8 | 137 |
| 0.42 J | 1.9 J | -1.48 | 8 | 138 |
| ND<1 U | 1.9 J | -0.9 | 8 | 139 |
| ND<0.1 U | 1.9 J | -1.8 | 8 | 140 |
| ND<0.1 U | 1.9 J | -1.8 | 8 | 141 |
| | | | | |
| 1.1 J | 1.2 J | -0.1 | 8 | 142 |
| ND<1.5 U | 1.2 J | 0.3 | 9 | 142 |
| ND<1.5 U | 1.2 J | 0.3 | 10 | 142 |
| ND<1.5 U | 1.2 J | 0.3 | 11 | 142 |
| ND<1.5 U | 1.2 J | 0.3 | 12 | 142 |
| ND<1.5 U | 1.2 J | 0.3 | 13 | 142 |
| ND<1.5 U | 1.2 J | 0.3 | 14 | 142 |
| ND<1.5 U | 1.2 J | 0.3 | 15 | 142 |
| ND<1.5 U | 1.2 J | 0.3 | 16 | 142 |
| 0.36 J | 1.2 J | -0.84 | 16 | 143 |
| ND<1.5 U | 1.2 J | 0.3 | 17 | 143 |
| ND<1.5 U | 1.2 J | 0.3 | 18 | 143 |
| ND<1.5 U | 1.2 J | 0.3 | 19 | 143 |
| 0.42 J | 1.2 J | -0.78 | 19 | 144 |
| ND<1 U | 1.2 J | -0.2 | 19 | 145 |
| ND<0.1 U | 1.2 J | -1.1 | 19 | 146 |
| ND<0.1 U | 1.2 J | -1.1 | 19 | 147 |
| | | | | |
| ND<1.5 U | 1.1 J | 0.4 | 20 | 147 |
| ND<1.5 U | 1.1 J | 0.4 | 21 | 147 |
| ND<1.5 U | 1.1 J | 0.4 | 22 | 147 |
| ND<1.5 U | 1.1 J | 0.4 | 23 | 147 |
| ND<1.5 U | 1.1 J | 0.4 | 24 | 147 |
| ND<1.5 U | 1.1 J | 0.4 | 25 | 147 |
| ND<1.5 U | 1.1 J | 0.4 | 26 | 147 |
| ND<1.5 U | 1.1 J | 0.4 | 27 | 147 |
| 0.36 J | 1.1 J | -0.74 | 27 | 148 |
| ND<1.5 U | 1.1 J | 0.4 | 28 | 148 |
| ND<1.5 U | 1.1 J | 0.4 | 29 | 148 |
| ND<1.5 U | 1.1 J | 0.4 | 30 | 148 |
| 0.42 J | 1.1 J | -0.68 | 30 | 149 |
| ND<1 U | 1.1 J | -0.1 | 30 | 150 |
| ND<0.1 U | 1.1 J | -1 | 30 | 151 |
| ND<0.1 U | 1.1 J | -1 | 30 | 152 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 30 | 152 |
| ND<1.5 U | ND<1.5 U | 0 | 30 | 152 |
| ND<1.5 U | ND<1.5 U | 0 | 30 | 152 |

| | | | | |
|---|---|---|---|---|
| ND<1.5 U | ND<1.5 U | 0 | 30 | 152 |
| ND<1.5 U | ND<1.5 U | 0 | 30 | 152 |
| ND<1.5 U | ND<1.5 U | 0 | 30 | 152 |
| ND<1.5 U | ND<1.5 U | 0 | 30 | 152 |
| 0.36 J | ND<1.5 U | -1.14 | 30 | 153 |
| ND<1.5 U | ND<1.5 U | 0 | 30 | 153 |
| ND<1.5 U | ND<1.5 U | 0 | 30 | 153 |
| ND<1.5 U | ND<1.5 U | 0 | 30 | 153 |
| 0.42 J | ND<1.5 U | -1.08 | 30 | 154 |
| ND<1 U | ND<1.5 U | -0.5 | 30 | 155 |
| ND<0.1 U | ND<1.5 U | -1.4 | 30 | 156 |
| ND<0.1 U | ND<1.5 U | -1.4 | 30 | 157 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 30 | 157 |
| ND<1.5 U | ND<1.5 U | 0 | 30 | 157 |
| ND<1.5 U | ND<1.5 U | 0 | 30 | 157 |
| ND<1.5 U | ND<1.5 U | 0 | 30 | 157 |
| ND<1.5 U | ND<1.5 U | 0 | 30 | 157 |
| ND<1.5 U | ND<1.5 U | 0 | 30 | 157 |
| 0.36 J | ND<1.5 U | -1.14 | 30 | 158 |
| ND<1.5 U | ND<1.5 U | 0 | 30 | 158 |
| ND<1.5 U | ND<1.5 U | 0 | 30 | 158 |
| ND<1.5 U | ND<1.5 U | 0 | 30 | 158 |
| 0.42 J | ND<1.5 U | -1.08 | 30 | 159 |
| ND<1 U | ND<1.5 U | -0.5 | 30 | 160 |
| ND<0.1 U | ND<1.5 U | -1.4 | 30 | 161 |
| ND<0.1 U | ND<1.5 U | -1.4 | 30 | 162 |
| | | | | |
| ND<1.5 U | ND<1.5 U | Same Date | 30 | 162 |
| ND<1.5 U | ND<1.5 U | 0 | 30 | 162 |
| ND<1.5 U | ND<1.5 U | 0 | 30 | 162 |
| ND<1.5 U | ND<1.5 U | 0 | 30 | 162 |
| ND<1.5 U | ND<1.5 U | 0 | 30 | 162 |
| 0.36 J | ND<1.5 U | -1.14 | 30 | 163 |
| ND<1.5 U | ND<1.5 U | 0 | 30 | 163 |
| ND<1.5 U | ND<1.5 U | 0 | 30 | 163 |
| ND<1.5 U | ND<1.5 U | 0 | 30 | 163 |
| 0.42 J | ND<1.5 U | -1.08 | 30 | 164 |
| ND<1 U | ND<1.5 U | -0.5 | 30 | 165 |
| ND<0.1 U | ND<1.5 U | -1.4 | 30 | 166 |
| ND<0.1 U | ND<1.5 U | -1.4 | 30 | 167 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 30 | 167 |
| ND<1.5 U | ND<1.5 U | 0 | 30 | 167 |
| ND<1.5 U | ND<1.5 U | 0 | 30 | 167 |
| ND<1.5 U | ND<1.5 U | 0 | 30 | 167 |
| 0.36 J | ND<1.5 U | -1.14 | 30 | 168 |
| ND<1.5 U | ND<1.5 U | 0 | 30 | 168 |
| ND<1.5 U | ND<1.5 U | 0 | 30 | 168 |
| ND<1.5 U | ND<1.5 U | 0 | 30 | 168 |
| 0.42 J | ND<1.5 U | -1.08 | 30 | 169 |
| ND<1 U | ND<1.5 U | -0.5 | 30 | 170 |
| ND<0.1 U | ND<1.5 U | -1.4 | 30 | 171 |
| ND<0.1 U | ND<1.5 U | -1.4 | 30 | 172 |
| | | | | |
| ND<1.5 U | ND<1.5 U | Same Date | 30 | 172 |
| ND<1.5 U | ND<1.5 U | 0 | 30 | 172 |

| | | | | |
|---|---|---|---|---|
| ND<1.5 U | ND<1.5 U | 0 | 30 | 172 |
| 0.36 J | ND<1.5 U | -1.14 | 30 | 173 |
| ND<1.5 U | ND<1.5 U | 0 | 30 | 173 |
| ND<1.5 U | ND<1.5 U | 0 | 30 | 173 |
| ND<1.5 U | ND<1.5 U | 0 | 30 | 173 |
| 0.42 J | ND<1.5 U | -1.08 | 30 | 174 |
| ND<1 U | ND<1.5 U | -0.5 | 30 | 175 |
| ND<0.1 U | ND<1.5 U | -1.4 | 30 | 176 |
| ND<0.1 U | ND<1.5 U | -1.4 | 30 | 177 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 30 | 177 |
| ND<1.5 U | ND<1.5 U | 0 | 30 | 177 |
| 0.36 J | ND<1.5 U | -1.14 | 30 | 178 |
| ND<1.5 U | ND<1.5 U | 0 | 30 | 178 |
| ND<1.5 U | ND<1.5 U | 0 | 30 | 178 |
| ND<1.5 U | ND<1.5 U | 0 | 30 | 178 |
| 0.42 J | ND<1.5 U | -1.08 | 30 | 179 |
| ND<1 U | ND<1.5 U | -0.5 | 30 | 180 |
| ND<0.1 U | ND<1.5 U | -1.4 | 30 | 181 |
| ND<0.1 U | ND<1.5 U | -1.4 | 30 | 182 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 30 | 182 |
| 0.36 J | ND<1.5 U | -1.14 | 30 | 183 |
| ND<1.5 U | ND<1.5 U | 0 | 30 | 183 |
| ND<1.5 U | ND<1.5 U | 0 | 30 | 183 |
| ND<1.5 U | ND<1.5 U | 0 | 30 | 183 |
| 0.42 J | ND<1.5 U | -1.08 | 30 | 184 |
| ND<1 U | ND<1.5 U | -0.5 | 30 | 185 |
| ND<0.1 U | ND<1.5 U | -1.4 | 30 | 186 |
| ND<0.1 U | ND<1.5 U | -1.4 | 30 | 187 |
| | | | | |
| 0.36 J | ND<1.5 U | -1.14 | 30 | 188 |
| ND<1.5 U | ND<1.5 U | 0 | 30 | 188 |
| ND<1.5 U | ND<1.5 U | 0 | 30 | 188 |
| ND<1.5 U | ND<1.5 U | 0 | 30 | 188 |
| 0.42 J | ND<1.5 U | -1.08 | 30 | 189 |
| ND<1 U | ND<1.5 U | -0.5 | 30 | 190 |
| ND<0.1 U | ND<1.5 U | -1.4 | 30 | 191 |
| ND<0.1 U | ND<1.5 U | -1.4 | 30 | 192 |
| | | | | |
| ND<1.5 U | 0.36 J | 1.14 | 31 | 192 |
| ND<1.5 U | 0.36 J | 1.14 | 32 | 192 |
| ND<1.5 U | 0.36 J | 1.14 | 33 | 192 |
| 0.42 J | 0.36 J | 0.06 | 34 | 192 |
| ND<1 U | 0.36 J | 0.64 | 35 | 192 |
| ND<0.1 U | 0.36 J | -0.26 | 35 | 193 |
| ND<0.1 U | 0.36 J | -0.26 | 35 | 194 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 35 | 194 |
| ND<1.5 U | ND<1.5 U | 0 | 35 | 194 |
| 0.42 J | ND<1.5 U | -1.08 | 35 | 195 |
| ND<1 U | ND<1.5 U | -0.5 | 35 | 196 |
| ND<0.1 U | ND<1.5 U | -1.4 | 35 | 197 |
| ND<0.1 U | ND<1.5 U | -1.4 | 35 | 198 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 35 | 198 |
| 0.42 J | ND<1.5 U | -1.08 | 35 | 199 |

| | | | | |
|---|---|---|---|---|
| ND<1 U | ND<1.5 U | -0.5 | 35 | 200 |
| ND<0.1 U | ND<1.5 U | -1.4 | 35 | 201 |
| ND<0.1 U | ND<1.5 U | -1.4 | 35 | 202 |
| | | | | |
| 0.42 J | ND<1.5 U | -1.08 | 35 | 203 |
| ND<1 U | ND<1.5 U | -0.5 | 35 | 204 |
| ND<0.1 U | ND<1.5 U | -1.4 | 35 | 205 |
| ND<0.1 U | ND<1.5 U | -1.4 | 35 | 206 |
| | | | | |
| ND<1 U | 0.42 J | 0.58 | 36 | 206 |
| ND<0.1 U | 0.42 J | -0.32 | 36 | 207 |
| ND<0.1 U | 0.42 J | -0.32 | 36 | 208 |
| | | | | |
| ND<0.1 U | ND<1 U | -0.9 | 36 | 209 |
| ND<0.1 U | ND<1 U | -0.9 | 36 | 210 |
| | | | | |
| ND<0.1 U | ND<0.1 U | 0 | 36 | 210 |

S Statistic = 36 - 210 = -174

| Tied Group | Value | Members |
|---|---|---|
| 1 | 1.5 | 13 |
| 2 | 0.1 | 2 |

| Time Period | Observations |
|---|---|
| 2/1/2017 | 1 |
| 3/1/2017 | 1 |
| 4/1/2017 | 1 |
| 5/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 3/1/2022 | 1 |
| 3/1/2023 | 1 |
| 3/1/2024 | 1 |

There are 2 time periods with multiple data

A = 4854
B = 36
C = 1716
D = 0
E = 158

F = 4
a = 37050
b = 140400
c = 1300
Group Variance = 1787.15
Z-Score = -4.09228
Comparison Level at 95% confidence level = -1.65463 (downward trend)
**-4.09228 < -1.65463 indicating a downward trend**

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RW18-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 63.8 | 70.3 | -6.5 | 0 | 1 |
| 119 | 70.3 | 48.7 | 1 | 1 |
| 92 | 70.3 | 21.7 | 2 | 1 |
| 65.1 | 70.3 | -5.2 | 2 | 2 |
| 61.7 | 70.3 | -8.6 | 2 | 3 |
| 74.4 | 70.3 | 4.1 | 3 | 3 |
| 72.2 | 70.3 | 1.9 | 4 | 3 |
| 43.7 | 70.3 | -26.6 | 4 | 4 |
| 66.6 | 70.3 | -3.7 | 4 | 5 |
| 51.5 | 70.3 | -18.8 | 4 | 6 |
| 63.5 | 70.3 | -6.8 | 4 | 7 |
| 55.8 | 70.3 | -14.5 | 4 | 8 |
| 35.1 | 70.3 | -35.2 | 4 | 9 |
| 14.5 | 70.3 | -55.8 | 4 | 10 |
| 82.9 | 70.3 | 12.6 | 5 | 10 |
| 80.3 | 70.3 | 10 | 6 | 10 |
| 38 | 70.3 | -32.3 | 6 | 11 |
| 38 | 70.3 | -32.3 | 6 | 12 |
| 50.4 | 70.3 | -19.9 | 6 | 13 |
| 87.6 | 70.3 | 17.3 | 7 | 13 |
| 36.8 | 70.3 | -33.5 | 7 | 14 |
| 16 | 70.3 | -54.3 | 7 | 15 |
| 43.1 | 70.3 | -27.2 | 7 | 16 |
| 42.1 | 70.3 | -28.2 | 7 | 17 |
| ND<1.5 U | 70.3 | -68.8 | 7 | 18 |
| 31.7 | 70.3 | -38.6 | 7 | 19 |
| 12.46 | 70.3 | -57.84 | 7 | 20 |
| 7.655 | 70.3 | -62.645 | 7 | 21 |
| | | | | |
| 119 | 63.8 | 55.2 | 8 | 21 |
| 92 | 63.8 | 28.2 | 9 | 21 |
| 65.1 | 63.8 | 1.3 | 10 | 21 |
| 61.7 | 63.8 | -2.1 | 10 | 22 |
| 74.4 | 63.8 | 10.6 | 11 | 22 |
| 72.2 | 63.8 | 8.4 | 12 | 22 |
| 43.7 | 63.8 | -20.1 | 12 | 23 |
| 66.6 | 63.8 | 2.8 | 13 | 23 |
| 51.5 | 63.8 | -12.3 | 13 | 24 |
| 63.5 | 63.8 | -0.3 | 13 | 25 |
| 55.8 | 63.8 | -8 | 13 | 26 |
| 35.1 | 63.8 | -28.7 | 13 | 27 |
| 14.5 | 63.8 | -49.3 | 13 | 28 |
| 82.9 | 63.8 | 19.1 | 14 | 28 |
| 80.3 | 63.8 | 16.5 | 15 | 28 |
| 38 | 63.8 | -25.8 | 15 | 29 |
| 38 | 63.8 | -25.8 | 15 | 30 |
| 50.4 | 63.8 | -13.4 | 15 | 31 |

| | | | | |
|---|---|---|---|---|
| 87.6 | 63.8 | 23.8 | 16 | 31 |
| 36.8 | 63.8 | -27 | 16 | 32 |
| 16 | 63.8 | -47.8 | 16 | 33 |
| 43.1 | 63.8 | -20.7 | 16 | 34 |
| 42.1 | 63.8 | -21.7 | 16 | 35 |
| ND<1.5 U | 63.8 | -62.3 | 16 | 36 |
| 31.7 | 63.8 | -32.1 | 16 | 37 |
| 12.46 | 63.8 | -51.34 | 16 | 38 |
| 7.655 | 63.8 | -56.145 | 16 | 39 |
| | | | | |
| 92 | 119 | -27 | 16 | 40 |
| 65.1 | 119 | -53.9 | 16 | 41 |
| 61.7 | 119 | -57.3 | 16 | 42 |
| 74.4 | 119 | -44.6 | 16 | 43 |
| 72.2 | 119 | -46.8 | 16 | 44 |
| 43.7 | 119 | -75.3 | 16 | 45 |
| 66.6 | 119 | -52.4 | 16 | 46 |
| 51.5 | 119 | -67.5 | 16 | 47 |
| 63.5 | 119 | -55.5 | 16 | 48 |
| 55.8 | 119 | -63.2 | 16 | 49 |
| 35.1 | 119 | -83.9 | 16 | 50 |
| 14.5 | 119 | -104.5 | 16 | 51 |
| 82.9 | 119 | -36.1 | 16 | 52 |
| 80.3 | 119 | -38.7 | 16 | 53 |
| 38 | 119 | -81 | 16 | 54 |
| 38 | 119 | -81 | 16 | 55 |
| 50.4 | 119 | -68.6 | 16 | 56 |
| 87.6 | 119 | -31.4 | 16 | 57 |
| 36.8 | 119 | -82.2 | 16 | 58 |
| 16 | 119 | -103 | 16 | 59 |
| 43.1 | 119 | -75.9 | 16 | 60 |
| 42.1 | 119 | -76.9 | 16 | 61 |
| ND<1.5 U | 119 | -117.5 | 16 | 62 |
| 31.7 | 119 | -87.3 | 16 | 63 |
| 12.46 | 119 | -106.54 | 16 | 64 |
| 7.655 | 119 | -111.345 | 16 | 65 |
| | | | | |
| 65.1 | 92 | -26.9 | 16 | 66 |
| 61.7 | 92 | -30.3 | 16 | 67 |
| 74.4 | 92 | -17.6 | 16 | 68 |
| 72.2 | 92 | -19.8 | 16 | 69 |
| 43.7 | 92 | -48.3 | 16 | 70 |
| 66.6 | 92 | -25.4 | 16 | 71 |
| 51.5 | 92 | -40.5 | 16 | 72 |
| 63.5 | 92 | -28.5 | 16 | 73 |
| 55.8 | 92 | -36.2 | 16 | 74 |
| 35.1 | 92 | -56.9 | 16 | 75 |
| 14.5 | 92 | -77.5 | 16 | 76 |
| 82.9 | 92 | -9.1 | 16 | 77 |
| 80.3 | 92 | -11.7 | 16 | 78 |
| 38 | 92 | -54 | 16 | 79 |
| 38 | 92 | -54 | 16 | 80 |
| 50.4 | 92 | -41.6 | 16 | 81 |
| 87.6 | 92 | -4.4 | 16 | 82 |
| 36.8 | 92 | -55.2 | 16 | 83 |
| 16 | 92 | -76 | 16 | 84 |
| 43.1 | 92 | -48.9 | 16 | 85 |

| | | | | |
|---|---|---|---|---|
| 42.1 | 92 | -49.9 | 16 | 86 |
| ND<1.5 U | 92 | -90.5 | 16 | 87 |
| 31.7 | 92 | -60.3 | 16 | 88 |
| 12.46 | 92 | -79.54 | 16 | 89 |
| 7.655 | 92 | -84.345 | 16 | 90 |
| | | | | |
| 61.7 | 65.1 | -3.4 | 16 | 91 |
| 74.4 | 65.1 | 9.3 | 17 | 91 |
| 72.2 | 65.1 | 7.1 | 18 | 91 |
| 43.7 | 65.1 | -21.4 | 18 | 92 |
| 66.6 | 65.1 | 1.5 | 19 | 92 |
| 51.5 | 65.1 | -13.6 | 19 | 93 |
| 63.5 | 65.1 | -1.6 | 19 | 94 |
| 55.8 | 65.1 | -9.3 | 19 | 95 |
| 35.1 | 65.1 | -30 | 19 | 96 |
| 14.5 | 65.1 | -50.6 | 19 | 97 |
| 82.9 | 65.1 | 17.8 | 20 | 97 |
| 80.3 | 65.1 | 15.2 | 21 | 97 |
| 38 | 65.1 | -27.1 | 21 | 98 |
| 38 | 65.1 | -27.1 | 21 | 99 |
| 50.4 | 65.1 | -14.7 | 21 | 100 |
| 87.6 | 65.1 | 22.5 | 22 | 100 |
| 36.8 | 65.1 | -28.3 | 22 | 101 |
| 16 | 65.1 | -49.1 | 22 | 102 |
| 43.1 | 65.1 | -22 | 22 | 103 |
| 42.1 | 65.1 | -23 | 22 | 104 |
| ND<1.5 U | 65.1 | -63.6 | 22 | 105 |
| 31.7 | 65.1 | -33.4 | 22 | 106 |
| 12.46 | 65.1 | -52.64 | 22 | 107 |
| 7.655 | 65.1 | -57.445 | 22 | 108 |
| | | | | |
| 74.4 | 61.7 | 12.7 | 23 | 108 |
| 72.2 | 61.7 | 10.5 | 24 | 108 |
| 43.7 | 61.7 | -18 | 24 | 109 |
| 66.6 | 61.7 | 4.9 | 25 | 109 |
| 51.5 | 61.7 | -10.2 | 25 | 110 |
| 63.5 | 61.7 | 1.8 | 26 | 110 |
| 55.8 | 61.7 | -5.9 | 26 | 111 |
| 35.1 | 61.7 | -26.6 | 26 | 112 |
| 14.5 | 61.7 | -47.2 | 26 | 113 |
| 82.9 | 61.7 | 21.2 | 27 | 113 |
| 80.3 | 61.7 | 18.6 | 28 | 113 |
| 38 | 61.7 | -23.7 | 28 | 114 |
| 38 | 61.7 | -23.7 | 28 | 115 |
| 50.4 | 61.7 | -11.3 | 28 | 116 |
| 87.6 | 61.7 | 25.9 | 29 | 116 |
| 36.8 | 61.7 | -24.9 | 29 | 117 |
| 16 | 61.7 | -45.7 | 29 | 118 |
| 43.1 | 61.7 | -18.6 | 29 | 119 |
| 42.1 | 61.7 | -19.6 | 29 | 120 |
| ND<1.5 U | 61.7 | -60.2 | 29 | 121 |
| 31.7 | 61.7 | -30 | 29 | 122 |
| 12.46 | 61.7 | -49.24 | 29 | 123 |
| 7.655 | 61.7 | -54.045 | 29 | 124 |
| | | | | |
| 72.2 | 74.4 | -2.2 | 29 | 125 |
| 43.7 | 74.4 | -30.7 | 29 | 126 |

| | | | | |
|---|---|---|---|---|
| 66.6 | 74.4 | -7.8 | 29 | 127 |
| 51.5 | 74.4 | -22.9 | 29 | 128 |
| 63.5 | 74.4 | -10.9 | 29 | 129 |
| 55.8 | 74.4 | -18.6 | 29 | 130 |
| 35.1 | 74.4 | -39.3 | 29 | 131 |
| 14.5 | 74.4 | -59.9 | 29 | 132 |
| 82.9 | 74.4 | 8.5 | 30 | 132 |
| 80.3 | 74.4 | 5.9 | 31 | 132 |
| 38 | 74.4 | -36.4 | 31 | 133 |
| 38 | 74.4 | -36.4 | 31 | 134 |
| 50.4 | 74.4 | -24 | 31 | 135 |
| 87.6 | 74.4 | 13.2 | 32 | 135 |
| 36.8 | 74.4 | -37.6 | 32 | 136 |
| 16 | 74.4 | -58.4 | 32 | 137 |
| 43.1 | 74.4 | -31.3 | 32 | 138 |
| 42.1 | 74.4 | -32.3 | 32 | 139 |
| ND<1.5 U | 74.4 | -72.9 | 32 | 140 |
| 31.7 | 74.4 | -42.7 | 32 | 141 |
| 12.46 | 74.4 | -61.94 | 32 | 142 |
| 7.655 | 74.4 | -66.745 | 32 | 143 |
| | | | | |
| 43.7 | 72.2 | -28.5 | 32 | 144 |
| 66.6 | 72.2 | -5.6 | 32 | 145 |
| 51.5 | 72.2 | -20.7 | 32 | 146 |
| 63.5 | 72.2 | -8.7 | 32 | 147 |
| 55.8 | 72.2 | -16.4 | 32 | 148 |
| 35.1 | 72.2 | -37.1 | 32 | 149 |
| 14.5 | 72.2 | -57.7 | 32 | 150 |
| 82.9 | 72.2 | 10.7 | 33 | 150 |
| 80.3 | 72.2 | 8.1 | 34 | 150 |
| 38 | 72.2 | -34.2 | 34 | 151 |
| 38 | 72.2 | -34.2 | 34 | 152 |
| 50.4 | 72.2 | -21.8 | 34 | 153 |
| 87.6 | 72.2 | 15.4 | 35 | 153 |
| 36.8 | 72.2 | -35.4 | 35 | 154 |
| 16 | 72.2 | -56.2 | 35 | 155 |
| 43.1 | 72.2 | -29.1 | 35 | 156 |
| 42.1 | 72.2 | -30.1 | 35 | 157 |
| ND<1.5 U | 72.2 | -70.7 | 35 | 158 |
| 31.7 | 72.2 | -40.5 | 35 | 159 |
| 12.46 | 72.2 | -59.74 | 35 | 160 |
| 7.655 | 72.2 | -64.545 | 35 | 161 |
| | | | | |
| 66.6 | 43.7 | 22.9 | 36 | 161 |
| 51.5 | 43.7 | 7.8 | 37 | 161 |
| 63.5 | 43.7 | 19.8 | 38 | 161 |
| 55.8 | 43.7 | 12.1 | 39 | 161 |
| 35.1 | 43.7 | -8.6 | 39 | 162 |
| 14.5 | 43.7 | -29.2 | 39 | 163 |
| 82.9 | 43.7 | 39.2 | 40 | 163 |
| 80.3 | 43.7 | 36.6 | 41 | 163 |
| 38 | 43.7 | -5.7 | 41 | 164 |
| 38 | 43.7 | -5.7 | 41 | 165 |
| 50.4 | 43.7 | 6.7 | 42 | 165 |
| 87.6 | 43.7 | 43.9 | 43 | 165 |
| 36.8 | 43.7 | -6.9 | 43 | 166 |
| 16 | 43.7 | -27.7 | 43 | 167 |

| | | | | |
|---|---|---|---|---|
| 43.1 | 43.7 | -0.6 | 43 | 168 |
| 42.1 | 43.7 | -1.6 | 43 | 169 |
| ND<1.5 U | 43.7 | -42.2 | 43 | 170 |
| 31.7 | 43.7 | -12 | 43 | 171 |
| 12.46 | 43.7 | -31.24 | 43 | 172 |
| 7.655 | 43.7 | -36.045 | 43 | 173 |
| | | | | |
| 51.5 | 66.6 | -15.1 | 43 | 174 |
| 63.5 | 66.6 | -3.1 | 43 | 175 |
| 55.8 | 66.6 | -10.8 | 43 | 176 |
| 35.1 | 66.6 | -31.5 | 43 | 177 |
| 14.5 | 66.6 | -52.1 | 43 | 178 |
| 82.9 | 66.6 | 16.3 | 44 | 178 |
| 80.3 | 66.6 | 13.7 | 45 | 178 |
| 38 | 66.6 | -28.6 | 45 | 179 |
| 38 | 66.6 | -28.6 | 45 | 180 |
| 50.4 | 66.6 | -16.2 | 45 | 181 |
| 87.6 | 66.6 | 21 | 46 | 181 |
| 36.8 | 66.6 | -29.8 | 46 | 182 |
| 16 | 66.6 | -50.6 | 46 | 183 |
| 43.1 | 66.6 | -23.5 | 46 | 184 |
| 42.1 | 66.6 | -24.5 | 46 | 185 |
| ND<1.5 U | 66.6 | -65.1 | 46 | 186 |
| 31.7 | 66.6 | -34.9 | 46 | 187 |
| 12.46 | 66.6 | -54.14 | 46 | 188 |
| 7.655 | 66.6 | -58.945 | 46 | 189 |
| | | | | |
| 63.5 | 51.5 | 12 | 47 | 189 |
| 55.8 | 51.5 | 4.3 | 48 | 189 |
| 35.1 | 51.5 | -16.4 | 48 | 190 |
| 14.5 | 51.5 | -37 | 48 | 191 |
| 82.9 | 51.5 | 31.4 | 49 | 191 |
| 80.3 | 51.5 | 28.8 | 50 | 191 |
| 38 | 51.5 | -13.5 | 50 | 192 |
| 38 | 51.5 | -13.5 | 50 | 193 |
| 50.4 | 51.5 | -1.1 | 50 | 194 |
| 87.6 | 51.5 | 36.1 | 51 | 194 |
| 36.8 | 51.5 | -14.7 | 51 | 195 |
| 16 | 51.5 | -35.5 | 51 | 196 |
| 43.1 | 51.5 | -8.4 | 51 | 197 |
| 42.1 | 51.5 | -9.4 | 51 | 198 |
| ND<1.5 U | 51.5 | -50 | 51 | 199 |
| 31.7 | 51.5 | -19.8 | 51 | 200 |
| 12.46 | 51.5 | -39.04 | 51 | 201 |
| 7.655 | 51.5 | -43.845 | 51 | 202 |
| | | | | |
| 55.8 | 63.5 | -7.7 | 51 | 203 |
| 35.1 | 63.5 | -28.4 | 51 | 204 |
| 14.5 | 63.5 | -49 | 51 | 205 |
| 82.9 | 63.5 | 19.4 | 52 | 205 |
| 80.3 | 63.5 | 16.8 | 53 | 205 |
| 38 | 63.5 | -25.5 | 53 | 206 |
| 38 | 63.5 | -25.5 | 53 | 207 |
| 50.4 | 63.5 | -13.1 | 53 | 208 |
| 87.6 | 63.5 | 24.1 | 54 | 208 |
| 36.8 | 63.5 | -26.7 | 54 | 209 |
| 16 | 63.5 | -47.5 | 54 | 210 |

| | | | | |
|---|---|---|---|---|
| 43.1 | 63.5 | -20.4 | 54 | 211 |
| 42.1 | 63.5 | -21.4 | 54 | 212 |
| ND<1.5 U | 63.5 | -62 | 54 | 213 |
| 31.7 | 63.5 | -31.8 | 54 | 214 |
| 12.46 | 63.5 | -51.04 | 54 | 215 |
| 7.655 | 63.5 | -55.845 | 54 | 216 |
| | | | | |
| 35.1 | 55.8 | -20.7 | 54 | 217 |
| 14.5 | 55.8 | -41.3 | 54 | 218 |
| 82.9 | 55.8 | 27.1 | 55 | 218 |
| 80.3 | 55.8 | 24.5 | 56 | 218 |
| 38 | 55.8 | -17.8 | 56 | 219 |
| 38 | 55.8 | -17.8 | 56 | 220 |
| 50.4 | 55.8 | -5.4 | 56 | 221 |
| 87.6 | 55.8 | 31.8 | 57 | 221 |
| 36.8 | 55.8 | -19 | 57 | 222 |
| 16 | 55.8 | -39.8 | 57 | 223 |
| 43.1 | 55.8 | -12.7 | 57 | 224 |
| 42.1 | 55.8 | -13.7 | 57 | 225 |
| ND<1.5 U | 55.8 | -54.3 | 57 | 226 |
| 31.7 | 55.8 | -24.1 | 57 | 227 |
| 12.46 | 55.8 | -43.34 | 57 | 228 |
| 7.655 | 55.8 | -48.145 | 57 | 229 |
| | | | | |
| 14.5 | 35.1 | -20.6 | 57 | 230 |
| 82.9 | 35.1 | 47.8 | 58 | 230 |
| 80.3 | 35.1 | 45.2 | 59 | 230 |
| 38 | 35.1 | 2.9 | 60 | 230 |
| 38 | 35.1 | 2.9 | 61 | 230 |
| 50.4 | 35.1 | 15.3 | 62 | 230 |
| 87.6 | 35.1 | 52.5 | 63 | 230 |
| 36.8 | 35.1 | 1.7 | 64 | 230 |
| 16 | 35.1 | -19.1 | 64 | 231 |
| 43.1 | 35.1 | 8 | 65 | 231 |
| 42.1 | 35.1 | 7 | 66 | 231 |
| ND<1.5 U | 35.1 | -33.6 | 66 | 232 |
| 31.7 | 35.1 | -3.4 | 66 | 233 |
| 12.46 | 35.1 | -22.64 | 66 | 234 |
| 7.655 | 35.1 | -27.445 | 66 | 235 |
| | | | | |
| 82.9 | 14.5 | 68.4 | 67 | 235 |
| 80.3 | 14.5 | 65.8 | 68 | 235 |
| 38 | 14.5 | 23.5 | 69 | 235 |
| 38 | 14.5 | 23.5 | 70 | 235 |
| 50.4 | 14.5 | 35.9 | 71 | 235 |
| 87.6 | 14.5 | 73.1 | 72 | 235 |
| 36.8 | 14.5 | 22.3 | 73 | 235 |
| 16 | 14.5 | 1.5 | 74 | 235 |
| 43.1 | 14.5 | 28.6 | 75 | 235 |
| 42.1 | 14.5 | 27.6 | 76 | 235 |
| ND<1.5 U | 14.5 | -13 | 76 | 236 |
| 31.7 | 14.5 | 17.2 | 77 | 236 |
| 12.46 | 14.5 | -2.04 | 77 | 237 |
| 7.655 | 14.5 | -6.845 | 77 | 238 |
| | | | | |
| 80.3 | 82.9 | Same Date | 77 | 238 |
| 38 | 82.9 | -44.9 | 77 | 239 |

| | | | | |
|---|---|---|---|---|
| 38 | 82.9 | -44.9 | 77 | 240 |
| 50.4 | 82.9 | -32.5 | 77 | 241 |
| 87.6 | 82.9 | 4.7 | 78 | 241 |
| 36.8 | 82.9 | -46.1 | 78 | 242 |
| 16 | 82.9 | -66.9 | 78 | 243 |
| 43.1 | 82.9 | -39.8 | 78 | 244 |
| 42.1 | 82.9 | -40.8 | 78 | 245 |
| ND<1.5 U | 82.9 | -81.4 | 78 | 246 |
| 31.7 | 82.9 | -51.2 | 78 | 247 |
| 12.46 | 82.9 | -70.44 | 78 | 248 |
| 7.655 | 82.9 | -75.245 | 78 | 249 |
| | | | | |
| 38 | 80.3 | -42.3 | 78 | 250 |
| 38 | 80.3 | -42.3 | 78 | 251 |
| 50.4 | 80.3 | -29.9 | 78 | 252 |
| 87.6 | 80.3 | 7.3 | 79 | 252 |
| 36.8 | 80.3 | -43.5 | 79 | 253 |
| 16 | 80.3 | -64.3 | 79 | 254 |
| 43.1 | 80.3 | -37.2 | 79 | 255 |
| 42.1 | 80.3 | -38.2 | 79 | 256 |
| ND<1.5 U | 80.3 | -78.8 | 79 | 257 |
| 31.7 | 80.3 | -48.6 | 79 | 258 |
| 12.46 | 80.3 | -67.84 | 79 | 259 |
| 7.655 | 80.3 | -72.645 | 79 | 260 |
| | | | | |
| 38 | 38 | Same Date | 79 | 260 |
| 50.4 | 38 | 12.4 | 80 | 260 |
| 87.6 | 38 | 49.6 | 81 | 260 |
| 36.8 | 38 | -1.2 | 81 | 261 |
| 16 | 38 | -22 | 81 | 262 |
| 43.1 | 38 | 5.1 | 82 | 262 |
| 42.1 | 38 | 4.1 | 83 | 262 |
| ND<1.5 U | 38 | -36.5 | 83 | 263 |
| 31.7 | 38 | -6.3 | 83 | 264 |
| 12.46 | 38 | -25.54 | 83 | 265 |
| 7.655 | 38 | -30.345 | 83 | 266 |
| | | | | |
| 50.4 | 38 | 12.4 | 84 | 266 |
| 87.6 | 38 | 49.6 | 85 | 266 |
| 36.8 | 38 | -1.2 | 85 | 267 |
| 16 | 38 | -22 | 85 | 268 |
| 43.1 | 38 | 5.1 | 86 | 268 |
| 42.1 | 38 | 4.1 | 87 | 268 |
| ND<1.5 U | 38 | -36.5 | 87 | 269 |
| 31.7 | 38 | -6.3 | 87 | 270 |
| 12.46 | 38 | -25.54 | 87 | 271 |
| 7.655 | 38 | -30.345 | 87 | 272 |
| | | | | |
| 87.6 | 50.4 | 37.2 | 88 | 272 |
| 36.8 | 50.4 | -13.6 | 88 | 273 |
| 16 | 50.4 | -34.4 | 88 | 274 |
| 43.1 | 50.4 | -7.3 | 88 | 275 |
| 42.1 | 50.4 | -8.3 | 88 | 276 |
| ND<1.5 U | 50.4 | -48.9 | 88 | 277 |
| 31.7 | 50.4 | -18.7 | 88 | 278 |
| 12.46 | 50.4 | -37.94 | 88 | 279 |
| 7.655 | 50.4 | -42.745 | 88 | 280 |

| | | | | |
|---|---|---|---|---|
| 36.8 | 87.6 | -50.8 | 88 | 281 |
| 16 | 87.6 | -71.6 | 88 | 282 |
| 43.1 | 87.6 | -44.5 | 88 | 283 |
| 42.1 | 87.6 | -45.5 | 88 | 284 |
| ND<1.5 U | 87.6 | -86.1 | 88 | 285 |
| 31.7 | 87.6 | -55.9 | 88 | 286 |
| 12.46 | 87.6 | -75.14 | 88 | 287 |
| 7.655 | 87.6 | -79.945 | 88 | 288 |
| | | | | |
| 16 | 36.8 | -20.8 | 88 | 289 |
| 43.1 | 36.8 | 6.3 | 89 | 289 |
| 42.1 | 36.8 | 5.3 | 90 | 289 |
| ND<1.5 U | 36.8 | -35.3 | 90 | 290 |
| 31.7 | 36.8 | -5.1 | 90 | 291 |
| 12.46 | 36.8 | -24.34 | 90 | 292 |
| 7.655 | 36.8 | -29.145 | 90 | 293 |
| | | | | |
| 43.1 | 16 | 27.1 | 91 | 293 |
| 42.1 | 16 | 26.1 | 92 | 293 |
| ND<1.5 U | 16 | -14.5 | 92 | 294 |
| 31.7 | 16 | 15.7 | 93 | 294 |
| 12.46 | 16 | -3.54 | 93 | 295 |
| 7.655 | 16 | -8.345 | 93 | 296 |
| | | | | |
| 42.1 | 43.1 | -1 | 93 | 297 |
| ND<1.5 U | 43.1 | -41.6 | 93 | 298 |
| 31.7 | 43.1 | -11.4 | 93 | 299 |
| 12.46 | 43.1 | -30.64 | 93 | 300 |
| 7.655 | 43.1 | -35.445 | 93 | 301 |
| | | | | |
| ND<1.5 U | 42.1 | -40.6 | 93 | 302 |
| 31.7 | 42.1 | -10.4 | 93 | 303 |
| 12.46 | 42.1 | -29.64 | 93 | 304 |
| 7.655 | 42.1 | -34.445 | 93 | 305 |
| | | | | |
| 31.7 | ND<1.5 U | 30.2 | 94 | 305 |
| 12.46 | ND<1.5 U | 10.96 | 95 | 305 |
| 7.655 | ND<1.5 U | 6.155 | 96 | 305 |
| | | | | |
| 12.46 | 31.7 | -19.24 | 96 | 306 |
| 7.655 | 31.7 | -24.045 | 96 | 307 |
| | | | | |
| 7.655 | 12.46 | -4.805 | 96 | 308 |

S Statistic = 96 - 308 = -212

| Tied Group | Value | Members |
|---|---|---|
| 1 | 38 | 2 |

| Time Period | Observations |
|---|---|
| 2/1/2017 | 1 |
| 3/1/2017 | 1 |
| 4/1/2017 | 1 |
| 5/1/2017 | 1 |
| 6/1/2017 | 1 |

| | |
|---|---|
| 7/1/2017 | 1 |
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 3/1/2022 | 1 |
| 3/1/2023 | 1 |
| 3/1/2024 | 1 |

There are 2 time periods with multiple data

---

A = 18
B = 36
C = 0
D = 0
E = 2
F = 4
a = 51156
b = 197316
c = 1624
Group Variance = 2839
Z-Score = -3.96004
Comparison Level at 95% confidence level = -1.65463 (downward trend)
**-3.96004 < -1.65463 indicating a downward trend**

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RW19-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 3450 | 3760 | -310 | 0 | 1 |
| 3380 MH | 3760 | -380 | 0 | 2 |
| 2770 | 3760 | -990 | 0 | 3 |
| 2280 | 3760 | -1480 | 0 | 4 |
| 2550 | 3760 | -1210 | 0 | 5 |
| 1670 | 3760 | -2090 | 0 | 6 |
| 1320 | 3760 | -2440 | 0 | 7 |
| 1710 | 3760 | -2050 | 0 | 8 |
| 1770 | 3760 | -1990 | 0 | 9 |
| 1710 | 3760 | -2050 | 0 | 10 |
| 1880 | 3760 | -1880 | 0 | 11 |
| 1700 | 3760 | -2060 | 0 | 12 |
| 1560 | 3760 | -2200 | 0 | 13 |
| 1610 | 3760 | -2150 | 0 | 14 |
| 1330 | 3760 | -2430 | 0 | 15 |
| 1320 | 3760 | -2440 | 0 | 16 |
| 2440 | 3760 | -1320 | 0 | 17 |
| 2420 | 3760 | -1340 | 0 | 18 |
| 1580 | 3760 | -2180 | 0 | 19 |
| 1500 | 3760 | -2260 | 0 | 20 |
| 1400 | 3760 | -2360 | 0 | 21 |
| 3390 | 3760 | -370 | 0 | 22 |
| 1630 | 3760 | -2130 | 0 | 23 |
| 1540 | 3760 | -2220 | 0 | 24 |
| 112 | 3760 | -3648 | 0 | 25 |
| 109 | 3760 | -3651 | 0 | 26 |
| ND<0.1 U | 3760 | -3759.9 | 0 | 27 |
| 259.6 | 3760 | -3500.4 | 0 | 28 |
| | | | | |
| 3380 MH | 3450 | -70 | 0 | 29 |
| 2770 | 3450 | -680 | 0 | 30 |
| 2280 | 3450 | -1170 | 0 | 31 |
| 2550 | 3450 | -900 | 0 | 32 |
| 1670 | 3450 | -1780 | 0 | 33 |
| 1320 | 3450 | -2130 | 0 | 34 |
| 1710 | 3450 | -1740 | 0 | 35 |
| 1770 | 3450 | -1680 | 0 | 36 |
| 1710 | 3450 | -1740 | 0 | 37 |
| 1880 | 3450 | -1570 | 0 | 38 |
| 1700 | 3450 | -1750 | 0 | 39 |
| 1560 | 3450 | -1890 | 0 | 40 |
| 1610 | 3450 | -1840 | 0 | 41 |
| 1330 | 3450 | -2120 | 0 | 42 |
| 1320 | 3450 | -2130 | 0 | 43 |
| 2440 | 3450 | -1010 | 0 | 44 |
| 2420 | 3450 | -1030 | 0 | 45 |
| 1580 | 3450 | -1870 | 0 | 46 |

| | | | | |
|---|---|---|---|---|
| 1500 | 3450 | -1950 | 0 | 47 |
| 1400 | 3450 | -2050 | 0 | 48 |
| 3390 | 3450 | -60 | 0 | 49 |
| 1630 | 3450 | -1820 | 0 | 50 |
| 1540 | 3450 | -1910 | 0 | 51 |
| 112 | 3450 | -3338 | 0 | 52 |
| 109 | 3450 | -3341 | 0 | 53 |
| ND<0.1 U | 3450 | -3449.9 | 0 | 54 |
| 259.6 | 3450 | -3190.4 | 0 | 55 |
| | | | | |
| 2770 | 3380 MH | -610 | 0 | 56 |
| 2280 | 3380 MH | -1100 | 0 | 57 |
| 2550 | 3380 MH | -830 | 0 | 58 |
| 1670 | 3380 MH | -1710 | 0 | 59 |
| 1320 | 3380 MH | -2060 | 0 | 60 |
| 1710 | 3380 MH | -1670 | 0 | 61 |
| 1770 | 3380 MH | -1610 | 0 | 62 |
| 1710 | 3380 MH | -1670 | 0 | 63 |
| 1880 | 3380 MH | -1500 | 0 | 64 |
| 1700 | 3380 MH | -1680 | 0 | 65 |
| 1560 | 3380 MH | -1820 | 0 | 66 |
| 1610 | 3380 MH | -1770 | 0 | 67 |
| 1330 | 3380 MH | -2050 | 0 | 68 |
| 1320 | 3380 MH | -2060 | 0 | 69 |
| 2440 | 3380 MH | -940 | 0 | 70 |
| 2420 | 3380 MH | -960 | 0 | 71 |
| 1580 | 3380 MH | -1800 | 0 | 72 |
| 1500 | 3380 MH | -1880 | 0 | 73 |
| 1400 | 3380 MH | -1980 | 0 | 74 |
| 3390 | 3380 MH | 10 | 1 | 74 |
| 1630 | 3380 MH | -1750 | 1 | 75 |
| 1540 | 3380 MH | -1840 | 1 | 76 |
| 112 | 3380 MH | -3268 | 1 | 77 |
| 109 | 3380 MH | -3271 | 1 | 78 |
| ND<0.1 U | 3380 MH | -3379.9 | 1 | 79 |
| 259.6 | 3380 MH | -3120.4 | 1 | 80 |
| | | | | |
| 2280 | 2770 | -490 | 1 | 81 |
| 2550 | 2770 | -220 | 1 | 82 |
| 1670 | 2770 | -1100 | 1 | 83 |
| 1320 | 2770 | -1450 | 1 | 84 |
| 1710 | 2770 | -1060 | 1 | 85 |
| 1770 | 2770 | -1000 | 1 | 86 |
| 1710 | 2770 | -1060 | 1 | 87 |
| 1880 | 2770 | -890 | 1 | 88 |
| 1700 | 2770 | -1070 | 1 | 89 |
| 1560 | 2770 | -1210 | 1 | 90 |
| 1610 | 2770 | -1160 | 1 | 91 |
| 1330 | 2770 | -1440 | 1 | 92 |
| 1320 | 2770 | -1450 | 1 | 93 |
| 2440 | 2770 | -330 | 1 | 94 |
| 2420 | 2770 | -350 | 1 | 95 |
| 1580 | 2770 | -1190 | 1 | 96 |
| 1500 | 2770 | -1270 | 1 | 97 |
| 1400 | 2770 | -1370 | 1 | 98 |
| 3390 | 2770 | 620 | 2 | 98 |
| 1630 | 2770 | -1140 | 2 | 99 |

| | | | | |
|---|---|---|---|---|
| 1540 | 2770 | -1230 | 2 | 100 |
| 112 | 2770 | -2658 | 2 | 101 |
| 109 | 2770 | -2661 | 2 | 102 |
| ND<0.1 U | 2770 | -2769.9 | 2 | 103 |
| 259.6 | 2770 | -2510.4 | 2 | 104 |
| | | | | |
| 2550 | 2280 | 270 | 3 | 104 |
| 1670 | 2280 | -610 | 3 | 105 |
| 1320 | 2280 | -960 | 3 | 106 |
| 1710 | 2280 | -570 | 3 | 107 |
| 1770 | 2280 | -510 | 3 | 108 |
| 1710 | 2280 | -570 | 3 | 109 |
| 1880 | 2280 | -400 | 3 | 110 |
| 1700 | 2280 | -580 | 3 | 111 |
| 1560 | 2280 | -720 | 3 | 112 |
| 1610 | 2280 | -670 | 3 | 113 |
| 1330 | 2280 | -950 | 3 | 114 |
| 1320 | 2280 | -960 | 3 | 115 |
| 2440 | 2280 | 160 | 4 | 115 |
| 2420 | 2280 | 140 | 5 | 115 |
| 1580 | 2280 | -700 | 5 | 116 |
| 1500 | 2280 | -780 | 5 | 117 |
| 1400 | 2280 | -880 | 5 | 118 |
| 3390 | 2280 | 1110 | 6 | 118 |
| 1630 | 2280 | -650 | 6 | 119 |
| 1540 | 2280 | -740 | 6 | 120 |
| 112 | 2280 | -2168 | 6 | 121 |
| 109 | 2280 | -2171 | 6 | 122 |
| ND<0.1 U | 2280 | -2279.9 | 6 | 123 |
| 259.6 | 2280 | -2020.4 | 6 | 124 |
| | | | | |
| 1670 | 2550 | -880 | 6 | 125 |
| 1320 | 2550 | -1230 | 6 | 126 |
| 1710 | 2550 | -840 | 6 | 127 |
| 1770 | 2550 | -780 | 6 | 128 |
| 1710 | 2550 | -840 | 6 | 129 |
| 1880 | 2550 | -670 | 6 | 130 |
| 1700 | 2550 | -850 | 6 | 131 |
| 1560 | 2550 | -990 | 6 | 132 |
| 1610 | 2550 | -940 | 6 | 133 |
| 1330 | 2550 | -1220 | 6 | 134 |
| 1320 | 2550 | -1230 | 6 | 135 |
| 2440 | 2550 | -110 | 6 | 136 |
| 2420 | 2550 | -130 | 6 | 137 |
| 1580 | 2550 | -970 | 6 | 138 |
| 1500 | 2550 | -1050 | 6 | 139 |
| 1400 | 2550 | -1150 | 6 | 140 |
| 3390 | 2550 | 840 | 7 | 140 |
| 1630 | 2550 | -920 | 7 | 141 |
| 1540 | 2550 | -1010 | 7 | 142 |
| 112 | 2550 | -2438 | 7 | 143 |
| 109 | 2550 | -2441 | 7 | 144 |
| ND<0.1 U | 2550 | -2549.9 | 7 | 145 |
| 259.6 | 2550 | -2290.4 | 7 | 146 |
| | | | | |
| 1320 | 1670 | -350 | 7 | 147 |
| 1710 | 1670 | 40 | 8 | 147 |

| | | | | |
|---|---|---|---|---|
| 1770 | 1670 | 100 | 9 | 147 |
| 1710 | 1670 | 40 | 10 | 147 |
| 1880 | 1670 | 210 | 11 | 147 |
| 1700 | 1670 | 30 | 12 | 147 |
| 1560 | 1670 | -110 | 12 | 148 |
| 1610 | 1670 | -60 | 12 | 149 |
| 1330 | 1670 | -340 | 12 | 150 |
| 1320 | 1670 | -350 | 12 | 151 |
| 2440 | 1670 | 770 | 13 | 151 |
| 2420 | 1670 | 750 | 14 | 151 |
| 1580 | 1670 | -90 | 14 | 152 |
| 1500 | 1670 | -170 | 14 | 153 |
| 1400 | 1670 | -270 | 14 | 154 |
| 3390 | 1670 | 1720 | 15 | 154 |
| 1630 | 1670 | -40 | 15 | 155 |
| 1540 | 1670 | -130 | 15 | 156 |
| 112 | 1670 | -1558 | 15 | 157 |
| 109 | 1670 | -1561 | 15 | 158 |
| ND<0.1 U | 1670 | -1669.9 | 15 | 159 |
| 259.6 | 1670 | -1410.4 | 15 | 160 |
| | | | | |
| 1710 | 1320 | 390 | 16 | 160 |
| 1770 | 1320 | 450 | 17 | 160 |
| 1710 | 1320 | 390 | 18 | 160 |
| 1880 | 1320 | 560 | 19 | 160 |
| 1700 | 1320 | 380 | 20 | 160 |
| 1560 | 1320 | 240 | 21 | 160 |
| 1610 | 1320 | 290 | 22 | 160 |
| 1330 | 1320 | 10 | 23 | 160 |
| 1320 | 1320 | 0 | 23 | 160 |
| 2440 | 1320 | 1120 | 24 | 160 |
| 2420 | 1320 | 1100 | 25 | 160 |
| 1580 | 1320 | 260 | 26 | 160 |
| 1500 | 1320 | 180 | 27 | 160 |
| 1400 | 1320 | 80 | 28 | 160 |
| 3390 | 1320 | 2070 | 29 | 160 |
| 1630 | 1320 | 310 | 30 | 160 |
| 1540 | 1320 | 220 | 31 | 160 |
| 112 | 1320 | -1208 | 31 | 161 |
| 109 | 1320 | -1211 | 31 | 162 |
| ND<0.1 U | 1320 | -1319.9 | 31 | 163 |
| 259.6 | 1320 | -1060.4 | 31 | 164 |
| | | | | |
| 1770 | 1710 | 60 | 32 | 164 |
| 1710 | 1710 | 0 | 32 | 164 |
| 1880 | 1710 | 170 | 33 | 164 |
| 1700 | 1710 | -10 | 33 | 165 |
| 1560 | 1710 | -150 | 33 | 166 |
| 1610 | 1710 | -100 | 33 | 167 |
| 1330 | 1710 | -380 | 33 | 168 |
| 1320 | 1710 | -390 | 33 | 169 |
| 2440 | 1710 | 730 | 34 | 169 |
| 2420 | 1710 | 710 | 35 | 169 |
| 1580 | 1710 | -130 | 35 | 170 |
| 1500 | 1710 | -210 | 35 | 171 |
| 1400 | 1710 | -310 | 35 | 172 |
| 3390 | 1710 | 1680 | 36 | 172 |

| | | | | |
|---|---|---|---|---|
| 1630 | 1710 | -80 | 36 | 173 |
| 1540 | 1710 | -170 | 36 | 174 |
| 112 | 1710 | -1598 | 36 | 175 |
| 109 | 1710 | -1601 | 36 | 176 |
| ND<0.1 U | 1710 | -1709.9 | 36 | 177 |
| 259.6 | 1710 | -1450.4 | 36 | 178 |
| | | | | |
| 1710 | 1770 | -60 | 36 | 179 |
| 1880 | 1770 | 110 | 37 | 179 |
| 1700 | 1770 | -70 | 37 | 180 |
| 1560 | 1770 | -210 | 37 | 181 |
| 1610 | 1770 | -160 | 37 | 182 |
| 1330 | 1770 | -440 | 37 | 183 |
| 1320 | 1770 | -450 | 37 | 184 |
| 2440 | 1770 | 670 | 38 | 184 |
| 2420 | 1770 | 650 | 39 | 184 |
| 1580 | 1770 | -190 | 39 | 185 |
| 1500 | 1770 | -270 | 39 | 186 |
| 1400 | 1770 | -370 | 39 | 187 |
| 3390 | 1770 | 1620 | 40 | 187 |
| 1630 | 1770 | -140 | 40 | 188 |
| 1540 | 1770 | -230 | 40 | 189 |
| 112 | 1770 | -1658 | 40 | 190 |
| 109 | 1770 | -1661 | 40 | 191 |
| ND<0.1 U | 1770 | -1769.9 | 40 | 192 |
| 259.6 | 1770 | -1510.4 | 40 | 193 |
| | | | | |
| 1880 | 1710 | 170 | 41 | 193 |
| 1700 | 1710 | -10 | 41 | 194 |
| 1560 | 1710 | -150 | 41 | 195 |
| 1610 | 1710 | -100 | 41 | 196 |
| 1330 | 1710 | -380 | 41 | 197 |
| 1320 | 1710 | -390 | 41 | 198 |
| 2440 | 1710 | 730 | 42 | 198 |
| 2420 | 1710 | 710 | 43 | 198 |
| 1580 | 1710 | -130 | 43 | 199 |
| 1500 | 1710 | -210 | 43 | 200 |
| 1400 | 1710 | -310 | 43 | 201 |
| 3390 | 1710 | 1680 | 44 | 201 |
| 1630 | 1710 | -80 | 44 | 202 |
| 1540 | 1710 | -170 | 44 | 203 |
| 112 | 1710 | -1598 | 44 | 204 |
| 109 | 1710 | -1601 | 44 | 205 |
| ND<0.1 U | 1710 | -1709.9 | 44 | 206 |
| 259.6 | 1710 | -1450.4 | 44 | 207 |
| | | | | |
| 1700 | 1880 | -180 | 44 | 208 |
| 1560 | 1880 | -320 | 44 | 209 |
| 1610 | 1880 | -270 | 44 | 210 |
| 1330 | 1880 | -550 | 44 | 211 |
| 1320 | 1880 | -560 | 44 | 212 |
| 2440 | 1880 | 560 | 45 | 212 |
| 2420 | 1880 | 540 | 46 | 212 |
| 1580 | 1880 | -300 | 46 | 213 |
| 1500 | 1880 | -380 | 46 | 214 |
| 1400 | 1880 | -480 | 46 | 215 |
| 3390 | 1880 | 1510 | 47 | 215 |

| | | | | |
|---|---|---|---|---|
| 1630 | 1880 | -250 | 47 | 216 |
| 1540 | 1880 | -340 | 47 | 217 |
| 112 | 1880 | -1768 | 47 | 218 |
| 109 | 1880 | -1771 | 47 | 219 |
| ND<0.1 U | 1880 | -1879.9 | 47 | 220 |
| 259.6 | 1880 | -1620.4 | 47 | 221 |
| | | | | |
| 1560 | 1700 | -140 | 47 | 222 |
| 1610 | 1700 | -90 | 47 | 223 |
| 1330 | 1700 | -370 | 47 | 224 |
| 1320 | 1700 | -380 | 47 | 225 |
| 2440 | 1700 | 740 | 48 | 225 |
| 2420 | 1700 | 720 | 49 | 225 |
| 1580 | 1700 | -120 | 49 | 226 |
| 1500 | 1700 | -200 | 49 | 227 |
| 1400 | 1700 | -300 | 49 | 228 |
| 3390 | 1700 | 1690 | 50 | 228 |
| 1630 | 1700 | -70 | 50 | 229 |
| 1540 | 1700 | -160 | 50 | 230 |
| 112 | 1700 | -1588 | 50 | 231 |
| 109 | 1700 | -1591 | 50 | 232 |
| ND<0.1 U | 1700 | -1699.9 | 50 | 233 |
| 259.6 | 1700 | -1440.4 | 50 | 234 |
| | | | | |
| 1610 | 1560 | 50 | 51 | 234 |
| 1330 | 1560 | -230 | 51 | 235 |
| 1320 | 1560 | -240 | 51 | 236 |
| 2440 | 1560 | 880 | 52 | 236 |
| 2420 | 1560 | 860 | 53 | 236 |
| 1580 | 1560 | 20 | 54 | 236 |
| 1500 | 1560 | -60 | 54 | 237 |
| 1400 | 1560 | -160 | 54 | 238 |
| 3390 | 1560 | 1830 | 55 | 238 |
| 1630 | 1560 | 70 | 56 | 238 |
| 1540 | 1560 | -20 | 56 | 239 |
| 112 | 1560 | -1448 | 56 | 240 |
| 109 | 1560 | -1451 | 56 | 241 |
| ND<0.1 U | 1560 | -1559.9 | 56 | 242 |
| 259.6 | 1560 | -1300.4 | 56 | 243 |
| | | | | |
| 1330 | 1610 | -280 | 56 | 244 |
| 1320 | 1610 | -290 | 56 | 245 |
| 2440 | 1610 | 830 | 57 | 245 |
| 2420 | 1610 | 810 | 58 | 245 |
| 1580 | 1610 | -30 | 58 | 246 |
| 1500 | 1610 | -110 | 58 | 247 |
| 1400 | 1610 | -210 | 58 | 248 |
| 3390 | 1610 | 1780 | 59 | 248 |
| 1630 | 1610 | 20 | 60 | 248 |
| 1540 | 1610 | -70 | 60 | 249 |
| 112 | 1610 | -1498 | 60 | 250 |
| 109 | 1610 | -1501 | 60 | 251 |
| ND<0.1 U | 1610 | -1609.9 | 60 | 252 |
| 259.6 | 1610 | -1350.4 | 60 | 253 |
| | | | | |
| 1320 | 1330 | Same Date | 60 | 253 |
| 2440 | 1330 | 1110 | 61 | 253 |

| | | | | |
|---|---|---|---|---|
| 2420 | 1330 | 1090 | 62 | 253 |
| 1580 | 1330 | 250 | 63 | 253 |
| 1500 | 1330 | 170 | 64 | 253 |
| 1400 | 1330 | 70 | 65 | 253 |
| 3390 | 1330 | 2060 | 66 | 253 |
| 1630 | 1330 | 300 | 67 | 253 |
| 1540 | 1330 | 210 | 68 | 253 |
| 112 | 1330 | -1218 | 68 | 254 |
| 109 | 1330 | -1221 | 68 | 255 |
| ND<0.1 U | 1330 | -1329.9 | 68 | 256 |
| 259.6 | 1330 | -1070.4 | 68 | 257 |
| | | | | |
| 2440 | 1320 | 1120 | 69 | 257 |
| 2420 | 1320 | 1100 | 70 | 257 |
| 1580 | 1320 | 260 | 71 | 257 |
| 1500 | 1320 | 180 | 72 | 257 |
| 1400 | 1320 | 80 | 73 | 257 |
| 3390 | 1320 | 2070 | 74 | 257 |
| 1630 | 1320 | 310 | 75 | 257 |
| 1540 | 1320 | 220 | 76 | 257 |
| 112 | 1320 | -1208 | 76 | 258 |
| 109 | 1320 | -1211 | 76 | 259 |
| ND<0.1 U | 1320 | -1319.9 | 76 | 260 |
| 259.6 | 1320 | -1060.4 | 76 | 261 |
| | | | | |
| 2420 | 2440 | Same Date | 76 | 261 |
| 1580 | 2440 | -860 | 76 | 262 |
| 1500 | 2440 | -940 | 76 | 263 |
| 1400 | 2440 | -1040 | 76 | 264 |
| 3390 | 2440 | 950 | 77 | 264 |
| 1630 | 2440 | -810 | 77 | 265 |
| 1540 | 2440 | -900 | 77 | 266 |
| 112 | 2440 | -2328 | 77 | 267 |
| 109 | 2440 | -2331 | 77 | 268 |
| ND<0.1 U | 2440 | -2439.9 | 77 | 269 |
| 259.6 | 2440 | -2180.4 | 77 | 270 |
| | | | | |
| 1580 | 2420 | -840 | 77 | 271 |
| 1500 | 2420 | -920 | 77 | 272 |
| 1400 | 2420 | -1020 | 77 | 273 |
| 3390 | 2420 | 970 | 78 | 273 |
| 1630 | 2420 | -790 | 78 | 274 |
| 1540 | 2420 | -880 | 78 | 275 |
| 112 | 2420 | -2308 | 78 | 276 |
| 109 | 2420 | -2311 | 78 | 277 |
| ND<0.1 U | 2420 | -2419.9 | 78 | 278 |
| 259.6 | 2420 | -2160.4 | 78 | 279 |
| | | | | |
| 1500 | 1580 | -80 | 78 | 280 |
| 1400 | 1580 | -180 | 78 | 281 |
| 3390 | 1580 | 1810 | 79 | 281 |
| 1630 | 1580 | 50 | 80 | 281 |
| 1540 | 1580 | -40 | 80 | 282 |
| 112 | 1580 | -1468 | 80 | 283 |
| 109 | 1580 | -1471 | 80 | 284 |
| ND<0.1 U | 1580 | -1579.9 | 80 | 285 |
| 259.6 | 1580 | -1320.4 | 80 | 286 |

| | | | | |
|---|---|---|---|---|
| 1400 | 1500 | -100 | 80 | 287 |
| 3390 | 1500 | 1890 | 81 | 287 |
| 1630 | 1500 | 130 | 82 | 287 |
| 1540 | 1500 | 40 | 83 | 287 |
| 112 | 1500 | -1388 | 83 | 288 |
| 109 | 1500 | -1391 | 83 | 289 |
| ND<0.1 U | 1500 | -1499.9 | 83 | 290 |
| 259.6 | 1500 | -1240.4 | 83 | 291 |
| | | | | |
| 3390 | 1400 | 1990 | 84 | 291 |
| 1630 | 1400 | 230 | 85 | 291 |
| 1540 | 1400 | 140 | 86 | 291 |
| 112 | 1400 | -1288 | 86 | 292 |
| 109 | 1400 | -1291 | 86 | 293 |
| ND<0.1 U | 1400 | -1399.9 | 86 | 294 |
| 259.6 | 1400 | -1140.4 | 86 | 295 |
| | | | | |
| 1630 | 3390 | -1760 | 86 | 296 |
| 1540 | 3390 | -1850 | 86 | 297 |
| 112 | 3390 | -3278 | 86 | 298 |
| 109 | 3390 | -3281 | 86 | 299 |
| ND<0.1 U | 3390 | -3389.9 | 86 | 300 |
| 259.6 | 3390 | -3130.4 | 86 | 301 |
| | | | | |
| 1540 | 1630 | -90 | 86 | 302 |
| 112 | 1630 | -1518 | 86 | 303 |
| 109 | 1630 | -1521 | 86 | 304 |
| ND<0.1 U | 1630 | -1629.9 | 86 | 305 |
| 259.6 | 1630 | -1370.4 | 86 | 306 |
| | | | | |
| 112 | 1540 | -1428 | 86 | 307 |
| 109 | 1540 | -1431 | 86 | 308 |
| ND<0.1 U | 1540 | -1539.9 | 86 | 309 |
| 259.6 | 1540 | -1280.4 | 86 | 310 |
| | | | | |
| 109 | 112 | -3 | 86 | 311 |
| ND<0.1 U | 112 | -111.9 | 86 | 312 |
| 259.6 | 112 | 147.6 | 87 | 312 |
| | | | | |
| ND<0.1 U | 109 | -108.9 | 87 | 313 |
| 259.6 | 109 | 150.6 | 88 | 313 |
| | | | | |
| 259.6 | ND<0.1 U | 259.5 | 89 | 313 |

S Statistic = 89 - 313 = -224

| Tied Group | Value | Members |
|---|---|---|
| 1 | 1320 | 2 |
| 2 | 1710 | 2 |

| Time Period | Observations |
|---|---|
| 2/1/2017 | 1 |
| 3/1/2017 | 1 |
| 4/1/2017 | 1 |
| 5/1/2017 | 1 |

| | |
|---|---|
| 6/1/2017 | 1 |
| 7/1/2017 | 1 |
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 3/1/2022 | 1 |
| 3/1/2023 | 1 |
| 3/1/2024 | 1 |

There are 2 time periods with multiple data

---

A = 36
B = 36
C = 0
D = 0
E = 4
F = 4
a = 51156
b = 197316
c = 1624
Group Variance = 2838.01
Z-Score = -4.18599
Comparison Level at 95% confidence level = -1.65463 (downward trend)
**-4.18599 < -1.65463 indicating a downward trend**

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RW21-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 53.9 | 50.2 | Same Date | 0 | 0 |
| 22.5 1c | 50.2 | -27.7 | 0 | 1 |
| 33.1 | 50.2 | -17.1 | 0 | 2 |
| 39.8 | 50.2 | -10.4 | 0 | 3 |
| 34 | 50.2 | -16.2 | 0 | 4 |
| 29.4 1c | 50.2 | -20.8 | 0 | 5 |
| 27.8 | 50.2 | -22.4 | 0 | 6 |
| 1.6 J | 50.2 | -48.6 | 0 | 7 |
| 34.2 | 50.2 | -16 | 0 | 8 |
| 32.7 | 50.2 | -17.5 | 0 | 9 |
| 46.27 | 50.2 | -3.93 | 0 | 10 |
| 30.4 | 50.2 | -19.8 | 0 | 11 |
| | | | | |
| 22.5 1c | 53.9 | -31.4 | 0 | 12 |
| 33.1 | 53.9 | -20.8 | 0 | 13 |
| 39.8 | 53.9 | -14.1 | 0 | 14 |
| 34 | 53.9 | -19.9 | 0 | 15 |
| 29.4 1c | 53.9 | -24.5 | 0 | 16 |
| 27.8 | 53.9 | -26.1 | 0 | 17 |
| 1.6 J | 53.9 | -52.3 | 0 | 18 |
| 34.2 | 53.9 | -19.7 | 0 | 19 |
| 32.7 | 53.9 | -21.2 | 0 | 20 |
| 46.27 | 53.9 | -7.63 | 0 | 21 |
| 30.4 | 53.9 | -23.5 | 0 | 22 |
| | | | | |
| 33.1 | 22.5 1c | 10.6 | 1 | 22 |
| 39.8 | 22.5 1c | 17.3 | 2 | 22 |
| 34 | 22.5 1c | 11.5 | 3 | 22 |
| 29.4 1c | 22.5 1c | 6.9 | 4 | 22 |
| 27.8 | 22.5 1c | 5.3 | 5 | 22 |
| 1.6 J | 22.5 1c | -20.9 | 5 | 23 |
| 34.2 | 22.5 1c | 11.7 | 6 | 23 |
| 32.7 | 22.5 1c | 10.2 | 7 | 23 |
| 46.27 | 22.5 1c | 23.77 | 8 | 23 |
| 30.4 | 22.5 1c | 7.9 | 9 | 23 |
| | | | | |
| 39.8 | 33.1 | 6.7 | 10 | 23 |
| 34 | 33.1 | 0.9 | 11 | 23 |
| 29.4 1c | 33.1 | -3.7 | 11 | 24 |
| 27.8 | 33.1 | -5.3 | 11 | 25 |
| 1.6 J | 33.1 | -31.5 | 11 | 26 |
| 34.2 | 33.1 | 1.1 | 12 | 26 |
| 32.7 | 33.1 | -0.4 | 12 | 27 |
| 46.27 | 33.1 | 13.17 | 13 | 27 |
| 30.4 | 33.1 | -2.7 | 13 | 28 |
| | | | | |
| 34 | 39.8 | -5.8 | 13 | 29 |

| | | | | |
|---|---|---|---|---|
| 29.4 1c | 39.8 | -10.4 | 13 | 30 |
| 27.8 | 39.8 | -12 | 13 | 31 |
| 1.6 J | 39.8 | -38.2 | 13 | 32 |
| 34.2 | 39.8 | -5.6 | 13 | 33 |
| 32.7 | 39.8 | -7.1 | 13 | 34 |
| 46.27 | 39.8 | 6.47 | 14 | 34 |
| 30.4 | 39.8 | -9.4 | 14 | 35 |
| | | | | |
| 29.4 1c | 34 | -4.6 | 14 | 36 |
| 27.8 | 34 | -6.2 | 14 | 37 |
| 1.6 J | 34 | -32.4 | 14 | 38 |
| 34.2 | 34 | 0.2 | 15 | 38 |
| 32.7 | 34 | -1.3 | 15 | 39 |
| 46.27 | 34 | 12.27 | 16 | 39 |
| 30.4 | 34 | -3.6 | 16 | 40 |
| | | | | |
| 27.8 | 29.4 1c | -1.6 | 16 | 41 |
| 1.6 J | 29.4 1c | -27.8 | 16 | 42 |
| 34.2 | 29.4 1c | 4.8 | 17 | 42 |
| 32.7 | 29.4 1c | 3.3 | 18 | 42 |
| 46.27 | 29.4 1c | 16.87 | 19 | 42 |
| 30.4 | 29.4 1c | 1 | 20 | 42 |
| | | | | |
| 1.6 J | 27.8 | Same Date | 20 | 42 |
| 34.2 | 27.8 | 6.4 | 21 | 42 |
| 32.7 | 27.8 | 4.9 | 22 | 42 |
| 46.27 | 27.8 | 18.47 | 23 | 42 |
| 30.4 | 27.8 | 2.6 | 24 | 42 |
| | | | | |
| 34.2 | 1.6 J | 32.6 | 25 | 42 |
| 32.7 | 1.6 J | 31.1 | 26 | 42 |
| 46.27 | 1.6 J | 44.67 | 27 | 42 |
| 30.4 | 1.6 J | 28.8 | 28 | 42 |
| | | | | |
| 32.7 | 34.2 | -1.5 | 28 | 43 |
| 46.27 | 34.2 | 12.07 | 29 | 43 |
| 30.4 | 34.2 | -3.8 | 29 | 44 |
| | | | | |
| 46.27 | 32.7 | 13.57 | 30 | 44 |
| 30.4 | 32.7 | -2.3 | 30 | 45 |
| | | | | |
| 30.4 | 46.27 | -15.87 | 30 | 46 |

S Statistic = 30 - 46 = -16

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 2 |
| 6/1/2021 | 1 |

3/1/2022 1
3/1/2023 1
3/1/2024 1
There are 2 time periods with multiple data

---

A = 0
B = 36
C = 0
D = 0
E = 0
F = 4
a = 4836
b = 15444
c = 312
Group Variance = 266.667
Z-Score = -0.918559
Comparison Level at 95% confidence level = -1.65463 (downward trend)
-0.918559 >= -1.65463 indicating no evidence of a downward trend

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RW22R-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| ND<1.5 U | ND<1.5 U | Same Date | 0 | 0 |
| ND<1.5 U | ND<1.5 U | Same Date | 0 | 0 |
| ND<1.5 U | ND<1.5 U | Same Date | 0 | 0 |
| 0.92 J | ND<1.5 U | Same Date | 0 | 0 |
| 0.92 J | ND<1.5 U | Same Date | 0 | 0 |
| ND<1.5 U1c3c | ND<1.5 U | Same Date | 0 | 0 |
| ND<1.5 U2c | ND<1.5 U | Same Date | 0 | 0 |
| 0.92 J | ND<1.5 U | Same Date | 0 | 0 |
| 0.92 J | ND<1.5 U | Same Date | 0 | 0 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 0 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 0 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 0 |
| 2 J | ND<1.5 U | 0.5 | 1 | 0 |
| 2.4 J | ND<1.5 U | 0.9 | 2 | 0 |
| 3.4 | ND<1.5 U | 1.9 | 3 | 0 |
| 2.5 J | ND<1.5 U | 1 | 4 | 0 |
| 3.4 | ND<1.5 U | 1.9 | 5 | 0 |
| 5.722 | ND<1.5 U | 4.222 | 6 | 0 |
| 5.722 | ND<1.5 U | 4.222 | 7 | 0 |
| 5.194 | ND<1.5 U | 3.694 | 8 | 0 |
| 4.492 | ND<1.5 U | 2.992 | 9 | 0 |
| 1.893 | ND<1.5 U | 0.393 | 10 | 0 |
| 1.564 | ND<1.5 U | 0.064 | 11 | 0 |
| | | | | |
| ND<1.5 U | ND<1.5 U | Same Date | 11 | 0 |
| ND<1.5 U | ND<1.5 U | Same Date | 11 | 0 |
| 0.92 J | ND<1.5 U | Same Date | 11 | 0 |
| 0.92 J | ND<1.5 U | Same Date | 11 | 0 |
| ND<1.5 U1c3c | ND<1.5 U | Same Date | 11 | 0 |
| ND<1.5 U2c | ND<1.5 U | Same Date | 11 | 0 |
| 0.92 J | ND<1.5 U | Same Date | 11 | 0 |
| 0.92 J | ND<1.5 U | Same Date | 11 | 0 |
| ND<1.5 U | ND<1.5 U | 0 | 11 | 0 |
| ND<1.5 U | ND<1.5 U | 0 | 11 | 0 |
| ND<1.5 U | ND<1.5 U | 0 | 11 | 0 |
| 2 J | ND<1.5 U | 0.5 | 12 | 0 |
| 2.4 J | ND<1.5 U | 0.9 | 13 | 0 |
| 3.4 | ND<1.5 U | 1.9 | 14 | 0 |
| 2.5 J | ND<1.5 U | 1 | 15 | 0 |
| 3.4 | ND<1.5 U | 1.9 | 16 | 0 |
| 5.722 | ND<1.5 U | 4.222 | 17 | 0 |
| 5.722 | ND<1.5 U | 4.222 | 18 | 0 |
| 5.194 | ND<1.5 U | 3.694 | 19 | 0 |
| 4.492 | ND<1.5 U | 2.992 | 20 | 0 |
| 1.893 | ND<1.5 U | 0.393 | 21 | 0 |
| 1.564 | ND<1.5 U | 0.064 | 22 | 0 |

| | | | | |
|---|---|---|---|---|
| ND<1.5 U | ND<1.5 U | Same Date | 22 | 0 |
| 0.92 J | ND<1.5 U | Same Date | 22 | 0 |
| 0.92 J | ND<1.5 U | Same Date | 22 | 0 |
| ND<1.5 U1c3c | ND<1.5 U | Same Date | 22 | 0 |
| ND<1.5 U2c | ND<1.5 U | Same Date | 22 | 0 |
| 0.92 J | ND<1.5 U | Same Date | 22 | 0 |
| 0.92 J | ND<1.5 U | Same Date | 22 | 0 |
| ND<1.5 U | ND<1.5 U | 0 | 22 | 0 |
| ND<1.5 U | ND<1.5 U | 0 | 22 | 0 |
| ND<1.5 U | ND<1.5 U | 0 | 22 | 0 |
| 2 J | ND<1.5 U | 0.5 | 23 | 0 |
| 2.4 J | ND<1.5 U | 0.9 | 24 | 0 |
| 3.4 | ND<1.5 U | 1.9 | 25 | 0 |
| 2.5 J | ND<1.5 U | 1 | 26 | 0 |
| 3.4 | ND<1.5 U | 1.9 | 27 | 0 |
| 5.722 | ND<1.5 U | 4.222 | 28 | 0 |
| 5.722 | ND<1.5 U | 4.222 | 29 | 0 |
| 5.194 | ND<1.5 U | 3.694 | 30 | 0 |
| 4.492 | ND<1.5 U | 2.992 | 31 | 0 |
| 1.893 | ND<1.5 U | 0.393 | 32 | 0 |
| 1.564 | ND<1.5 U | 0.064 | 33 | 0 |
| | | | | |
| 0.92 J | ND<1.5 U | Same Date | 33 | 0 |
| 0.92 J | ND<1.5 U | Same Date | 33 | 0 |
| ND<1.5 U1c3c | ND<1.5 U | Same Date | 33 | 0 |
| ND<1.5 U2c | ND<1.5 U | Same Date | 33 | 0 |
| 0.92 J | ND<1.5 U | Same Date | 33 | 0 |
| 0.92 J | ND<1.5 U | Same Date | 33 | 0 |
| ND<1.5 U | ND<1.5 U | 0 | 33 | 0 |
| ND<1.5 U | ND<1.5 U | 0 | 33 | 0 |
| ND<1.5 U | ND<1.5 U | 0 | 33 | 0 |
| 2 J | ND<1.5 U | 0.5 | 34 | 0 |
| 2.4 J | ND<1.5 U | 0.9 | 35 | 0 |
| 3.4 | ND<1.5 U | 1.9 | 36 | 0 |
| 2.5 J | ND<1.5 U | 1 | 37 | 0 |
| 3.4 | ND<1.5 U | 1.9 | 38 | 0 |
| 5.722 | ND<1.5 U | 4.222 | 39 | 0 |
| 5.722 | ND<1.5 U | 4.222 | 40 | 0 |
| 5.194 | ND<1.5 U | 3.694 | 41 | 0 |
| 4.492 | ND<1.5 U | 2.992 | 42 | 0 |
| 1.893 | ND<1.5 U | 0.393 | 43 | 0 |
| 1.564 | ND<1.5 U | 0.064 | 44 | 0 |
| | | | | |
| 0.92 J | 0.92 J | Same Date | 44 | 0 |
| ND<1.5 U1c3c | 0.92 J | Same Date | 44 | 0 |
| ND<1.5 U2c | 0.92 J | Same Date | 44 | 0 |
| 0.92 J | 0.92 J | Same Date | 44 | 0 |
| 0.92 J | 0.92 J | Same Date | 44 | 0 |
| ND<1.5 U | 0.92 J | 0.58 | 45 | 0 |
| ND<1.5 U | 0.92 J | 0.58 | 46 | 0 |
| ND<1.5 U | 0.92 J | 0.58 | 47 | 0 |
| 2 J | 0.92 J | 1.08 | 48 | 0 |
| 2.4 J | 0.92 J | 1.48 | 49 | 0 |
| 3.4 | 0.92 J | 2.48 | 50 | 0 |
| 2.5 J | 0.92 J | 1.58 | 51 | 0 |
| 3.4 | 0.92 J | 2.48 | 52 | 0 |
| 5.722 | 0.92 J | 4.802 | 53 | 0 |

| | | | | |
|---|---|---|---|---|
| 5.722 | 0.92 J | 4.802 | 54 | 0 |
| 5.194 | 0.92 J | 4.274 | 55 | 0 |
| 4.492 | 0.92 J | 3.572 | 56 | 0 |
| 1.893 | 0.92 J | 0.973 | 57 | 0 |
| 1.564 | 0.92 J | 0.644 | 58 | 0 |
| | | | | |
| ND<1.5 U1c3c | 0.92 J | Same Date | 58 | 0 |
| ND<1.5 U2c | 0.92 J | Same Date | 58 | 0 |
| 0.92 J | 0.92 J | Same Date | 58 | 0 |
| 0.92 J | 0.92 J | Same Date | 58 | 0 |
| ND<1.5 U | 0.92 J | 0.58 | 59 | 0 |
| ND<1.5 U | 0.92 J | 0.58 | 60 | 0 |
| ND<1.5 U | 0.92 J | 0.58 | 61 | 0 |
| 2 J | 0.92 J | 1.08 | 62 | 0 |
| 2.4 J | 0.92 J | 1.48 | 63 | 0 |
| 3.4 | 0.92 J | 2.48 | 64 | 0 |
| 2.5 J | 0.92 J | 1.58 | 65 | 0 |
| 3.4 | 0.92 J | 2.48 | 66 | 0 |
| 5.722 | 0.92 J | 4.802 | 67 | 0 |
| 5.722 | 0.92 J | 4.802 | 68 | 0 |
| 5.194 | 0.92 J | 4.274 | 69 | 0 |
| 4.492 | 0.92 J | 3.572 | 70 | 0 |
| 1.893 | 0.92 J | 0.973 | 71 | 0 |
| 1.564 | 0.92 J | 0.644 | 72 | 0 |
| | | | | |
| ND<1.5 U2c | ND<1.5 U1c3c | Same Date | 72 | 0 |
| 0.92 J | ND<1.5 U1c3c | Same Date | 72 | 0 |
| 0.92 J | ND<1.5 U1c3c | Same Date | 72 | 0 |
| ND<1.5 U | ND<1.5 U1c3c | 0 | 72 | 0 |
| ND<1.5 U | ND<1.5 U1c3c | 0 | 72 | 0 |
| ND<1.5 U | ND<1.5 U1c3c | 0 | 72 | 0 |
| 2 J | ND<1.5 U1c3c | 0.5 | 73 | 0 |
| 2.4 J | ND<1.5 U1c3c | 0.9 | 74 | 0 |
| 3.4 | ND<1.5 U1c3c | 1.9 | 75 | 0 |
| 2.5 J | ND<1.5 U1c3c | 1 | 76 | 0 |
| 3.4 | ND<1.5 U1c3c | 1.9 | 77 | 0 |
| 5.722 | ND<1.5 U1c3c | 4.222 | 78 | 0 |
| 5.722 | ND<1.5 U1c3c | 4.222 | 79 | 0 |
| 5.194 | ND<1.5 U1c3c | 3.694 | 80 | 0 |
| 4.492 | ND<1.5 U1c3c | 2.992 | 81 | 0 |
| 1.893 | ND<1.5 U1c3c | 0.393 | 82 | 0 |
| 1.564 | ND<1.5 U1c3c | 0.064 | 83 | 0 |
| | | | | |
| 0.92 J | ND<1.5 U2c | Same Date | 83 | 0 |
| 0.92 J | ND<1.5 U2c | Same Date | 83 | 0 |
| ND<1.5 U | ND<1.5 U2c | 0 | 83 | 0 |
| ND<1.5 U | ND<1.5 U2c | 0 | 83 | 0 |
| ND<1.5 U | ND<1.5 U2c | 0 | 83 | 0 |
| 2 J | ND<1.5 U2c | 0.5 | 84 | 0 |
| 2.4 J | ND<1.5 U2c | 0.9 | 85 | 0 |
| 3.4 | ND<1.5 U2c | 1.9 | 86 | 0 |
| 2.5 J | ND<1.5 U2c | 1 | 87 | 0 |
| 3.4 | ND<1.5 U2c | 1.9 | 88 | 0 |
| 5.722 | ND<1.5 U2c | 4.222 | 89 | 0 |
| 5.722 | ND<1.5 U2c | 4.222 | 90 | 0 |
| 5.194 | ND<1.5 U2c | 3.694 | 91 | 0 |
| 4.492 | ND<1.5 U2c | 2.992 | 92 | 0 |

| | | | | |
|---|---|---|---|---|
| 1.893 | ND<1.5 U2c | 0.393 | 93 | 0 |
| 1.564 | ND<1.5 U2c | 0.064 | 94 | 0 |
| | | | | |
| 0.92 J | 0.92 J | Same Date | 94 | 0 |
| ND<1.5 U | 0.92 J | 0.58 | 95 | 0 |
| ND<1.5 U | 0.92 J | 0.58 | 96 | 0 |
| ND<1.5 U | 0.92 J | 0.58 | 97 | 0 |
| 2 J | 0.92 J | 1.08 | 98 | 0 |
| 2.4 J | 0.92 J | 1.48 | 99 | 0 |
| 3.4 | 0.92 J | 2.48 | 100 | 0 |
| 2.5 J | 0.92 J | 1.58 | 101 | 0 |
| 3.4 | 0.92 J | 2.48 | 102 | 0 |
| 5.722 | 0.92 J | 4.802 | 103 | 0 |
| 5.722 | 0.92 J | 4.802 | 104 | 0 |
| 5.194 | 0.92 J | 4.274 | 105 | 0 |
| 4.492 | 0.92 J | 3.572 | 106 | 0 |
| 1.893 | 0.92 J | 0.973 | 107 | 0 |
| 1.564 | 0.92 J | 0.644 | 108 | 0 |
| | | | | |
| ND<1.5 U | 0.92 J | 0.58 | 109 | 0 |
| ND<1.5 U | 0.92 J | 0.58 | 110 | 0 |
| ND<1.5 U | 0.92 J | 0.58 | 111 | 0 |
| 2 J | 0.92 J | 1.08 | 112 | 0 |
| 2.4 J | 0.92 J | 1.48 | 113 | 0 |
| 3.4 | 0.92 J | 2.48 | 114 | 0 |
| 2.5 J | 0.92 J | 1.58 | 115 | 0 |
| 3.4 | 0.92 J | 2.48 | 116 | 0 |
| 5.722 | 0.92 J | 4.802 | 117 | 0 |
| 5.722 | 0.92 J | 4.802 | 118 | 0 |
| 5.194 | 0.92 J | 4.274 | 119 | 0 |
| 4.492 | 0.92 J | 3.572 | 120 | 0 |
| 1.893 | 0.92 J | 0.973 | 121 | 0 |
| 1.564 | 0.92 J | 0.644 | 122 | 0 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 122 | 0 |
| ND<1.5 U | ND<1.5 U | 0 | 122 | 0 |
| 2 J | ND<1.5 U | 0.5 | 123 | 0 |
| 2.4 J | ND<1.5 U | 0.9 | 124 | 0 |
| 3.4 | ND<1.5 U | 1.9 | 125 | 0 |
| 2.5 J | ND<1.5 U | 1 | 126 | 0 |
| 3.4 | ND<1.5 U | 1.9 | 127 | 0 |
| 5.722 | ND<1.5 U | 4.222 | 128 | 0 |
| 5.722 | ND<1.5 U | 4.222 | 129 | 0 |
| 5.194 | ND<1.5 U | 3.694 | 130 | 0 |
| 4.492 | ND<1.5 U | 2.992 | 131 | 0 |
| 1.893 | ND<1.5 U | 0.393 | 132 | 0 |
| 1.564 | ND<1.5 U | 0.064 | 133 | 0 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 133 | 0 |
| 2 J | ND<1.5 U | 0.5 | 134 | 0 |
| 2.4 J | ND<1.5 U | 0.9 | 135 | 0 |
| 3.4 | ND<1.5 U | 1.9 | 136 | 0 |
| 2.5 J | ND<1.5 U | 1 | 137 | 0 |
| 3.4 | ND<1.5 U | 1.9 | 138 | 0 |
| 5.722 | ND<1.5 U | 4.222 | 139 | 0 |
| 5.722 | ND<1.5 U | 4.222 | 140 | 0 |
| 5.194 | ND<1.5 U | 3.694 | 141 | 0 |

| | | | | |
|---|---|---|---|---|
| 4.492 | ND<1.5 U | 2.992 | 142 | 0 |
| 1.893 | ND<1.5 U | 0.393 | 143 | 0 |
| 1.564 | ND<1.5 U | 0.064 | 144 | 0 |
| | | | | |
| 2 J | ND<1.5 U | 0.5 | 145 | 0 |
| 2.4 J | ND<1.5 U | 0.9 | 146 | 0 |
| 3.4 | ND<1.5 U | 1.9 | 147 | 0 |
| 2.5 J | ND<1.5 U | 1 | 148 | 0 |
| 3.4 | ND<1.5 U | 1.9 | 149 | 0 |
| 5.722 | ND<1.5 U | 4.222 | 150 | 0 |
| 5.722 | ND<1.5 U | 4.222 | 151 | 0 |
| 5.194 | ND<1.5 U | 3.694 | 152 | 0 |
| 4.492 | ND<1.5 U | 2.992 | 153 | 0 |
| 1.893 | ND<1.5 U | 0.393 | 154 | 0 |
| 1.564 | ND<1.5 U | 0.064 | 155 | 0 |
| | | | | |
| 2.4 J | 2 J | 0.4 | 156 | 0 |
| 3.4 | 2 J | 1.4 | 157 | 0 |
| 2.5 J | 2 J | 0.5 | 158 | 0 |
| 3.4 | 2 J | 1.4 | 159 | 0 |
| 5.722 | 2 J | 3.722 | 160 | 0 |
| 5.722 | 2 J | 3.722 | 161 | 0 |
| 5.194 | 2 J | 3.194 | 162 | 0 |
| 4.492 | 2 J | 2.492 | 163 | 0 |
| 1.893 | 2 J | -0.107 | 163 | 1 |
| 1.564 | 2 J | -0.436 | 163 | 2 |
| | | | | |
| 3.4 | 2.4 J | 1 | 164 | 2 |
| 2.5 J | 2.4 J | 0.1 | 165 | 2 |
| 3.4 | 2.4 J | 1 | 166 | 2 |
| 5.722 | 2.4 J | 3.322 | 167 | 2 |
| 5.722 | 2.4 J | 3.322 | 168 | 2 |
| 5.194 | 2.4 J | 2.794 | 169 | 2 |
| 4.492 | 2.4 J | 2.092 | 170 | 2 |
| 1.893 | 2.4 J | -0.507 | 170 | 3 |
| 1.564 | 2.4 J | -0.836 | 170 | 4 |
| | | | | |
| 2.5 J | 3.4 | -0.9 | 170 | 5 |
| 3.4 | 3.4 | 0 | 170 | 5 |
| 5.722 | 3.4 | 2.322 | 171 | 5 |
| 5.722 | 3.4 | 2.322 | 172 | 5 |
| 5.194 | 3.4 | 1.794 | 173 | 5 |
| 4.492 | 3.4 | 1.092 | 174 | 5 |
| 1.893 | 3.4 | -1.507 | 174 | 6 |
| 1.564 | 3.4 | -1.836 | 174 | 7 |
| | | | | |
| 3.4 | 2.5 J | 0.9 | 175 | 7 |
| 5.722 | 2.5 J | 3.222 | 176 | 7 |
| 5.722 | 2.5 J | 3.222 | 177 | 7 |
| 5.194 | 2.5 J | 2.694 | 178 | 7 |
| 4.492 | 2.5 J | 1.992 | 179 | 7 |
| 1.893 | 2.5 J | -0.607 | 179 | 8 |
| 1.564 | 2.5 J | -0.936 | 179 | 9 |
| | | | | |
| 5.722 | 3.4 | 2.322 | 180 | 9 |
| 5.722 | 3.4 | 2.322 | 181 | 9 |
| 5.194 | 3.4 | 1.794 | 182 | 9 |

| | | | | |
|---|---|---|---|---|
| 4.492 | 3.4 | 1.092 | 183 | 9 |
| 1.893 | 3.4 | -1.507 | 183 | 10 |
| 1.564 | 3.4 | -1.836 | 183 | 11 |
| | | | | |
| 5.722 | 5.722 | Same Date | 183 | 11 |
| 5.194 | 5.722 | -0.528 | 183 | 12 |
| 4.492 | 5.722 | -1.23 | 183 | 13 |
| 1.893 | 5.722 | -3.829 | 183 | 14 |
| 1.564 | 5.722 | -4.158 | 183 | 15 |
| | | | | |
| 5.194 | 5.722 | -0.528 | 183 | 16 |
| 4.492 | 5.722 | -1.23 | 183 | 17 |
| 1.893 | 5.722 | -3.829 | 183 | 18 |
| 1.564 | 5.722 | -4.158 | 183 | 19 |
| | | | | |
| 4.492 | 5.194 | -0.702 | 183 | 20 |
| 1.893 | 5.194 | -3.301 | 183 | 21 |
| 1.564 | 5.194 | -3.63 | 183 | 22 |
| | | | | |
| 1.893 | 4.492 | -2.599 | 183 | 23 |
| 1.564 | 4.492 | -2.928 | 183 | 24 |
| | | | | |
| 1.564 | 1.893 | -0.329 | 183 | 25 |

S Statistic = 183 - 25 = 158

| Tied Group | Value | Members |
|---|---|---|
| 1 | 1.5 | 9 |
| 2 | 0.92 | 4 |
| 3 | 3.4 | 2 |
| 4 | 5.722 | 2 |

| Time Period | Observations |
|---|---|
| 5/1/2019 | 10 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 2 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 2 time periods with multiple data

A = 1848
B = 2268
C = 528
D = 720
E = 88
F = 92
a = 29256

b = 109296
c = 1104
Group Variance = 1407.48
Z-Score = 4.18484
Comparison Level at 95% confidence level = -1.65463 (downward trend)
4.18484 >= -1.65463 indicating no evidence of a downward trend

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RW23-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 2270 | 2340 | Same Date | 0 | 0 |
| 2800 | 2340 | 460 | 1 | 0 |
| 2680 | 2340 | 340 | 2 | 0 |
| 2600 | 2340 | 260 | 3 | 0 |
| 2740 | 2340 | 400 | 4 | 0 |
| 2500 1c | 2340 | 160 | 5 | 0 |
| 2340 | 2340 | 0 | 5 | 0 |
| 2870 | 2340 | 530 | 6 | 0 |
| 2590 | 2340 | 250 | 7 | 0 |
| 2610 | 2340 | 270 | 8 | 0 |
| 2844 | 2340 | 504 | 9 | 0 |
| 3005 | 2340 | 665 | 10 | 0 |
| 3222 | 2340 | 882 | 11 | 0 |
| 2687 | 2340 | 347 | 12 | 0 |
| 3342 | 2340 | 1002 | 13 | 0 |
| | | | | |
| 2800 | 2270 | 530 | 14 | 0 |
| 2680 | 2270 | 410 | 15 | 0 |
| 2600 | 2270 | 330 | 16 | 0 |
| 2740 | 2270 | 470 | 17 | 0 |
| 2500 1c | 2270 | 230 | 18 | 0 |
| 2340 | 2270 | 70 | 19 | 0 |
| 2870 | 2270 | 600 | 20 | 0 |
| 2590 | 2270 | 320 | 21 | 0 |
| 2610 | 2270 | 340 | 22 | 0 |
| 2844 | 2270 | 574 | 23 | 0 |
| 3005 | 2270 | 735 | 24 | 0 |
| 3222 | 2270 | 952 | 25 | 0 |
| 2687 | 2270 | 417 | 26 | 0 |
| 3342 | 2270 | 1072 | 27 | 0 |
| | | | | |
| 2680 | 2800 | -120 | 27 | 1 |
| 2600 | 2800 | -200 | 27 | 2 |
| 2740 | 2800 | -60 | 27 | 3 |
| 2500 1c | 2800 | -300 | 27 | 4 |
| 2340 | 2800 | -460 | 27 | 5 |
| 2870 | 2800 | 70 | 28 | 5 |
| 2590 | 2800 | -210 | 28 | 6 |
| 2610 | 2800 | -190 | 28 | 7 |
| 2844 | 2800 | 44 | 29 | 7 |
| 3005 | 2800 | 205 | 30 | 7 |
| 3222 | 2800 | 422 | 31 | 7 |
| 2687 | 2800 | -113 | 31 | 8 |
| 3342 | 2800 | 542 | 32 | 8 |
| | | | | |
| 2600 | 2680 | -80 | 32 | 9 |
| 2740 | 2680 | 60 | 33 | 9 |

| | | | | |
|---|---|---|---|---|
| 2500 1c | 2680 | -180 | 33 | 10 |
| 2340 | 2680 | -340 | 33 | 11 |
| 2870 | 2680 | 190 | 34 | 11 |
| 2590 | 2680 | -90 | 34 | 12 |
| 2610 | 2680 | -70 | 34 | 13 |
| 2844 | 2680 | 164 | 35 | 13 |
| 3005 | 2680 | 325 | 36 | 13 |
| 3222 | 2680 | 542 | 37 | 13 |
| 2687 | 2680 | 7 | 38 | 13 |
| 3342 | 2680 | 662 | 39 | 13 |
| | | | | |
| 2740 | 2600 | 140 | 40 | 13 |
| 2500 1c | 2600 | -100 | 40 | 14 |
| 2340 | 2600 | -260 | 40 | 15 |
| 2870 | 2600 | 270 | 41 | 15 |
| 2590 | 2600 | -10 | 41 | 16 |
| 2610 | 2600 | 10 | 42 | 16 |
| 2844 | 2600 | 244 | 43 | 16 |
| 3005 | 2600 | 405 | 44 | 16 |
| 3222 | 2600 | 622 | 45 | 16 |
| 2687 | 2600 | 87 | 46 | 16 |
| 3342 | 2600 | 742 | 47 | 16 |
| | | | | |
| 2500 1c | 2740 | -240 | 47 | 17 |
| 2340 | 2740 | -400 | 47 | 18 |
| 2870 | 2740 | 130 | 48 | 18 |
| 2590 | 2740 | -150 | 48 | 19 |
| 2610 | 2740 | -130 | 48 | 20 |
| 2844 | 2740 | 104 | 49 | 20 |
| 3005 | 2740 | 265 | 50 | 20 |
| 3222 | 2740 | 482 | 51 | 20 |
| 2687 | 2740 | -53 | 51 | 21 |
| 3342 | 2740 | 602 | 52 | 21 |
| | | | | |
| 2340 | 2500 1c | -160 | 52 | 22 |
| 2870 | 2500 1c | 370 | 53 | 22 |
| 2590 | 2500 1c | 90 | 54 | 22 |
| 2610 | 2500 1c | 110 | 55 | 22 |
| 2844 | 2500 1c | 344 | 56 | 22 |
| 3005 | 2500 1c | 505 | 57 | 22 |
| 3222 | 2500 1c | 722 | 58 | 22 |
| 2687 | 2500 1c | 187 | 59 | 22 |
| 3342 | 2500 1c | 842 | 60 | 22 |
| | | | | |
| 2870 | 2340 | 530 | 61 | 22 |
| 2590 | 2340 | 250 | 62 | 22 |
| 2610 | 2340 | 270 | 63 | 22 |
| 2844 | 2340 | 504 | 64 | 22 |
| 3005 | 2340 | 665 | 65 | 22 |
| 3222 | 2340 | 882 | 66 | 22 |
| 2687 | 2340 | 347 | 67 | 22 |
| 3342 | 2340 | 1002 | 68 | 22 |
| | | | | |
| 2590 | 2870 | -280 | 68 | 23 |
| 2610 | 2870 | -260 | 68 | 24 |
| 2844 | 2870 | -26 | 68 | 25 |
| 3005 | 2870 | 135 | 69 | 25 |

| | | | | |
|---|---|---|---|---|
| 3222 | 2870 | 352 | 70 | 25 |
| 2687 | 2870 | -183 | 70 | 26 |
| 3342 | 2870 | 472 | 71 | 26 |
| | | | | |
| 2610 | 2590 | 20 | 72 | 26 |
| 2844 | 2590 | 254 | 73 | 26 |
| 3005 | 2590 | 415 | 74 | 26 |
| 3222 | 2590 | 632 | 75 | 26 |
| 2687 | 2590 | 97 | 76 | 26 |
| 3342 | 2590 | 752 | 77 | 26 |
| | | | | |
| 2844 | 2610 | 234 | 78 | 26 |
| 3005 | 2610 | 395 | 79 | 26 |
| 3222 | 2610 | 612 | 80 | 26 |
| 2687 | 2610 | 77 | 81 | 26 |
| 3342 | 2610 | 732 | 82 | 26 |
| | | | | |
| 3005 | 2844 | 161 | 83 | 26 |
| 3222 | 2844 | 378 | 84 | 26 |
| 2687 | 2844 | -157 | 84 | 27 |
| 3342 | 2844 | 498 | 85 | 27 |
| | | | | |
| 3222 | 3005 | 217 | 86 | 27 |
| 2687 | 3005 | -318 | 86 | 28 |
| 3342 | 3005 | 337 | 87 | 28 |
| | | | | |
| 2687 | 3222 | -535 | 87 | 29 |
| 3342 | 3222 | 120 | 88 | 29 |
| | | | | |
| 3342 | 2687 | 655 | 89 | 29 |

S Statistic = 89 - 29 = 60

| Tied Group | Value | Members |
|---|---|---|
| 1 | 2340 | 2 |

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 18
B = 18

C = 0
D = 0
E = 2
F = 2
a = 8880
b = 30240
c = 480
Group Variance = 491.342
Z-Score = 2.66171
Comparison Level at 95% confidence level = -1.65463 (downward trend)
2.66171 >= -1.65463 indicating no evidence of a downward trend

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RW24-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 1580 | 1610 | Same Date | 0 | 0 |
| 1540 | 1610 | -70 | 0 | 1 |
| 1250 | 1610 | -360 | 0 | 2 |
| 1190 | 1610 | -420 | 0 | 3 |
| 1050 | 1610 | -560 | 0 | 4 |
| 922 | 1610 | -688 | 0 | 5 |
| 842 | 1610 | -768 | 0 | 6 |
| 890 | 1610 | -720 | 0 | 7 |
| 1200 | 1610 | -410 | 0 | 8 |
| 1113 | 1610 | -497 | 0 | 9 |
| 2122 | 1610 | 512 | 1 | 9 |
| | | | | |
| 1540 | 1580 | -40 | 1 | 10 |
| 1250 | 1580 | -330 | 1 | 11 |
| 1190 | 1580 | -390 | 1 | 12 |
| 1050 | 1580 | -530 | 1 | 13 |
| 922 | 1580 | -658 | 1 | 14 |
| 842 | 1580 | -738 | 1 | 15 |
| 890 | 1580 | -690 | 1 | 16 |
| 1200 | 1580 | -380 | 1 | 17 |
| 1113 | 1580 | -467 | 1 | 18 |
| 2122 | 1580 | 542 | 2 | 18 |
| | | | | |
| 1250 | 1540 | -290 | 2 | 19 |
| 1190 | 1540 | -350 | 2 | 20 |
| 1050 | 1540 | -490 | 2 | 21 |
| 922 | 1540 | -618 | 2 | 22 |
| 842 | 1540 | -698 | 2 | 23 |
| 890 | 1540 | -650 | 2 | 24 |
| 1200 | 1540 | -340 | 2 | 25 |
| 1113 | 1540 | -427 | 2 | 26 |
| 2122 | 1540 | 582 | 3 | 26 |
| | | | | |
| 1190 | 1250 | -60 | 3 | 27 |
| 1050 | 1250 | -200 | 3 | 28 |
| 922 | 1250 | -328 | 3 | 29 |
| 842 | 1250 | -408 | 3 | 30 |
| 890 | 1250 | -360 | 3 | 31 |
| 1200 | 1250 | -50 | 3 | 32 |
| 1113 | 1250 | -137 | 3 | 33 |
| 2122 | 1250 | 872 | 4 | 33 |
| | | | | |
| 1050 | 1190 | -140 | 4 | 34 |
| 922 | 1190 | -268 | 4 | 35 |
| 842 | 1190 | -348 | 4 | 36 |
| 890 | 1190 | -300 | 4 | 37 |
| 1200 | 1190 | 10 | 5 | 37 |

| | | | | |
|---|---|---|---|---|
| 1113 | 1190 | -77 | 5 | 38 |
| 2122 | 1190 | 932 | 6 | 38 |
| | | | | |
| 922 | 1050 | -128 | 6 | 39 |
| 842 | 1050 | -208 | 6 | 40 |
| 890 | 1050 | -160 | 6 | 41 |
| 1200 | 1050 | 150 | 7 | 41 |
| 1113 | 1050 | 63 | 8 | 41 |
| 2122 | 1050 | 1072 | 9 | 41 |
| | | | | |
| 842 | 922 | -80 | 9 | 42 |
| 890 | 922 | -32 | 9 | 43 |
| 1200 | 922 | 278 | 10 | 43 |
| 1113 | 922 | 191 | 11 | 43 |
| 2122 | 922 | 1200 | 12 | 43 |
| | | | | |
| 890 | 842 | 48 | 13 | 43 |
| 1200 | 842 | 358 | 14 | 43 |
| 1113 | 842 | 271 | 15 | 43 |
| 2122 | 842 | 1280 | 16 | 43 |
| | | | | |
| 1200 | 890 | 310 | 17 | 43 |
| 1113 | 890 | 223 | 18 | 43 |
| 2122 | 890 | 1232 | 19 | 43 |
| | | | | |
| 1113 | 1200 | -87 | 19 | 44 |
| 2122 | 1200 | 922 | 20 | 44 |
| | | | | |
| 2122 | 1113 | 1009 | 21 | 44 |

S Statistic = 21 - 44 = -23

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 3/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 0
B = 18
C = 0
D = 0
E = 0
F = 2
a = 3828
b = 11880

c = 264
Group Variance = 211.667
Z-Score = -1.51216
Comparison Level at 95% confidence level = -1.65463 (downward trend)
-1.51216 >= -1.65463 indicating no evidence of a downward trend

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RW25-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 507 | 500 | Same Date | 0 | 0 |
| 9.9 | 500 | -490.1 | 0 | 1 |
| 622 | 500 | 122 | 1 | 1 |
| 633 | 500 | 133 | 2 | 1 |
| 652 | 500 | 152 | 3 | 1 |
| 708 | 500 | 208 | 4 | 1 |
| 703 | 500 | 203 | 5 | 1 |
| 626 | 500 | 126 | 6 | 1 |
| 926 | 500 | 426 | 7 | 1 |
| 640.3 | 500 | 140.3 | 8 | 1 |
| 1156 | 500 | 656 | 9 | 1 |
| | | | | |
| 9.9 | 507 | -497.1 | 9 | 2 |
| 622 | 507 | 115 | 10 | 2 |
| 633 | 507 | 126 | 11 | 2 |
| 652 | 507 | 145 | 12 | 2 |
| 708 | 507 | 201 | 13 | 2 |
| 703 | 507 | 196 | 14 | 2 |
| 626 | 507 | 119 | 15 | 2 |
| 926 | 507 | 419 | 16 | 2 |
| 640.3 | 507 | 133.3 | 17 | 2 |
| 1156 | 507 | 649 | 18 | 2 |
| | | | | |
| 622 | 9.9 | 612.1 | 19 | 2 |
| 633 | 9.9 | 623.1 | 20 | 2 |
| 652 | 9.9 | 642.1 | 21 | 2 |
| 708 | 9.9 | 698.1 | 22 | 2 |
| 703 | 9.9 | 693.1 | 23 | 2 |
| 626 | 9.9 | 616.1 | 24 | 2 |
| 926 | 9.9 | 916.1 | 25 | 2 |
| 640.3 | 9.9 | 630.4 | 26 | 2 |
| 1156 | 9.9 | 1146.1 | 27 | 2 |
| | | | | |
| 633 | 622 | 11 | 28 | 2 |
| 652 | 622 | 30 | 29 | 2 |
| 708 | 622 | 86 | 30 | 2 |
| 703 | 622 | 81 | 31 | 2 |
| 626 | 622 | 4 | 32 | 2 |
| 926 | 622 | 304 | 33 | 2 |
| 640.3 | 622 | 18.3 | 34 | 2 |
| 1156 | 622 | 534 | 35 | 2 |
| | | | | |
| 652 | 633 | 19 | 36 | 2 |
| 708 | 633 | 75 | 37 | 2 |
| 703 | 633 | 70 | 38 | 2 |
| 626 | 633 | -7 | 38 | 3 |
| 926 | 633 | 293 | 39 | 3 |

| | | | | |
|---|---|---|---|---|
| 640.3 | 633 | 7.3 | 40 | 3 |
| 1156 | 633 | 523 | 41 | 3 |
| | | | | |
| 708 | 652 | 56 | 42 | 3 |
| 703 | 652 | 51 | 43 | 3 |
| 626 | 652 | -26 | 43 | 4 |
| 926 | 652 | 274 | 44 | 4 |
| 640.3 | 652 | -11.7 | 44 | 5 |
| 1156 | 652 | 504 | 45 | 5 |
| | | | | |
| 703 | 708 | -5 | 45 | 6 |
| 626 | 708 | -82 | 45 | 7 |
| 926 | 708 | 218 | 46 | 7 |
| 640.3 | 708 | -67.7 | 46 | 8 |
| 1156 | 708 | 448 | 47 | 8 |
| | | | | |
| 626 | 703 | -77 | 47 | 9 |
| 926 | 703 | 223 | 48 | 9 |
| 640.3 | 703 | -62.7 | 48 | 10 |
| 1156 | 703 | 453 | 49 | 10 |
| | | | | |
| 926 | 626 | 300 | 50 | 10 |
| 640.3 | 626 | 14.3 | 51 | 10 |
| 1156 | 626 | 530 | 52 | 10 |
| | | | | |
| 640.3 | 926 | -285.7 | 52 | 11 |
| 1156 | 926 | 230 | 53 | 11 |
| | | | | |
| 1156 | 640.3 | 515.7 | 54 | 11 |

S Statistic = 54 - 11 = 43

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 3/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 0
B = 18
C = 0
D = 0
E = 0
F = 2
a = 3828
b = 11880

c = 264
Group Variance = 211.667
Z-Score = 2.88684
Comparison Level at 95% confidence level = -1.65463 (downward trend)
2.88684 >= -1.65463 indicating no evidence of a downward trend

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RWA-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 6960 M6 | 6960 M6 | Same Date | 0 | 0 |
| 7060 M6 | 6960 M6 | Same Date | 0 | 0 |
| 7060 M6 | 6960 M6 | Same Date | 0 | 0 |
| 7060 M6 | 6960 M6 | Same Date | 0 | 0 |
| 7060 M6 | 6960 M6 | Same Date | 0 | 0 |
| 6960 M6 | 6960 M6 | Same Date | 0 | 0 |
| 6960 M6 | 6960 M6 | Same Date | 0 | 0 |
| 6970 1c2c | 6960 M6 | Same Date | 0 | 0 |
| 6830 | 6960 M6 | Same Date | 0 | 0 |
| 7740 | 6960 M6 | 780 | 1 | 0 |
| 9020 | 6960 M6 | 2060 | 2 | 0 |
| 12600 | 6960 M6 | 5640 | 3 | 0 |
| 10200 | 6960 M6 | 3240 | 4 | 0 |
| 7630 | 6960 M6 | 670 | 5 | 0 |
| 10100 MH | 6960 M6 | 3140 | 6 | 0 |
| 11700 | 6960 M6 | 4740 | 7 | 0 |
| 8510 | 6960 M6 | 1550 | 8 | 0 |
| 9840 | 6960 M6 | 2880 | 9 | 0 |
| 8587 | 6960 M6 | 1627 | 10 | 0 |
| 8051 | 6960 M6 | 1091 | 11 | 0 |
| 7977 | 6960 M6 | 1017 | 12 | 0 |
| 8386 | 6960 M6 | 1426 | 13 | 0 |
| 8451 | 6960 M6 | 1491 | 14 | 0 |
| | | | | |
| 7060 M6 | 6960 M6 | Same Date | 14 | 0 |
| 7060 M6 | 6960 M6 | Same Date | 14 | 0 |
| 7060 M6 | 6960 M6 | Same Date | 14 | 0 |
| 7060 M6 | 6960 M6 | Same Date | 14 | 0 |
| 6960 M6 | 6960 M6 | Same Date | 14 | 0 |
| 6960 M6 | 6960 M6 | Same Date | 14 | 0 |
| 6970 1c2c | 6960 M6 | Same Date | 14 | 0 |
| 6830 | 6960 M6 | Same Date | 14 | 0 |
| 7740 | 6960 M6 | 780 | 15 | 0 |
| 9020 | 6960 M6 | 2060 | 16 | 0 |
| 12600 | 6960 M6 | 5640 | 17 | 0 |
| 10200 | 6960 M6 | 3240 | 18 | 0 |
| 7630 | 6960 M6 | 670 | 19 | 0 |
| 10100 MH | 6960 M6 | 3140 | 20 | 0 |
| 11700 | 6960 M6 | 4740 | 21 | 0 |
| 8510 | 6960 M6 | 1550 | 22 | 0 |
| 9840 | 6960 M6 | 2880 | 23 | 0 |
| 8587 | 6960 M6 | 1627 | 24 | 0 |
| 8051 | 6960 M6 | 1091 | 25 | 0 |
| 7977 | 6960 M6 | 1017 | 26 | 0 |
| 8386 | 6960 M6 | 1426 | 27 | 0 |
| 8451 | 6960 M6 | 1491 | 28 | 0 |

| | | | | |
|---|---|---|---|---|
| 7060 M6 | 7060 M6 | Same Date | 28 | 0 |
| 7060 M6 | 7060 M6 | Same Date | 28 | 0 |
| 7060 M6 | 7060 M6 | Same Date | 28 | 0 |
| 6960 M6 | 7060 M6 | Same Date | 28 | 0 |
| 6960 M6 | 7060 M6 | Same Date | 28 | 0 |
| 6970 1c2c | 7060 M6 | Same Date | 28 | 0 |
| 6830 | 7060 M6 | Same Date | 28 | 0 |
| 7740 | 7060 M6 | 680 | 29 | 0 |
| 9020 | 7060 M6 | 1960 | 30 | 0 |
| 12600 | 7060 M6 | 5540 | 31 | 0 |
| 10200 | 7060 M6 | 3140 | 32 | 0 |
| 7630 | 7060 M6 | 570 | 33 | 0 |
| 10100 MH | 7060 M6 | 3040 | 34 | 0 |
| 11700 | 7060 M6 | 4640 | 35 | 0 |
| 8510 | 7060 M6 | 1450 | 36 | 0 |
| 9840 | 7060 M6 | 2780 | 37 | 0 |
| 8587 | 7060 M6 | 1527 | 38 | 0 |
| 8051 | 7060 M6 | 991 | 39 | 0 |
| 7977 | 7060 M6 | 917 | 40 | 0 |
| 8386 | 7060 M6 | 1326 | 41 | 0 |
| 8451 | 7060 M6 | 1391 | 42 | 0 |

| | | | | |
|---|---|---|---|---|
| 7060 M6 | 7060 M6 | Same Date | 42 | 0 |
| 7060 M6 | 7060 M6 | Same Date | 42 | 0 |
| 6960 M6 | 7060 M6 | Same Date | 42 | 0 |
| 6960 M6 | 7060 M6 | Same Date | 42 | 0 |
| 6970 1c2c | 7060 M6 | Same Date | 42 | 0 |
| 6830 | 7060 M6 | Same Date | 42 | 0 |
| 7740 | 7060 M6 | 680 | 43 | 0 |
| 9020 | 7060 M6 | 1960 | 44 | 0 |
| 12600 | 7060 M6 | 5540 | 45 | 0 |
| 10200 | 7060 M6 | 3140 | 46 | 0 |
| 7630 | 7060 M6 | 570 | 47 | 0 |
| 10100 MH | 7060 M6 | 3040 | 48 | 0 |
| 11700 | 7060 M6 | 4640 | 49 | 0 |
| 8510 | 7060 M6 | 1450 | 50 | 0 |
| 9840 | 7060 M6 | 2780 | 51 | 0 |
| 8587 | 7060 M6 | 1527 | 52 | 0 |
| 8051 | 7060 M6 | 991 | 53 | 0 |
| 7977 | 7060 M6 | 917 | 54 | 0 |
| 8386 | 7060 M6 | 1326 | 55 | 0 |
| 8451 | 7060 M6 | 1391 | 56 | 0 |

| | | | | |
|---|---|---|---|---|
| 7060 M6 | 7060 M6 | Same Date | 56 | 0 |
| 6960 M6 | 7060 M6 | Same Date | 56 | 0 |
| 6960 M6 | 7060 M6 | Same Date | 56 | 0 |
| 6970 1c2c | 7060 M6 | Same Date | 56 | 0 |
| 6830 | 7060 M6 | Same Date | 56 | 0 |
| 7740 | 7060 M6 | 680 | 57 | 0 |
| 9020 | 7060 M6 | 1960 | 58 | 0 |
| 12600 | 7060 M6 | 5540 | 59 | 0 |
| 10200 | 7060 M6 | 3140 | 60 | 0 |
| 7630 | 7060 M6 | 570 | 61 | 0 |
| 10100 MH | 7060 M6 | 3040 | 62 | 0 |
| 11700 | 7060 M6 | 4640 | 63 | 0 |
| 8510 | 7060 M6 | 1450 | 64 | 0 |
| 9840 | 7060 M6 | 2780 | 65 | 0 |

| | | | | |
|---|---|---|---|---|
| 8587 | 7060 M6 | 1527 | 66 | 0 |
| 8051 | 7060 M6 | 991 | 67 | 0 |
| 7977 | 7060 M6 | 917 | 68 | 0 |
| 8386 | 7060 M6 | 1326 | 69 | 0 |
| 8451 | 7060 M6 | 1391 | 70 | 0 |
| | | | | |
| 6960 M6 | 7060 M6 | Same Date | 70 | 0 |
| 6960 M6 | 7060 M6 | Same Date | 70 | 0 |
| 6970 1c2c | 7060 M6 | Same Date | 70 | 0 |
| 6830 | 7060 M6 | Same Date | 70 | 0 |
| 7740 | 7060 M6 | 680 | 71 | 0 |
| 9020 | 7060 M6 | 1960 | 72 | 0 |
| 12600 | 7060 M6 | 5540 | 73 | 0 |
| 10200 | 7060 M6 | 3140 | 74 | 0 |
| 7630 | 7060 M6 | 570 | 75 | 0 |
| 10100 MH | 7060 M6 | 3040 | 76 | 0 |
| 11700 | 7060 M6 | 4640 | 77 | 0 |
| 8510 | 7060 M6 | 1450 | 78 | 0 |
| 9840 | 7060 M6 | 2780 | 79 | 0 |
| 8587 | 7060 M6 | 1527 | 80 | 0 |
| 8051 | 7060 M6 | 991 | 81 | 0 |
| 7977 | 7060 M6 | 917 | 82 | 0 |
| 8386 | 7060 M6 | 1326 | 83 | 0 |
| 8451 | 7060 M6 | 1391 | 84 | 0 |
| | | | | |
| 6960 M6 | 6960 M6 | Same Date | 84 | 0 |
| 6970 1c2c | 6960 M6 | Same Date | 84 | 0 |
| 6830 | 6960 M6 | Same Date | 84 | 0 |
| 7740 | 6960 M6 | 780 | 85 | 0 |
| 9020 | 6960 M6 | 2060 | 86 | 0 |
| 12600 | 6960 M6 | 5640 | 87 | 0 |
| 10200 | 6960 M6 | 3240 | 88 | 0 |
| 7630 | 6960 M6 | 670 | 89 | 0 |
| 10100 MH | 6960 M6 | 3140 | 90 | 0 |
| 11700 | 6960 M6 | 4740 | 91 | 0 |
| 8510 | 6960 M6 | 1550 | 92 | 0 |
| 9840 | 6960 M6 | 2880 | 93 | 0 |
| 8587 | 6960 M6 | 1627 | 94 | 0 |
| 8051 | 6960 M6 | 1091 | 95 | 0 |
| 7977 | 6960 M6 | 1017 | 96 | 0 |
| 8386 | 6960 M6 | 1426 | 97 | 0 |
| 8451 | 6960 M6 | 1491 | 98 | 0 |
| | | | | |
| 6970 1c2c | 6960 M6 | Same Date | 98 | 0 |
| 6830 | 6960 M6 | Same Date | 98 | 0 |
| 7740 | 6960 M6 | 780 | 99 | 0 |
| 9020 | 6960 M6 | 2060 | 100 | 0 |
| 12600 | 6960 M6 | 5640 | 101 | 0 |
| 10200 | 6960 M6 | 3240 | 102 | 0 |
| 7630 | 6960 M6 | 670 | 103 | 0 |
| 10100 MH | 6960 M6 | 3140 | 104 | 0 |
| 11700 | 6960 M6 | 4740 | 105 | 0 |
| 8510 | 6960 M6 | 1550 | 106 | 0 |
| 9840 | 6960 M6 | 2880 | 107 | 0 |
| 8587 | 6960 M6 | 1627 | 108 | 0 |
| 8051 | 6960 M6 | 1091 | 109 | 0 |
| 7977 | 6960 M6 | 1017 | 110 | 0 |

| | | | | |
|---|---|---|---|---|
| 8386 | 6960 M6 | 1426 | 111 | 0 |
| 8451 | 6960 M6 | 1491 | 112 | 0 |
| | | | | |
| 6830 | 6970 1c2c | Same Date | 112 | 0 |
| 7740 | 6970 1c2c | 770 | 113 | 0 |
| 9020 | 6970 1c2c | 2050 | 114 | 0 |
| 12600 | 6970 1c2c | 5630 | 115 | 0 |
| 10200 | 6970 1c2c | 3230 | 116 | 0 |
| 7630 | 6970 1c2c | 660 | 117 | 0 |
| 10100 MH | 6970 1c2c | 3130 | 118 | 0 |
| 11700 | 6970 1c2c | 4730 | 119 | 0 |
| 8510 | 6970 1c2c | 1540 | 120 | 0 |
| 9840 | 6970 1c2c | 2870 | 121 | 0 |
| 8587 | 6970 1c2c | 1617 | 122 | 0 |
| 8051 | 6970 1c2c | 1081 | 123 | 0 |
| 7977 | 6970 1c2c | 1007 | 124 | 0 |
| 8386 | 6970 1c2c | 1416 | 125 | 0 |
| 8451 | 6970 1c2c | 1481 | 126 | 0 |
| | | | | |
| 7740 | 6830 | 910 | 127 | 0 |
| 9020 | 6830 | 2190 | 128 | 0 |
| 12600 | 6830 | 5770 | 129 | 0 |
| 10200 | 6830 | 3370 | 130 | 0 |
| 7630 | 6830 | 800 | 131 | 0 |
| 10100 MH | 6830 | 3270 | 132 | 0 |
| 11700 | 6830 | 4870 | 133 | 0 |
| 8510 | 6830 | 1680 | 134 | 0 |
| 9840 | 6830 | 3010 | 135 | 0 |
| 8587 | 6830 | 1757 | 136 | 0 |
| 8051 | 6830 | 1221 | 137 | 0 |
| 7977 | 6830 | 1147 | 138 | 0 |
| 8386 | 6830 | 1556 | 139 | 0 |
| 8451 | 6830 | 1621 | 140 | 0 |
| | | | | |
| 9020 | 7740 | 1280 | 141 | 0 |
| 12600 | 7740 | 4860 | 142 | 0 |
| 10200 | 7740 | 2460 | 143 | 0 |
| 7630 | 7740 | -110 | 143 | 1 |
| 10100 MH | 7740 | 2360 | 144 | 1 |
| 11700 | 7740 | 3960 | 145 | 1 |
| 8510 | 7740 | 770 | 146 | 1 |
| 9840 | 7740 | 2100 | 147 | 1 |
| 8587 | 7740 | 847 | 148 | 1 |
| 8051 | 7740 | 311 | 149 | 1 |
| 7977 | 7740 | 237 | 150 | 1 |
| 8386 | 7740 | 646 | 151 | 1 |
| 8451 | 7740 | 711 | 152 | 1 |
| | | | | |
| 12600 | 9020 | 3580 | 153 | 1 |
| 10200 | 9020 | 1180 | 154 | 1 |
| 7630 | 9020 | -1390 | 154 | 2 |
| 10100 MH | 9020 | 1080 | 155 | 2 |
| 11700 | 9020 | 2680 | 156 | 2 |
| 8510 | 9020 | -510 | 156 | 3 |
| 9840 | 9020 | 820 | 157 | 3 |
| 8587 | 9020 | -433 | 157 | 4 |
| 8051 | 9020 | -969 | 157 | 5 |

| | | | | |
|---|---|---|---|---|
| 7977 | 9020 | -1043 | 157 | 6 |
| 8386 | 9020 | -634 | 157 | 7 |
| 8451 | 9020 | -569 | 157 | 8 |
| | | | | |
| 10200 | 12600 | -2400 | 157 | 9 |
| 7630 | 12600 | -4970 | 157 | 10 |
| 10100 MH | 12600 | -2500 | 157 | 11 |
| 11700 | 12600 | -900 | 157 | 12 |
| 8510 | 12600 | -4090 | 157 | 13 |
| 9840 | 12600 | -2760 | 157 | 14 |
| 8587 | 12600 | -4013 | 157 | 15 |
| 8051 | 12600 | -4549 | 157 | 16 |
| 7977 | 12600 | -4623 | 157 | 17 |
| 8386 | 12600 | -4214 | 157 | 18 |
| 8451 | 12600 | -4149 | 157 | 19 |
| | | | | |
| 7630 | 10200 | -2570 | 157 | 20 |
| 10100 MH | 10200 | -100 | 157 | 21 |
| 11700 | 10200 | 1500 | 158 | 21 |
| 8510 | 10200 | -1690 | 158 | 22 |
| 9840 | 10200 | -360 | 158 | 23 |
| 8587 | 10200 | -1613 | 158 | 24 |
| 8051 | 10200 | -2149 | 158 | 25 |
| 7977 | 10200 | -2223 | 158 | 26 |
| 8386 | 10200 | -1814 | 158 | 27 |
| 8451 | 10200 | -1749 | 158 | 28 |
| | | | | |
| 10100 MH | 7630 | 2470 | 159 | 28 |
| 11700 | 7630 | 4070 | 160 | 28 |
| 8510 | 7630 | 880 | 161 | 28 |
| 9840 | 7630 | 2210 | 162 | 28 |
| 8587 | 7630 | 957 | 163 | 28 |
| 8051 | 7630 | 421 | 164 | 28 |
| 7977 | 7630 | 347 | 165 | 28 |
| 8386 | 7630 | 756 | 166 | 28 |
| 8451 | 7630 | 821 | 167 | 28 |
| | | | | |
| 11700 | 10100 MH | 1600 | 168 | 28 |
| 8510 | 10100 MH | -1590 | 168 | 29 |
| 9840 | 10100 MH | -260 | 168 | 30 |
| 8587 | 10100 MH | -1513 | 168 | 31 |
| 8051 | 10100 MH | -2049 | 168 | 32 |
| 7977 | 10100 MH | -2123 | 168 | 33 |
| 8386 | 10100 MH | -1714 | 168 | 34 |
| 8451 | 10100 MH | -1649 | 168 | 35 |
| | | | | |
| 8510 | 11700 | -3190 | 168 | 36 |
| 9840 | 11700 | -1860 | 168 | 37 |
| 8587 | 11700 | -3113 | 168 | 38 |
| 8051 | 11700 | -3649 | 168 | 39 |
| 7977 | 11700 | -3723 | 168 | 40 |
| 8386 | 11700 | -3314 | 168 | 41 |
| 8451 | 11700 | -3249 | 168 | 42 |
| | | | | |
| 9840 | 8510 | 1330 | 169 | 42 |
| 8587 | 8510 | 77 | 170 | 42 |
| 8051 | 8510 | -459 | 170 | 43 |

| | | | | |
|---|---|---|---|---|
| 7977 | 8510 | -533 | 170 | 44 |
| 8386 | 8510 | -124 | 170 | 45 |
| 8451 | 8510 | -59 | 170 | 46 |
| | | | | |
| 8587 | 9840 | -1253 | 170 | 47 |
| 8051 | 9840 | -1789 | 170 | 48 |
| 7977 | 9840 | -1863 | 170 | 49 |
| 8386 | 9840 | -1454 | 170 | 50 |
| 8451 | 9840 | -1389 | 170 | 51 |
| | | | | |
| 8051 | 8587 | -536 | 170 | 52 |
| 7977 | 8587 | -610 | 170 | 53 |
| 8386 | 8587 | -201 | 170 | 54 |
| 8451 | 8587 | -136 | 170 | 55 |
| | | | | |
| 7977 | 8051 | -74 | 170 | 56 |
| 8386 | 8051 | 335 | 171 | 56 |
| 8451 | 8051 | 400 | 172 | 56 |
| | | | | |
| 8386 | 7977 | 409 | 173 | 56 |
| 8451 | 7977 | 474 | 174 | 56 |
| | | | | |
| 8451 | 8386 | 65 | 175 | 56 |

S Statistic = 175 - 56 = 119

| Tied Group | Value | Members |
|---|---|---|
| 1 | 6960 | 4 |
| 2 | 7060 | 4 |

| Time Period | Observations |
|---|---|
| 5/1/2019 | 10 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 312
B = 2250
C = 48
D = 720
E = 24
F = 90
a = 29256
b = 109296

c = 1104
Group Variance = 1485.27
Z-Score = 3.06181
Comparison Level at 95% confidence level = -1.65463 (downward trend)
3.06181 >= -1.65463 indicating no evidence of a downward trend

## Mann-Kendall Trend Analysis
### Parameter: Cadmium
### Location: RWB-MWI
**Original Data (Not Transformed)**
**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| ND<1.5 U | ND<1.5 U1c2c | Same Date | 0 | 0 |
| ND<1.5 U | ND<1.5 U1c2c | Same Date | 0 | 0 |
| ND<1.5 U | ND<1.5 U1c2c | Same Date | 0 | 0 |
| ND<1.5 U | ND<1.5 U1c2c | Same Date | 0 | 0 |
| ND<1.5 U | ND<1.5 U1c2c | Same Date | 0 | 0 |
| ND<1.5 U | ND<1.5 U1c2c | Same Date | 0 | 0 |
| ND<1.5 U | ND<1.5 U1c2c | Same Date | 0 | 0 |
| ND<1.5 U | ND<1.5 U1c2c | Same Date | 0 | 0 |
| ND<1.5 U | ND<1.5 U1c2c | Same Date | 0 | 0 |
| ND<1.5 U | ND<1.5 U1c2c | 0 | 0 | 0 |
| ND<1.5 U | ND<1.5 U1c2c | 0 | 0 | 0 |
| ND<1.5 U | ND<1.5 U1c2c | 0 | 0 | 0 |
| ND<1.5 U | ND<1.5 U1c2c | 0 | 0 | 0 |
| 0.59 J | ND<1.5 U1c2c | -0.91 | 0 | 1 |
| ND<1.5 U | ND<1.5 U1c2c | 0 | 0 | 1 |
| 0.34 J | ND<1.5 U1c2c | -1.16 | 0 | 2 |
| ND<0.5 U | ND<1.5 U1c2c | -1 | 0 | 3 |
| ND<1 U | ND<1.5 U1c2c | -0.5 | 0 | 4 |
| 0.062 J | ND<1.5 U1c2c | -1.438 | 0 | 5 |
| ND<0.1 U | ND<1.5 U1c2c | -1.4 | 0 | 6 |
| ND<0.1 U | ND<1.5 U1c2c | -1.4 | 0 | 7 |
| ND<0.1 U | ND<1.5 U1c2c | -1.4 | 0 | 8 |
| ND<0.1 U | ND<1.5 U1c2c | -1.4 | 0 | 9 |
| | | | | |
| ND<1.5 U | ND<1.5 U | Same Date | 0 | 9 |
| ND<1.5 U | ND<1.5 U | Same Date | 0 | 9 |
| ND<1.5 U | ND<1.5 U | Same Date | 0 | 9 |
| ND<1.5 U | ND<1.5 U | Same Date | 0 | 9 |
| ND<1.5 U | ND<1.5 U | Same Date | 0 | 9 |
| ND<1.5 U | ND<1.5 U | Same Date | 0 | 9 |
| ND<1.5 U | ND<1.5 U | Same Date | 0 | 9 |
| ND<1.5 U | ND<1.5 U | Same Date | 0 | 9 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 9 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 9 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 9 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 9 |
| 0.59 J | ND<1.5 U | -0.91 | 0 | 10 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 10 |
| 0.34 J | ND<1.5 U | -1.16 | 0 | 11 |
| ND<0.5 U | ND<1.5 U | -1 | 0 | 12 |
| ND<1 U | ND<1.5 U | -0.5 | 0 | 13 |
| 0.062 J | ND<1.5 U | -1.438 | 0 | 14 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 15 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 16 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 17 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 18 |

| | | | | |
|---|---|---|---|---|
| ND<1.5 U | ND<1.5 U | Same Date | 0 | 18 |
| ND<1.5 U | ND<1.5 U | Same Date | 0 | 18 |
| ND<1.5 U | ND<1.5 U | Same Date | 0 | 18 |
| ND<1.5 U | ND<1.5 U | Same Date | 0 | 18 |
| ND<1.5 U | ND<1.5 U | Same Date | 0 | 18 |
| ND<1.5 U | ND<1.5 U | Same Date | 0 | 18 |
| ND<1.5 U | ND<1.5 U | Same Date | 0 | 18 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 18 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 18 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 18 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 18 |
| 0.59 J | ND<1.5 U | -0.91 | 0 | 19 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 19 |
| 0.34 J | ND<1.5 U | -1.16 | 0 | 20 |
| ND<0.5 U | ND<1.5 U | -1 | 0 | 21 |
| ND<1 U | ND<1.5 U | -0.5 | 0 | 22 |
| 0.062 J | ND<1.5 U | -1.438 | 0 | 23 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 24 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 25 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 26 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 27 |
| | | | | |
| ND<1.5 U | ND<1.5 U | Same Date | 0 | 27 |
| ND<1.5 U | ND<1.5 U | Same Date | 0 | 27 |
| ND<1.5 U | ND<1.5 U | Same Date | 0 | 27 |
| ND<1.5 U | ND<1.5 U | Same Date | 0 | 27 |
| ND<1.5 U | ND<1.5 U | Same Date | 0 | 27 |
| ND<1.5 U | ND<1.5 U | Same Date | 0 | 27 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 27 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 27 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 27 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 27 |
| 0.59 J | ND<1.5 U | -0.91 | 0 | 28 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 28 |
| 0.34 J | ND<1.5 U | -1.16 | 0 | 29 |
| ND<0.5 U | ND<1.5 U | -1 | 0 | 30 |
| ND<1 U | ND<1.5 U | -0.5 | 0 | 31 |
| 0.062 J | ND<1.5 U | -1.438 | 0 | 32 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 33 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 34 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 35 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 36 |
| | | | | |
| ND<1.5 U | ND<1.5 U | Same Date | 0 | 36 |
| ND<1.5 U | ND<1.5 U | Same Date | 0 | 36 |
| ND<1.5 U | ND<1.5 U | Same Date | 0 | 36 |
| ND<1.5 U | ND<1.5 U | Same Date | 0 | 36 |
| ND<1.5 U | ND<1.5 U | Same Date | 0 | 36 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 36 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 36 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 36 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 36 |
| 0.59 J | ND<1.5 U | -0.91 | 0 | 37 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 37 |
| 0.34 J | ND<1.5 U | -1.16 | 0 | 38 |
| ND<0.5 U | ND<1.5 U | -1 | 0 | 39 |
| ND<1 U | ND<1.5 U | -0.5 | 0 | 40 |

| | | | | |
|---|---|---|---|---|
| 0.062 J | ND<1.5 U | -1.438 | 0 | 41 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 42 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 43 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 44 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 45 |
| | | | | |
| ND<1.5 U | ND<1.5 U | Same Date | 0 | 45 |
| ND<1.5 U | ND<1.5 U | Same Date | 0 | 45 |
| ND<1.5 U | ND<1.5 U | Same Date | 0 | 45 |
| ND<1.5 U | ND<1.5 U | Same Date | 0 | 45 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 45 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 45 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 45 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 45 |
| 0.59 J | ND<1.5 U | -0.91 | 0 | 46 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 46 |
| 0.34 J | ND<1.5 U | -1.16 | 0 | 47 |
| ND<0.5 U | ND<1.5 U | -1 | 0 | 48 |
| ND<1 U | ND<1.5 U | -0.5 | 0 | 49 |
| 0.062 J | ND<1.5 U | -1.438 | 0 | 50 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 51 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 52 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 53 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 54 |
| | | | | |
| ND<1.5 U | ND<1.5 U | Same Date | 0 | 54 |
| ND<1.5 U | ND<1.5 U | Same Date | 0 | 54 |
| ND<1.5 U | ND<1.5 U | Same Date | 0 | 54 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 54 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 54 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 54 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 54 |
| 0.59 J | ND<1.5 U | -0.91 | 0 | 55 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 55 |
| 0.34 J | ND<1.5 U | -1.16 | 0 | 56 |
| ND<0.5 U | ND<1.5 U | -1 | 0 | 57 |
| ND<1 U | ND<1.5 U | -0.5 | 0 | 58 |
| 0.062 J | ND<1.5 U | -1.438 | 0 | 59 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 60 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 61 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 62 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 63 |
| | | | | |
| ND<1.5 U | ND<1.5 U | Same Date | 0 | 63 |
| ND<1.5 U | ND<1.5 U | Same Date | 0 | 63 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 63 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 63 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 63 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 63 |
| 0.59 J | ND<1.5 U | -0.91 | 0 | 64 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 64 |
| 0.34 J | ND<1.5 U | -1.16 | 0 | 65 |
| ND<0.5 U | ND<1.5 U | -1 | 0 | 66 |
| ND<1 U | ND<1.5 U | -0.5 | 0 | 67 |
| 0.062 J | ND<1.5 U | -1.438 | 0 | 68 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 69 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 70 |

| | | | | |
|---|---|---|---|---|
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 71 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 72 |
| | | | | |
| ND<1.5 U | ND<1.5 U | Same Date | 0 | 72 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 72 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 72 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 72 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 72 |
| 0.59 J | ND<1.5 U | -0.91 | 0 | 73 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 73 |
| 0.34 J | ND<1.5 U | -1.16 | 0 | 74 |
| ND<0.5 U | ND<1.5 U | -1 | 0 | 75 |
| ND<1 U | ND<1.5 U | -0.5 | 0 | 76 |
| 0.062 J | ND<1.5 U | -1.438 | 0 | 77 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 78 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 79 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 80 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 81 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 81 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 81 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 81 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 81 |
| 0.59 J | ND<1.5 U | -0.91 | 0 | 82 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 82 |
| 0.34 J | ND<1.5 U | -1.16 | 0 | 83 |
| ND<0.5 U | ND<1.5 U | -1 | 0 | 84 |
| ND<1 U | ND<1.5 U | -0.5 | 0 | 85 |
| 0.062 J | ND<1.5 U | -1.438 | 0 | 86 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 87 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 88 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 89 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 90 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 90 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 90 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 90 |
| 0.59 J | ND<1.5 U | -0.91 | 0 | 91 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 91 |
| 0.34 J | ND<1.5 U | -1.16 | 0 | 92 |
| ND<0.5 U | ND<1.5 U | -1 | 0 | 93 |
| ND<1 U | ND<1.5 U | -0.5 | 0 | 94 |
| 0.062 J | ND<1.5 U | -1.438 | 0 | 95 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 96 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 97 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 98 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 99 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 99 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 99 |
| 0.59 J | ND<1.5 U | -0.91 | 0 | 100 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 100 |
| 0.34 J | ND<1.5 U | -1.16 | 0 | 101 |
| ND<0.5 U | ND<1.5 U | -1 | 0 | 102 |
| ND<1 U | ND<1.5 U | -0.5 | 0 | 103 |
| 0.062 J | ND<1.5 U | -1.438 | 0 | 104 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 105 |

| | | | | |
|---|---|---|---|---|
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 106 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 107 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 108 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 108 |
| 0.59 J | ND<1.5 U | -0.91 | 0 | 109 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 109 |
| 0.34 J | ND<1.5 U | -1.16 | 0 | 110 |
| ND<0.5 U | ND<1.5 U | -1 | 0 | 111 |
| ND<1 U | ND<1.5 U | -0.5 | 0 | 112 |
| 0.062 J | ND<1.5 U | -1.438 | 0 | 113 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 114 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 115 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 116 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 117 |
| | | | | |
| 0.59 J | ND<1.5 U | -0.91 | 0 | 118 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 118 |
| 0.34 J | ND<1.5 U | -1.16 | 0 | 119 |
| ND<0.5 U | ND<1.5 U | -1 | 0 | 120 |
| ND<1 U | ND<1.5 U | -0.5 | 0 | 121 |
| 0.062 J | ND<1.5 U | -1.438 | 0 | 122 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 123 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 124 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 125 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 126 |
| | | | | |
| ND<1.5 U | 0.59 J | 0.91 | 1 | 126 |
| 0.34 J | 0.59 J | -0.25 | 1 | 127 |
| ND<0.5 U | 0.59 J | -0.09 | 1 | 128 |
| ND<1 U | 0.59 J | 0.41 | 2 | 128 |
| 0.062 J | 0.59 J | -0.528 | 2 | 129 |
| ND<0.1 U | 0.59 J | -0.49 | 2 | 130 |
| ND<0.1 U | 0.59 J | -0.49 | 2 | 131 |
| ND<0.1 U | 0.59 J | -0.49 | 2 | 132 |
| ND<0.1 U | 0.59 J | -0.49 | 2 | 133 |
| | | | | |
| 0.34 J | ND<1.5 U | -1.16 | 2 | 134 |
| ND<0.5 U | ND<1.5 U | -1 | 2 | 135 |
| ND<1 U | ND<1.5 U | -0.5 | 2 | 136 |
| 0.062 J | ND<1.5 U | -1.438 | 2 | 137 |
| ND<0.1 U | ND<1.5 U | -1.4 | 2 | 138 |
| ND<0.1 U | ND<1.5 U | -1.4 | 2 | 139 |
| ND<0.1 U | ND<1.5 U | -1.4 | 2 | 140 |
| ND<0.1 U | ND<1.5 U | -1.4 | 2 | 141 |
| | | | | |
| ND<0.5 U | 0.34 J | 0.16 | 3 | 141 |
| ND<1 U | 0.34 J | 0.66 | 4 | 141 |
| 0.062 J | 0.34 J | -0.278 | 4 | 142 |
| ND<0.1 U | 0.34 J | -0.24 | 4 | 143 |
| ND<0.1 U | 0.34 J | -0.24 | 4 | 144 |
| ND<0.1 U | 0.34 J | -0.24 | 4 | 145 |
| ND<0.1 U | 0.34 J | -0.24 | 4 | 146 |
| | | | | |
| ND<1 U | ND<0.5 U | 0.5 | 5 | 146 |
| 0.062 J | ND<0.5 U | -0.438 | 5 | 147 |
| ND<0.1 U | ND<0.5 U | -0.4 | 5 | 148 |

| | | | | |
|---|---|---|---|---|
| ND<0.1 U | ND<0.5 U | -0.4 | 5 | 149 |
| ND<0.1 U | ND<0.5 U | -0.4 | 5 | 150 |
| ND<0.1 U | ND<0.5 U | -0.4 | 5 | 151 |
| | | | | |
| 0.062 J | ND<1 U | -0.938 | 5 | 152 |
| ND<0.1 U | ND<1 U | -0.9 | 5 | 153 |
| ND<0.1 U | ND<1 U | -0.9 | 5 | 154 |
| ND<0.1 U | ND<1 U | -0.9 | 5 | 155 |
| ND<0.1 U | ND<1 U | -0.9 | 5 | 156 |
| | | | | |
| ND<0.1 U | 0.062 J | 0.038 | 6 | 156 |
| ND<0.1 U | 0.062 J | 0.038 | 7 | 156 |
| ND<0.1 U | 0.062 J | 0.038 | 8 | 156 |
| ND<0.1 U | 0.062 J | 0.038 | 9 | 156 |
| | | | | |
| ND<0.1 U | ND<0.1 U | 0 | 9 | 156 |
| ND<0.1 U | ND<0.1 U | 0 | 9 | 156 |
| ND<0.1 U | ND<0.1 U | 0 | 9 | 156 |
| | | | | |
| ND<0.1 U | ND<0.1 U | 0 | 9 | 156 |
| ND<0.1 U | ND<0.1 U | 0 | 9 | 156 |
| | | | | |
| ND<0.1 U | ND<0.1 U | 0 | 9 | 156 |

S Statistic = 9 - 156 = -147

| Tied Group | Value | Members |
|---|---|---|
| 1 | 1.5 | 15 |
| 2 | 0.1 | 4 |

| Time Period | Observations |
|---|---|
| 5/1/2019 | 10 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 7506
B = 2250
C = 2754
D = 720
E = 222
F = 90
a = 29256
b = 109296

c = 1104
Group Variance = 1119.57
Z-Score = -4.36342
Comparison Level at 95% confidence level = -1.65463 (downward trend)
**-4.36342 < -1.65463 indicating a downward trend**

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RWD-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 395 2c | 402 1c3c | Same Date | 0 | 0 |
| 514 | 402 1c3c | 112 | 1 | 0 |
| 586 | 402 1c3c | 184 | 2 | 0 |
| 555 | 402 1c3c | 153 | 3 | 0 |
| 515 | 402 1c3c | 113 | 4 | 0 |
| 541 | 402 1c3c | 139 | 5 | 0 |
| 596 | 402 1c3c | 194 | 6 | 0 |
| 713 | 402 1c3c | 311 | 7 | 0 |
| 536 | 402 1c3c | 134 | 8 | 0 |
| 567 | 402 1c3c | 165 | 9 | 0 |
| 487.9 | 402 1c3c | 85.9 | 10 | 0 |
| 487.9 | 402 1c3c | 85.9 | 11 | 0 |
| 477.2 | 402 1c3c | 75.2 | 12 | 0 |
| 442.3 | 402 1c3c | 40.3 | 13 | 0 |
| 497.4 | 402 1c3c | 95.4 | 14 | 0 |
| 504.3 | 402 1c3c | 102.3 | 15 | 0 |
| | | | | |
| 514 | 395 2c | 119 | 16 | 0 |
| 586 | 395 2c | 191 | 17 | 0 |
| 555 | 395 2c | 160 | 18 | 0 |
| 515 | 395 2c | 120 | 19 | 0 |
| 541 | 395 2c | 146 | 20 | 0 |
| 596 | 395 2c | 201 | 21 | 0 |
| 713 | 395 2c | 318 | 22 | 0 |
| 536 | 395 2c | 141 | 23 | 0 |
| 567 | 395 2c | 172 | 24 | 0 |
| 487.9 | 395 2c | 92.9 | 25 | 0 |
| 487.9 | 395 2c | 92.9 | 26 | 0 |
| 477.2 | 395 2c | 82.2 | 27 | 0 |
| 442.3 | 395 2c | 47.3 | 28 | 0 |
| 497.4 | 395 2c | 102.4 | 29 | 0 |
| 504.3 | 395 2c | 109.3 | 30 | 0 |
| | | | | |
| 586 | 514 | 72 | 31 | 0 |
| 555 | 514 | 41 | 32 | 0 |
| 515 | 514 | 1 | 33 | 0 |
| 541 | 514 | 27 | 34 | 0 |
| 596 | 514 | 82 | 35 | 0 |
| 713 | 514 | 199 | 36 | 0 |
| 536 | 514 | 22 | 37 | 0 |
| 567 | 514 | 53 | 38 | 0 |
| 487.9 | 514 | -26.1 | 38 | 1 |
| 487.9 | 514 | -26.1 | 38 | 2 |
| 477.2 | 514 | -36.8 | 38 | 3 |
| 442.3 | 514 | -71.7 | 38 | 4 |
| 497.4 | 514 | -16.6 | 38 | 5 |
| 504.3 | 514 | -9.7 | 38 | 6 |

| | | | | |
|---|---|---|---|---|
| 555 | 586 | -31 | 38 | 7 |
| 515 | 586 | -71 | 38 | 8 |
| 541 | 586 | -45 | 38 | 9 |
| 596 | 586 | 10 | 39 | 9 |
| 713 | 586 | 127 | 40 | 9 |
| 536 | 586 | -50 | 40 | 10 |
| 567 | 586 | -19 | 40 | 11 |
| 487.9 | 586 | -98.1 | 40 | 12 |
| 487.9 | 586 | -98.1 | 40 | 13 |
| 477.2 | 586 | -108.8 | 40 | 14 |
| 442.3 | 586 | -143.7 | 40 | 15 |
| 497.4 | 586 | -88.6 | 40 | 16 |
| 504.3 | 586 | -81.7 | 40 | 17 |
| | | | | |
| 515 | 555 | -40 | 40 | 18 |
| 541 | 555 | -14 | 40 | 19 |
| 596 | 555 | 41 | 41 | 19 |
| 713 | 555 | 158 | 42 | 19 |
| 536 | 555 | -19 | 42 | 20 |
| 567 | 555 | 12 | 43 | 20 |
| 487.9 | 555 | -67.1 | 43 | 21 |
| 487.9 | 555 | -67.1 | 43 | 22 |
| 477.2 | 555 | -77.8 | 43 | 23 |
| 442.3 | 555 | -112.7 | 43 | 24 |
| 497.4 | 555 | -57.6 | 43 | 25 |
| 504.3 | 555 | -50.7 | 43 | 26 |
| | | | | |
| 541 | 515 | 26 | 44 | 26 |
| 596 | 515 | 81 | 45 | 26 |
| 713 | 515 | 198 | 46 | 26 |
| 536 | 515 | 21 | 47 | 26 |
| 567 | 515 | 52 | 48 | 26 |
| 487.9 | 515 | -27.1 | 48 | 27 |
| 487.9 | 515 | -27.1 | 48 | 28 |
| 477.2 | 515 | -37.8 | 48 | 29 |
| 442.3 | 515 | -72.7 | 48 | 30 |
| 497.4 | 515 | -17.6 | 48 | 31 |
| 504.3 | 515 | -10.7 | 48 | 32 |
| | | | | |
| 596 | 541 | 55 | 49 | 32 |
| 713 | 541 | 172 | 50 | 32 |
| 536 | 541 | -5 | 50 | 33 |
| 567 | 541 | 26 | 51 | 33 |
| 487.9 | 541 | -53.1 | 51 | 34 |
| 487.9 | 541 | -53.1 | 51 | 35 |
| 477.2 | 541 | -63.8 | 51 | 36 |
| 442.3 | 541 | -98.7 | 51 | 37 |
| 497.4 | 541 | -43.6 | 51 | 38 |
| 504.3 | 541 | -36.7 | 51 | 39 |
| | | | | |
| 713 | 596 | 117 | 52 | 39 |
| 536 | 596 | -60 | 52 | 40 |
| 567 | 596 | -29 | 52 | 41 |
| 487.9 | 596 | -108.1 | 52 | 42 |
| 487.9 | 596 | -108.1 | 52 | 43 |
| 477.2 | 596 | -118.8 | 52 | 44 |

| | | | | |
|---|---|---|---|---|
| 442.3 | 596 | -153.7 | 52 | 45 |
| 497.4 | 596 | -98.6 | 52 | 46 |
| 504.3 | 596 | -91.7 | 52 | 47 |
| | | | | |
| 536 | 713 | -177 | 52 | 48 |
| 567 | 713 | -146 | 52 | 49 |
| 487.9 | 713 | -225.1 | 52 | 50 |
| 487.9 | 713 | -225.1 | 52 | 51 |
| 477.2 | 713 | -235.8 | 52 | 52 |
| 442.3 | 713 | -270.7 | 52 | 53 |
| 497.4 | 713 | -215.6 | 52 | 54 |
| 504.3 | 713 | -208.7 | 52 | 55 |
| | | | | |
| 567 | 536 | 31 | 53 | 55 |
| 487.9 | 536 | -48.1 | 53 | 56 |
| 487.9 | 536 | -48.1 | 53 | 57 |
| 477.2 | 536 | -58.8 | 53 | 58 |
| 442.3 | 536 | -93.7 | 53 | 59 |
| 497.4 | 536 | -38.6 | 53 | 60 |
| 504.3 | 536 | -31.7 | 53 | 61 |
| | | | | |
| 487.9 | 567 | -79.1 | 53 | 62 |
| 487.9 | 567 | -79.1 | 53 | 63 |
| 477.2 | 567 | -89.8 | 53 | 64 |
| 442.3 | 567 | -124.7 | 53 | 65 |
| 497.4 | 567 | -69.6 | 53 | 66 |
| 504.3 | 567 | -62.7 | 53 | 67 |
| | | | | |
| 487.9 | 487.9 | Same Date | 53 | 67 |
| 477.2 | 487.9 | -10.7 | 53 | 68 |
| 442.3 | 487.9 | -45.6 | 53 | 69 |
| 497.4 | 487.9 | 9.5 | 54 | 69 |
| 504.3 | 487.9 | 16.4 | 55 | 69 |
| | | | | |
| 477.2 | 487.9 | -10.7 | 55 | 70 |
| 442.3 | 487.9 | -45.6 | 55 | 71 |
| 497.4 | 487.9 | 9.5 | 56 | 71 |
| 504.3 | 487.9 | 16.4 | 57 | 71 |
| | | | | |
| 442.3 | 477.2 | -34.9 | 57 | 72 |
| 497.4 | 477.2 | 20.2 | 58 | 72 |
| 504.3 | 477.2 | 27.1 | 59 | 72 |
| | | | | |
| 497.4 | 442.3 | 55.1 | 60 | 72 |
| 504.3 | 442.3 | 62 | 61 | 72 |
| | | | | |
| 504.3 | 497.4 | 6.9 | 62 | 72 |

S Statistic = 62 - 72 = -10

| Tied Group | Value | Members |
|---|---|---|
| 1 | 487.9 | 2 |

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |

| | |
|---|---|
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 2 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 2 time periods with multiple data

---

A = 18
B = 36
C = 0
D = 0
E = 2
F = 4
a = 10608
b = 36720
c = 544
Group Variance = 586.348
Z-Score = -0.371676
Comparison Level at 95% confidence level = -1.65463 (downward trend)
-0.371676 >= -1.65463 indicating no evidence of a downward trend

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RWE-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 700 2c | 722 1c3c | Same Date | 0 | 0 |
| 656 | 722 1c3c | -66 | 0 | 1 |
| 707 | 722 1c3c | -15 | 0 | 2 |
| 664 | 722 1c3c | -58 | 0 | 3 |
| 609 | 722 1c3c | -113 | 0 | 4 |
| 584 | 722 1c3c | -138 | 0 | 5 |
| 527 | 722 1c3c | -195 | 0 | 6 |
| 530 | 722 1c3c | -192 | 0 | 7 |
| 497 | 722 1c3c | -225 | 0 | 8 |
| 438 | 722 1c3c | -284 | 0 | 9 |
| 398.8 | 722 1c3c | -323.2 | 0 | 10 |
| 398.8 | 722 1c3c | -323.2 | 0 | 11 |
| 354.7 | 722 1c3c | -367.3 | 0 | 12 |
| 360.3 | 722 1c3c | -361.7 | 0 | 13 |
| 444.8 | 722 1c3c | -277.2 | 0 | 14 |
| 423.6 | 722 1c3c | -298.4 | 0 | 15 |
| | | | | |
| 656 | 700 2c | -44 | 0 | 16 |
| 707 | 700 2c | 7 | 1 | 16 |
| 664 | 700 2c | -36 | 1 | 17 |
| 609 | 700 2c | -91 | 1 | 18 |
| 584 | 700 2c | -116 | 1 | 19 |
| 527 | 700 2c | -173 | 1 | 20 |
| 530 | 700 2c | -170 | 1 | 21 |
| 497 | 700 2c | -203 | 1 | 22 |
| 438 | 700 2c | -262 | 1 | 23 |
| 398.8 | 700 2c | -301.2 | 1 | 24 |
| 398.8 | 700 2c | -301.2 | 1 | 25 |
| 354.7 | 700 2c | -345.3 | 1 | 26 |
| 360.3 | 700 2c | -339.7 | 1 | 27 |
| 444.8 | 700 2c | -255.2 | 1 | 28 |
| 423.6 | 700 2c | -276.4 | 1 | 29 |
| | | | | |
| 707 | 656 | 51 | 2 | 29 |
| 664 | 656 | 8 | 3 | 29 |
| 609 | 656 | -47 | 3 | 30 |
| 584 | 656 | -72 | 3 | 31 |
| 527 | 656 | -129 | 3 | 32 |
| 530 | 656 | -126 | 3 | 33 |
| 497 | 656 | -159 | 3 | 34 |
| 438 | 656 | -218 | 3 | 35 |
| 398.8 | 656 | -257.2 | 3 | 36 |
| 398.8 | 656 | -257.2 | 3 | 37 |
| 354.7 | 656 | -301.3 | 3 | 38 |
| 360.3 | 656 | -295.7 | 3 | 39 |
| 444.8 | 656 | -211.2 | 3 | 40 |
| 423.6 | 656 | -232.4 | 3 | 41 |

| | | | | |
|---|---|---|---|---|
| 664 | 707 | -43 | 3 | 42 |
| 609 | 707 | -98 | 3 | 43 |
| 584 | 707 | -123 | 3 | 44 |
| 527 | 707 | -180 | 3 | 45 |
| 530 | 707 | -177 | 3 | 46 |
| 497 | 707 | -210 | 3 | 47 |
| 438 | 707 | -269 | 3 | 48 |
| 398.8 | 707 | -308.2 | 3 | 49 |
| 398.8 | 707 | -308.2 | 3 | 50 |
| 354.7 | 707 | -352.3 | 3 | 51 |
| 360.3 | 707 | -346.7 | 3 | 52 |
| 444.8 | 707 | -262.2 | 3 | 53 |
| 423.6 | 707 | -283.4 | 3 | 54 |
| | | | | |
| 609 | 664 | -55 | 3 | 55 |
| 584 | 664 | -80 | 3 | 56 |
| 527 | 664 | -137 | 3 | 57 |
| 530 | 664 | -134 | 3 | 58 |
| 497 | 664 | -167 | 3 | 59 |
| 438 | 664 | -226 | 3 | 60 |
| 398.8 | 664 | -265.2 | 3 | 61 |
| 398.8 | 664 | -265.2 | 3 | 62 |
| 354.7 | 664 | -309.3 | 3 | 63 |
| 360.3 | 664 | -303.7 | 3 | 64 |
| 444.8 | 664 | -219.2 | 3 | 65 |
| 423.6 | 664 | -240.4 | 3 | 66 |
| | | | | |
| 584 | 609 | -25 | 3 | 67 |
| 527 | 609 | -82 | 3 | 68 |
| 530 | 609 | -79 | 3 | 69 |
| 497 | 609 | -112 | 3 | 70 |
| 438 | 609 | -171 | 3 | 71 |
| 398.8 | 609 | -210.2 | 3 | 72 |
| 398.8 | 609 | -210.2 | 3 | 73 |
| 354.7 | 609 | -254.3 | 3 | 74 |
| 360.3 | 609 | -248.7 | 3 | 75 |
| 444.8 | 609 | -164.2 | 3 | 76 |
| 423.6 | 609 | -185.4 | 3 | 77 |
| | | | | |
| 527 | 584 | -57 | 3 | 78 |
| 530 | 584 | -54 | 3 | 79 |
| 497 | 584 | -87 | 3 | 80 |
| 438 | 584 | -146 | 3 | 81 |
| 398.8 | 584 | -185.2 | 3 | 82 |
| 398.8 | 584 | -185.2 | 3 | 83 |
| 354.7 | 584 | -229.3 | 3 | 84 |
| 360.3 | 584 | -223.7 | 3 | 85 |
| 444.8 | 584 | -139.2 | 3 | 86 |
| 423.6 | 584 | -160.4 | 3 | 87 |
| | | | | |
| 530 | 527 | 3 | 4 | 87 |
| 497 | 527 | -30 | 4 | 88 |
| 438 | 527 | -89 | 4 | 89 |
| 398.8 | 527 | -128.2 | 4 | 90 |
| 398.8 | 527 | -128.2 | 4 | 91 |
| 354.7 | 527 | -172.3 | 4 | 92 |

| | | | | |
|---|---|---|---|---|
| 360.3 | 527 | -166.7 | 4 | 93 |
| 444.8 | 527 | -82.2 | 4 | 94 |
| 423.6 | 527 | -103.4 | 4 | 95 |
| | | | | |
| 497 | 530 | -33 | 4 | 96 |
| 438 | 530 | -92 | 4 | 97 |
| 398.8 | 530 | -131.2 | 4 | 98 |
| 398.8 | 530 | -131.2 | 4 | 99 |
| 354.7 | 530 | -175.3 | 4 | 100 |
| 360.3 | 530 | -169.7 | 4 | 101 |
| 444.8 | 530 | -85.2 | 4 | 102 |
| 423.6 | 530 | -106.4 | 4 | 103 |
| | | | | |
| 438 | 497 | -59 | 4 | 104 |
| 398.8 | 497 | -98.2 | 4 | 105 |
| 398.8 | 497 | -98.2 | 4 | 106 |
| 354.7 | 497 | -142.3 | 4 | 107 |
| 360.3 | 497 | -136.7 | 4 | 108 |
| 444.8 | 497 | -52.2 | 4 | 109 |
| 423.6 | 497 | -73.4 | 4 | 110 |
| | | | | |
| 398.8 | 438 | -39.2 | 4 | 111 |
| 398.8 | 438 | -39.2 | 4 | 112 |
| 354.7 | 438 | -83.3 | 4 | 113 |
| 360.3 | 438 | -77.7 | 4 | 114 |
| 444.8 | 438 | 6.8 | 5 | 114 |
| 423.6 | 438 | -14.4 | 5 | 115 |
| | | | | |
| 398.8 | 398.8 | Same Date | 5 | 115 |
| 354.7 | 398.8 | -44.1 | 5 | 116 |
| 360.3 | 398.8 | -38.5 | 5 | 117 |
| 444.8 | 398.8 | 46 | 6 | 117 |
| 423.6 | 398.8 | 24.8 | 7 | 117 |
| | | | | |
| 354.7 | 398.8 | -44.1 | 7 | 118 |
| 360.3 | 398.8 | -38.5 | 7 | 119 |
| 444.8 | 398.8 | 46 | 8 | 119 |
| 423.6 | 398.8 | 24.8 | 9 | 119 |
| | | | | |
| 360.3 | 354.7 | 5.6 | 10 | 119 |
| 444.8 | 354.7 | 90.1 | 11 | 119 |
| 423.6 | 354.7 | 68.9 | 12 | 119 |
| | | | | |
| 444.8 | 360.3 | 84.5 | 13 | 119 |
| 423.6 | 360.3 | 63.3 | 14 | 119 |
| | | | | |
| 423.6 | 444.8 | -21.2 | 14 | 120 |

S Statistic = 14 - 120 = -106

| Tied Group | Value | Members |
|---|---|---|
| 1 | 398.8 | 2 |

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |

| | |
|---|---|
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 2 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 2 time periods with multiple data

---

A = 18
B = 36
C = 0
D = 0
E = 2
F = 4
a = 10608
b = 36720
c = 544
Group Variance = 586.348
Z-Score = -4.33622
Comparison Level at 95% confidence level = -1.65463 (downward trend)
**-4.33622 < -1.65463 indicating a downward trend**

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RWF-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 859 | 906 | Same Date | 0 | 0 |
| 1020 | 906 | 114 | 1 | 0 |
| 1340 | 906 | 434 | 2 | 0 |
| 2010 | 906 | 1104 | 3 | 0 |
| 2580 | 906 | 1674 | 4 | 0 |
| 3170 | 906 | 2264 | 5 | 0 |
| 3330 | 906 | 2424 | 6 | 0 |
| 3710 | 906 | 2804 | 7 | 0 |
| 2610 | 906 | 1704 | 8 | 0 |
| 2590 | 906 | 1684 | 9 | 0 |
| 2263 | 906 | 1357 | 10 | 0 |
| 1903 | 906 | 997 | 11 | 0 |
| 1787 | 906 | 881 | 12 | 0 |
| 1558 | 906 | 652 | 13 | 0 |
| 1653 | 906 | 747 | 14 | 0 |
| 1020 | 859 | 161 | 15 | 0 |
| 1340 | 859 | 481 | 16 | 0 |
| 2010 | 859 | 1151 | 17 | 0 |
| 2580 | 859 | 1721 | 18 | 0 |
| 3170 | 859 | 2311 | 19 | 0 |
| 3330 | 859 | 2471 | 20 | 0 |
| 3710 | 859 | 2851 | 21 | 0 |
| 2610 | 859 | 1751 | 22 | 0 |
| 2590 | 859 | 1731 | 23 | 0 |
| 2263 | 859 | 1404 | 24 | 0 |
| 1903 | 859 | 1044 | 25 | 0 |
| 1787 | 859 | 928 | 26 | 0 |
| 1558 | 859 | 699 | 27 | 0 |
| 1653 | 859 | 794 | 28 | 0 |
| 1340 | 1020 | 320 | 29 | 0 |
| 2010 | 1020 | 990 | 30 | 0 |
| 2580 | 1020 | 1560 | 31 | 0 |
| 3170 | 1020 | 2150 | 32 | 0 |
| 3330 | 1020 | 2310 | 33 | 0 |
| 3710 | 1020 | 2690 | 34 | 0 |
| 2610 | 1020 | 1590 | 35 | 0 |
| 2590 | 1020 | 1570 | 36 | 0 |
| 2263 | 1020 | 1243 | 37 | 0 |
| 1903 | 1020 | 883 | 38 | 0 |
| 1787 | 1020 | 767 | 39 | 0 |
| 1558 | 1020 | 538 | 40 | 0 |
| 1653 | 1020 | 633 | 41 | 0 |
| 2010 | 1340 | 670 | 42 | 0 |
| 2580 | 1340 | 1240 | 43 | 0 |

| | | | | |
|---|---|---|---|---|
| 3170 | 1340 | 1830 | 44 | 0 |
| 3330 | 1340 | 1990 | 45 | 0 |
| 3710 | 1340 | 2370 | 46 | 0 |
| 2610 | 1340 | 1270 | 47 | 0 |
| 2590 | 1340 | 1250 | 48 | 0 |
| 2263 | 1340 | 923 | 49 | 0 |
| 1903 | 1340 | 563 | 50 | 0 |
| 1787 | 1340 | 447 | 51 | 0 |
| 1558 | 1340 | 218 | 52 | 0 |
| 1653 | 1340 | 313 | 53 | 0 |
| | | | | |
| 2580 | 2010 | 570 | 54 | 0 |
| 3170 | 2010 | 1160 | 55 | 0 |
| 3330 | 2010 | 1320 | 56 | 0 |
| 3710 | 2010 | 1700 | 57 | 0 |
| 2610 | 2010 | 600 | 58 | 0 |
| 2590 | 2010 | 580 | 59 | 0 |
| 2263 | 2010 | 253 | 60 | 0 |
| 1903 | 2010 | -107 | 60 | 1 |
| 1787 | 2010 | -223 | 60 | 2 |
| 1558 | 2010 | -452 | 60 | 3 |
| 1653 | 2010 | -357 | 60 | 4 |
| | | | | |
| 3170 | 2580 | 590 | 61 | 4 |
| 3330 | 2580 | 750 | 62 | 4 |
| 3710 | 2580 | 1130 | 63 | 4 |
| 2610 | 2580 | 30 | 64 | 4 |
| 2590 | 2580 | 10 | 65 | 4 |
| 2263 | 2580 | -317 | 65 | 5 |
| 1903 | 2580 | -677 | 65 | 6 |
| 1787 | 2580 | -793 | 65 | 7 |
| 1558 | 2580 | -1022 | 65 | 8 |
| 1653 | 2580 | -927 | 65 | 9 |
| | | | | |
| 3330 | 3170 | 160 | 66 | 9 |
| 3710 | 3170 | 540 | 67 | 9 |
| 2610 | 3170 | -560 | 67 | 10 |
| 2590 | 3170 | -580 | 67 | 11 |
| 2263 | 3170 | -907 | 67 | 12 |
| 1903 | 3170 | -1267 | 67 | 13 |
| 1787 | 3170 | -1383 | 67 | 14 |
| 1558 | 3170 | -1612 | 67 | 15 |
| 1653 | 3170 | -1517 | 67 | 16 |
| | | | | |
| 3710 | 3330 | 380 | 68 | 16 |
| 2610 | 3330 | -720 | 68 | 17 |
| 2590 | 3330 | -740 | 68 | 18 |
| 2263 | 3330 | -1067 | 68 | 19 |
| 1903 | 3330 | -1427 | 68 | 20 |
| 1787 | 3330 | -1543 | 68 | 21 |
| 1558 | 3330 | -1772 | 68 | 22 |
| 1653 | 3330 | -1677 | 68 | 23 |
| | | | | |
| 2610 | 3710 | -1100 | 68 | 24 |
| 2590 | 3710 | -1120 | 68 | 25 |
| 2263 | 3710 | -1447 | 68 | 26 |
| 1903 | 3710 | -1807 | 68 | 27 |

| | | | | |
|---|---|---|---|---|
| 1787 | 3710 | -1923 | 68 | 28 |
| 1558 | 3710 | -2152 | 68 | 29 |
| 1653 | 3710 | -2057 | 68 | 30 |
| | | | | |
| 2590 | 2610 | -20 | 68 | 31 |
| 2263 | 2610 | -347 | 68 | 32 |
| 1903 | 2610 | -707 | 68 | 33 |
| 1787 | 2610 | -823 | 68 | 34 |
| 1558 | 2610 | -1052 | 68 | 35 |
| 1653 | 2610 | -957 | 68 | 36 |
| | | | | |
| 2263 | 2590 | -327 | 68 | 37 |
| 1903 | 2590 | -687 | 68 | 38 |
| 1787 | 2590 | -803 | 68 | 39 |
| 1558 | 2590 | -1032 | 68 | 40 |
| 1653 | 2590 | -937 | 68 | 41 |
| | | | | |
| 1903 | 2263 | -360 | 68 | 42 |
| 1787 | 2263 | -476 | 68 | 43 |
| 1558 | 2263 | -705 | 68 | 44 |
| 1653 | 2263 | -610 | 68 | 45 |
| | | | | |
| 1787 | 1903 | -116 | 68 | 46 |
| 1558 | 1903 | -345 | 68 | 47 |
| 1653 | 1903 | -250 | 68 | 48 |
| | | | | |
| 1558 | 1787 | -229 | 68 | 49 |
| 1653 | 1787 | -134 | 68 | 50 |
| | | | | |
| 1653 | 1558 | 95 | 69 | 50 |

S Statistic = 69 - 50 = 19

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 0
B = 18
C = 0

D = 0
E = 0
F = 2
a = 8880
b = 30240
c = 480
Group Variance = 492.333
Z-Score = 0.811228
Comparison Level at 95% confidence level = -1.65463 (downward trend)
0.811228 >= -1.65463 indicating no evidence of a downward trend

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RWG-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 22.9 2c | 23.9 1c3c | Same Date | 0 | 0 |
| 15.4 | 23.9 1c3c | -8.5 | 0 | 1 |
| 26 | 23.9 1c3c | 2.1 | 1 | 1 |
| 38.2 | 23.9 1c3c | 14.3 | 2 | 1 |
| 26.7 | 23.9 1c3c | 2.8 | 3 | 1 |
| 38.2 | 23.9 1c3c | 14.3 | 4 | 1 |
| 40 | 23.9 1c3c | 16.1 | 5 | 1 |
| 1.8 | 23.9 1c3c | -22.1 | 5 | 2 |
| 8.6 | 23.9 1c3c | -15.3 | 5 | 3 |
| 51.02 | 23.9 1c3c | 27.12 | 6 | 3 |
| 130.7 | 23.9 1c3c | 106.8 | 7 | 3 |
| | | | | |
| 15.4 | 22.9 2c | -7.5 | 7 | 4 |
| 26 | 22.9 2c | 3.1 | 8 | 4 |
| 38.2 | 22.9 2c | 15.3 | 9 | 4 |
| 26.7 | 22.9 2c | 3.8 | 10 | 4 |
| 38.2 | 22.9 2c | 15.3 | 11 | 4 |
| 40 | 22.9 2c | 17.1 | 12 | 4 |
| 1.8 | 22.9 2c | -21.1 | 12 | 5 |
| 8.6 | 22.9 2c | -14.3 | 12 | 6 |
| 51.02 | 22.9 2c | 28.12 | 13 | 6 |
| 130.7 | 22.9 2c | 107.8 | 14 | 6 |
| | | | | |
| 26 | 15.4 | 10.6 | 15 | 6 |
| 38.2 | 15.4 | 22.8 | 16 | 6 |
| 26.7 | 15.4 | 11.3 | 17 | 6 |
| 38.2 | 15.4 | 22.8 | 18 | 6 |
| 40 | 15.4 | 24.6 | 19 | 6 |
| 1.8 | 15.4 | -13.6 | 19 | 7 |
| 8.6 | 15.4 | -6.8 | 19 | 8 |
| 51.02 | 15.4 | 35.62 | 20 | 8 |
| 130.7 | 15.4 | 115.3 | 21 | 8 |
| | | | | |
| 38.2 | 26 | 12.2 | 22 | 8 |
| 26.7 | 26 | 0.7 | 23 | 8 |
| 38.2 | 26 | 12.2 | 24 | 8 |
| 40 | 26 | 14 | 25 | 8 |
| 1.8 | 26 | -24.2 | 25 | 9 |
| 8.6 | 26 | -17.4 | 25 | 10 |
| 51.02 | 26 | 25.02 | 26 | 10 |
| 130.7 | 26 | 104.7 | 27 | 10 |
| | | | | |
| 26.7 | 38.2 | -11.5 | 27 | 11 |
| 38.2 | 38.2 | 0 | 27 | 11 |
| 40 | 38.2 | 1.8 | 28 | 11 |
| 1.8 | 38.2 | -36.4 | 28 | 12 |
| 8.6 | 38.2 | -29.6 | 28 | 13 |

| | | | | |
|---|---|---|---|---|
| 51.02 | 38.2 | 12.82 | 29 | 13 |
| 130.7 | 38.2 | 92.5 | 30 | 13 |
| | | | | |
| 38.2 | 26.7 | 11.5 | 31 | 13 |
| 40 | 26.7 | 13.3 | 32 | 13 |
| 1.8 | 26.7 | -24.9 | 32 | 14 |
| 8.6 | 26.7 | -18.1 | 32 | 15 |
| 51.02 | 26.7 | 24.32 | 33 | 15 |
| 130.7 | 26.7 | 104 | 34 | 15 |
| | | | | |
| 40 | 38.2 | 1.8 | 35 | 15 |
| 1.8 | 38.2 | -36.4 | 35 | 16 |
| 8.6 | 38.2 | -29.6 | 35 | 17 |
| 51.02 | 38.2 | 12.82 | 36 | 17 |
| 130.7 | 38.2 | 92.5 | 37 | 17 |
| | | | | |
| 1.8 | 40 | -38.2 | 37 | 18 |
| 8.6 | 40 | -31.4 | 37 | 19 |
| 51.02 | 40 | 11.02 | 38 | 19 |
| 130.7 | 40 | 90.7 | 39 | 19 |
| | | | | |
| 8.6 | 1.8 | 6.8 | 40 | 19 |
| 51.02 | 1.8 | 49.22 | 41 | 19 |
| 130.7 | 1.8 | 128.9 | 42 | 19 |
| | | | | |
| 51.02 | 8.6 | 42.42 | 43 | 19 |
| 130.7 | 8.6 | 122.1 | 44 | 19 |
| | | | | |
| 130.7 | 51.02 | 79.68 | 45 | 19 |

S Statistic = 45 - 19 = 26

| Tied Group | Value | Members |
|---|---|---|
| 1 | 38.2 | 2 |

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 11/1/2021 | 1 |
| 3/1/2022 | 1 |
| 3/1/2023 | 1 |
| 3/1/2024 | 1 |

There are 1 time periods with multiple data

A = 18
B = 18
C = 0
D = 0
E = 2
F = 2
a = 3828

b = 11880
c = 264
Group Variance = 210.682
Z-Score = 1.72237
Comparison Level at 95% confidence level = -1.65463 (downward trend)
1.72237 >= -1.65463 indicating no evidence of a downward trend

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RWH-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 92.4 | 103 | Same Date | 0 | 0 |
| 1380 1c | 103 | 1277 | 1 | 0 |
| 3580 | 103 | 3477 | 2 | 0 |
| 3210 | 103 | 3107 | 3 | 0 |
| 4610 | 103 | 4507 | 4 | 0 |
| 4330 | 103 | 4227 | 5 | 0 |
| 6650 | 103 | 6547 | 6 | 0 |
| 6760 | 103 | 6657 | 7 | 0 |
| 4220 | 103 | 4117 | 8 | 0 |
| 5150 M1 | 103 | 5047 | 9 | 0 |
| 2520 | 103 | 2417 | 10 | 0 |
| 4700 | 103 | 4597 | 11 | 0 |
| 3385 | 103 | 3282 | 12 | 0 |
| 5315 | 103 | 5212 | 13 | 0 |
| 4904 | 103 | 4801 | 14 | 0 |
| 1380 1c | 92.4 | 1287.6 | 15 | 0 |
| 3580 | 92.4 | 3487.6 | 16 | 0 |
| 3210 | 92.4 | 3117.6 | 17 | 0 |
| 4610 | 92.4 | 4517.6 | 18 | 0 |
| 4330 | 92.4 | 4237.6 | 19 | 0 |
| 6650 | 92.4 | 6557.6 | 20 | 0 |
| 6760 | 92.4 | 6667.6 | 21 | 0 |
| 4220 | 92.4 | 4127.6 | 22 | 0 |
| 5150 M1 | 92.4 | 5057.6 | 23 | 0 |
| 2520 | 92.4 | 2427.6 | 24 | 0 |
| 4700 | 92.4 | 4607.6 | 25 | 0 |
| 3385 | 92.4 | 3292.6 | 26 | 0 |
| 5315 | 92.4 | 5222.6 | 27 | 0 |
| 4904 | 92.4 | 4811.6 | 28 | 0 |
| 3580 | 1380 1c | 2200 | 29 | 0 |
| 3210 | 1380 1c | 1830 | 30 | 0 |
| 4610 | 1380 1c | 3230 | 31 | 0 |
| 4330 | 1380 1c | 2950 | 32 | 0 |
| 6650 | 1380 1c | 5270 | 33 | 0 |
| 6760 | 1380 1c | 5380 | 34 | 0 |
| 4220 | 1380 1c | 2840 | 35 | 0 |
| 5150 M1 | 1380 1c | 3770 | 36 | 0 |
| 2520 | 1380 1c | 1140 | 37 | 0 |
| 4700 | 1380 1c | 3320 | 38 | 0 |
| 3385 | 1380 1c | 2005 | 39 | 0 |
| 5315 | 1380 1c | 3935 | 40 | 0 |
| 4904 | 1380 1c | 3524 | 41 | 0 |
| 3210 | 3580 | -370 | 41 | 1 |
| 4610 | 3580 | 1030 | 42 | 1 |

| | | | | |
|---|---|---|---|---|
| 4330 | 3580 | 750 | 43 | 1 |
| 6650 | 3580 | 3070 | 44 | 1 |
| 6760 | 3580 | 3180 | 45 | 1 |
| 4220 | 3580 | 640 | 46 | 1 |
| 5150 M1 | 3580 | 1570 | 47 | 1 |
| 2520 | 3580 | -1060 | 47 | 2 |
| 4700 | 3580 | 1120 | 48 | 2 |
| 3385 | 3580 | -195 | 48 | 3 |
| 5315 | 3580 | 1735 | 49 | 3 |
| 4904 | 3580 | 1324 | 50 | 3 |
| | | | | |
| 4610 | 3210 | 1400 | 51 | 3 |
| 4330 | 3210 | 1120 | 52 | 3 |
| 6650 | 3210 | 3440 | 53 | 3 |
| 6760 | 3210 | 3550 | 54 | 3 |
| 4220 | 3210 | 1010 | 55 | 3 |
| 5150 M1 | 3210 | 1940 | 56 | 3 |
| 2520 | 3210 | -690 | 56 | 4 |
| 4700 | 3210 | 1490 | 57 | 4 |
| 3385 | 3210 | 175 | 58 | 4 |
| 5315 | 3210 | 2105 | 59 | 4 |
| 4904 | 3210 | 1694 | 60 | 4 |
| | | | | |
| 4330 | 4610 | -280 | 60 | 5 |
| 6650 | 4610 | 2040 | 61 | 5 |
| 6760 | 4610 | 2150 | 62 | 5 |
| 4220 | 4610 | -390 | 62 | 6 |
| 5150 M1 | 4610 | 540 | 63 | 6 |
| 2520 | 4610 | -2090 | 63 | 7 |
| 4700 | 4610 | 90 | 64 | 7 |
| 3385 | 4610 | -1225 | 64 | 8 |
| 5315 | 4610 | 705 | 65 | 8 |
| 4904 | 4610 | 294 | 66 | 8 |
| | | | | |
| 6650 | 4330 | 2320 | 67 | 8 |
| 6760 | 4330 | 2430 | 68 | 8 |
| 4220 | 4330 | -110 | 68 | 9 |
| 5150 M1 | 4330 | 820 | 69 | 9 |
| 2520 | 4330 | -1810 | 69 | 10 |
| 4700 | 4330 | 370 | 70 | 10 |
| 3385 | 4330 | -945 | 70 | 11 |
| 5315 | 4330 | 985 | 71 | 11 |
| 4904 | 4330 | 574 | 72 | 11 |
| | | | | |
| 6760 | 6650 | 110 | 73 | 11 |
| 4220 | 6650 | -2430 | 73 | 12 |
| 5150 M1 | 6650 | -1500 | 73 | 13 |
| 2520 | 6650 | -4130 | 73 | 14 |
| 4700 | 6650 | -1950 | 73 | 15 |
| 3385 | 6650 | -3265 | 73 | 16 |
| 5315 | 6650 | -1335 | 73 | 17 |
| 4904 | 6650 | -1746 | 73 | 18 |
| | | | | |
| 4220 | 6760 | -2540 | 73 | 19 |
| 5150 M1 | 6760 | -1610 | 73 | 20 |
| 2520 | 6760 | -4240 | 73 | 21 |
| 4700 | 6760 | -2060 | 73 | 22 |

| | | | | |
|---|---|---|---|---|
| 3385 | 6760 | -3375 | 73 | 23 |
| 5315 | 6760 | -1445 | 73 | 24 |
| 4904 | 6760 | -1856 | 73 | 25 |
| | | | | |
| 5150 M1 | 4220 | 930 | 74 | 25 |
| 2520 | 4220 | -1700 | 74 | 26 |
| 4700 | 4220 | 480 | 75 | 26 |
| 3385 | 4220 | -835 | 75 | 27 |
| 5315 | 4220 | 1095 | 76 | 27 |
| 4904 | 4220 | 684 | 77 | 27 |
| | | | | |
| 2520 | 5150 M1 | -2630 | 77 | 28 |
| 4700 | 5150 M1 | -450 | 77 | 29 |
| 3385 | 5150 M1 | -1765 | 77 | 30 |
| 5315 | 5150 M1 | 165 | 78 | 30 |
| 4904 | 5150 M1 | -246 | 78 | 31 |
| | | | | |
| 4700 | 2520 | 2180 | 79 | 31 |
| 3385 | 2520 | 865 | 80 | 31 |
| 5315 | 2520 | 2795 | 81 | 31 |
| 4904 | 2520 | 2384 | 82 | 31 |
| | | | | |
| 3385 | 4700 | -1315 | 82 | 32 |
| 5315 | 4700 | 615 | 83 | 32 |
| 4904 | 4700 | 204 | 84 | 32 |
| | | | | |
| 5315 | 3385 | 1930 | 85 | 32 |
| 4904 | 3385 | 1519 | 86 | 32 |
| | | | | |
| 4904 | 5315 | -411 | 86 | 33 |

S Statistic = 86 - 33 = 53

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 0
B = 18
C = 0

D = 0
E = 0
F = 2
a = 8880
b = 30240
c = 480
Group Variance = 492.333
Z-Score = 2.34355
Comparison Level at 95% confidence level = -1.65463 (downward trend)
2.34355 >= -1.65463 indicating no evidence of a downward trend

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RWI-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 8950 | 8050 | Same Date | 0 | 0 |
| 8120 1c | 8050 | 70 | 1 | 0 |
| 8270 | 8050 | 220 | 2 | 0 |
| 13300 | 8050 | 5250 | 3 | 0 |
| 10800 | 8050 | 2750 | 4 | 0 |
| 6810 | 8050 | -1240 | 4 | 1 |
| 5230 | 8050 | -2820 | 4 | 2 |
| 5797 | 8050 | -2253 | 4 | 3 |
| 7153 | 8050 | -897 | 4 | 4 |
| | | | | |
| 8120 1c | 8950 | -830 | 4 | 5 |
| 8270 | 8950 | -680 | 4 | 6 |
| 13300 | 8950 | 4350 | 5 | 6 |
| 10800 | 8950 | 1850 | 6 | 6 |
| 6810 | 8950 | -2140 | 6 | 7 |
| 5230 | 8950 | -3720 | 6 | 8 |
| 5797 | 8950 | -3153 | 6 | 9 |
| 7153 | 8950 | -1797 | 6 | 10 |
| | | | | |
| 8270 | 8120 1c | 150 | 7 | 10 |
| 13300 | 8120 1c | 5180 | 8 | 10 |
| 10800 | 8120 1c | 2680 | 9 | 10 |
| 6810 | 8120 1c | -1310 | 9 | 11 |
| 5230 | 8120 1c | -2890 | 9 | 12 |
| 5797 | 8120 1c | -2323 | 9 | 13 |
| 7153 | 8120 1c | -967 | 9 | 14 |
| | | | | |
| 13300 | 8270 | 5030 | 10 | 14 |
| 10800 | 8270 | 2530 | 11 | 14 |
| 6810 | 8270 | -1460 | 11 | 15 |
| 5230 | 8270 | -3040 | 11 | 16 |
| 5797 | 8270 | -2473 | 11 | 17 |
| 7153 | 8270 | -1117 | 11 | 18 |
| | | | | |
| 10800 | 13300 | -2500 | 11 | 19 |
| 6810 | 13300 | -6490 | 11 | 20 |
| 5230 | 13300 | -8070 | 11 | 21 |
| 5797 | 13300 | -7503 | 11 | 22 |
| 7153 | 13300 | -6147 | 11 | 23 |
| | | | | |
| 6810 | 10800 | -3990 | 11 | 24 |
| 5230 | 10800 | -5570 | 11 | 25 |
| 5797 | 10800 | -5003 | 11 | 26 |
| 7153 | 10800 | -3647 | 11 | 27 |
| | | | | |
| 5230 | 6810 | -1580 | 11 | 28 |
| 5797 | 6810 | -1013 | 11 | 29 |

| | | | | |
|---|---|---|---|---|
| 7153 | 6810 | 343 | 12 | 29 |
| 5797 | 5230 | 567 | 13 | 29 |
| 7153 | 5230 | 1923 | 14 | 29 |
| 7153 | 5797 | 1356 | 15 | 29 |

S Statistic = 15 - 29 = -14

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 6/1/2021 | 1 |
| 3/1/2022 | 1 |
| 3/1/2023 | 1 |
| 3/1/2024 | 1 |

There are 1 time periods with multiple data

A = 0
B = 18
C = 0
D = 0
E = 0
F = 2
a = 2250
b = 6480
c = 180
Group Variance = 124
Z-Score = -1.16743
Comparison Level at 95% confidence level = -1.65463 (downward trend)
-1.16743 >= -1.65463 indicating no evidence of a downward trend

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RWJ-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 61.2 1c | 61.4 | Same Date | 0 | 0 |
| 12.8 | 61.4 | Same Date | 0 | 0 |
| 11.8 1c | 61.4 | -49.6 | 0 | 1 |
| 45.7 | 61.4 | -15.7 | 0 | 2 |
| 30 | 61.4 | -31.4 | 0 | 3 |
| 2.1 J | 61.4 | -59.3 | 0 | 4 |
| 2.3 J | 61.4 | -59.1 | 0 | 5 |
| 2.4 J | 61.4 | -59 | 0 | 6 |
| 31.3 | 61.4 | -30.1 | 0 | 7 |
| 49.1 | 61.4 | -12.3 | 0 | 8 |
| 52.8 | 61.4 | -8.6 | 0 | 9 |
| 18.01 | 61.4 | -43.39 | 0 | 10 |
| 65.27 | 61.4 | 3.87 | 1 | 10 |
| 80.59 | 61.4 | 19.19 | 2 | 10 |
| 109.5 | 61.4 | 48.1 | 3 | 10 |
| 30.18 | 61.4 | -31.22 | 3 | 11 |
| | | | | |
| 12.8 | 61.2 1c | Same Date | 3 | 11 |
| 11.8 1c | 61.2 1c | -49.4 | 3 | 12 |
| 45.7 | 61.2 1c | -15.5 | 3 | 13 |
| 30 | 61.2 1c | -31.2 | 3 | 14 |
| 2.1 J | 61.2 1c | -59.1 | 3 | 15 |
| 2.3 J | 61.2 1c | -58.9 | 3 | 16 |
| 2.4 J | 61.2 1c | -58.8 | 3 | 17 |
| 31.3 | 61.2 1c | -29.9 | 3 | 18 |
| 49.1 | 61.2 1c | -12.1 | 3 | 19 |
| 52.8 | 61.2 1c | -8.4 | 3 | 20 |
| 18.01 | 61.2 1c | -43.19 | 3 | 21 |
| 65.27 | 61.2 1c | 4.07 | 4 | 21 |
| 80.59 | 61.2 1c | 19.39 | 5 | 21 |
| 109.5 | 61.2 1c | 48.3 | 6 | 21 |
| 30.18 | 61.2 1c | -31.02 | 6 | 22 |
| | | | | |
| 11.8 1c | 12.8 | -1 | 6 | 23 |
| 45.7 | 12.8 | 32.9 | 7 | 23 |
| 30 | 12.8 | 17.2 | 8 | 23 |
| 2.1 J | 12.8 | -10.7 | 8 | 24 |
| 2.3 J | 12.8 | -10.5 | 8 | 25 |
| 2.4 J | 12.8 | -10.4 | 8 | 26 |
| 31.3 | 12.8 | 18.5 | 9 | 26 |
| 49.1 | 12.8 | 36.3 | 10 | 26 |
| 52.8 | 12.8 | 40 | 11 | 26 |
| 18.01 | 12.8 | 5.21 | 12 | 26 |
| 65.27 | 12.8 | 52.47 | 13 | 26 |
| 80.59 | 12.8 | 67.79 | 14 | 26 |
| 109.5 | 12.8 | 96.7 | 15 | 26 |
| 30.18 | 12.8 | 17.38 | 16 | 26 |

| | | | | |
|---|---|---|---|---|
| 45.7 | 11.8 1c | 33.9 | 17 | 26 |
| 30 | 11.8 1c | 18.2 | 18 | 26 |
| 2.1 J | 11.8 1c | -9.7 | 18 | 27 |
| 2.3 J | 11.8 1c | -9.5 | 18 | 28 |
| 2.4 J | 11.8 1c | -9.4 | 18 | 29 |
| 31.3 | 11.8 1c | 19.5 | 19 | 29 |
| 49.1 | 11.8 1c | 37.3 | 20 | 29 |
| 52.8 | 11.8 1c | 41 | 21 | 29 |
| 18.01 | 11.8 1c | 6.21 | 22 | 29 |
| 65.27 | 11.8 1c | 53.47 | 23 | 29 |
| 80.59 | 11.8 1c | 68.79 | 24 | 29 |
| 109.5 | 11.8 1c | 97.7 | 25 | 29 |
| 30.18 | 11.8 1c | 18.38 | 26 | 29 |
| | | | | |
| 30 | 45.7 | -15.7 | 26 | 30 |
| 2.1 J | 45.7 | -43.6 | 26 | 31 |
| 2.3 J | 45.7 | -43.4 | 26 | 32 |
| 2.4 J | 45.7 | -43.3 | 26 | 33 |
| 31.3 | 45.7 | -14.4 | 26 | 34 |
| 49.1 | 45.7 | 3.4 | 27 | 34 |
| 52.8 | 45.7 | 7.1 | 28 | 34 |
| 18.01 | 45.7 | -27.69 | 28 | 35 |
| 65.27 | 45.7 | 19.57 | 29 | 35 |
| 80.59 | 45.7 | 34.89 | 30 | 35 |
| 109.5 | 45.7 | 63.8 | 31 | 35 |
| 30.18 | 45.7 | -15.52 | 31 | 36 |
| | | | | |
| 2.1 J | 30 | -27.9 | 31 | 37 |
| 2.3 J | 30 | -27.7 | 31 | 38 |
| 2.4 J | 30 | -27.6 | 31 | 39 |
| 31.3 | 30 | 1.3 | 32 | 39 |
| 49.1 | 30 | 19.1 | 33 | 39 |
| 52.8 | 30 | 22.8 | 34 | 39 |
| 18.01 | 30 | -11.99 | 34 | 40 |
| 65.27 | 30 | 35.27 | 35 | 40 |
| 80.59 | 30 | 50.59 | 36 | 40 |
| 109.5 | 30 | 79.5 | 37 | 40 |
| 30.18 | 30 | 0.18 | 38 | 40 |
| | | | | |
| 2.3 J | 2.1 J | 0.2 | 39 | 40 |
| 2.4 J | 2.1 J | 0.3 | 40 | 40 |
| 31.3 | 2.1 J | 29.2 | 41 | 40 |
| 49.1 | 2.1 J | 47 | 42 | 40 |
| 52.8 | 2.1 J | 50.7 | 43 | 40 |
| 18.01 | 2.1 J | 15.91 | 44 | 40 |
| 65.27 | 2.1 J | 63.17 | 45 | 40 |
| 80.59 | 2.1 J | 78.49 | 46 | 40 |
| 109.5 | 2.1 J | 107.4 | 47 | 40 |
| 30.18 | 2.1 J | 28.08 | 48 | 40 |
| | | | | |
| 2.4 J | 2.3 J | 0.1 | 49 | 40 |
| 31.3 | 2.3 J | 29 | 50 | 40 |
| 49.1 | 2.3 J | 46.8 | 51 | 40 |
| 52.8 | 2.3 J | 50.5 | 52 | 40 |
| 18.01 | 2.3 J | 15.71 | 53 | 40 |
| 65.27 | 2.3 J | 62.97 | 54 | 40 |

| | | | | |
|---|---|---|---|---|
| 80.59 | 2.3 J | 78.29 | 55 | 40 |
| 109.5 | 2.3 J | 107.2 | 56 | 40 |
| 30.18 | 2.3 J | 27.88 | 57 | 40 |
| | | | | |
| 31.3 | 2.4 J | 28.9 | 58 | 40 |
| 49.1 | 2.4 J | 46.7 | 59 | 40 |
| 52.8 | 2.4 J | 50.4 | 60 | 40 |
| 18.01 | 2.4 J | 15.61 | 61 | 40 |
| 65.27 | 2.4 J | 62.87 | 62 | 40 |
| 80.59 | 2.4 J | 78.19 | 63 | 40 |
| 109.5 | 2.4 J | 107.1 | 64 | 40 |
| 30.18 | 2.4 J | 27.78 | 65 | 40 |
| | | | | |
| 49.1 | 31.3 | 17.8 | 66 | 40 |
| 52.8 | 31.3 | 21.5 | 67 | 40 |
| 18.01 | 31.3 | -13.29 | 67 | 41 |
| 65.27 | 31.3 | 33.97 | 68 | 41 |
| 80.59 | 31.3 | 49.29 | 69 | 41 |
| 109.5 | 31.3 | 78.2 | 70 | 41 |
| 30.18 | 31.3 | -1.12 | 70 | 42 |
| | | | | |
| 52.8 | 49.1 | 3.7 | 71 | 42 |
| 18.01 | 49.1 | -31.09 | 71 | 43 |
| 65.27 | 49.1 | 16.17 | 72 | 43 |
| 80.59 | 49.1 | 31.49 | 73 | 43 |
| 109.5 | 49.1 | 60.4 | 74 | 43 |
| 30.18 | 49.1 | -18.92 | 74 | 44 |
| | | | | |
| 18.01 | 52.8 | -34.79 | 74 | 45 |
| 65.27 | 52.8 | 12.47 | 75 | 45 |
| 80.59 | 52.8 | 27.79 | 76 | 45 |
| 109.5 | 52.8 | 56.7 | 77 | 45 |
| 30.18 | 52.8 | -22.62 | 77 | 46 |
| | | | | |
| 65.27 | 18.01 | 47.26 | 78 | 46 |
| 80.59 | 18.01 | 62.58 | 79 | 46 |
| 109.5 | 18.01 | 91.49 | 80 | 46 |
| 30.18 | 18.01 | 12.17 | 81 | 46 |
| | | | | |
| 80.59 | 65.27 | 15.32 | 82 | 46 |
| 109.5 | 65.27 | 44.23 | 83 | 46 |
| 30.18 | 65.27 | -35.09 | 83 | 47 |
| | | | | |
| 109.5 | 80.59 | 28.91 | 84 | 47 |
| 30.18 | 80.59 | -50.41 | 84 | 48 |
| | | | | |
| 30.18 | 109.5 | -79.32 | 84 | 49 |

S Statistic = 84 - 49 = 35

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 5/1/2019 | 3 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |

| | |
|---|---|
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

---

A = 0
B = 66
C = 0
D = 6
E = 0
F = 6
a = 10608
b = 36720
c = 544
Group Variance = 585.667
Z-Score = 1.40493
Comparison Level at 95% confidence level = -1.65463 (downward trend)
1.40493 >= -1.65463 indicating no evidence of a downward trend

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RWK-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 46.7 | 33.5 1c | Same Date | 0 | 0 |
| 65.6 1c | 33.5 1c | 32.1 | 1 | 0 |
| 99.5 | 33.5 1c | 66 | 2 | 0 |
| 89.1 | 33.5 1c | 55.6 | 3 | 0 |
| 76.9 | 33.5 1c | 43.4 | 4 | 0 |
| 79.1 | 33.5 1c | 45.6 | 5 | 0 |
| 74.4 | 33.5 1c | 40.9 | 6 | 0 |
| 97.8 | 33.5 1c | 64.3 | 7 | 0 |
| 77.6 | 33.5 1c | 44.1 | 8 | 0 |
| 62.8 | 33.5 1c | 29.3 | 9 | 0 |
| 72.73 | 33.5 1c | 39.23 | 10 | 0 |
| 57.36 | 33.5 1c | 23.86 | 11 | 0 |
| 89.91 | 33.5 1c | 56.41 | 12 | 0 |
| 168.8 | 33.5 1c | 135.3 | 13 | 0 |
| 238.8 | 33.5 1c | 205.3 | 14 | 0 |
| | | | | |
| 65.6 1c | 46.7 | 18.9 | 15 | 0 |
| 99.5 | 46.7 | 52.8 | 16 | 0 |
| 89.1 | 46.7 | 42.4 | 17 | 0 |
| 76.9 | 46.7 | 30.2 | 18 | 0 |
| 79.1 | 46.7 | 32.4 | 19 | 0 |
| 74.4 | 46.7 | 27.7 | 20 | 0 |
| 97.8 | 46.7 | 51.1 | 21 | 0 |
| 77.6 | 46.7 | 30.9 | 22 | 0 |
| 62.8 | 46.7 | 16.1 | 23 | 0 |
| 72.73 | 46.7 | 26.03 | 24 | 0 |
| 57.36 | 46.7 | 10.66 | 25 | 0 |
| 89.91 | 46.7 | 43.21 | 26 | 0 |
| 168.8 | 46.7 | 122.1 | 27 | 0 |
| 238.8 | 46.7 | 192.1 | 28 | 0 |
| | | | | |
| 99.5 | 65.6 1c | 33.9 | 29 | 0 |
| 89.1 | 65.6 1c | 23.5 | 30 | 0 |
| 76.9 | 65.6 1c | 11.3 | 31 | 0 |
| 79.1 | 65.6 1c | 13.5 | 32 | 0 |
| 74.4 | 65.6 1c | 8.8 | 33 | 0 |
| 97.8 | 65.6 1c | 32.2 | 34 | 0 |
| 77.6 | 65.6 1c | 12 | 35 | 0 |
| 62.8 | 65.6 1c | -2.8 | 35 | 1 |
| 72.73 | 65.6 1c | 7.13 | 36 | 1 |
| 57.36 | 65.6 1c | -8.24 | 36 | 2 |
| 89.91 | 65.6 1c | 24.31 | 37 | 2 |
| 168.8 | 65.6 1c | 103.2 | 38 | 2 |
| 238.8 | 65.6 1c | 173.2 | 39 | 2 |
| | | | | |
| 89.1 | 99.5 | -10.4 | 39 | 3 |
| 76.9 | 99.5 | -22.6 | 39 | 4 |

| | | | | |
|---|---|---|---|---|
| 79.1 | 99.5 | -20.4 | 39 | 5 |
| 74.4 | 99.5 | -25.1 | 39 | 6 |
| 97.8 | 99.5 | -1.7 | 39 | 7 |
| 77.6 | 99.5 | -21.9 | 39 | 8 |
| 62.8 | 99.5 | -36.7 | 39 | 9 |
| 72.73 | 99.5 | -26.77 | 39 | 10 |
| 57.36 | 99.5 | -42.14 | 39 | 11 |
| 89.91 | 99.5 | -9.59 | 39 | 12 |
| 168.8 | 99.5 | 69.3 | 40 | 12 |
| 238.8 | 99.5 | 139.3 | 41 | 12 |
| | | | | |
| 76.9 | 89.1 | -12.2 | 41 | 13 |
| 79.1 | 89.1 | -10 | 41 | 14 |
| 74.4 | 89.1 | -14.7 | 41 | 15 |
| 97.8 | 89.1 | 8.7 | 42 | 15 |
| 77.6 | 89.1 | -11.5 | 42 | 16 |
| 62.8 | 89.1 | -26.3 | 42 | 17 |
| 72.73 | 89.1 | -16.37 | 42 | 18 |
| 57.36 | 89.1 | -31.74 | 42 | 19 |
| 89.91 | 89.1 | 0.81 | 43 | 19 |
| 168.8 | 89.1 | 79.7 | 44 | 19 |
| 238.8 | 89.1 | 149.7 | 45 | 19 |
| | | | | |
| 79.1 | 76.9 | 2.2 | 46 | 19 |
| 74.4 | 76.9 | -2.5 | 46 | 20 |
| 97.8 | 76.9 | 20.9 | 47 | 20 |
| 77.6 | 76.9 | 0.7 | 48 | 20 |
| 62.8 | 76.9 | -14.1 | 48 | 21 |
| 72.73 | 76.9 | -4.17 | 48 | 22 |
| 57.36 | 76.9 | -19.54 | 48 | 23 |
| 89.91 | 76.9 | 13.01 | 49 | 23 |
| 168.8 | 76.9 | 91.9 | 50 | 23 |
| 238.8 | 76.9 | 161.9 | 51 | 23 |
| | | | | |
| 74.4 | 79.1 | -4.7 | 51 | 24 |
| 97.8 | 79.1 | 18.7 | 52 | 24 |
| 77.6 | 79.1 | -1.5 | 52 | 25 |
| 62.8 | 79.1 | -16.3 | 52 | 26 |
| 72.73 | 79.1 | -6.37 | 52 | 27 |
| 57.36 | 79.1 | -21.74 | 52 | 28 |
| 89.91 | 79.1 | 10.81 | 53 | 28 |
| 168.8 | 79.1 | 89.7 | 54 | 28 |
| 238.8 | 79.1 | 159.7 | 55 | 28 |
| | | | | |
| 97.8 | 74.4 | 23.4 | 56 | 28 |
| 77.6 | 74.4 | 3.2 | 57 | 28 |
| 62.8 | 74.4 | -11.6 | 57 | 29 |
| 72.73 | 74.4 | -1.67 | 57 | 30 |
| 57.36 | 74.4 | -17.04 | 57 | 31 |
| 89.91 | 74.4 | 15.51 | 58 | 31 |
| 168.8 | 74.4 | 94.4 | 59 | 31 |
| 238.8 | 74.4 | 164.4 | 60 | 31 |
| | | | | |
| 77.6 | 97.8 | -20.2 | 60 | 32 |
| 62.8 | 97.8 | -35 | 60 | 33 |
| 72.73 | 97.8 | -25.07 | 60 | 34 |
| 57.36 | 97.8 | -40.44 | 60 | 35 |

| | | | | |
|---|---|---|---|---|
| 89.91 | 97.8 | -7.89 | 60 | 36 |
| 168.8 | 97.8 | 71 | 61 | 36 |
| 238.8 | 97.8 | 141 | 62 | 36 |
| | | | | |
| 62.8 | 77.6 | -14.8 | 62 | 37 |
| 72.73 | 77.6 | -4.87 | 62 | 38 |
| 57.36 | 77.6 | -20.24 | 62 | 39 |
| 89.91 | 77.6 | 12.31 | 63 | 39 |
| 168.8 | 77.6 | 91.2 | 64 | 39 |
| 238.8 | 77.6 | 161.2 | 65 | 39 |
| | | | | |
| 72.73 | 62.8 | 9.93 | 66 | 39 |
| 57.36 | 62.8 | -5.44 | 66 | 40 |
| 89.91 | 62.8 | 27.11 | 67 | 40 |
| 168.8 | 62.8 | 106 | 68 | 40 |
| 238.8 | 62.8 | 176 | 69 | 40 |
| | | | | |
| 57.36 | 72.73 | -15.37 | 69 | 41 |
| 89.91 | 72.73 | 17.18 | 70 | 41 |
| 168.8 | 72.73 | 96.07 | 71 | 41 |
| 238.8 | 72.73 | 166.07 | 72 | 41 |
| | | | | |
| 89.91 | 57.36 | 32.55 | 73 | 41 |
| 168.8 | 57.36 | 111.44 | 74 | 41 |
| 238.8 | 57.36 | 181.44 | 75 | 41 |
| | | | | |
| 168.8 | 89.91 | 78.89 | 76 | 41 |
| 238.8 | 89.91 | 148.89 | 77 | 41 |
| | | | | |
| 238.8 | 168.8 | 70 | 78 | 41 |

S Statistic = 78 - 41 = 37

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 0
B = 18
C = 0

D = 0
E = 0
F = 2
a = 8880
b = 30240
c = 480
Group Variance = 492.333
Z-Score = 1.62246
Comparison Level at 95% confidence level = -1.65463 (downward trend)
1.62246 >= -1.65463 indicating no evidence of a downward trend

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RWL-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 1230 | 1260 | Same Date | 0 | 0 |
| 1240 1c | 1260 | -20 | 0 | 1 |
| 1280 | 1260 | 20 | 1 | 1 |
| 1170 | 1260 | -90 | 1 | 2 |
| 1140 | 1260 | -120 | 1 | 3 |
| 1210 1c | 1260 | -50 | 1 | 4 |
| 1160 | 1260 | -100 | 1 | 5 |
| 1290 | 1260 | 30 | 2 | 5 |
| 1230 | 1260 | -30 | 2 | 6 |
| 1230 | 1260 | -30 | 2 | 7 |
| 818.6 | 1260 | -441.4 | 2 | 8 |
| 738.7 | 1260 | -521.3 | 2 | 9 |
| 850.5 | 1260 | -409.5 | 2 | 10 |
| 787.8 | 1260 | -472.2 | 2 | 11 |
| 1114 | 1260 | -146 | 2 | 12 |
| | | | | |
| 1240 1c | 1230 | 10 | 3 | 12 |
| 1280 | 1230 | 50 | 4 | 12 |
| 1170 | 1230 | -60 | 4 | 13 |
| 1140 | 1230 | -90 | 4 | 14 |
| 1210 1c | 1230 | -20 | 4 | 15 |
| 1160 | 1230 | -70 | 4 | 16 |
| 1290 | 1230 | 60 | 5 | 16 |
| 1230 | 1230 | 0 | 5 | 16 |
| 1230 | 1230 | 0 | 5 | 16 |
| 818.6 | 1230 | -411.4 | 5 | 17 |
| 738.7 | 1230 | -491.3 | 5 | 18 |
| 850.5 | 1230 | -379.5 | 5 | 19 |
| 787.8 | 1230 | -442.2 | 5 | 20 |
| 1114 | 1230 | -116 | 5 | 21 |
| | | | | |
| 1280 | 1240 1c | 40 | 6 | 21 |
| 1170 | 1240 1c | -70 | 6 | 22 |
| 1140 | 1240 1c | -100 | 6 | 23 |
| 1210 1c | 1240 1c | -30 | 6 | 24 |
| 1160 | 1240 1c | -80 | 6 | 25 |
| 1290 | 1240 1c | 50 | 7 | 25 |
| 1230 | 1240 1c | -10 | 7 | 26 |
| 1230 | 1240 1c | -10 | 7 | 27 |
| 818.6 | 1240 1c | -421.4 | 7 | 28 |
| 738.7 | 1240 1c | -501.3 | 7 | 29 |
| 850.5 | 1240 1c | -389.5 | 7 | 30 |
| 787.8 | 1240 1c | -452.2 | 7 | 31 |
| 1114 | 1240 1c | -126 | 7 | 32 |
| | | | | |
| 1170 | 1280 | -110 | 7 | 33 |
| 1140 | 1280 | -140 | 7 | 34 |

| | | | | |
|---|---|---|---|---|
| 1210 1c | 1280 | -70 | 7 | 35 |
| 1160 | 1280 | -120 | 7 | 36 |
| 1290 | 1280 | 10 | 8 | 36 |
| 1230 | 1280 | -50 | 8 | 37 |
| 1230 | 1280 | -50 | 8 | 38 |
| 818.6 | 1280 | -461.4 | 8 | 39 |
| 738.7 | 1280 | -541.3 | 8 | 40 |
| 850.5 | 1280 | -429.5 | 8 | 41 |
| 787.8 | 1280 | -492.2 | 8 | 42 |
| 1114 | 1280 | -166 | 8 | 43 |
| | | | | |
| 1140 | 1170 | -30 | 8 | 44 |
| 1210 1c | 1170 | 40 | 9 | 44 |
| 1160 | 1170 | -10 | 9 | 45 |
| 1290 | 1170 | 120 | 10 | 45 |
| 1230 | 1170 | 60 | 11 | 45 |
| 1230 | 1170 | 60 | 12 | 45 |
| 818.6 | 1170 | -351.4 | 12 | 46 |
| 738.7 | 1170 | -431.3 | 12 | 47 |
| 850.5 | 1170 | -319.5 | 12 | 48 |
| 787.8 | 1170 | -382.2 | 12 | 49 |
| 1114 | 1170 | -56 | 12 | 50 |
| | | | | |
| 1210 1c | 1140 | 70 | 13 | 50 |
| 1160 | 1140 | 20 | 14 | 50 |
| 1290 | 1140 | 150 | 15 | 50 |
| 1230 | 1140 | 90 | 16 | 50 |
| 1230 | 1140 | 90 | 17 | 50 |
| 818.6 | 1140 | -321.4 | 17 | 51 |
| 738.7 | 1140 | -401.3 | 17 | 52 |
| 850.5 | 1140 | -289.5 | 17 | 53 |
| 787.8 | 1140 | -352.2 | 17 | 54 |
| 1114 | 1140 | -26 | 17 | 55 |
| | | | | |
| 1160 | 1210 1c | -50 | 17 | 56 |
| 1290 | 1210 1c | 80 | 18 | 56 |
| 1230 | 1210 1c | 20 | 19 | 56 |
| 1230 | 1210 1c | 20 | 20 | 56 |
| 818.6 | 1210 1c | -391.4 | 20 | 57 |
| 738.7 | 1210 1c | -471.3 | 20 | 58 |
| 850.5 | 1210 1c | -359.5 | 20 | 59 |
| 787.8 | 1210 1c | -422.2 | 20 | 60 |
| 1114 | 1210 1c | -96 | 20 | 61 |
| | | | | |
| 1290 | 1160 | 130 | 21 | 61 |
| 1230 | 1160 | 70 | 22 | 61 |
| 1230 | 1160 | 70 | 23 | 61 |
| 818.6 | 1160 | -341.4 | 23 | 62 |
| 738.7 | 1160 | -421.3 | 23 | 63 |
| 850.5 | 1160 | -309.5 | 23 | 64 |
| 787.8 | 1160 | -372.2 | 23 | 65 |
| 1114 | 1160 | -46 | 23 | 66 |
| | | | | |
| 1230 | 1290 | -60 | 23 | 67 |
| 1230 | 1290 | -60 | 23 | 68 |
| 818.6 | 1290 | -471.4 | 23 | 69 |
| 738.7 | 1290 | -551.3 | 23 | 70 |

| | | | | |
|---|---|---|---|---|
| 850.5 | 1290 | -439.5 | 23 | 71 |
| 787.8 | 1290 | -502.2 | 23 | 72 |
| 1114 | 1290 | -176 | 23 | 73 |
| | | | | |
| 1230 | 1230 | 0 | 23 | 73 |
| 818.6 | 1230 | -411.4 | 23 | 74 |
| 738.7 | 1230 | -491.3 | 23 | 75 |
| 850.5 | 1230 | -379.5 | 23 | 76 |
| 787.8 | 1230 | -442.2 | 23 | 77 |
| 1114 | 1230 | -116 | 23 | 78 |
| | | | | |
| 818.6 | 1230 | -411.4 | 23 | 79 |
| 738.7 | 1230 | -491.3 | 23 | 80 |
| 850.5 | 1230 | -379.5 | 23 | 81 |
| 787.8 | 1230 | -442.2 | 23 | 82 |
| 1114 | 1230 | -116 | 23 | 83 |
| | | | | |
| 738.7 | 818.6 | -79.9 | 23 | 84 |
| 850.5 | 818.6 | 31.9 | 24 | 84 |
| 787.8 | 818.6 | -30.8 | 24 | 85 |
| 1114 | 818.6 | 295.4 | 25 | 85 |
| | | | | |
| 850.5 | 738.7 | 111.8 | 26 | 85 |
| 787.8 | 738.7 | 49.1 | 27 | 85 |
| 1114 | 738.7 | 375.3 | 28 | 85 |
| | | | | |
| 787.8 | 850.5 | -62.7 | 28 | 86 |
| 1114 | 850.5 | 263.5 | 29 | 86 |
| | | | | |
| 1114 | 787.8 | 326.2 | 30 | 86 |

S Statistic = 30 - 86 = -56

| Tied Group | Value | Members |
|---|---|---|
| 1 | 1230 | 3 |

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 66
B = 18

C = 6
D = 0
E = 6
F = 2
a = 8880
b = 30240
c = 480
Group Variance = 488.692
Z-Score = -2.48797
Comparison Level at 95% confidence level = -1.65463 (downward trend)
**-2.48797 < -1.65463 indicating a downward trend**

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RWM-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 1130 | 1080 | Same Date | 0 | 0 |
| 1200 | 1080 | 120 | 1 | 0 |
| 1230 | 1080 | 150 | 2 | 0 |
| 1120 | 1080 | 40 | 3 | 0 |
| 1040 | 1080 | -40 | 3 | 1 |
| 1060 1c | 1080 | -20 | 3 | 2 |
| 1120 | 1080 | 40 | 4 | 2 |
| 1220 | 1080 | 140 | 5 | 2 |
| 1250 | 1080 | 170 | 6 | 2 |
| 1286 | 1080 | 206 | 7 | 2 |
| 1353 | 1080 | 273 | 8 | 2 |
| | | | | |
| 1200 | 1130 | 70 | 9 | 2 |
| 1230 | 1130 | 100 | 10 | 2 |
| 1120 | 1130 | -10 | 10 | 3 |
| 1040 | 1130 | -90 | 10 | 4 |
| 1060 1c | 1130 | -70 | 10 | 5 |
| 1120 | 1130 | -10 | 10 | 6 |
| 1220 | 1130 | 90 | 11 | 6 |
| 1250 | 1130 | 120 | 12 | 6 |
| 1286 | 1130 | 156 | 13 | 6 |
| 1353 | 1130 | 223 | 14 | 6 |
| | | | | |
| 1230 | 1200 | 30 | 15 | 6 |
| 1120 | 1200 | -80 | 15 | 7 |
| 1040 | 1200 | -160 | 15 | 8 |
| 1060 1c | 1200 | -140 | 15 | 9 |
| 1120 | 1200 | -80 | 15 | 10 |
| 1220 | 1200 | 20 | 16 | 10 |
| 1250 | 1200 | 50 | 17 | 10 |
| 1286 | 1200 | 86 | 18 | 10 |
| 1353 | 1200 | 153 | 19 | 10 |
| | | | | |
| 1120 | 1230 | -110 | 19 | 11 |
| 1040 | 1230 | -190 | 19 | 12 |
| 1060 1c | 1230 | -170 | 19 | 13 |
| 1120 | 1230 | -110 | 19 | 14 |
| 1220 | 1230 | -10 | 19 | 15 |
| 1250 | 1230 | 20 | 20 | 15 |
| 1286 | 1230 | 56 | 21 | 15 |
| 1353 | 1230 | 123 | 22 | 15 |
| | | | | |
| 1040 | 1120 | -80 | 22 | 16 |
| 1060 1c | 1120 | -60 | 22 | 17 |
| 1120 | 1120 | 0 | 22 | 17 |
| 1220 | 1120 | 100 | 23 | 17 |
| 1250 | 1120 | 130 | 24 | 17 |

| | | | | |
|---|---|---|---|---|
| 1286 | 1120 | 166 | 25 | 17 |
| 1353 | 1120 | 233 | 26 | 17 |
| | | | | |
| 1060 1c | 1040 | 20 | 27 | 17 |
| 1120 | 1040 | 80 | 28 | 17 |
| 1220 | 1040 | 180 | 29 | 17 |
| 1250 | 1040 | 210 | 30 | 17 |
| 1286 | 1040 | 246 | 31 | 17 |
| 1353 | 1040 | 313 | 32 | 17 |
| | | | | |
| 1120 | 1060 1c | 60 | 33 | 17 |
| 1220 | 1060 1c | 160 | 34 | 17 |
| 1250 | 1060 1c | 190 | 35 | 17 |
| 1286 | 1060 1c | 226 | 36 | 17 |
| 1353 | 1060 1c | 293 | 37 | 17 |
| | | | | |
| 1220 | 1120 | 100 | 38 | 17 |
| 1250 | 1120 | 130 | 39 | 17 |
| 1286 | 1120 | 166 | 40 | 17 |
| 1353 | 1120 | 233 | 41 | 17 |
| | | | | |
| 1250 | 1220 | 30 | 42 | 17 |
| 1286 | 1220 | 66 | 43 | 17 |
| 1353 | 1220 | 133 | 44 | 17 |
| | | | | |
| 1286 | 1250 | 36 | 45 | 17 |
| 1353 | 1250 | 103 | 46 | 17 |
| | | | | |
| 1353 | 1286 | 67 | 47 | 17 |

S Statistic = 47 - 17 = 30

| Tied Group | Value | Members |
|---|---|---|
| 1 | 1120 | 2 |

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 3/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 18
B = 18
C = 0
D = 0
E = 2
F = 2
a = 3828

b = 11880
c = 264
Group Variance = 210.682
Z-Score = 1.99795
Comparison Level at 95% confidence level = -1.65463 (downward trend)
1.99795 >= -1.65463 indicating no evidence of a downward trend

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RWO-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 68.2 2c | 70.3 1c4c | Same Date | 0 | 0 |
| 72.1 1c | 70.3 1c4c | 1.8 | 1 | 0 |
| 55.4 | 70.3 1c4c | -14.9 | 1 | 1 |
| 54.3 | 70.3 1c4c | -16 | 1 | 2 |
| 66.2 | 70.3 1c4c | -4.1 | 1 | 3 |
| 57.8 1c | 70.3 1c4c | -12.5 | 1 | 4 |
| 27.9 | 70.3 1c4c | -42.4 | 1 | 5 |
| 35.8 | 70.3 1c4c | -34.5 | 1 | 6 |
| 31.4 | 70.3 1c4c | -38.9 | 1 | 7 |
| 10.1 | 70.3 1c4c | -60.2 | 1 | 8 |
| 26.3 | 70.3 1c4c | -44 | 1 | 9 |
| 27.33 | 70.3 1c4c | -42.97 | 1 | 10 |
| 18.07 | 70.3 1c4c | -52.23 | 1 | 11 |
| 30.13 | 70.3 1c4c | -40.17 | 1 | 12 |
| 17.06 | 70.3 1c4c | -53.24 | 1 | 13 |
| 64.04 | 70.3 1c4c | -6.26 | 1 | 14 |
| | | | | |
| 72.1 1c | 68.2 2c | 3.9 | 2 | 14 |
| 55.4 | 68.2 2c | -12.8 | 2 | 15 |
| 54.3 | 68.2 2c | -13.9 | 2 | 16 |
| 66.2 | 68.2 2c | -2 | 2 | 17 |
| 57.8 1c | 68.2 2c | -10.4 | 2 | 18 |
| 27.9 | 68.2 2c | -40.3 | 2 | 19 |
| 35.8 | 68.2 2c | -32.4 | 2 | 20 |
| 31.4 | 68.2 2c | -36.8 | 2 | 21 |
| 10.1 | 68.2 2c | -58.1 | 2 | 22 |
| 26.3 | 68.2 2c | -41.9 | 2 | 23 |
| 27.33 | 68.2 2c | -40.87 | 2 | 24 |
| 18.07 | 68.2 2c | -50.13 | 2 | 25 |
| 30.13 | 68.2 2c | -38.07 | 2 | 26 |
| 17.06 | 68.2 2c | -51.14 | 2 | 27 |
| 64.04 | 68.2 2c | -4.16 | 2 | 28 |
| | | | | |
| 55.4 | 72.1 1c | -16.7 | 2 | 29 |
| 54.3 | 72.1 1c | -17.8 | 2 | 30 |
| 66.2 | 72.1 1c | -5.9 | 2 | 31 |
| 57.8 1c | 72.1 1c | -14.3 | 2 | 32 |
| 27.9 | 72.1 1c | -44.2 | 2 | 33 |
| 35.8 | 72.1 1c | -36.3 | 2 | 34 |
| 31.4 | 72.1 1c | -40.7 | 2 | 35 |
| 10.1 | 72.1 1c | -62 | 2 | 36 |
| 26.3 | 72.1 1c | -45.8 | 2 | 37 |
| 27.33 | 72.1 1c | -44.77 | 2 | 38 |
| 18.07 | 72.1 1c | -54.03 | 2 | 39 |
| 30.13 | 72.1 1c | -41.97 | 2 | 40 |
| 17.06 | 72.1 1c | -55.04 | 2 | 41 |
| 64.04 | 72.1 1c | -8.06 | 2 | 42 |

| | | | | |
|---|---|---|---|---|
| 54.3 | 55.4 | -1.1 | 2 | 43 |
| 66.2 | 55.4 | 10.8 | 3 | 43 |
| 57.8 1c | 55.4 | 2.4 | 4 | 43 |
| 27.9 | 55.4 | -27.5 | 4 | 44 |
| 35.8 | 55.4 | -19.6 | 4 | 45 |
| 31.4 | 55.4 | -24 | 4 | 46 |
| 10.1 | 55.4 | -45.3 | 4 | 47 |
| 26.3 | 55.4 | -29.1 | 4 | 48 |
| 27.33 | 55.4 | -28.07 | 4 | 49 |
| 18.07 | 55.4 | -37.33 | 4 | 50 |
| 30.13 | 55.4 | -25.27 | 4 | 51 |
| 17.06 | 55.4 | -38.34 | 4 | 52 |
| 64.04 | 55.4 | 8.64 | 5 | 52 |
| | | | | |
| 66.2 | 54.3 | 11.9 | 6 | 52 |
| 57.8 1c | 54.3 | 3.5 | 7 | 52 |
| 27.9 | 54.3 | -26.4 | 7 | 53 |
| 35.8 | 54.3 | -18.5 | 7 | 54 |
| 31.4 | 54.3 | -22.9 | 7 | 55 |
| 10.1 | 54.3 | -44.2 | 7 | 56 |
| 26.3 | 54.3 | -28 | 7 | 57 |
| 27.33 | 54.3 | -26.97 | 7 | 58 |
| 18.07 | 54.3 | -36.23 | 7 | 59 |
| 30.13 | 54.3 | -24.17 | 7 | 60 |
| 17.06 | 54.3 | -37.24 | 7 | 61 |
| 64.04 | 54.3 | 9.74 | 8 | 61 |
| | | | | |
| 57.8 1c | 66.2 | -8.4 | 8 | 62 |
| 27.9 | 66.2 | -38.3 | 8 | 63 |
| 35.8 | 66.2 | -30.4 | 8 | 64 |
| 31.4 | 66.2 | -34.8 | 8 | 65 |
| 10.1 | 66.2 | -56.1 | 8 | 66 |
| 26.3 | 66.2 | -39.9 | 8 | 67 |
| 27.33 | 66.2 | -38.87 | 8 | 68 |
| 18.07 | 66.2 | -48.13 | 8 | 69 |
| 30.13 | 66.2 | -36.07 | 8 | 70 |
| 17.06 | 66.2 | -49.14 | 8 | 71 |
| 64.04 | 66.2 | -2.16 | 8 | 72 |
| | | | | |
| 27.9 | 57.8 1c | -29.9 | 8 | 73 |
| 35.8 | 57.8 1c | -22 | 8 | 74 |
| 31.4 | 57.8 1c | -26.4 | 8 | 75 |
| 10.1 | 57.8 1c | -47.7 | 8 | 76 |
| 26.3 | 57.8 1c | -31.5 | 8 | 77 |
| 27.33 | 57.8 1c | -30.47 | 8 | 78 |
| 18.07 | 57.8 1c | -39.73 | 8 | 79 |
| 30.13 | 57.8 1c | -27.67 | 8 | 80 |
| 17.06 | 57.8 1c | -40.74 | 8 | 81 |
| 64.04 | 57.8 1c | 6.24 | 9 | 81 |
| | | | | |
| 35.8 | 27.9 | 7.9 | 10 | 81 |
| 31.4 | 27.9 | 3.5 | 11 | 81 |
| 10.1 | 27.9 | -17.8 | 11 | 82 |
| 26.3 | 27.9 | -1.6 | 11 | 83 |
| 27.33 | 27.9 | -0.57 | 11 | 84 |
| 18.07 | 27.9 | -9.83 | 11 | 85 |

| | | | | |
|---|---|---|---|---|
| 30.13 | 27.9 | 2.23 | 12 | 85 |
| 17.06 | 27.9 | -10.84 | 12 | 86 |
| 64.04 | 27.9 | 36.14 | 13 | 86 |
| | | | | |
| 31.4 | 35.8 | -4.4 | 13 | 87 |
| 10.1 | 35.8 | -25.7 | 13 | 88 |
| 26.3 | 35.8 | -9.5 | 13 | 89 |
| 27.33 | 35.8 | -8.47 | 13 | 90 |
| 18.07 | 35.8 | -17.73 | 13 | 91 |
| 30.13 | 35.8 | -5.67 | 13 | 92 |
| 17.06 | 35.8 | -18.74 | 13 | 93 |
| 64.04 | 35.8 | 28.24 | 14 | 93 |
| | | | | |
| 10.1 | 31.4 | -21.3 | 14 | 94 |
| 26.3 | 31.4 | -5.1 | 14 | 95 |
| 27.33 | 31.4 | -4.07 | 14 | 96 |
| 18.07 | 31.4 | -13.33 | 14 | 97 |
| 30.13 | 31.4 | -1.27 | 14 | 98 |
| 17.06 | 31.4 | -14.34 | 14 | 99 |
| 64.04 | 31.4 | 32.64 | 15 | 99 |
| | | | | |
| 26.3 | 10.1 | 16.2 | 16 | 99 |
| 27.33 | 10.1 | 17.23 | 17 | 99 |
| 18.07 | 10.1 | 7.97 | 18 | 99 |
| 30.13 | 10.1 | 20.03 | 19 | 99 |
| 17.06 | 10.1 | 6.96 | 20 | 99 |
| 64.04 | 10.1 | 53.94 | 21 | 99 |
| | | | | |
| 27.33 | 26.3 | 1.03 | 22 | 99 |
| 18.07 | 26.3 | -8.23 | 22 | 100 |
| 30.13 | 26.3 | 3.83 | 23 | 100 |
| 17.06 | 26.3 | -9.24 | 23 | 101 |
| 64.04 | 26.3 | 37.74 | 24 | 101 |
| | | | | |
| 18.07 | 27.33 | -9.26 | 24 | 102 |
| 30.13 | 27.33 | 2.8 | 25 | 102 |
| 17.06 | 27.33 | -10.27 | 25 | 103 |
| 64.04 | 27.33 | 36.71 | 26 | 103 |
| | | | | |
| 30.13 | 18.07 | 12.06 | 27 | 103 |
| 17.06 | 18.07 | -1.01 | 27 | 104 |
| 64.04 | 18.07 | 45.97 | 28 | 104 |
| | | | | |
| 17.06 | 30.13 | -13.07 | 28 | 105 |
| 64.04 | 30.13 | 33.91 | 29 | 105 |
| | | | | |
| 64.04 | 17.06 | 46.98 | 30 | 105 |

S Statistic = 30 - 105 = -75

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |

| | |
|---|---|
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 11/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

---

A = 0
B = 18
C = 0
D = 0
E = 0
F = 2
a = 10608
b = 36720
c = 544
Group Variance = 588.333
Z-Score = -3.05084
Comparison Level at 95% confidence level = -1.65463 (downward trend)
**-3.05084 < -1.65463 indicating a downward trend**

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RWP-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 2790 | 2810 | Same Date | 0 | 0 |
| 6990 1c | 2810 | 4180 | 1 | 0 |
| 8910 | 2810 | 6100 | 2 | 0 |
| 5560 | 2810 | 2750 | 3 | 0 |
| 7090 | 2810 | 4280 | 4 | 0 |
| 7220 | 2810 | 4410 | 5 | 0 |
| 7700 | 2810 | 4890 | 6 | 0 |
| 8430 | 2810 | 5620 | 7 | 0 |
| 1.9 | 2810 | -2808.1 | 7 | 1 |
| 5340 | 2810 | 2530 | 8 | 1 |
| 6136 | 2810 | 3326 | 9 | 1 |
| 0.6083 | 2810 | -2809.39 | 9 | 2 |
| 5384 | 2810 | 2574 | 10 | 2 |
| 6017 | 2810 | 3207 | 11 | 2 |
| 6930 | 2810 | 4120 | 12 | 2 |
| | | | | |
| 6990 1c | 2790 | 4200 | 13 | 2 |
| 8910 | 2790 | 6120 | 14 | 2 |
| 5560 | 2790 | 2770 | 15 | 2 |
| 7090 | 2790 | 4300 | 16 | 2 |
| 7220 | 2790 | 4430 | 17 | 2 |
| 7700 | 2790 | 4910 | 18 | 2 |
| 8430 | 2790 | 5640 | 19 | 2 |
| 1.9 | 2790 | -2788.1 | 19 | 3 |
| 5340 | 2790 | 2550 | 20 | 3 |
| 6136 | 2790 | 3346 | 21 | 3 |
| 0.6083 | 2790 | -2789.39 | 21 | 4 |
| 5384 | 2790 | 2594 | 22 | 4 |
| 6017 | 2790 | 3227 | 23 | 4 |
| 6930 | 2790 | 4140 | 24 | 4 |
| | | | | |
| 8910 | 6990 1c | 1920 | 25 | 4 |
| 5560 | 6990 1c | -1430 | 25 | 5 |
| 7090 | 6990 1c | 100 | 26 | 5 |
| 7220 | 6990 1c | 230 | 27 | 5 |
| 7700 | 6990 1c | 710 | 28 | 5 |
| 8430 | 6990 1c | 1440 | 29 | 5 |
| 1.9 | 6990 1c | -6988.1 | 29 | 6 |
| 5340 | 6990 1c | -1650 | 29 | 7 |
| 6136 | 6990 1c | -854 | 29 | 8 |
| 0.6083 | 6990 1c | -6989.39 | 29 | 9 |
| 5384 | 6990 1c | -1606 | 29 | 10 |
| 6017 | 6990 1c | -973 | 29 | 11 |
| 6930 | 6990 1c | -60 | 29 | 12 |
| | | | | |
| 5560 | 8910 | -3350 | 29 | 13 |
| 7090 | 8910 | -1820 | 29 | 14 |

| | | | | |
|---|---|---|---|---|
| 7220 | 8910 | -1690 | 29 | 15 |
| 7700 | 8910 | -1210 | 29 | 16 |
| 8430 | 8910 | -480 | 29 | 17 |
| 1.9 | 8910 | -8908.1 | 29 | 18 |
| 5340 | 8910 | -3570 | 29 | 19 |
| 6136 | 8910 | -2774 | 29 | 20 |
| 0.6083 | 8910 | -8909.39 | 29 | 21 |
| 5384 | 8910 | -3526 | 29 | 22 |
| 6017 | 8910 | -2893 | 29 | 23 |
| 6930 | 8910 | -1980 | 29 | 24 |
| | | | | |
| 7090 | 5560 | 1530 | 30 | 24 |
| 7220 | 5560 | 1660 | 31 | 24 |
| 7700 | 5560 | 2140 | 32 | 24 |
| 8430 | 5560 | 2870 | 33 | 24 |
| 1.9 | 5560 | -5558.1 | 33 | 25 |
| 5340 | 5560 | -220 | 33 | 26 |
| 6136 | 5560 | 576 | 34 | 26 |
| 0.6083 | 5560 | -5559.39 | 34 | 27 |
| 5384 | 5560 | -176 | 34 | 28 |
| 6017 | 5560 | 457 | 35 | 28 |
| 6930 | 5560 | 1370 | 36 | 28 |
| | | | | |
| 7220 | 7090 | 130 | 37 | 28 |
| 7700 | 7090 | 610 | 38 | 28 |
| 8430 | 7090 | 1340 | 39 | 28 |
| 1.9 | 7090 | -7088.1 | 39 | 29 |
| 5340 | 7090 | -1750 | 39 | 30 |
| 6136 | 7090 | -954 | 39 | 31 |
| 0.6083 | 7090 | -7089.39 | 39 | 32 |
| 5384 | 7090 | -1706 | 39 | 33 |
| 6017 | 7090 | -1073 | 39 | 34 |
| 6930 | 7090 | -160 | 39 | 35 |
| | | | | |
| 7700 | 7220 | 480 | 40 | 35 |
| 8430 | 7220 | 1210 | 41 | 35 |
| 1.9 | 7220 | -7218.1 | 41 | 36 |
| 5340 | 7220 | -1880 | 41 | 37 |
| 6136 | 7220 | -1084 | 41 | 38 |
| 0.6083 | 7220 | -7219.39 | 41 | 39 |
| 5384 | 7220 | -1836 | 41 | 40 |
| 6017 | 7220 | -1203 | 41 | 41 |
| 6930 | 7220 | -290 | 41 | 42 |
| | | | | |
| 8430 | 7700 | 730 | 42 | 42 |
| 1.9 | 7700 | -7698.1 | 42 | 43 |
| 5340 | 7700 | -2360 | 42 | 44 |
| 6136 | 7700 | -1564 | 42 | 45 |
| 0.6083 | 7700 | -7699.39 | 42 | 46 |
| 5384 | 7700 | -2316 | 42 | 47 |
| 6017 | 7700 | -1683 | 42 | 48 |
| 6930 | 7700 | -770 | 42 | 49 |
| | | | | |
| 1.9 | 8430 | -8428.1 | 42 | 50 |
| 5340 | 8430 | -3090 | 42 | 51 |
| 6136 | 8430 | -2294 | 42 | 52 |
| 0.6083 | 8430 | -8429.39 | 42 | 53 |

| | | | | |
|---|---|---|---|---|
| 5384 | 8430 | -3046 | 42 | 54 |
| 6017 | 8430 | -2413 | 42 | 55 |
| 6930 | 8430 | -1500 | 42 | 56 |
| | | | | |
| 5340 | 1.9 | 5338.1 | 43 | 56 |
| 6136 | 1.9 | 6134.1 | 44 | 56 |
| 0.6083 | 1.9 | -1.2917 | 44 | 57 |
| 5384 | 1.9 | 5382.1 | 45 | 57 |
| 6017 | 1.9 | 6015.1 | 46 | 57 |
| 6930 | 1.9 | 6928.1 | 47 | 57 |
| | | | | |
| 6136 | 5340 | 796 | 48 | 57 |
| 0.6083 | 5340 | -5339.39 | 48 | 58 |
| 5384 | 5340 | 44 | 49 | 58 |
| 6017 | 5340 | 677 | 50 | 58 |
| 6930 | 5340 | 1590 | 51 | 58 |
| | | | | |
| 0.6083 | 6136 | -6135.39 | 51 | 59 |
| 5384 | 6136 | -752 | 51 | 60 |
| 6017 | 6136 | -119 | 51 | 61 |
| 6930 | 6136 | 794 | 52 | 61 |
| | | | | |
| 5384 | 0.6083 | 5383.39 | 53 | 61 |
| 6017 | 0.6083 | 6016.39 | 54 | 61 |
| 6930 | 0.6083 | 6929.39 | 55 | 61 |
| | | | | |
| 6017 | 5384 | 633 | 56 | 61 |
| 6930 | 5384 | 1546 | 57 | 61 |
| | | | | |
| 6930 | 6017 | 913 | 58 | 61 |

S Statistic = 58 - 61 = -3

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 11/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 0
B = 18
C = 0

D = 0
E = 0
F = 2
a = 8880
b = 30240
c = 480
Group Variance = 492.333
Z-Score = -0.0901364
Comparison Level at 95% confidence level = -1.65463 (downward trend)
-0.0901364 >= -1.65463 indicating no evidence of a downward trend

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RWQ-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 28.3 | 26.2 | Same Date | 0 | 0 |
| ND<1.5 U1c | 26.2 | -24.7 | 0 | 1 |
| 2.9 J | 26.2 | -23.3 | 0 | 2 |
| 1.9 J | 26.2 | -24.3 | 0 | 3 |
| 3.7 | 26.2 | -22.5 | 0 | 4 |
| 4.2 1c | 26.2 | -22 | 0 | 5 |
| 2.9 J | 26.2 | -23.3 | 0 | 6 |
| 6.1 | 26.2 | -20.1 | 0 | 7 |
| 10.6 | 26.2 | -15.6 | 0 | 8 |
| 23.3 | 26.2 | -2.9 | 0 | 9 |
| ND<1 U | 26.2 | -25.2 | 0 | 10 |
| ND<0.1 U | 26.2 | -26.1 | 0 | 11 |
| 55.91 | 26.2 | 29.71 | 1 | 11 |
| 62.38 | 26.2 | 36.18 | 2 | 11 |
| 89.56 | 26.2 | 63.36 | 3 | 11 |
| | | | | |
| ND<1.5 U1c | 28.3 | -26.8 | 3 | 12 |
| 2.9 J | 28.3 | -25.4 | 3 | 13 |
| 1.9 J | 28.3 | -26.4 | 3 | 14 |
| 3.7 | 28.3 | -24.6 | 3 | 15 |
| 4.2 1c | 28.3 | -24.1 | 3 | 16 |
| 2.9 J | 28.3 | -25.4 | 3 | 17 |
| 6.1 | 28.3 | -22.2 | 3 | 18 |
| 10.6 | 28.3 | -17.7 | 3 | 19 |
| 23.3 | 28.3 | -5 | 3 | 20 |
| ND<1 U | 28.3 | -27.3 | 3 | 21 |
| ND<0.1 U | 28.3 | -28.2 | 3 | 22 |
| 55.91 | 28.3 | 27.61 | 4 | 22 |
| 62.38 | 28.3 | 34.08 | 5 | 22 |
| 89.56 | 28.3 | 61.26 | 6 | 22 |
| | | | | |
| 2.9 J | ND<1.5 U1c | 1.4 | 7 | 22 |
| 1.9 J | ND<1.5 U1c | 0.4 | 8 | 22 |
| 3.7 | ND<1.5 U1c | 2.2 | 9 | 22 |
| 4.2 1c | ND<1.5 U1c | 2.7 | 10 | 22 |
| 2.9 J | ND<1.5 U1c | 1.4 | 11 | 22 |
| 6.1 | ND<1.5 U1c | 4.6 | 12 | 22 |
| 10.6 | ND<1.5 U1c | 9.1 | 13 | 22 |
| 23.3 | ND<1.5 U1c | 21.8 | 14 | 22 |
| ND<1 U | ND<1.5 U1c | -0.5 | 14 | 23 |
| ND<0.1 U | ND<1.5 U1c | -1.4 | 14 | 24 |
| 55.91 | ND<1.5 U1c | 54.41 | 15 | 24 |
| 62.38 | ND<1.5 U1c | 60.88 | 16 | 24 |
| 89.56 | ND<1.5 U1c | 88.06 | 17 | 24 |
| | | | | |
| 1.9 J | 2.9 J | -1 | 17 | 25 |
| 3.7 | 2.9 J | 0.8 | 18 | 25 |

| | | | | |
|---|---|---|---|---|
| 4.2 1c | 2.9 J | 1.3 | 19 | 25 |
| 2.9 J | 2.9 J | 0 | 19 | 25 |
| 6.1 | 2.9 J | 3.2 | 20 | 25 |
| 10.6 | 2.9 J | 7.7 | 21 | 25 |
| 23.3 | 2.9 J | 20.4 | 22 | 25 |
| ND<1 U | 2.9 J | -1.9 | 22 | 26 |
| ND<0.1 U | 2.9 J | -2.8 | 22 | 27 |
| 55.91 | 2.9 J | 53.01 | 23 | 27 |
| 62.38 | 2.9 J | 59.48 | 24 | 27 |
| 89.56 | 2.9 J | 86.66 | 25 | 27 |
| | | | | |
| 3.7 | 1.9 J | 1.8 | 26 | 27 |
| 4.2 1c | 1.9 J | 2.3 | 27 | 27 |
| 2.9 J | 1.9 J | 1 | 28 | 27 |
| 6.1 | 1.9 J | 4.2 | 29 | 27 |
| 10.6 | 1.9 J | 8.7 | 30 | 27 |
| 23.3 | 1.9 J | 21.4 | 31 | 27 |
| ND<1 U | 1.9 J | -0.9 | 31 | 28 |
| ND<0.1 U | 1.9 J | -1.8 | 31 | 29 |
| 55.91 | 1.9 J | 54.01 | 32 | 29 |
| 62.38 | 1.9 J | 60.48 | 33 | 29 |
| 89.56 | 1.9 J | 87.66 | 34 | 29 |
| | | | | |
| 4.2 1c | 3.7 | 0.5 | 35 | 29 |
| 2.9 J | 3.7 | -0.8 | 35 | 30 |
| 6.1 | 3.7 | 2.4 | 36 | 30 |
| 10.6 | 3.7 | 6.9 | 37 | 30 |
| 23.3 | 3.7 | 19.6 | 38 | 30 |
| ND<1 U | 3.7 | -2.7 | 38 | 31 |
| ND<0.1 U | 3.7 | -3.6 | 38 | 32 |
| 55.91 | 3.7 | 52.21 | 39 | 32 |
| 62.38 | 3.7 | 58.68 | 40 | 32 |
| 89.56 | 3.7 | 85.86 | 41 | 32 |
| | | | | |
| 2.9 J | 4.2 1c | -1.3 | 41 | 33 |
| 6.1 | 4.2 1c | 1.9 | 42 | 33 |
| 10.6 | 4.2 1c | 6.4 | 43 | 33 |
| 23.3 | 4.2 1c | 19.1 | 44 | 33 |
| ND<1 U | 4.2 1c | -3.2 | 44 | 34 |
| ND<0.1 U | 4.2 1c | -4.1 | 44 | 35 |
| 55.91 | 4.2 1c | 51.71 | 45 | 35 |
| 62.38 | 4.2 1c | 58.18 | 46 | 35 |
| 89.56 | 4.2 1c | 85.36 | 47 | 35 |
| | | | | |
| 6.1 | 2.9 J | 3.2 | 48 | 35 |
| 10.6 | 2.9 J | 7.7 | 49 | 35 |
| 23.3 | 2.9 J | 20.4 | 50 | 35 |
| ND<1 U | 2.9 J | -1.9 | 50 | 36 |
| ND<0.1 U | 2.9 J | -2.8 | 50 | 37 |
| 55.91 | 2.9 J | 53.01 | 51 | 37 |
| 62.38 | 2.9 J | 59.48 | 52 | 37 |
| 89.56 | 2.9 J | 86.66 | 53 | 37 |
| | | | | |
| 10.6 | 6.1 | 4.5 | 54 | 37 |
| 23.3 | 6.1 | 17.2 | 55 | 37 |
| ND<1 U | 6.1 | -5.1 | 55 | 38 |
| ND<0.1 U | 6.1 | -6 | 55 | 39 |

| | | | | |
|---|---|---|---|---|
| 55.91 | 6.1 | 49.81 | 56 | 39 |
| 62.38 | 6.1 | 56.28 | 57 | 39 |
| 89.56 | 6.1 | 83.46 | 58 | 39 |
| | | | | |
| 23.3 | 10.6 | 12.7 | 59 | 39 |
| ND<1 U | 10.6 | -9.6 | 59 | 40 |
| ND<0.1 U | 10.6 | -10.5 | 59 | 41 |
| 55.91 | 10.6 | 45.31 | 60 | 41 |
| 62.38 | 10.6 | 51.78 | 61 | 41 |
| 89.56 | 10.6 | 78.96 | 62 | 41 |
| | | | | |
| ND<1 U | 23.3 | -22.3 | 62 | 42 |
| ND<0.1 U | 23.3 | -23.2 | 62 | 43 |
| 55.91 | 23.3 | 32.61 | 63 | 43 |
| 62.38 | 23.3 | 39.08 | 64 | 43 |
| 89.56 | 23.3 | 66.26 | 65 | 43 |
| | | | | |
| ND<0.1 U | ND<1 U | -0.9 | 65 | 44 |
| 55.91 | ND<1 U | 54.91 | 66 | 44 |
| 62.38 | ND<1 U | 61.38 | 67 | 44 |
| 89.56 | ND<1 U | 88.56 | 68 | 44 |
| | | | | |
| 55.91 | ND<0.1 U | 55.81 | 69 | 44 |
| 62.38 | ND<0.1 U | 62.28 | 70 | 44 |
| 89.56 | ND<0.1 U | 89.46 | 71 | 44 |
| | | | | |
| 62.38 | 55.91 | 6.47 | 72 | 44 |
| 89.56 | 55.91 | 33.65 | 73 | 44 |
| | | | | |
| 89.56 | 62.38 | 27.18 | 74 | 44 |

S Statistic = 74 - 44 = 30

| Tied Group | Value | Members |
|---|---|---|
| 1 | 2.9 | 2 |

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 18
B = 18

C = 0
D = 0
E = 2
F = 2
a = 8880
b = 30240
c = 480
Group Variance = 491.342
Z-Score = 1.3083
Comparison Level at 95% confidence level = -1.65463 (downward trend)
1.3083 >= -1.65463 indicating no evidence of a downward trend

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RWR-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 457 1c4c | 440 2c | Same Date | 0 | 0 |
| 535 1c | 440 2c | 95 | 1 | 0 |
| 650 | 440 2c | 210 | 2 | 0 |
| 340 | 440 2c | -100 | 2 | 1 |
| 508 | 440 2c | 68 | 3 | 1 |
| 425 | 440 2c | -15 | 3 | 2 |
| 398 | 440 2c | -42 | 3 | 3 |
| 367 | 440 2c | -73 | 3 | 4 |
| 753 | 440 2c | 313 | 4 | 4 |
| 295 | 440 2c | -145 | 4 | 5 |
| 340.4 | 440 2c | -99.6 | 4 | 6 |
| 530.9 | 440 2c | 90.9 | 5 | 6 |
| 422.3 | 440 2c | -17.7 | 5 | 7 |
| 684.9 | 440 2c | 244.9 | 6 | 7 |
| 1203 | 440 2c | 763 | 7 | 7 |
| | | | | |
| 535 1c | 457 1c4c | 78 | 8 | 7 |
| 650 | 457 1c4c | 193 | 9 | 7 |
| 340 | 457 1c4c | -117 | 9 | 8 |
| 508 | 457 1c4c | 51 | 10 | 8 |
| 425 | 457 1c4c | -32 | 10 | 9 |
| 398 | 457 1c4c | -59 | 10 | 10 |
| 367 | 457 1c4c | -90 | 10 | 11 |
| 753 | 457 1c4c | 296 | 11 | 11 |
| 295 | 457 1c4c | -162 | 11 | 12 |
| 340.4 | 457 1c4c | -116.6 | 11 | 13 |
| 530.9 | 457 1c4c | 73.9 | 12 | 13 |
| 422.3 | 457 1c4c | -34.7 | 12 | 14 |
| 684.9 | 457 1c4c | 227.9 | 13 | 14 |
| 1203 | 457 1c4c | 746 | 14 | 14 |
| | | | | |
| 650 | 535 1c | 115 | 15 | 14 |
| 340 | 535 1c | -195 | 15 | 15 |
| 508 | 535 1c | -27 | 15 | 16 |
| 425 | 535 1c | -110 | 15 | 17 |
| 398 | 535 1c | -137 | 15 | 18 |
| 367 | 535 1c | -168 | 15 | 19 |
| 753 | 535 1c | 218 | 16 | 19 |
| 295 | 535 1c | -240 | 16 | 20 |
| 340.4 | 535 1c | -194.6 | 16 | 21 |
| 530.9 | 535 1c | -4.1 | 16 | 22 |
| 422.3 | 535 1c | -112.7 | 16 | 23 |
| 684.9 | 535 1c | 149.9 | 17 | 23 |
| 1203 | 535 1c | 668 | 18 | 23 |
| | | | | |
| 340 | 650 | -310 | 18 | 24 |
| 508 | 650 | -142 | 18 | 25 |

| | | | | |
|---|---|---|---|---|
| 425 | 650 | -225 | 18 | 26 |
| 398 | 650 | -252 | 18 | 27 |
| 367 | 650 | -283 | 18 | 28 |
| 753 | 650 | 103 | 19 | 28 |
| 295 | 650 | -355 | 19 | 29 |
| 340.4 | 650 | -309.6 | 19 | 30 |
| 530.9 | 650 | -119.1 | 19 | 31 |
| 422.3 | 650 | -227.7 | 19 | 32 |
| 684.9 | 650 | 34.9 | 20 | 32 |
| 1203 | 650 | 553 | 21 | 32 |
| | | | | |
| 508 | 340 | 168 | 22 | 32 |
| 425 | 340 | 85 | 23 | 32 |
| 398 | 340 | 58 | 24 | 32 |
| 367 | 340 | 27 | 25 | 32 |
| 753 | 340 | 413 | 26 | 32 |
| 295 | 340 | -45 | 26 | 33 |
| 340.4 | 340 | 0.4 | 27 | 33 |
| 530.9 | 340 | 190.9 | 28 | 33 |
| 422.3 | 340 | 82.3 | 29 | 33 |
| 684.9 | 340 | 344.9 | 30 | 33 |
| 1203 | 340 | 863 | 31 | 33 |
| | | | | |
| 425 | 508 | -83 | 31 | 34 |
| 398 | 508 | -110 | 31 | 35 |
| 367 | 508 | -141 | 31 | 36 |
| 753 | 508 | 245 | 32 | 36 |
| 295 | 508 | -213 | 32 | 37 |
| 340.4 | 508 | -167.6 | 32 | 38 |
| 530.9 | 508 | 22.9 | 33 | 38 |
| 422.3 | 508 | -85.7 | 33 | 39 |
| 684.9 | 508 | 176.9 | 34 | 39 |
| 1203 | 508 | 695 | 35 | 39 |
| | | | | |
| 398 | 425 | -27 | 35 | 40 |
| 367 | 425 | -58 | 35 | 41 |
| 753 | 425 | 328 | 36 | 41 |
| 295 | 425 | -130 | 36 | 42 |
| 340.4 | 425 | -84.6 | 36 | 43 |
| 530.9 | 425 | 105.9 | 37 | 43 |
| 422.3 | 425 | -2.7 | 37 | 44 |
| 684.9 | 425 | 259.9 | 38 | 44 |
| 1203 | 425 | 778 | 39 | 44 |
| | | | | |
| 367 | 398 | -31 | 39 | 45 |
| 753 | 398 | 355 | 40 | 45 |
| 295 | 398 | -103 | 40 | 46 |
| 340.4 | 398 | -57.6 | 40 | 47 |
| 530.9 | 398 | 132.9 | 41 | 47 |
| 422.3 | 398 | 24.3 | 42 | 47 |
| 684.9 | 398 | 286.9 | 43 | 47 |
| 1203 | 398 | 805 | 44 | 47 |
| | | | | |
| 753 | 367 | 386 | 45 | 47 |
| 295 | 367 | -72 | 45 | 48 |
| 340.4 | 367 | -26.6 | 45 | 49 |
| 530.9 | 367 | 163.9 | 46 | 49 |

| | | | | |
|---|---|---|---|---|
| 422.3 | 367 | 55.3 | 47 | 49 |
| 684.9 | 367 | 317.9 | 48 | 49 |
| 1203 | 367 | 836 | 49 | 49 |
| | | | | |
| 295 | 753 | -458 | 49 | 50 |
| 340.4 | 753 | -412.6 | 49 | 51 |
| 530.9 | 753 | -222.1 | 49 | 52 |
| 422.3 | 753 | -330.7 | 49 | 53 |
| 684.9 | 753 | -68.1 | 49 | 54 |
| 1203 | 753 | 450 | 50 | 54 |
| | | | | |
| 340.4 | 295 | 45.4 | 51 | 54 |
| 530.9 | 295 | 235.9 | 52 | 54 |
| 422.3 | 295 | 127.3 | 53 | 54 |
| 684.9 | 295 | 389.9 | 54 | 54 |
| 1203 | 295 | 908 | 55 | 54 |
| | | | | |
| 530.9 | 340.4 | 190.5 | 56 | 54 |
| 422.3 | 340.4 | 81.9 | 57 | 54 |
| 684.9 | 340.4 | 344.5 | 58 | 54 |
| 1203 | 340.4 | 862.6 | 59 | 54 |
| | | | | |
| 422.3 | 530.9 | -108.6 | 59 | 55 |
| 684.9 | 530.9 | 154 | 60 | 55 |
| 1203 | 530.9 | 672.1 | 61 | 55 |
| | | | | |
| 684.9 | 422.3 | 262.6 | 62 | 55 |
| 1203 | 422.3 | 780.7 | 63 | 55 |
| | | | | |
| 1203 | 684.9 | 518.1 | 64 | 55 |

S Statistic = 64 - 55 = 9

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 0
B = 18
C = 0

D = 0
E = 0
F = 2
a = 8880
b = 30240
c = 480
Group Variance = 492.333
Z-Score = 0.360546
Comparison Level at 95% confidence level = -1.65463 (downward trend)
0.360546 >= -1.65463 indicating no evidence of a downward trend

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RWS-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| ND<1.5 U | ND<1.5 U | Same Date | 0 | 0 |
| ND<1.5 U1c | ND<1.5 U | 0 | 0 | 0 |
| 1.6 J | ND<1.5 U | 0.1 | 1 | 0 |
| ND<1.5 U | ND<1.5 U | 0 | 1 | 0 |
| 0.58 J | ND<1.5 U | -0.92 | 1 | 1 |
| 1.8 J | ND<1.5 U | 0.3 | 2 | 1 |
| 1.7 J | ND<1.5 U | 0.2 | 3 | 1 |
| 0.86 J | ND<1.5 U | -0.64 | 3 | 2 |
| 4.7 J | ND<1.5 U | 3.2 | 4 | 2 |
| ND<10 U | ND<1.5 U | 8.5 | 5 | 2 |
| 25.68 | ND<1.5 U | 24.18 | 6 | 2 |
| ND<0.1 U | ND<1.5 U | -1.4 | 6 | 3 |
| ND<1 U | ND<1.5 U | -0.5 | 6 | 4 |
| 0.0805 J | ND<1.5 U | -1.4195 | 6 | 5 |
| 0.1143 J | ND<1.5 U | -1.3857 | 6 | 6 |
| | | | | |
| ND<1.5 U1c | ND<1.5 U | 0 | 6 | 6 |
| 1.6 J | ND<1.5 U | 0.1 | 7 | 6 |
| ND<1.5 U | ND<1.5 U | 0 | 7 | 6 |
| 0.58 J | ND<1.5 U | -0.92 | 7 | 7 |
| 1.8 J | ND<1.5 U | 0.3 | 8 | 7 |
| 1.7 J | ND<1.5 U | 0.2 | 9 | 7 |
| 0.86 J | ND<1.5 U | -0.64 | 9 | 8 |
| 4.7 J | ND<1.5 U | 3.2 | 10 | 8 |
| ND<10 U | ND<1.5 U | 8.5 | 11 | 8 |
| 25.68 | ND<1.5 U | 24.18 | 12 | 8 |
| ND<0.1 U | ND<1.5 U | -1.4 | 12 | 9 |
| ND<1 U | ND<1.5 U | -0.5 | 12 | 10 |
| 0.0805 J | ND<1.5 U | -1.4195 | 12 | 11 |
| 0.1143 J | ND<1.5 U | -1.3857 | 12 | 12 |
| | | | | |
| 1.6 J | ND<1.5 U1c | 0.1 | 13 | 12 |
| ND<1.5 U | ND<1.5 U1c | 0 | 13 | 12 |
| 0.58 J | ND<1.5 U1c | -0.92 | 13 | 13 |
| 1.8 J | ND<1.5 U1c | 0.3 | 14 | 13 |
| 1.7 J | ND<1.5 U1c | 0.2 | 15 | 13 |
| 0.86 J | ND<1.5 U1c | -0.64 | 15 | 14 |
| 4.7 J | ND<1.5 U1c | 3.2 | 16 | 14 |
| ND<10 U | ND<1.5 U1c | 8.5 | 17 | 14 |
| 25.68 | ND<1.5 U1c | 24.18 | 18 | 14 |
| ND<0.1 U | ND<1.5 U1c | -1.4 | 18 | 15 |
| ND<1 U | ND<1.5 U1c | -0.5 | 18 | 16 |
| 0.0805 J | ND<1.5 U1c | -1.4195 | 18 | 17 |
| 0.1143 J | ND<1.5 U1c | -1.3857 | 18 | 18 |
| | | | | |
| ND<1.5 U | 1.6 J | -0.1 | 18 | 19 |
| 0.58 J | 1.6 J | -1.02 | 18 | 20 |

| | | | | |
|---|---|---|---|---|
| 1.8 J | 1.6 J | 0.2 | 19 | 20 |
| 1.7 J | 1.6 J | 0.1 | 20 | 20 |
| 0.86 J | 1.6 J | -0.74 | 20 | 21 |
| 4.7 J | 1.6 J | 3.1 | 21 | 21 |
| ND<10 U | 1.6 J | 8.4 | 22 | 21 |
| 25.68 | 1.6 J | 24.08 | 23 | 21 |
| ND<0.1 U | 1.6 J | -1.5 | 23 | 22 |
| ND<1 U | 1.6 J | -0.6 | 23 | 23 |
| 0.0805 J | 1.6 J | -1.5195 | 23 | 24 |
| 0.1143 J | 1.6 J | -1.4857 | 23 | 25 |
| | | | | |
| 0.58 J | ND<1.5 U | -0.92 | 23 | 26 |
| 1.8 J | ND<1.5 U | 0.3 | 24 | 26 |
| 1.7 J | ND<1.5 U | 0.2 | 25 | 26 |
| 0.86 J | ND<1.5 U | -0.64 | 25 | 27 |
| 4.7 J | ND<1.5 U | 3.2 | 26 | 27 |
| ND<10 U | ND<1.5 U | 8.5 | 27 | 27 |
| 25.68 | ND<1.5 U | 24.18 | 28 | 27 |
| ND<0.1 U | ND<1.5 U | -1.4 | 28 | 28 |
| ND<1 U | ND<1.5 U | -0.5 | 28 | 29 |
| 0.0805 J | ND<1.5 U | -1.4195 | 28 | 30 |
| 0.1143 J | ND<1.5 U | -1.3857 | 28 | 31 |
| | | | | |
| 1.8 J | 0.58 J | 1.22 | 29 | 31 |
| 1.7 J | 0.58 J | 1.12 | 30 | 31 |
| 0.86 J | 0.58 J | 0.28 | 31 | 31 |
| 4.7 J | 0.58 J | 4.12 | 32 | 31 |
| ND<10 U | 0.58 J | 9.42 | 33 | 31 |
| 25.68 | 0.58 J | 25.1 | 34 | 31 |
| ND<0.1 U | 0.58 J | -0.48 | 34 | 32 |
| ND<1 U | 0.58 J | 0.42 | 35 | 32 |
| 0.0805 J | 0.58 J | -0.4995 | 35 | 33 |
| 0.1143 J | 0.58 J | -0.4657 | 35 | 34 |
| | | | | |
| 1.7 J | 1.8 J | -0.1 | 35 | 35 |
| 0.86 J | 1.8 J | -0.94 | 35 | 36 |
| 4.7 J | 1.8 J | 2.9 | 36 | 36 |
| ND<10 U | 1.8 J | 8.2 | 37 | 36 |
| 25.68 | 1.8 J | 23.88 | 38 | 36 |
| ND<0.1 U | 1.8 J | -1.7 | 38 | 37 |
| ND<1 U | 1.8 J | -0.8 | 38 | 38 |
| 0.0805 J | 1.8 J | -1.7195 | 38 | 39 |
| 0.1143 J | 1.8 J | -1.6857 | 38 | 40 |
| | | | | |
| 0.86 J | 1.7 J | -0.84 | 38 | 41 |
| 4.7 J | 1.7 J | 3 | 39 | 41 |
| ND<10 U | 1.7 J | 8.3 | 40 | 41 |
| 25.68 | 1.7 J | 23.98 | 41 | 41 |
| ND<0.1 U | 1.7 J | -1.6 | 41 | 42 |
| ND<1 U | 1.7 J | -0.7 | 41 | 43 |
| 0.0805 J | 1.7 J | -1.6195 | 41 | 44 |
| 0.1143 J | 1.7 J | -1.5857 | 41 | 45 |
| | | | | |
| 4.7 J | 0.86 J | 3.84 | 42 | 45 |
| ND<10 U | 0.86 J | 9.14 | 43 | 45 |
| 25.68 | 0.86 J | 24.82 | 44 | 45 |
| ND<0.1 U | 0.86 J | -0.76 | 44 | 46 |

| | | | | |
|---|---|---|---|---|
| ND<1 U | 0.86 J | 0.14 | 45 | 46 |
| 0.0805 J | 0.86 J | -0.7795 | 45 | 47 |
| 0.1143 J | 0.86 J | -0.7457 | 45 | 48 |
| | | | | |
| ND<10 U | 4.7 J | 5.3 | 46 | 48 |
| 25.68 | 4.7 J | 20.98 | 47 | 48 |
| ND<0.1 U | 4.7 J | -4.6 | 47 | 49 |
| ND<1 U | 4.7 J | -3.7 | 47 | 50 |
| 0.0805 J | 4.7 J | -4.6195 | 47 | 51 |
| 0.1143 J | 4.7 J | -4.5857 | 47 | 52 |
| | | | | |
| 25.68 | ND<10 U | 15.68 | 48 | 52 |
| ND<0.1 U | ND<10 U | -9.9 | 48 | 53 |
| ND<1 U | ND<10 U | -9 | 48 | 54 |
| 0.0805 J | ND<10 U | -9.9195 | 48 | 55 |
| 0.1143 J | ND<10 U | -9.8857 | 48 | 56 |
| | | | | |
| ND<0.1 U | 25.68 | -25.58 | 48 | 57 |
| ND<1 U | 25.68 | -24.68 | 48 | 58 |
| 0.0805 J | 25.68 | -25.5995 | 48 | 59 |
| 0.1143 J | 25.68 | -25.5657 | 48 | 60 |
| | | | | |
| ND<1 U | ND<0.1 U | 0.9 | 49 | 60 |
| 0.0805 J | ND<0.1 U | -0.0195 | 49 | 61 |
| 0.1143 J | ND<0.1 U | 0.0143 | 50 | 61 |
| | | | | |
| 0.0805 J | ND<1 U | -0.9195 | 50 | 62 |
| 0.1143 J | ND<1 U | -0.8857 | 50 | 63 |
| | | | | |
| 0.1143 J | 0.0805 J | 0.0338 | 51 | 63 |

S Statistic = 51 - 63 = -12

| Tied Group | Value | Members |
|---|---|---|
| 1 | 1.5 | 4 |

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 156
B = 18

C = 24
D = 0
E = 12
F = 2
a = 8880
b = 30240
c = 480
Group Variance = 483.717
Z-Score = -0.500146
Comparison Level at 95% confidence level = -1.65463 (downward trend)
-0.500146 >= -1.65463 indicating no evidence of a downward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RW01-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 90 | 11600 | -11510 | 0 | 1 |
| 13700 | 11600 | 2100 | 1 | 1 |
| 29 | 11600 | -11571 | 1 | 2 |
| 41000 | 11600 | 29400 | 2 | 2 |
| 104 | 11600 | -11496 | 2 | 3 |
| 576 | 11600 | -11024 | 2 | 4 |
| 9710 | 11600 | -1890 | 2 | 5 |
| 143 | 11600 | -11457 | 2 | 6 |
| 2480 | 11600 | -9120 | 2 | 7 |
| 2460 | 11600 | -9140 | 2 | 8 |
| 5670 | 11600 | -5930 | 2 | 9 |
| 5980 | 11600 | -5620 | 2 | 10 |
| 5940 2c | 11600 | -5660 | 2 | 11 |
| 2060 | 11600 | -9540 | 2 | 12 |
| 8120 | 11600 | -3480 | 2 | 13 |
| 13700 | 11600 | 2100 | 3 | 13 |
| 3.7 J | 11600 | -11596.3 | 3 | 14 |
| 15200 | 11600 | 3600 | 4 | 14 |
| 26600 | 11600 | 15000 | 5 | 14 |
| 24000 | 11600 | 12400 | 6 | 14 |
| 37300 M1 | 11600 | 25700 | 7 | 14 |
| 29010 | 11600 | 17410 | 8 | 14 |
| 30440 | 11600 | 18840 | 9 | 14 |
| | | | | |
| 13700 | 90 | 13610 | 10 | 14 |
| 29 | 90 | -61 | 10 | 15 |
| 41000 | 90 | 40910 | 11 | 15 |
| 104 | 90 | 14 | 12 | 15 |
| 576 | 90 | 486 | 13 | 15 |
| 9710 | 90 | 9620 | 14 | 15 |
| 143 | 90 | 53 | 15 | 15 |
| 2480 | 90 | 2390 | 16 | 15 |
| 2460 | 90 | 2370 | 17 | 15 |
| 5670 | 90 | 5580 | 18 | 15 |
| 5980 | 90 | 5890 | 19 | 15 |
| 5940 2c | 90 | 5850 | 20 | 15 |
| 2060 | 90 | 1970 | 21 | 15 |
| 8120 | 90 | 8030 | 22 | 15 |
| 13700 | 90 | 13610 | 23 | 15 |
| 3.7 J | 90 | -86.3 | 23 | 16 |
| 15200 | 90 | 15110 | 24 | 16 |
| 26600 | 90 | 26510 | 25 | 16 |
| 24000 | 90 | 23910 | 26 | 16 |
| 37300 M1 | 90 | 37210 | 27 | 16 |
| 29010 | 90 | 28920 | 28 | 16 |
| 30440 | 90 | 30350 | 29 | 16 |

| | | | | |
|---|---|---|---|---|
| 29 | 13700 | -13671 | 29 | 17 |
| 41000 | 13700 | 27300 | 30 | 17 |
| 104 | 13700 | -13596 | 30 | 18 |
| 576 | 13700 | -13124 | 30 | 19 |
| 9710 | 13700 | -3990 | 30 | 20 |
| 143 | 13700 | -13557 | 30 | 21 |
| 2480 | 13700 | -11220 | 30 | 22 |
| 2460 | 13700 | -11240 | 30 | 23 |
| 5670 | 13700 | -8030 | 30 | 24 |
| 5980 | 13700 | -7720 | 30 | 25 |
| 5940 2c | 13700 | -7760 | 30 | 26 |
| 2060 | 13700 | -11640 | 30 | 27 |
| 8120 | 13700 | -5580 | 30 | 28 |
| 13700 | 13700 | 0 | 30 | 28 |
| 3.7 J | 13700 | -13696.3 | 30 | 29 |
| 15200 | 13700 | 1500 | 31 | 29 |
| 26600 | 13700 | 12900 | 32 | 29 |
| 24000 | 13700 | 10300 | 33 | 29 |
| 37300 M1 | 13700 | 23600 | 34 | 29 |
| 29010 | 13700 | 15310 | 35 | 29 |
| 30440 | 13700 | 16740 | 36 | 29 |
| | | | | |
| 41000 | 29 | 40971 | 37 | 29 |
| 104 | 29 | 75 | 38 | 29 |
| 576 | 29 | 547 | 39 | 29 |
| 9710 | 29 | 9681 | 40 | 29 |
| 143 | 29 | 114 | 41 | 29 |
| 2480 | 29 | 2451 | 42 | 29 |
| 2460 | 29 | 2431 | 43 | 29 |
| 5670 | 29 | 5641 | 44 | 29 |
| 5980 | 29 | 5951 | 45 | 29 |
| 5940 2c | 29 | 5911 | 46 | 29 |
| 2060 | 29 | 2031 | 47 | 29 |
| 8120 | 29 | 8091 | 48 | 29 |
| 13700 | 29 | 13671 | 49 | 29 |
| 3.7 J | 29 | -25.3 | 49 | 30 |
| 15200 | 29 | 15171 | 50 | 30 |
| 26600 | 29 | 26571 | 51 | 30 |
| 24000 | 29 | 23971 | 52 | 30 |
| 37300 M1 | 29 | 37271 | 53 | 30 |
| 29010 | 29 | 28981 | 54 | 30 |
| 30440 | 29 | 30411 | 55 | 30 |
| | | | | |
| 104 | 41000 | -40896 | 55 | 31 |
| 576 | 41000 | -40424 | 55 | 32 |
| 9710 | 41000 | -31290 | 55 | 33 |
| 143 | 41000 | -40857 | 55 | 34 |
| 2480 | 41000 | -38520 | 55 | 35 |
| 2460 | 41000 | -38540 | 55 | 36 |
| 5670 | 41000 | -35330 | 55 | 37 |
| 5980 | 41000 | -35020 | 55 | 38 |
| 5940 2c | 41000 | -35060 | 55 | 39 |
| 2060 | 41000 | -38940 | 55 | 40 |
| 8120 | 41000 | -32880 | 55 | 41 |
| 13700 | 41000 | -27300 | 55 | 42 |
| 3.7 J | 41000 | -40996.3 | 55 | 43 |
| 15200 | 41000 | -25800 | 55 | 44 |

| | | | | |
|---|---|---|---|---|
| 26600 | 41000 | -14400 | 55 | 45 |
| 24000 | 41000 | -17000 | 55 | 46 |
| 37300 M1 | 41000 | -3700 | 55 | 47 |
| 29010 | 41000 | -11990 | 55 | 48 |
| 30440 | 41000 | -10560 | 55 | 49 |
| | | | | |
| 576 | 104 | 472 | 56 | 49 |
| 9710 | 104 | 9606 | 57 | 49 |
| 143 | 104 | 39 | 58 | 49 |
| 2480 | 104 | 2376 | 59 | 49 |
| 2460 | 104 | 2356 | 60 | 49 |
| 5670 | 104 | 5566 | 61 | 49 |
| 5980 | 104 | 5876 | 62 | 49 |
| 5940 2c | 104 | 5836 | 63 | 49 |
| 2060 | 104 | 1956 | 64 | 49 |
| 8120 | 104 | 8016 | 65 | 49 |
| 13700 | 104 | 13596 | 66 | 49 |
| 3.7 J | 104 | -100.3 | 66 | 50 |
| 15200 | 104 | 15096 | 67 | 50 |
| 26600 | 104 | 26496 | 68 | 50 |
| 24000 | 104 | 23896 | 69 | 50 |
| 37300 M1 | 104 | 37196 | 70 | 50 |
| 29010 | 104 | 28906 | 71 | 50 |
| 30440 | 104 | 30336 | 72 | 50 |
| | | | | |
| 9710 | 576 | 9134 | 73 | 50 |
| 143 | 576 | -433 | 73 | 51 |
| 2480 | 576 | 1904 | 74 | 51 |
| 2460 | 576 | 1884 | 75 | 51 |
| 5670 | 576 | 5094 | 76 | 51 |
| 5980 | 576 | 5404 | 77 | 51 |
| 5940 2c | 576 | 5364 | 78 | 51 |
| 2060 | 576 | 1484 | 79 | 51 |
| 8120 | 576 | 7544 | 80 | 51 |
| 13700 | 576 | 13124 | 81 | 51 |
| 3.7 J | 576 | -572.3 | 81 | 52 |
| 15200 | 576 | 14624 | 82 | 52 |
| 26600 | 576 | 26024 | 83 | 52 |
| 24000 | 576 | 23424 | 84 | 52 |
| 37300 M1 | 576 | 36724 | 85 | 52 |
| 29010 | 576 | 28434 | 86 | 52 |
| 30440 | 576 | 29864 | 87 | 52 |
| | | | | |
| 143 | 9710 | -9567 | 87 | 53 |
| 2480 | 9710 | -7230 | 87 | 54 |
| 2460 | 9710 | -7250 | 87 | 55 |
| 5670 | 9710 | -4040 | 87 | 56 |
| 5980 | 9710 | -3730 | 87 | 57 |
| 5940 2c | 9710 | -3770 | 87 | 58 |
| 2060 | 9710 | -7650 | 87 | 59 |
| 8120 | 9710 | -1590 | 87 | 60 |
| 13700 | 9710 | 3990 | 88 | 60 |
| 3.7 J | 9710 | -9706.3 | 88 | 61 |
| 15200 | 9710 | 5490 | 89 | 61 |
| 26600 | 9710 | 16890 | 90 | 61 |
| 24000 | 9710 | 14290 | 91 | 61 |
| 37300 M1 | 9710 | 27590 | 92 | 61 |

| | | | | |
|---|---|---|---|---|
| 29010 | 9710 | 19300 | 93 | 61 |
| 30440 | 9710 | 20730 | 94 | 61 |
| | | | | |
| 2480 | 143 | 2337 | 95 | 61 |
| 2460 | 143 | 2317 | 96 | 61 |
| 5670 | 143 | 5527 | 97 | 61 |
| 5980 | 143 | 5837 | 98 | 61 |
| 5940 2c | 143 | 5797 | 99 | 61 |
| 2060 | 143 | 1917 | 100 | 61 |
| 8120 | 143 | 7977 | 101 | 61 |
| 13700 | 143 | 13557 | 102 | 61 |
| 3.7 J | 143 | -139.3 | 102 | 62 |
| 15200 | 143 | 15057 | 103 | 62 |
| 26600 | 143 | 26457 | 104 | 62 |
| 24000 | 143 | 23857 | 105 | 62 |
| 37300 M1 | 143 | 37157 | 106 | 62 |
| 29010 | 143 | 28867 | 107 | 62 |
| 30440 | 143 | 30297 | 108 | 62 |
| | | | | |
| 2460 | 2480 | Same Date | 108 | 62 |
| 5670 | 2480 | 3190 | 109 | 62 |
| 5980 | 2480 | 3500 | 110 | 62 |
| 5940 2c | 2480 | 3460 | 111 | 62 |
| 2060 | 2480 | -420 | 111 | 63 |
| 8120 | 2480 | 5640 | 112 | 63 |
| 13700 | 2480 | 11220 | 113 | 63 |
| 3.7 J | 2480 | -2476.3 | 113 | 64 |
| 15200 | 2480 | 12720 | 114 | 64 |
| 26600 | 2480 | 24120 | 115 | 64 |
| 24000 | 2480 | 21520 | 116 | 64 |
| 37300 M1 | 2480 | 34820 | 117 | 64 |
| 29010 | 2480 | 26530 | 118 | 64 |
| 30440 | 2480 | 27960 | 119 | 64 |
| | | | | |
| 5670 | 2460 | 3210 | 120 | 64 |
| 5980 | 2460 | 3520 | 121 | 64 |
| 5940 2c | 2460 | 3480 | 122 | 64 |
| 2060 | 2460 | -400 | 122 | 65 |
| 8120 | 2460 | 5660 | 123 | 65 |
| 13700 | 2460 | 11240 | 124 | 65 |
| 3.7 J | 2460 | -2456.3 | 124 | 66 |
| 15200 | 2460 | 12740 | 125 | 66 |
| 26600 | 2460 | 24140 | 126 | 66 |
| 24000 | 2460 | 21540 | 127 | 66 |
| 37300 M1 | 2460 | 34840 | 128 | 66 |
| 29010 | 2460 | 26550 | 129 | 66 |
| 30440 | 2460 | 27980 | 130 | 66 |
| | | | | |
| 5980 | 5670 | Same Date | 130 | 66 |
| 5940 2c | 5670 | 270 | 131 | 66 |
| 2060 | 5670 | -3610 | 131 | 67 |
| 8120 | 5670 | 2450 | 132 | 67 |
| 13700 | 5670 | 8030 | 133 | 67 |
| 3.7 J | 5670 | -5666.3 | 133 | 68 |
| 15200 | 5670 | 9530 | 134 | 68 |
| 26600 | 5670 | 20930 | 135 | 68 |
| 24000 | 5670 | 18330 | 136 | 68 |

| | | | | |
|---|---|---|---|---|
| 37300 M1 | 5670 | 31630 | 137 | 68 |
| 29010 | 5670 | 23340 | 138 | 68 |
| 30440 | 5670 | 24770 | 139 | 68 |
| | | | | |
| 5940 2c | 5980 | -40 | 139 | 69 |
| 2060 | 5980 | -3920 | 139 | 70 |
| 8120 | 5980 | 2140 | 140 | 70 |
| 13700 | 5980 | 7720 | 141 | 70 |
| 3.7 J | 5980 | -5976.3 | 141 | 71 |
| 15200 | 5980 | 9220 | 142 | 71 |
| 26600 | 5980 | 20620 | 143 | 71 |
| 24000 | 5980 | 18020 | 144 | 71 |
| 37300 M1 | 5980 | 31320 | 145 | 71 |
| 29010 | 5980 | 23030 | 146 | 71 |
| 30440 | 5980 | 24460 | 147 | 71 |
| | | | | |
| 2060 | 5940 2c | -3880 | 147 | 72 |
| 8120 | 5940 2c | 2180 | 148 | 72 |
| 13700 | 5940 2c | 7760 | 149 | 72 |
| 3.7 J | 5940 2c | -5936.3 | 149 | 73 |
| 15200 | 5940 2c | 9260 | 150 | 73 |
| 26600 | 5940 2c | 20660 | 151 | 73 |
| 24000 | 5940 2c | 18060 | 152 | 73 |
| 37300 M1 | 5940 2c | 31360 | 153 | 73 |
| 29010 | 5940 2c | 23070 | 154 | 73 |
| 30440 | 5940 2c | 24500 | 155 | 73 |
| | | | | |
| 8120 | 2060 | 6060 | 156 | 73 |
| 13700 | 2060 | 11640 | 157 | 73 |
| 3.7 J | 2060 | -2056.3 | 157 | 74 |
| 15200 | 2060 | 13140 | 158 | 74 |
| 26600 | 2060 | 24540 | 159 | 74 |
| 24000 | 2060 | 21940 | 160 | 74 |
| 37300 M1 | 2060 | 35240 | 161 | 74 |
| 29010 | 2060 | 26950 | 162 | 74 |
| 30440 | 2060 | 28380 | 163 | 74 |
| | | | | |
| 13700 | 8120 | 5580 | 164 | 74 |
| 3.7 J | 8120 | -8116.3 | 164 | 75 |
| 15200 | 8120 | 7080 | 165 | 75 |
| 26600 | 8120 | 18480 | 166 | 75 |
| 24000 | 8120 | 15880 | 167 | 75 |
| 37300 M1 | 8120 | 29180 | 168 | 75 |
| 29010 | 8120 | 20890 | 169 | 75 |
| 30440 | 8120 | 22320 | 170 | 75 |
| | | | | |
| 3.7 J | 13700 | -13696.3 | 170 | 76 |
| 15200 | 13700 | 1500 | 171 | 76 |
| 26600 | 13700 | 12900 | 172 | 76 |
| 24000 | 13700 | 10300 | 173 | 76 |
| 37300 M1 | 13700 | 23600 | 174 | 76 |
| 29010 | 13700 | 15310 | 175 | 76 |
| 30440 | 13700 | 16740 | 176 | 76 |
| | | | | |
| 15200 | 3.7 J | 15196.3 | 177 | 76 |
| 26600 | 3.7 J | 26596.3 | 178 | 76 |
| 24000 | 3.7 J | 23996.3 | 179 | 76 |

| | | | | |
|---|---|---|---|---|
| 37300 M1 | 3.7 J | 37296.3 | 180 | 76 |
| 29010 | 3.7 J | 29006.3 | 181 | 76 |
| 30440 | 3.7 J | 30436.3 | 182 | 76 |
| | | | | |
| 26600 | 15200 | 11400 | 183 | 76 |
| 24000 | 15200 | 8800 | 184 | 76 |
| 37300 M1 | 15200 | 22100 | 185 | 76 |
| 29010 | 15200 | 13810 | 186 | 76 |
| 30440 | 15200 | 15240 | 187 | 76 |
| | | | | |
| 24000 | 26600 | -2600 | 187 | 77 |
| 37300 M1 | 26600 | 10700 | 188 | 77 |
| 29010 | 26600 | 2410 | 189 | 77 |
| 30440 | 26600 | 3840 | 190 | 77 |
| | | | | |
| 37300 M1 | 24000 | 13300 | 191 | 77 |
| 29010 | 24000 | 5010 | 192 | 77 |
| 30440 | 24000 | 6440 | 193 | 77 |
| | | | | |
| 29010 | 37300 M1 | -8290 | 193 | 78 |
| 30440 | 37300 M1 | -6860 | 193 | 79 |
| | | | | |
| 30440 | 29010 | 1430 | 194 | 79 |

S Statistic = 194 - 79 = 115

| Tied Group | Value | Members |
|---|---|---|
| 1 | 13700 | 2 |

| Time Period | Observations |
|---|---|
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |

There are 2 time periods with multiple data

A = 18
B = 36

C = 0
D = 0
E = 2
F = 4
a = 29256
b = 109296
c = 1104
Group Variance = 1622.34
Z-Score = 2.83031
Comparison Level at 95% confidence level = -1.65463 (downward trend)
2.83031 >= -1.65463 indicating no evidence of a downward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RW02-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 203 | 18200 | -17997 | 0 | 1 |
| 290 | 18200 | -17910 | 0 | 2 |
| 38.6 | 18200 | -18161.4 | 0 | 3 |
| 186 | 18200 | -18014 | 0 | 4 |
| 573 | 18200 | -17627 | 0 | 5 |
| 452 | 18200 | -17748 | 0 | 6 |
| 5030 ML | 18200 | -13170 | 0 | 7 |
| 3240 | 18200 | -14960 | 0 | 8 |
| 21500 | 18200 | 3300 | 1 | 8 |
| 18500 | 18200 | 300 | 2 | 8 |
| 56600 | 18200 | 38400 | 3 | 8 |
| 58700 M6 | 18200 | 40500 | 4 | 8 |
| 72000 2c | 18200 | 53800 | 5 | 8 |
| 17200 | 18200 | -1000 | 5 | 9 |
| 14100 | 18200 | -4100 | 5 | 10 |
| 34900 | 18200 | 16700 | 6 | 10 |
| 123 | 18200 | -18077 | 6 | 11 |
| 20200 | 18200 | 2000 | 7 | 11 |
| 104 | 18200 | -18096 | 7 | 12 |
| 433 | 18200 | -17767 | 7 | 13 |
| 751 | 18200 | -17449 | 7 | 14 |
| 8598 | 18200 | -9602 | 7 | 15 |
| 41190 | 18200 | 22990 | 8 | 15 |
| | | | | |
| 290 | 203 | 87 | 9 | 15 |
| 38.6 | 203 | -164.4 | 9 | 16 |
| 186 | 203 | -17 | 9 | 17 |
| 573 | 203 | 370 | 10 | 17 |
| 452 | 203 | 249 | 11 | 17 |
| 5030 ML | 203 | 4827 | 12 | 17 |
| 3240 | 203 | 3037 | 13 | 17 |
| 21500 | 203 | 21297 | 14 | 17 |
| 18500 | 203 | 18297 | 15 | 17 |
| 56600 | 203 | 56397 | 16 | 17 |
| 58700 M6 | 203 | 58497 | 17 | 17 |
| 72000 2c | 203 | 71797 | 18 | 17 |
| 17200 | 203 | 16997 | 19 | 17 |
| 14100 | 203 | 13897 | 20 | 17 |
| 34900 | 203 | 34697 | 21 | 17 |
| 123 | 203 | -80 | 21 | 18 |
| 20200 | 203 | 19997 | 22 | 18 |
| 104 | 203 | -99 | 22 | 19 |
| 433 | 203 | 230 | 23 | 19 |
| 751 | 203 | 548 | 24 | 19 |
| 8598 | 203 | 8395 | 25 | 19 |
| 41190 | 203 | 40987 | 26 | 19 |

| | | | | |
|---|---|---|---|---|
| 38.6 | 290 | -251.4 | 26 | 20 |
| 186 | 290 | -104 | 26 | 21 |
| 573 | 290 | 283 | 27 | 21 |
| 452 | 290 | 162 | 28 | 21 |
| 5030 ML | 290 | 4740 | 29 | 21 |
| 3240 | 290 | 2950 | 30 | 21 |
| 21500 | 290 | 21210 | 31 | 21 |
| 18500 | 290 | 18210 | 32 | 21 |
| 56600 | 290 | 56310 | 33 | 21 |
| 58700 M6 | 290 | 58410 | 34 | 21 |
| 72000 2c | 290 | 71710 | 35 | 21 |
| 17200 | 290 | 16910 | 36 | 21 |
| 14100 | 290 | 13810 | 37 | 21 |
| 34900 | 290 | 34610 | 38 | 21 |
| 123 | 290 | -167 | 38 | 22 |
| 20200 | 290 | 19910 | 39 | 22 |
| 104 | 290 | -186 | 39 | 23 |
| 433 | 290 | 143 | 40 | 23 |
| 751 | 290 | 461 | 41 | 23 |
| 8598 | 290 | 8308 | 42 | 23 |
| 41190 | 290 | 40900 | 43 | 23 |
| | | | | |
| 186 | 38.6 | 147.4 | 44 | 23 |
| 573 | 38.6 | 534.4 | 45 | 23 |
| 452 | 38.6 | 413.4 | 46 | 23 |
| 5030 ML | 38.6 | 4991.4 | 47 | 23 |
| 3240 | 38.6 | 3201.4 | 48 | 23 |
| 21500 | 38.6 | 21461.4 | 49 | 23 |
| 18500 | 38.6 | 18461.4 | 50 | 23 |
| 56600 | 38.6 | 56561.4 | 51 | 23 |
| 58700 M6 | 38.6 | 58661.4 | 52 | 23 |
| 72000 2c | 38.6 | 71961.4 | 53 | 23 |
| 17200 | 38.6 | 17161.4 | 54 | 23 |
| 14100 | 38.6 | 14061.4 | 55 | 23 |
| 34900 | 38.6 | 34861.4 | 56 | 23 |
| 123 | 38.6 | 84.4 | 57 | 23 |
| 20200 | 38.6 | 20161.4 | 58 | 23 |
| 104 | 38.6 | 65.4 | 59 | 23 |
| 433 | 38.6 | 394.4 | 60 | 23 |
| 751 | 38.6 | 712.4 | 61 | 23 |
| 8598 | 38.6 | 8559.4 | 62 | 23 |
| 41190 | 38.6 | 41151.4 | 63 | 23 |
| | | | | |
| 573 | 186 | 387 | 64 | 23 |
| 452 | 186 | 266 | 65 | 23 |
| 5030 ML | 186 | 4844 | 66 | 23 |
| 3240 | 186 | 3054 | 67 | 23 |
| 21500 | 186 | 21314 | 68 | 23 |
| 18500 | 186 | 18314 | 69 | 23 |
| 56600 | 186 | 56414 | 70 | 23 |
| 58700 M6 | 186 | 58514 | 71 | 23 |
| 72000 2c | 186 | 71814 | 72 | 23 |
| 17200 | 186 | 17014 | 73 | 23 |
| 14100 | 186 | 13914 | 74 | 23 |
| 34900 | 186 | 34714 | 75 | 23 |
| 123 | 186 | -63 | 75 | 24 |
| 20200 | 186 | 20014 | 76 | 24 |

| | | | | |
|---|---|---|---|---|
| 104 | 186 | -82 | 76 | 25 |
| 433 | 186 | 247 | 77 | 25 |
| 751 | 186 | 565 | 78 | 25 |
| 8598 | 186 | 8412 | 79 | 25 |
| 41190 | 186 | 41004 | 80 | 25 |
| | | | | |
| 452 | 573 | -121 | 80 | 26 |
| 5030 ML | 573 | 4457 | 81 | 26 |
| 3240 | 573 | 2667 | 82 | 26 |
| 21500 | 573 | 20927 | 83 | 26 |
| 18500 | 573 | 17927 | 84 | 26 |
| 56600 | 573 | 56027 | 85 | 26 |
| 58700 M6 | 573 | 58127 | 86 | 26 |
| 72000 2c | 573 | 71427 | 87 | 26 |
| 17200 | 573 | 16627 | 88 | 26 |
| 14100 | 573 | 13527 | 89 | 26 |
| 34900 | 573 | 34327 | 90 | 26 |
| 123 | 573 | -450 | 90 | 27 |
| 20200 | 573 | 19627 | 91 | 27 |
| 104 | 573 | -469 | 91 | 28 |
| 433 | 573 | -140 | 91 | 29 |
| 751 | 573 | 178 | 92 | 29 |
| 8598 | 573 | 8025 | 93 | 29 |
| 41190 | 573 | 40617 | 94 | 29 |
| | | | | |
| 5030 ML | 452 | 4578 | 95 | 29 |
| 3240 | 452 | 2788 | 96 | 29 |
| 21500 | 452 | 21048 | 97 | 29 |
| 18500 | 452 | 18048 | 98 | 29 |
| 56600 | 452 | 56148 | 99 | 29 |
| 58700 M6 | 452 | 58248 | 100 | 29 |
| 72000 2c | 452 | 71548 | 101 | 29 |
| 17200 | 452 | 16748 | 102 | 29 |
| 14100 | 452 | 13648 | 103 | 29 |
| 34900 | 452 | 34448 | 104 | 29 |
| 123 | 452 | -329 | 104 | 30 |
| 20200 | 452 | 19748 | 105 | 30 |
| 104 | 452 | -348 | 105 | 31 |
| 433 | 452 | -19 | 105 | 32 |
| 751 | 452 | 299 | 106 | 32 |
| 8598 | 452 | 8146 | 107 | 32 |
| 41190 | 452 | 40738 | 108 | 32 |
| | | | | |
| 3240 | 5030 ML | -1790 | 108 | 33 |
| 21500 | 5030 ML | 16470 | 109 | 33 |
| 18500 | 5030 ML | 13470 | 110 | 33 |
| 56600 | 5030 ML | 51570 | 111 | 33 |
| 58700 M6 | 5030 ML | 53670 | 112 | 33 |
| 72000 2c | 5030 ML | 66970 | 113 | 33 |
| 17200 | 5030 ML | 12170 | 114 | 33 |
| 14100 | 5030 ML | 9070 | 115 | 33 |
| 34900 | 5030 ML | 29870 | 116 | 33 |
| 123 | 5030 ML | -4907 | 116 | 34 |
| 20200 | 5030 ML | 15170 | 117 | 34 |
| 104 | 5030 ML | -4926 | 117 | 35 |
| 433 | 5030 ML | -4597 | 117 | 36 |
| 751 | 5030 ML | -4279 | 117 | 37 |

| | | | | |
|---|---|---|---|---|
| 8598 | 5030 ML | 3568 | 118 | 37 |
| 41190 | 5030 ML | 36160 | 119 | 37 |
| | | | | |
| 21500 | 3240 | 18260 | 120 | 37 |
| 18500 | 3240 | 15260 | 121 | 37 |
| 56600 | 3240 | 53360 | 122 | 37 |
| 58700 M6 | 3240 | 55460 | 123 | 37 |
| 72000 2c | 3240 | 68760 | 124 | 37 |
| 17200 | 3240 | 13960 | 125 | 37 |
| 14100 | 3240 | 10860 | 126 | 37 |
| 34900 | 3240 | 31660 | 127 | 37 |
| 123 | 3240 | -3117 | 127 | 38 |
| 20200 | 3240 | 16960 | 128 | 38 |
| 104 | 3240 | -3136 | 128 | 39 |
| 433 | 3240 | -2807 | 128 | 40 |
| 751 | 3240 | -2489 | 128 | 41 |
| 8598 | 3240 | 5358 | 129 | 41 |
| 41190 | 3240 | 37950 | 130 | 41 |
| | | | | |
| 18500 | 21500 | Same Date | 130 | 41 |
| 56600 | 21500 | 35100 | 131 | 41 |
| 58700 M6 | 21500 | 37200 | 132 | 41 |
| 72000 2c | 21500 | 50500 | 133 | 41 |
| 17200 | 21500 | -4300 | 133 | 42 |
| 14100 | 21500 | -7400 | 133 | 43 |
| 34900 | 21500 | 13400 | 134 | 43 |
| 123 | 21500 | -21377 | 134 | 44 |
| 20200 | 21500 | -1300 | 134 | 45 |
| 104 | 21500 | -21396 | 134 | 46 |
| 433 | 21500 | -21067 | 134 | 47 |
| 751 | 21500 | -20749 | 134 | 48 |
| 8598 | 21500 | -12902 | 134 | 49 |
| 41190 | 21500 | 19690 | 135 | 49 |
| | | | | |
| 56600 | 18500 | 38100 | 136 | 49 |
| 58700 M6 | 18500 | 40200 | 137 | 49 |
| 72000 2c | 18500 | 53500 | 138 | 49 |
| 17200 | 18500 | -1300 | 138 | 50 |
| 14100 | 18500 | -4400 | 138 | 51 |
| 34900 | 18500 | 16400 | 139 | 51 |
| 123 | 18500 | -18377 | 139 | 52 |
| 20200 | 18500 | 1700 | 140 | 52 |
| 104 | 18500 | -18396 | 140 | 53 |
| 433 | 18500 | -18067 | 140 | 54 |
| 751 | 18500 | -17749 | 140 | 55 |
| 8598 | 18500 | -9902 | 140 | 56 |
| 41190 | 18500 | 22690 | 141 | 56 |
| | | | | |
| 58700 M6 | 56600 | Same Date | 141 | 56 |
| 72000 2c | 56600 | 15400 | 142 | 56 |
| 17200 | 56600 | -39400 | 142 | 57 |
| 14100 | 56600 | -42500 | 142 | 58 |
| 34900 | 56600 | -21700 | 142 | 59 |
| 123 | 56600 | -56477 | 142 | 60 |
| 20200 | 56600 | -36400 | 142 | 61 |
| 104 | 56600 | -56496 | 142 | 62 |
| 433 | 56600 | -56167 | 142 | 63 |

| | | | | |
|---|---|---|---|---|
| 751 | 56600 | -55849 | 142 | 64 |
| 8598 | 56600 | -48002 | 142 | 65 |
| 41190 | 56600 | -15410 | 142 | 66 |
| | | | | |
| 72000 2c | 58700 M6 | 13300 | 143 | 66 |
| 17200 | 58700 M6 | -41500 | 143 | 67 |
| 14100 | 58700 M6 | -44600 | 143 | 68 |
| 34900 | 58700 M6 | -23800 | 143 | 69 |
| 123 | 58700 M6 | -58577 | 143 | 70 |
| 20200 | 58700 M6 | -38500 | 143 | 71 |
| 104 | 58700 M6 | -58596 | 143 | 72 |
| 433 | 58700 M6 | -58267 | 143 | 73 |
| 751 | 58700 M6 | -57949 | 143 | 74 |
| 8598 | 58700 M6 | -50102 | 143 | 75 |
| 41190 | 58700 M6 | -17510 | 143 | 76 |
| | | | | |
| 17200 | 72000 2c | -54800 | 143 | 77 |
| 14100 | 72000 2c | -57900 | 143 | 78 |
| 34900 | 72000 2c | -37100 | 143 | 79 |
| 123 | 72000 2c | -71877 | 143 | 80 |
| 20200 | 72000 2c | -51800 | 143 | 81 |
| 104 | 72000 2c | -71896 | 143 | 82 |
| 433 | 72000 2c | -71567 | 143 | 83 |
| 751 | 72000 2c | -71249 | 143 | 84 |
| 8598 | 72000 2c | -63402 | 143 | 85 |
| 41190 | 72000 2c | -30810 | 143 | 86 |
| | | | | |
| 14100 | 17200 | -3100 | 143 | 87 |
| 34900 | 17200 | 17700 | 144 | 87 |
| 123 | 17200 | -17077 | 144 | 88 |
| 20200 | 17200 | 3000 | 145 | 88 |
| 104 | 17200 | -17096 | 145 | 89 |
| 433 | 17200 | -16767 | 145 | 90 |
| 751 | 17200 | -16449 | 145 | 91 |
| 8598 | 17200 | -8602 | 145 | 92 |
| 41190 | 17200 | 23990 | 146 | 92 |
| | | | | |
| 34900 | 14100 | 20800 | 147 | 92 |
| 123 | 14100 | -13977 | 147 | 93 |
| 20200 | 14100 | 6100 | 148 | 93 |
| 104 | 14100 | -13996 | 148 | 94 |
| 433 | 14100 | -13667 | 148 | 95 |
| 751 | 14100 | -13349 | 148 | 96 |
| 8598 | 14100 | -5502 | 148 | 97 |
| 41190 | 14100 | 27090 | 149 | 97 |
| | | | | |
| 123 | 34900 | -34777 | 149 | 98 |
| 20200 | 34900 | -14700 | 149 | 99 |
| 104 | 34900 | -34796 | 149 | 100 |
| 433 | 34900 | -34467 | 149 | 101 |
| 751 | 34900 | -34149 | 149 | 102 |
| 8598 | 34900 | -26302 | 149 | 103 |
| 41190 | 34900 | 6290 | 150 | 103 |
| | | | | |
| 20200 | 123 | 20077 | 151 | 103 |
| 104 | 123 | -19 | 151 | 104 |
| 433 | 123 | 310 | 152 | 104 |

| | | | | |
|---|---|---|---|---|
| 751 | 123 | 628 | 153 | 104 |
| 8598 | 123 | 8475 | 154 | 104 |
| 41190 | 123 | 41067 | 155 | 104 |
| | | | | |
| 104 | 20200 | -20096 | 155 | 105 |
| 433 | 20200 | -19767 | 155 | 106 |
| 751 | 20200 | -19449 | 155 | 107 |
| 8598 | 20200 | -11602 | 155 | 108 |
| 41190 | 20200 | 20990 | 156 | 108 |
| | | | | |
| 433 | 104 | 329 | 157 | 108 |
| 751 | 104 | 647 | 158 | 108 |
| 8598 | 104 | 8494 | 159 | 108 |
| 41190 | 104 | 41086 | 160 | 108 |
| | | | | |
| 751 | 433 | 318 | 161 | 108 |
| 8598 | 433 | 8165 | 162 | 108 |
| 41190 | 433 | 40757 | 163 | 108 |
| | | | | |
| 8598 | 751 | 7847 | 164 | 108 |
| 41190 | 751 | 40439 | 165 | 108 |
| | | | | |
| 41190 | 8598 | 32592 | 166 | 108 |

S Statistic = 166 - 108 = 58

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |

There are 2 time periods with multiple data

A = 0
B = 36
C = 0

D = 0
E = 0
F = 4
a = 29256
b = 109296
c = 1104
Group Variance = 1623.33
Z-Score = 1.41472
Comparison Level at 95% confidence level = -1.65463 (downward trend)
1.41472 >= -1.65463 indicating no evidence of a downward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RW03R-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 11250 | 3063 | 8187 | 1 | 0 |
| 16920 | 3063 | 13857 | 2 | 0 |
| 196.1 | 3063 | -2866.9 | 2 | 1 |
| ND<250 U | 3063 | -2813 | 2 | 2 |
| | | | | |
| 16920 | 11250 | 5670 | 3 | 2 |
| 196.1 | 11250 | -11053.9 | 3 | 3 |
| ND<250 U | 11250 | -11000 | 3 | 4 |
| | | | | |
| 196.1 | 16920 | -16723.9 | 3 | 5 |
| ND<250 U | 16920 | -16670 | 3 | 6 |
| | | | | |
| ND<250 U | 196.1 | 53.9 | 4 | 6 |

S Statistic = 4 - 6 = -2

Comparing at 95% confidence level (downward trend)

Probability of obtaining S >= 2 is 0.408

S > 0 or 0.408 > 0.05 indicating no evidence of a downward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RW05-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 1730 | 374 | 1356 | 1 | 0 |
| 1730 | 374 | 1356 | 2 | 0 |
| 328 | 374 | -46 | 2 | 1 |
| 349 | 374 | -25 | 2 | 2 |
| 502 | 374 | 128 | 3 | 2 |
| 205 | 374 | -169 | 3 | 3 |
| 173 | 374 | -201 | 3 | 4 |
| 402 | 374 | 28 | 4 | 4 |
| 282 | 374 | -92 | 4 | 5 |
| 110 | 374 | -264 | 4 | 6 |
| 490 1c | 374 | 116 | 5 | 6 |
| 7.5 J2c | 374 | -366.5 | 5 | 7 |
| 76600 | 374 | 76226 | 6 | 7 |
| | | | | |
| 1730 | 1730 | 0 | 6 | 7 |
| 328 | 1730 | -1402 | 6 | 8 |
| 349 | 1730 | -1381 | 6 | 9 |
| 502 | 1730 | -1228 | 6 | 10 |
| 205 | 1730 | -1525 | 6 | 11 |
| 173 | 1730 | -1557 | 6 | 12 |
| 402 | 1730 | -1328 | 6 | 13 |
| 282 | 1730 | -1448 | 6 | 14 |
| 110 | 1730 | -1620 | 6 | 15 |
| 490 1c | 1730 | -1240 | 6 | 16 |
| 7.5 J2c | 1730 | -1722.5 | 6 | 17 |
| 76600 | 1730 | 74870 | 7 | 17 |
| | | | | |
| 328 | 1730 | -1402 | 7 | 18 |
| 349 | 1730 | -1381 | 7 | 19 |
| 502 | 1730 | -1228 | 7 | 20 |
| 205 | 1730 | -1525 | 7 | 21 |
| 173 | 1730 | -1557 | 7 | 22 |
| 402 | 1730 | -1328 | 7 | 23 |
| 282 | 1730 | -1448 | 7 | 24 |
| 110 | 1730 | -1620 | 7 | 25 |
| 490 1c | 1730 | -1240 | 7 | 26 |
| 7.5 J2c | 1730 | -1722.5 | 7 | 27 |
| 76600 | 1730 | 74870 | 8 | 27 |
| | | | | |
| 349 | 328 | 21 | 9 | 27 |
| 502 | 328 | 174 | 10 | 27 |
| 205 | 328 | -123 | 10 | 28 |
| 173 | 328 | -155 | 10 | 29 |
| 402 | 328 | 74 | 11 | 29 |
| 282 | 328 | -46 | 11 | 30 |
| 110 | 328 | -218 | 11 | 31 |
| 490 1c | 328 | 162 | 12 | 31 |

| | | | | |
|---|---|---|---|---|
| 7.5 J2c | 328 | -320.5 | 12 | 32 |
| 76600 | 328 | 76272 | 13 | 32 |
| | | | | |
| 502 | 349 | 153 | 14 | 32 |
| 205 | 349 | -144 | 14 | 33 |
| 173 | 349 | -176 | 14 | 34 |
| 402 | 349 | 53 | 15 | 34 |
| 282 | 349 | -67 | 15 | 35 |
| 110 | 349 | -239 | 15 | 36 |
| 490 1c | 349 | 141 | 16 | 36 |
| 7.5 J2c | 349 | -341.5 | 16 | 37 |
| 76600 | 349 | 76251 | 17 | 37 |
| | | | | |
| 205 | 502 | -297 | 17 | 38 |
| 173 | 502 | -329 | 17 | 39 |
| 402 | 502 | -100 | 17 | 40 |
| 282 | 502 | -220 | 17 | 41 |
| 110 | 502 | -392 | 17 | 42 |
| 490 1c | 502 | -12 | 17 | 43 |
| 7.5 J2c | 502 | -494.5 | 17 | 44 |
| 76600 | 502 | 76098 | 18 | 44 |
| | | | | |
| 173 | 205 | -32 | 18 | 45 |
| 402 | 205 | 197 | 19 | 45 |
| 282 | 205 | 77 | 20 | 45 |
| 110 | 205 | -95 | 20 | 46 |
| 490 1c | 205 | 285 | 21 | 46 |
| 7.5 J2c | 205 | -197.5 | 21 | 47 |
| 76600 | 205 | 76395 | 22 | 47 |
| | | | | |
| 402 | 173 | 229 | 23 | 47 |
| 282 | 173 | 109 | 24 | 47 |
| 110 | 173 | -63 | 24 | 48 |
| 490 1c | 173 | 317 | 25 | 48 |
| 7.5 J2c | 173 | -165.5 | 25 | 49 |
| 76600 | 173 | 76427 | 26 | 49 |
| | | | | |
| 282 | 402 | -120 | 26 | 50 |
| 110 | 402 | -292 | 26 | 51 |
| 490 1c | 402 | 88 | 27 | 51 |
| 7.5 J2c | 402 | -394.5 | 27 | 52 |
| 76600 | 402 | 76198 | 28 | 52 |
| | | | | |
| 110 | 282 | -172 | 28 | 53 |
| 490 1c | 282 | 208 | 29 | 53 |
| 7.5 J2c | 282 | -274.5 | 29 | 54 |
| 76600 | 282 | 76318 | 30 | 54 |
| | | | | |
| 490 1c | 110 | 380 | 31 | 54 |
| 7.5 J2c | 110 | -102.5 | 31 | 55 |
| 76600 | 110 | 76490 | 32 | 55 |
| | | | | |
| 7.5 J2c | 490 1c | Same Date | 32 | 55 |
| 76600 | 490 1c | 76110 | 33 | 55 |
| | | | | |
| 76600 | 7.5 J2c | 76592.5 | 34 | 55 |

S Statistic = 34 - 55 = -21

| Tied Group | Value | Members |
|---|---|---|
| 1 | 1730 | 2 |

| Time Period | Observations |
|---|---|
| 6/1/2017 | 1 |
| 7/1/2017 | 1 |
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 6/1/2020 | 1 |

There are 1 time periods with multiple data

A = 18
B = 18
C = 0
D = 0
E = 2
F = 2
a = 6006
b = 19656
c = 364
Group Variance = 331.678
Z-Score = -1.09818
Comparison Level at 95% confidence level = -1.65463 (downward trend)
-1.09818 >= -1.65463 indicating no evidence of a downward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RW05R-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 68400 1c3c | 66800 2c | Same Date | 0 | 0 |
| 71700 2c | 66800 2c | 4900 | 1 | 0 |
| 83400 | 66800 2c | 16600 | 2 | 0 |
| 70700 | 66800 2c | 3900 | 3 | 0 |
| 80000 ML1c | 66800 2c | 13200 | 4 | 0 |
| 68200 1c | 66800 2c | 1400 | 5 | 0 |
| 79000 | 66800 2c | 12200 | 6 | 0 |
| ND<100 U | 66800 2c | -66700 | 6 | 1 |
| 55200 | 66800 2c | -11600 | 6 | 2 |
| 60560 | 66800 2c | -6240 | 6 | 3 |
| 53290 | 66800 2c | -13510 | 6 | 4 |
| 63410 | 66800 2c | -3390 | 6 | 5 |
| 60490 | 66800 2c | -6310 | 6 | 6 |
| 81220 | 66800 2c | 14420 | 7 | 6 |
| | | | | |
| 71700 2c | 68400 1c3c | 3300 | 8 | 6 |
| 83400 | 68400 1c3c | 15000 | 9 | 6 |
| 70700 | 68400 1c3c | 2300 | 10 | 6 |
| 80000 ML1c | 68400 1c3c | 11600 | 11 | 6 |
| 68200 1c | 68400 1c3c | -200 | 11 | 7 |
| 79000 | 68400 1c3c | 10600 | 12 | 7 |
| ND<100 U | 68400 1c3c | -68300 | 12 | 8 |
| 55200 | 68400 1c3c | -13200 | 12 | 9 |
| 60560 | 68400 1c3c | -7840 | 12 | 10 |
| 53290 | 68400 1c3c | -15110 | 12 | 11 |
| 63410 | 68400 1c3c | -4990 | 12 | 12 |
| 60490 | 68400 1c3c | -7910 | 12 | 13 |
| 81220 | 68400 1c3c | 12820 | 13 | 13 |
| | | | | |
| 83400 | 71700 2c | 11700 | 14 | 13 |
| 70700 | 71700 2c | -1000 | 14 | 14 |
| 80000 ML1c | 71700 2c | 8300 | 15 | 14 |
| 68200 1c | 71700 2c | -3500 | 15 | 15 |
| 79000 | 71700 2c | 7300 | 16 | 15 |
| ND<100 U | 71700 2c | -71600 | 16 | 16 |
| 55200 | 71700 2c | -16500 | 16 | 17 |
| 60560 | 71700 2c | -11140 | 16 | 18 |
| 53290 | 71700 2c | -18410 | 16 | 19 |
| 63410 | 71700 2c | -8290 | 16 | 20 |
| 60490 | 71700 2c | -11210 | 16 | 21 |
| 81220 | 71700 2c | 9520 | 17 | 21 |
| | | | | |
| 70700 | 83400 | -12700 | 17 | 22 |
| 80000 ML1c | 83400 | -3400 | 17 | 23 |
| 68200 1c | 83400 | -15200 | 17 | 24 |
| 79000 | 83400 | -4400 | 17 | 25 |
| ND<100 U | 83400 | -83300 | 17 | 26 |

| | | | | |
|---|---|---|---|---|
| 55200 | 83400 | -28200 | 17 | 27 |
| 60560 | 83400 | -22840 | 17 | 28 |
| 53290 | 83400 | -30110 | 17 | 29 |
| 63410 | 83400 | -19990 | 17 | 30 |
| 60490 | 83400 | -22910 | 17 | 31 |
| 81220 | 83400 | -2180 | 17 | 32 |
| | | | | |
| 80000 ML1c | 70700 | 9300 | 18 | 32 |
| 68200 1c | 70700 | -2500 | 18 | 33 |
| 79000 | 70700 | 8300 | 19 | 33 |
| ND<100 U | 70700 | -70600 | 19 | 34 |
| 55200 | 70700 | -15500 | 19 | 35 |
| 60560 | 70700 | -10140 | 19 | 36 |
| 53290 | 70700 | -17410 | 19 | 37 |
| 63410 | 70700 | -7290 | 19 | 38 |
| 60490 | 70700 | -10210 | 19 | 39 |
| 81220 | 70700 | 10520 | 20 | 39 |
| | | | | |
| 68200 1c | 80000 ML1c | -11800 | 20 | 40 |
| 79000 | 80000 ML1c | -1000 | 20 | 41 |
| ND<100 U | 80000 ML1c | -79900 | 20 | 42 |
| 55200 | 80000 ML1c | -24800 | 20 | 43 |
| 60560 | 80000 ML1c | -19440 | 20 | 44 |
| 53290 | 80000 ML1c | -26710 | 20 | 45 |
| 63410 | 80000 ML1c | -16590 | 20 | 46 |
| 60490 | 80000 ML1c | -19510 | 20 | 47 |
| 81220 | 80000 ML1c | 1220 | 21 | 47 |
| | | | | |
| 79000 | 68200 1c | 10800 | 22 | 47 |
| ND<100 U | 68200 1c | -68100 | 22 | 48 |
| 55200 | 68200 1c | -13000 | 22 | 49 |
| 60560 | 68200 1c | -7640 | 22 | 50 |
| 53290 | 68200 1c | -14910 | 22 | 51 |
| 63410 | 68200 1c | -4790 | 22 | 52 |
| 60490 | 68200 1c | -7710 | 22 | 53 |
| 81220 | 68200 1c | 13020 | 23 | 53 |
| | | | | |
| ND<100 U | 79000 | -78900 | 23 | 54 |
| 55200 | 79000 | -23800 | 23 | 55 |
| 60560 | 79000 | -18440 | 23 | 56 |
| 53290 | 79000 | -25710 | 23 | 57 |
| 63410 | 79000 | -15590 | 23 | 58 |
| 60490 | 79000 | -18510 | 23 | 59 |
| 81220 | 79000 | 2220 | 24 | 59 |
| | | | | |
| 55200 | ND<100 U | 55100 | 25 | 59 |
| 60560 | ND<100 U | 60460 | 26 | 59 |
| 53290 | ND<100 U | 53190 | 27 | 59 |
| 63410 | ND<100 U | 63310 | 28 | 59 |
| 60490 | ND<100 U | 60390 | 29 | 59 |
| 81220 | ND<100 U | 81120 | 30 | 59 |
| | | | | |
| 60560 | 55200 | 5360 | 31 | 59 |
| 53290 | 55200 | -1910 | 31 | 60 |
| 63410 | 55200 | 8210 | 32 | 60 |
| 60490 | 55200 | 5290 | 33 | 60 |
| 81220 | 55200 | 26020 | 34 | 60 |

| | | | | |
|---|---|---|---|---|
| 53290 | 60560 | -7270 | 34 | 61 |
| 63410 | 60560 | 2850 | 35 | 61 |
| 60490 | 60560 | -70 | 35 | 62 |
| 81220 | 60560 | 20660 | 36 | 62 |
| | | | | |
| 63410 | 53290 | 10120 | 37 | 62 |
| 60490 | 53290 | 7200 | 38 | 62 |
| 81220 | 53290 | 27930 | 39 | 62 |
| | | | | |
| 60490 | 63410 | -2920 | 39 | 63 |
| 81220 | 63410 | 17810 | 40 | 63 |
| | | | | |
| 81220 | 60490 | 20730 | 41 | 63 |

S Statistic = 41 - 63 = -22

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 0
B = 18
C = 0
D = 0
E = 0
F = 2
a = 7350
b = 24570
c = 420
Group Variance = 407.333
Z-Score = -1.04051
Comparison Level at 95% confidence level = -1.65463 (downward trend)
-1.04051 >= -1.65463 indicating no evidence of a downward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RW06-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 1680 | 1900 | -220 | 0 | 1 |
| 1420 | 1900 | -480 | 0 | 2 |
| 999 | 1900 | -901 | 0 | 3 |
| 876 | 1900 | -1024 | 0 | 4 |
| 1690 | 1900 | -210 | 0 | 5 |
| 1340 | 1900 | -560 | 0 | 6 |
| 508 | 1900 | -1392 | 0 | 7 |
| 615 | 1900 | -1285 | 0 | 8 |
| 909 | 1900 | -991 | 0 | 9 |
| 1360 | 1900 | -540 | 0 | 10 |
| 1950 | 1900 | 50 | 1 | 10 |
| 27900 | 1900 | 26000 | 2 | 10 |
| 191 | 1900 | -1709 | 2 | 11 |
| 90100 | 1900 | 88200 | 3 | 11 |
| 122000 2c | 1900 | 120100 | 4 | 11 |
| 128000 1c | 1900 | 126100 | 5 | 11 |
| 108000 | 1900 | 106100 | 6 | 11 |
| 109000 | 1900 | 107100 | 7 | 11 |
| 122000 | 1900 | 120100 | 8 | 11 |
| 116000 | 1900 | 114100 | 9 | 11 |
| 117000 | 1900 | 115100 | 10 | 11 |
| 94400 | 1900 | 92500 | 11 | 11 |
| 111000 ML | 1900 | 109100 | 12 | 11 |
| 79.7 | 1900 | -1820.3 | 12 | 12 |
| 109000 | 1900 | 107100 | 13 | 12 |
| 85500 | 1900 | 83600 | 14 | 12 |
| ND<100 U | 1900 | -1800 | 14 | 13 |
| 97570 | 1900 | 95670 | 15 | 13 |
| 51260 | 1900 | 49360 | 16 | 13 |
| | | | | |
| 1420 | 1680 | -260 | 16 | 14 |
| 999 | 1680 | -681 | 16 | 15 |
| 876 | 1680 | -804 | 16 | 16 |
| 1690 | 1680 | 10 | 17 | 16 |
| 1340 | 1680 | -340 | 17 | 17 |
| 508 | 1680 | -1172 | 17 | 18 |
| 615 | 1680 | -1065 | 17 | 19 |
| 909 | 1680 | -771 | 17 | 20 |
| 1360 | 1680 | -320 | 17 | 21 |
| 1950 | 1680 | 270 | 18 | 21 |
| 27900 | 1680 | 26220 | 19 | 21 |
| 191 | 1680 | -1489 | 19 | 22 |
| 90100 | 1680 | 88420 | 20 | 22 |
| 122000 2c | 1680 | 120320 | 21 | 22 |
| 128000 1c | 1680 | 126320 | 22 | 22 |
| 108000 | 1680 | 106320 | 23 | 22 |
| 109000 | 1680 | 107320 | 24 | 22 |

| | | | | |
|---|---|---|---|---|
| 122000 | 1680 | 120320 | 25 | 22 |
| 116000 | 1680 | 114320 | 26 | 22 |
| 117000 | 1680 | 115320 | 27 | 22 |
| 94400 | 1680 | 92720 | 28 | 22 |
| 111000 ML | 1680 | 109320 | 29 | 22 |
| 79.7 | 1680 | -1600.3 | 29 | 23 |
| 109000 | 1680 | 107320 | 30 | 23 |
| 85500 | 1680 | 83820 | 31 | 23 |
| ND<100 U | 1680 | -1580 | 31 | 24 |
| 97570 | 1680 | 95890 | 32 | 24 |
| 51260 | 1680 | 49580 | 33 | 24 |
| | | | | |
| 999 | 1420 | -421 | 33 | 25 |
| 876 | 1420 | -544 | 33 | 26 |
| 1690 | 1420 | 270 | 34 | 26 |
| 1340 | 1420 | -80 | 34 | 27 |
| 508 | 1420 | -912 | 34 | 28 |
| 615 | 1420 | -805 | 34 | 29 |
| 909 | 1420 | -511 | 34 | 30 |
| 1360 | 1420 | -60 | 34 | 31 |
| 1950 | 1420 | 530 | 35 | 31 |
| 27900 | 1420 | 26480 | 36 | 31 |
| 191 | 1420 | -1229 | 36 | 32 |
| 90100 | 1420 | 88680 | 37 | 32 |
| 122000 2c | 1420 | 120580 | 38 | 32 |
| 128000 1c | 1420 | 126580 | 39 | 32 |
| 108000 | 1420 | 106580 | 40 | 32 |
| 109000 | 1420 | 107580 | 41 | 32 |
| 122000 | 1420 | 120580 | 42 | 32 |
| 116000 | 1420 | 114580 | 43 | 32 |
| 117000 | 1420 | 115580 | 44 | 32 |
| 94400 | 1420 | 92980 | 45 | 32 |
| 111000 ML | 1420 | 109580 | 46 | 32 |
| 79.7 | 1420 | -1340.3 | 46 | 33 |
| 109000 | 1420 | 107580 | 47 | 33 |
| 85500 | 1420 | 84080 | 48 | 33 |
| ND<100 U | 1420 | -1320 | 48 | 34 |
| 97570 | 1420 | 96150 | 49 | 34 |
| 51260 | 1420 | 49840 | 50 | 34 |
| | | | | |
| 876 | 999 | -123 | 50 | 35 |
| 1690 | 999 | 691 | 51 | 35 |
| 1340 | 999 | 341 | 52 | 35 |
| 508 | 999 | -491 | 52 | 36 |
| 615 | 999 | -384 | 52 | 37 |
| 909 | 999 | -90 | 52 | 38 |
| 1360 | 999 | 361 | 53 | 38 |
| 1950 | 999 | 951 | 54 | 38 |
| 27900 | 999 | 26901 | 55 | 38 |
| 191 | 999 | -808 | 55 | 39 |
| 90100 | 999 | 89101 | 56 | 39 |
| 122000 2c | 999 | 121001 | 57 | 39 |
| 128000 1c | 999 | 127001 | 58 | 39 |
| 108000 | 999 | 107001 | 59 | 39 |
| 109000 | 999 | 108001 | 60 | 39 |
| 122000 | 999 | 121001 | 61 | 39 |
| 116000 | 999 | 115001 | 62 | 39 |

| | | | | |
|---|---|---|---|---|
| 117000 | 999 | 116001 | 63 | 39 |
| 94400 | 999 | 93401 | 64 | 39 |
| 111000 ML | 999 | 110001 | 65 | 39 |
| 79.7 | 999 | -919.3 | 65 | 40 |
| 109000 | 999 | 108001 | 66 | 40 |
| 85500 | 999 | 84501 | 67 | 40 |
| ND<100 U | 999 | -899 | 67 | 41 |
| 97570 | 999 | 96571 | 68 | 41 |
| 51260 | 999 | 50261 | 69 | 41 |
| | | | | |
| 1690 | 876 | 814 | 70 | 41 |
| 1340 | 876 | 464 | 71 | 41 |
| 508 | 876 | -368 | 71 | 42 |
| 615 | 876 | -261 | 71 | 43 |
| 909 | 876 | 33 | 72 | 43 |
| 1360 | 876 | 484 | 73 | 43 |
| 1950 | 876 | 1074 | 74 | 43 |
| 27900 | 876 | 27024 | 75 | 43 |
| 191 | 876 | -685 | 75 | 44 |
| 90100 | 876 | 89224 | 76 | 44 |
| 122000 2c | 876 | 121124 | 77 | 44 |
| 128000 1c | 876 | 127124 | 78 | 44 |
| 108000 | 876 | 107124 | 79 | 44 |
| 109000 | 876 | 108124 | 80 | 44 |
| 122000 | 876 | 121124 | 81 | 44 |
| 116000 | 876 | 115124 | 82 | 44 |
| 117000 | 876 | 116124 | 83 | 44 |
| 94400 | 876 | 93524 | 84 | 44 |
| 111000 ML | 876 | 110124 | 85 | 44 |
| 79.7 | 876 | -796.3 | 85 | 45 |
| 109000 | 876 | 108124 | 86 | 45 |
| 85500 | 876 | 84624 | 87 | 45 |
| ND<100 U | 876 | -776 | 87 | 46 |
| 97570 | 876 | 96694 | 88 | 46 |
| 51260 | 876 | 50384 | 89 | 46 |
| | | | | |
| 1340 | 1690 | -350 | 89 | 47 |
| 508 | 1690 | -1182 | 89 | 48 |
| 615 | 1690 | -1075 | 89 | 49 |
| 909 | 1690 | -781 | 89 | 50 |
| 1360 | 1690 | -330 | 89 | 51 |
| 1950 | 1690 | 260 | 90 | 51 |
| 27900 | 1690 | 26210 | 91 | 51 |
| 191 | 1690 | -1499 | 91 | 52 |
| 90100 | 1690 | 88410 | 92 | 52 |
| 122000 2c | 1690 | 120310 | 93 | 52 |
| 128000 1c | 1690 | 126310 | 94 | 52 |
| 108000 | 1690 | 106310 | 95 | 52 |
| 109000 | 1690 | 107310 | 96 | 52 |
| 122000 | 1690 | 120310 | 97 | 52 |
| 116000 | 1690 | 114310 | 98 | 52 |
| 117000 | 1690 | 115310 | 99 | 52 |
| 94400 | 1690 | 92710 | 100 | 52 |
| 111000 ML | 1690 | 109310 | 101 | 52 |
| 79.7 | 1690 | -1610.3 | 101 | 53 |
| 109000 | 1690 | 107310 | 102 | 53 |
| 85500 | 1690 | 83810 | 103 | 53 |

| | | | | |
|---|---|---|---|---|
| ND<100 U | 1690 | -1590 | 103 | 54 |
| 97570 | 1690 | 95880 | 104 | 54 |
| 51260 | 1690 | 49570 | 105 | 54 |
| | | | | |
| 508 | 1340 | -832 | 105 | 55 |
| 615 | 1340 | -725 | 105 | 56 |
| 909 | 1340 | -431 | 105 | 57 |
| 1360 | 1340 | 20 | 106 | 57 |
| 1950 | 1340 | 610 | 107 | 57 |
| 27900 | 1340 | 26560 | 108 | 57 |
| 191 | 1340 | -1149 | 108 | 58 |
| 90100 | 1340 | 88760 | 109 | 58 |
| 122000 2c | 1340 | 120660 | 110 | 58 |
| 128000 1c | 1340 | 126660 | 111 | 58 |
| 108000 | 1340 | 106660 | 112 | 58 |
| 109000 | 1340 | 107660 | 113 | 58 |
| 122000 | 1340 | 120660 | 114 | 58 |
| 116000 | 1340 | 114660 | 115 | 58 |
| 117000 | 1340 | 115660 | 116 | 58 |
| 94400 | 1340 | 93060 | 117 | 58 |
| 111000 ML | 1340 | 109660 | 118 | 58 |
| 79.7 | 1340 | -1260.3 | 118 | 59 |
| 109000 | 1340 | 107660 | 119 | 59 |
| 85500 | 1340 | 84160 | 120 | 59 |
| ND<100 U | 1340 | -1240 | 120 | 60 |
| 97570 | 1340 | 96230 | 121 | 60 |
| 51260 | 1340 | 49920 | 122 | 60 |
| | | | | |
| 615 | 508 | 107 | 123 | 60 |
| 909 | 508 | 401 | 124 | 60 |
| 1360 | 508 | 852 | 125 | 60 |
| 1950 | 508 | 1442 | 126 | 60 |
| 27900 | 508 | 27392 | 127 | 60 |
| 191 | 508 | -317 | 127 | 61 |
| 90100 | 508 | 89592 | 128 | 61 |
| 122000 2c | 508 | 121492 | 129 | 61 |
| 128000 1c | 508 | 127492 | 130 | 61 |
| 108000 | 508 | 107492 | 131 | 61 |
| 109000 | 508 | 108492 | 132 | 61 |
| 122000 | 508 | 121492 | 133 | 61 |
| 116000 | 508 | 115492 | 134 | 61 |
| 117000 | 508 | 116492 | 135 | 61 |
| 94400 | 508 | 93892 | 136 | 61 |
| 111000 ML | 508 | 110492 | 137 | 61 |
| 79.7 | 508 | -428.3 | 137 | 62 |
| 109000 | 508 | 108492 | 138 | 62 |
| 85500 | 508 | 84992 | 139 | 62 |
| ND<100 U | 508 | -408 | 139 | 63 |
| 97570 | 508 | 97062 | 140 | 63 |
| 51260 | 508 | 50752 | 141 | 63 |
| | | | | |
| 909 | 615 | 294 | 142 | 63 |
| 1360 | 615 | 745 | 143 | 63 |
| 1950 | 615 | 1335 | 144 | 63 |
| 27900 | 615 | 27285 | 145 | 63 |
| 191 | 615 | -424 | 145 | 64 |
| 90100 | 615 | 89485 | 146 | 64 |

| | | | | |
|---|---|---|---|---|
| 122000 2c | 615 | 121385 | 147 | 64 |
| 128000 1c | 615 | 127385 | 148 | 64 |
| 108000 | 615 | 107385 | 149 | 64 |
| 109000 | 615 | 108385 | 150 | 64 |
| 122000 | 615 | 121385 | 151 | 64 |
| 116000 | 615 | 115385 | 152 | 64 |
| 117000 | 615 | 116385 | 153 | 64 |
| 94400 | 615 | 93785 | 154 | 64 |
| 111000 ML | 615 | 110385 | 155 | 64 |
| 79.7 | 615 | -535.3 | 155 | 65 |
| 109000 | 615 | 108385 | 156 | 65 |
| 85500 | 615 | 84885 | 157 | 65 |
| ND<100 U | 615 | -515 | 157 | 66 |
| 97570 | 615 | 96955 | 158 | 66 |
| 51260 | 615 | 50645 | 159 | 66 |
| | | | | |
| 1360 | 909 | 451 | 160 | 66 |
| 1950 | 909 | 1041 | 161 | 66 |
| 27900 | 909 | 26991 | 162 | 66 |
| 191 | 909 | -718 | 162 | 67 |
| 90100 | 909 | 89191 | 163 | 67 |
| 122000 2c | 909 | 121091 | 164 | 67 |
| 128000 1c | 909 | 127091 | 165 | 67 |
| 108000 | 909 | 107091 | 166 | 67 |
| 109000 | 909 | 108091 | 167 | 67 |
| 122000 | 909 | 121091 | 168 | 67 |
| 116000 | 909 | 115091 | 169 | 67 |
| 117000 | 909 | 116091 | 170 | 67 |
| 94400 | 909 | 93491 | 171 | 67 |
| 111000 ML | 909 | 110091 | 172 | 67 |
| 79.7 | 909 | -829.3 | 172 | 68 |
| 109000 | 909 | 108091 | 173 | 68 |
| 85500 | 909 | 84591 | 174 | 68 |
| ND<100 U | 909 | -809 | 174 | 69 |
| 97570 | 909 | 96661 | 175 | 69 |
| 51260 | 909 | 50351 | 176 | 69 |
| | | | | |
| 1950 | 1360 | 590 | 177 | 69 |
| 27900 | 1360 | 26540 | 178 | 69 |
| 191 | 1360 | -1169 | 178 | 70 |
| 90100 | 1360 | 88740 | 179 | 70 |
| 122000 2c | 1360 | 120640 | 180 | 70 |
| 128000 1c | 1360 | 126640 | 181 | 70 |
| 108000 | 1360 | 106640 | 182 | 70 |
| 109000 | 1360 | 107640 | 183 | 70 |
| 122000 | 1360 | 120640 | 184 | 70 |
| 116000 | 1360 | 114640 | 185 | 70 |
| 117000 | 1360 | 115640 | 186 | 70 |
| 94400 | 1360 | 93040 | 187 | 70 |
| 111000 ML | 1360 | 109640 | 188 | 70 |
| 79.7 | 1360 | -1280.3 | 188 | 71 |
| 109000 | 1360 | 107640 | 189 | 71 |
| 85500 | 1360 | 84140 | 190 | 71 |
| ND<100 U | 1360 | -1260 | 190 | 72 |
| 97570 | 1360 | 96210 | 191 | 72 |
| 51260 | 1360 | 49900 | 192 | 72 |

| | | | | |
|---|---|---|---|---|
| 27900 | 1950 | 25950 | 193 | 72 |
| 191 | 1950 | -1759 | 193 | 73 |
| 90100 | 1950 | 88150 | 194 | 73 |
| 122000 2c | 1950 | 120050 | 195 | 73 |
| 128000 1c | 1950 | 126050 | 196 | 73 |
| 108000 | 1950 | 106050 | 197 | 73 |
| 109000 | 1950 | 107050 | 198 | 73 |
| 122000 | 1950 | 120050 | 199 | 73 |
| 116000 | 1950 | 114050 | 200 | 73 |
| 117000 | 1950 | 115050 | 201 | 73 |
| 94400 | 1950 | 92450 | 202 | 73 |
| 111000 ML | 1950 | 109050 | 203 | 73 |
| 79.7 | 1950 | -1870.3 | 203 | 74 |
| 109000 | 1950 | 107050 | 204 | 74 |
| 85500 | 1950 | 83550 | 205 | 74 |
| ND<100 U | 1950 | -1850 | 205 | 75 |
| 97570 | 1950 | 95620 | 206 | 75 |
| 51260 | 1950 | 49310 | 207 | 75 |
| | | | | |
| 191 | 27900 | -27709 | 207 | 76 |
| 90100 | 27900 | 62200 | 208 | 76 |
| 122000 2c | 27900 | 94100 | 209 | 76 |
| 128000 1c | 27900 | 100100 | 210 | 76 |
| 108000 | 27900 | 80100 | 211 | 76 |
| 109000 | 27900 | 81100 | 212 | 76 |
| 122000 | 27900 | 94100 | 213 | 76 |
| 116000 | 27900 | 88100 | 214 | 76 |
| 117000 | 27900 | 89100 | 215 | 76 |
| 94400 | 27900 | 66500 | 216 | 76 |
| 111000 ML | 27900 | 83100 | 217 | 76 |
| 79.7 | 27900 | -27820.3 | 217 | 77 |
| 109000 | 27900 | 81100 | 218 | 77 |
| 85500 | 27900 | 57600 | 219 | 77 |
| ND<100 U | 27900 | -27800 | 219 | 78 |
| 97570 | 27900 | 69670 | 220 | 78 |
| 51260 | 27900 | 23360 | 221 | 78 |
| | | | | |
| 90100 | 191 | 89909 | 222 | 78 |
| 122000 2c | 191 | 121809 | 223 | 78 |
| 128000 1c | 191 | 127809 | 224 | 78 |
| 108000 | 191 | 107809 | 225 | 78 |
| 109000 | 191 | 108809 | 226 | 78 |
| 122000 | 191 | 121809 | 227 | 78 |
| 116000 | 191 | 115809 | 228 | 78 |
| 117000 | 191 | 116809 | 229 | 78 |
| 94400 | 191 | 94209 | 230 | 78 |
| 111000 ML | 191 | 110809 | 231 | 78 |
| 79.7 | 191 | -111.3 | 231 | 79 |
| 109000 | 191 | 108809 | 232 | 79 |
| 85500 | 191 | 85309 | 233 | 79 |
| ND<100 U | 191 | -91 | 233 | 80 |
| 97570 | 191 | 97379 | 234 | 80 |
| 51260 | 191 | 51069 | 235 | 80 |
| | | | | |
| 122000 2c | 90100 | 31900 | 236 | 80 |
| 128000 1c | 90100 | 37900 | 237 | 80 |
| 108000 | 90100 | 17900 | 238 | 80 |

| | | | | |
|---|---|---|---|---|
| 109000 | 90100 | 18900 | 239 | 80 |
| 122000 | 90100 | 31900 | 240 | 80 |
| 116000 | 90100 | 25900 | 241 | 80 |
| 117000 | 90100 | 26900 | 242 | 80 |
| 94400 | 90100 | 4300 | 243 | 80 |
| 111000 ML | 90100 | 20900 | 244 | 80 |
| 79.7 | 90100 | -90020.3 | 244 | 81 |
| 109000 | 90100 | 18900 | 245 | 81 |
| 85500 | 90100 | -4600 | 245 | 82 |
| ND<100 U | 90100 | -90000 | 245 | 83 |
| 97570 | 90100 | 7470 | 246 | 83 |
| 51260 | 90100 | -38840 | 246 | 84 |
| | | | | |
| 128000 1c | 122000 2c | Same Date | 246 | 84 |
| 108000 | 122000 2c | -14000 | 246 | 85 |
| 109000 | 122000 2c | -13000 | 246 | 86 |
| 122000 | 122000 2c | 0 | 246 | 86 |
| 116000 | 122000 2c | -6000 | 246 | 87 |
| 117000 | 122000 2c | -5000 | 246 | 88 |
| 94400 | 122000 2c | -27600 | 246 | 89 |
| 111000 ML | 122000 2c | -11000 | 246 | 90 |
| 79.7 | 122000 2c | -121920 | 246 | 91 |
| 109000 | 122000 2c | -13000 | 246 | 92 |
| 85500 | 122000 2c | -36500 | 246 | 93 |
| ND<100 U | 122000 2c | -121900 | 246 | 94 |
| 97570 | 122000 2c | -24430 | 246 | 95 |
| 51260 | 122000 2c | -70740 | 246 | 96 |
| | | | | |
| 108000 | 128000 1c | -20000 | 246 | 97 |
| 109000 | 128000 1c | -19000 | 246 | 98 |
| 122000 | 128000 1c | -6000 | 246 | 99 |
| 116000 | 128000 1c | -12000 | 246 | 100 |
| 117000 | 128000 1c | -11000 | 246 | 101 |
| 94400 | 128000 1c | -33600 | 246 | 102 |
| 111000 ML | 128000 1c | -17000 | 246 | 103 |
| 79.7 | 128000 1c | -127920 | 246 | 104 |
| 109000 | 128000 1c | -19000 | 246 | 105 |
| 85500 | 128000 1c | -42500 | 246 | 106 |
| ND<100 U | 128000 1c | -127900 | 246 | 107 |
| 97570 | 128000 1c | -30430 | 246 | 108 |
| 51260 | 128000 1c | -76740 | 246 | 109 |
| | | | | |
| 109000 | 108000 | Same Date | 246 | 109 |
| 122000 | 108000 | 14000 | 247 | 109 |
| 116000 | 108000 | 8000 | 248 | 109 |
| 117000 | 108000 | 9000 | 249 | 109 |
| 94400 | 108000 | -13600 | 249 | 110 |
| 111000 ML | 108000 | 3000 | 250 | 110 |
| 79.7 | 108000 | -107920 | 250 | 111 |
| 109000 | 108000 | 1000 | 251 | 111 |
| 85500 | 108000 | -22500 | 251 | 112 |
| ND<100 U | 108000 | -107900 | 251 | 113 |
| 97570 | 108000 | -10430 | 251 | 114 |
| 51260 | 108000 | -56740 | 251 | 115 |
| | | | | |
| 122000 | 109000 | 13000 | 252 | 115 |
| 116000 | 109000 | 7000 | 253 | 115 |

| | | | | |
|---|---|---|---|---|
| 117000 | 109000 | 8000 | 254 | 115 |
| 94400 | 109000 | -14600 | 254 | 116 |
| 111000 ML | 109000 | 2000 | 255 | 116 |
| 79.7 | 109000 | -108920 | 255 | 117 |
| 109000 | 109000 | 0 | 255 | 117 |
| 85500 | 109000 | -23500 | 255 | 118 |
| ND<100 U | 109000 | -108900 | 255 | 119 |
| 97570 | 109000 | -11430 | 255 | 120 |
| 51260 | 109000 | -57740 | 255 | 121 |
| | | | | |
| 116000 | 122000 | -6000 | 255 | 122 |
| 117000 | 122000 | -5000 | 255 | 123 |
| 94400 | 122000 | -27600 | 255 | 124 |
| 111000 ML | 122000 | -11000 | 255 | 125 |
| 79.7 | 122000 | -121920 | 255 | 126 |
| 109000 | 122000 | -13000 | 255 | 127 |
| 85500 | 122000 | -36500 | 255 | 128 |
| ND<100 U | 122000 | -121900 | 255 | 129 |
| 97570 | 122000 | -24430 | 255 | 130 |
| 51260 | 122000 | -70740 | 255 | 131 |
| | | | | |
| 117000 | 116000 | 1000 | 256 | 131 |
| 94400 | 116000 | -21600 | 256 | 132 |
| 111000 ML | 116000 | -5000 | 256 | 133 |
| 79.7 | 116000 | -115920 | 256 | 134 |
| 109000 | 116000 | -7000 | 256 | 135 |
| 85500 | 116000 | -30500 | 256 | 136 |
| ND<100 U | 116000 | -115900 | 256 | 137 |
| 97570 | 116000 | -18430 | 256 | 138 |
| 51260 | 116000 | -64740 | 256 | 139 |
| | | | | |
| 94400 | 117000 | -22600 | 256 | 140 |
| 111000 ML | 117000 | -6000 | 256 | 141 |
| 79.7 | 117000 | -116920 | 256 | 142 |
| 109000 | 117000 | -8000 | 256 | 143 |
| 85500 | 117000 | -31500 | 256 | 144 |
| ND<100 U | 117000 | -116900 | 256 | 145 |
| 97570 | 117000 | -19430 | 256 | 146 |
| 51260 | 117000 | -65740 | 256 | 147 |
| | | | | |
| 111000 ML | 94400 | 16600 | 257 | 147 |
| 79.7 | 94400 | -94320.3 | 257 | 148 |
| 109000 | 94400 | 14600 | 258 | 148 |
| 85500 | 94400 | -8900 | 258 | 149 |
| ND<100 U | 94400 | -94300 | 258 | 150 |
| 97570 | 94400 | 3170 | 259 | 150 |
| 51260 | 94400 | -43140 | 259 | 151 |
| | | | | |
| 79.7 | 111000 ML | -110920 | 259 | 152 |
| 109000 | 111000 ML | -2000 | 259 | 153 |
| 85500 | 111000 ML | -25500 | 259 | 154 |
| ND<100 U | 111000 ML | -110900 | 259 | 155 |
| 97570 | 111000 ML | -13430 | 259 | 156 |
| 51260 | 111000 ML | -59740 | 259 | 157 |
| | | | | |
| 109000 | 79.7 | 108920 | 260 | 157 |
| 85500 | 79.7 | 85420.3 | 261 | 157 |

| | | | | |
|---|---|---|---|---|
| ND<100 U | 79.7 | 20.3 | 262 | 157 |
| 97570 | 79.7 | 97490.3 | 263 | 157 |
| 51260 | 79.7 | 51180.3 | 264 | 157 |
| | | | | |
| 85500 | 109000 | -23500 | 264 | 158 |
| ND<100 U | 109000 | -108900 | 264 | 159 |
| 97570 | 109000 | -11430 | 264 | 160 |
| 51260 | 109000 | -57740 | 264 | 161 |
| | | | | |
| ND<100 U | 85500 | -85400 | 264 | 162 |
| 97570 | 85500 | 12070 | 265 | 162 |
| 51260 | 85500 | -34240 | 265 | 163 |
| | | | | |
| 97570 | ND<100 U | 97470 | 266 | 163 |
| 51260 | ND<100 U | 51160 | 267 | 163 |
| | | | | |
| 51260 | 97570 | -46310 | 267 | 164 |

S Statistic = 267 - 164 = 103

| Tied Group | Value | Members |
|---|---|---|
| 1 | 122000 | 2 |
| 2 | 109000 | 2 |

| Time Period | Observations |
|---|---|
| 2/1/2017 | 1 |
| 3/1/2017 | 1 |
| 4/1/2017 | 1 |
| 5/1/2017 | 1 |
| 6/1/2017 | 1 |
| 7/1/2017 | 1 |
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |

There are 2 time periods with multiple data

A = 36

B = 36
C = 0
D = 0
E = 4
F = 4
a = 56550
b = 219240
c = 1740
Group Variance = 3137.68
Z-Score = 1.82094
Comparison Level at 95% confidence level = -1.65463 (downward trend)
1.82094 >= -1.65463 indicating no evidence of a downward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RW07-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 1210 | 944 | 266 | 1 | 0 |
| 364 | 944 | -580 | 1 | 1 |
| 298 | 944 | -646 | 1 | 2 |
| 432 | 944 | -512 | 1 | 3 |
| 45.7 | 944 | -898.3 | 1 | 4 |
| 62.7 | 944 | -881.3 | 1 | 5 |
| 2840 | 944 | 1896 | 2 | 5 |
| 23.4 | 944 | -920.6 | 2 | 6 |
| 1650 | 944 | 706 | 3 | 6 |
| 39.8 | 944 | -904.2 | 3 | 7 |
| 70.6 | 944 | -873.4 | 3 | 8 |
| 756 | 944 | -188 | 3 | 9 |
| 26300 | 944 | 25356 | 4 | 9 |
| 12200 | 944 | 11256 | 5 | 9 |
| 24800 | 944 | 23856 | 6 | 9 |
| 24200 | 944 | 23256 | 7 | 9 |
| 132000 | 944 | 131056 | 8 | 9 |
| 136000 | 944 | 135056 | 9 | 9 |
| 48300 | 944 | 47356 | 10 | 9 |
| 16600 | 944 | 15656 | 11 | 9 |
| 39000 | 944 | 38056 | 12 | 9 |
| 400 | 944 | -544 | 12 | 10 |
| 53900 | 944 | 52956 | 13 | 10 |
| 65300 | 944 | 64356 | 14 | 10 |
| 47770 | 944 | 46826 | 15 | 10 |
| 307.2 | 944 | -636.8 | 15 | 11 |
| 50180 | 944 | 49236 | 16 | 11 |
| 499.8 | 944 | -444.2 | 16 | 12 |
| 8125 | 944 | 7181 | 17 | 12 |
| | | | | |
| 364 | 1210 | -846 | 17 | 13 |
| 298 | 1210 | -912 | 17 | 14 |
| 432 | 1210 | -778 | 17 | 15 |
| 45.7 | 1210 | -1164.3 | 17 | 16 |
| 62.7 | 1210 | -1147.3 | 17 | 17 |
| 2840 | 1210 | 1630 | 18 | 17 |
| 23.4 | 1210 | -1186.6 | 18 | 18 |
| 1650 | 1210 | 440 | 19 | 18 |
| 39.8 | 1210 | -1170.2 | 19 | 19 |
| 70.6 | 1210 | -1139.4 | 19 | 20 |
| 756 | 1210 | -454 | 19 | 21 |
| 26300 | 1210 | 25090 | 20 | 21 |
| 12200 | 1210 | 10990 | 21 | 21 |
| 24800 | 1210 | 23590 | 22 | 21 |
| 24200 | 1210 | 22990 | 23 | 21 |
| 132000 | 1210 | 130790 | 24 | 21 |
| 136000 | 1210 | 134790 | 25 | 21 |

| | | | | |
|---|---|---|---|---|
| 48300 | 1210 | 47090 | 26 | 21 |
| 16600 | 1210 | 15390 | 27 | 21 |
| 39000 | 1210 | 37790 | 28 | 21 |
| 400 | 1210 | -810 | 28 | 22 |
| 53900 | 1210 | 52690 | 29 | 22 |
| 65300 | 1210 | 64090 | 30 | 22 |
| 47770 | 1210 | 46560 | 31 | 22 |
| 307.2 | 1210 | -902.8 | 31 | 23 |
| 50180 | 1210 | 48970 | 32 | 23 |
| 499.8 | 1210 | -710.2 | 32 | 24 |
| 8125 | 1210 | 6915 | 33 | 24 |
| | | | | |
| 298 | 364 | -66 | 33 | 25 |
| 432 | 364 | 68 | 34 | 25 |
| 45.7 | 364 | -318.3 | 34 | 26 |
| 62.7 | 364 | -301.3 | 34 | 27 |
| 2840 | 364 | 2476 | 35 | 27 |
| 23.4 | 364 | -340.6 | 35 | 28 |
| 1650 | 364 | 1286 | 36 | 28 |
| 39.8 | 364 | -324.2 | 36 | 29 |
| 70.6 | 364 | -293.4 | 36 | 30 |
| 756 | 364 | 392 | 37 | 30 |
| 26300 | 364 | 25936 | 38 | 30 |
| 12200 | 364 | 11836 | 39 | 30 |
| 24800 | 364 | 24436 | 40 | 30 |
| 24200 | 364 | 23836 | 41 | 30 |
| 132000 | 364 | 131636 | 42 | 30 |
| 136000 | 364 | 135636 | 43 | 30 |
| 48300 | 364 | 47936 | 44 | 30 |
| 16600 | 364 | 16236 | 45 | 30 |
| 39000 | 364 | 38636 | 46 | 30 |
| 400 | 364 | 36 | 47 | 30 |
| 53900 | 364 | 53536 | 48 | 30 |
| 65300 | 364 | 64936 | 49 | 30 |
| 47770 | 364 | 47406 | 50 | 30 |
| 307.2 | 364 | -56.8 | 50 | 31 |
| 50180 | 364 | 49816 | 51 | 31 |
| 499.8 | 364 | 135.8 | 52 | 31 |
| 8125 | 364 | 7761 | 53 | 31 |
| | | | | |
| 432 | 298 | 134 | 54 | 31 |
| 45.7 | 298 | -252.3 | 54 | 32 |
| 62.7 | 298 | -235.3 | 54 | 33 |
| 2840 | 298 | 2542 | 55 | 33 |
| 23.4 | 298 | -274.6 | 55 | 34 |
| 1650 | 298 | 1352 | 56 | 34 |
| 39.8 | 298 | -258.2 | 56 | 35 |
| 70.6 | 298 | -227.4 | 56 | 36 |
| 756 | 298 | 458 | 57 | 36 |
| 26300 | 298 | 26002 | 58 | 36 |
| 12200 | 298 | 11902 | 59 | 36 |
| 24800 | 298 | 24502 | 60 | 36 |
| 24200 | 298 | 23902 | 61 | 36 |
| 132000 | 298 | 131702 | 62 | 36 |
| 136000 | 298 | 135702 | 63 | 36 |
| 48300 | 298 | 48002 | 64 | 36 |
| 16600 | 298 | 16302 | 65 | 36 |

| | | | | |
|---|---|---|---|---|
| 39000 | 298 | 38702 | 66 | 36 |
| 400 | 298 | 102 | 67 | 36 |
| 53900 | 298 | 53602 | 68 | 36 |
| 65300 | 298 | 65002 | 69 | 36 |
| 47770 | 298 | 47472 | 70 | 36 |
| 307.2 | 298 | 9.2 | 71 | 36 |
| 50180 | 298 | 49882 | 72 | 36 |
| 499.8 | 298 | 201.8 | 73 | 36 |
| 8125 | 298 | 7827 | 74 | 36 |
| | | | | |
| 45.7 | 432 | -386.3 | 74 | 37 |
| 62.7 | 432 | -369.3 | 74 | 38 |
| 2840 | 432 | 2408 | 75 | 38 |
| 23.4 | 432 | -408.6 | 75 | 39 |
| 1650 | 432 | 1218 | 76 | 39 |
| 39.8 | 432 | -392.2 | 76 | 40 |
| 70.6 | 432 | -361.4 | 76 | 41 |
| 756 | 432 | 324 | 77 | 41 |
| 26300 | 432 | 25868 | 78 | 41 |
| 12200 | 432 | 11768 | 79 | 41 |
| 24800 | 432 | 24368 | 80 | 41 |
| 24200 | 432 | 23768 | 81 | 41 |
| 132000 | 432 | 131568 | 82 | 41 |
| 136000 | 432 | 135568 | 83 | 41 |
| 48300 | 432 | 47868 | 84 | 41 |
| 16600 | 432 | 16168 | 85 | 41 |
| 39000 | 432 | 38568 | 86 | 41 |
| 400 | 432 | -32 | 86 | 42 |
| 53900 | 432 | 53468 | 87 | 42 |
| 65300 | 432 | 64868 | 88 | 42 |
| 47770 | 432 | 47338 | 89 | 42 |
| 307.2 | 432 | -124.8 | 89 | 43 |
| 50180 | 432 | 49748 | 90 | 43 |
| 499.8 | 432 | 67.8 | 91 | 43 |
| 8125 | 432 | 7693 | 92 | 43 |
| | | | | |
| 62.7 | 45.7 | 17 | 93 | 43 |
| 2840 | 45.7 | 2794.3 | 94 | 43 |
| 23.4 | 45.7 | -22.3 | 94 | 44 |
| 1650 | 45.7 | 1604.3 | 95 | 44 |
| 39.8 | 45.7 | -5.9 | 95 | 45 |
| 70.6 | 45.7 | 24.9 | 96 | 45 |
| 756 | 45.7 | 710.3 | 97 | 45 |
| 26300 | 45.7 | 26254.3 | 98 | 45 |
| 12200 | 45.7 | 12154.3 | 99 | 45 |
| 24800 | 45.7 | 24754.3 | 100 | 45 |
| 24200 | 45.7 | 24154.3 | 101 | 45 |
| 132000 | 45.7 | 131954 | 102 | 45 |
| 136000 | 45.7 | 135954 | 103 | 45 |
| 48300 | 45.7 | 48254.3 | 104 | 45 |
| 16600 | 45.7 | 16554.3 | 105 | 45 |
| 39000 | 45.7 | 38954.3 | 106 | 45 |
| 400 | 45.7 | 354.3 | 107 | 45 |
| 53900 | 45.7 | 53854.3 | 108 | 45 |
| 65300 | 45.7 | 65254.3 | 109 | 45 |
| 47770 | 45.7 | 47724.3 | 110 | 45 |
| 307.2 | 45.7 | 261.5 | 111 | 45 |

| | | | | |
|---|---|---|---|---|
| 50180 | 45.7 | 50134.3 | 112 | 45 |
| 499.8 | 45.7 | 454.1 | 113 | 45 |
| 8125 | 45.7 | 8079.3 | 114 | 45 |
| | | | | |
| 2840 | 62.7 | 2777.3 | 115 | 45 |
| 23.4 | 62.7 | -39.3 | 115 | 46 |
| 1650 | 62.7 | 1587.3 | 116 | 46 |
| 39.8 | 62.7 | -22.9 | 116 | 47 |
| 70.6 | 62.7 | 7.9 | 117 | 47 |
| 756 | 62.7 | 693.3 | 118 | 47 |
| 26300 | 62.7 | 26237.3 | 119 | 47 |
| 12200 | 62.7 | 12137.3 | 120 | 47 |
| 24800 | 62.7 | 24737.3 | 121 | 47 |
| 24200 | 62.7 | 24137.3 | 122 | 47 |
| 132000 | 62.7 | 131937 | 123 | 47 |
| 136000 | 62.7 | 135937 | 124 | 47 |
| 48300 | 62.7 | 48237.3 | 125 | 47 |
| 16600 | 62.7 | 16537.3 | 126 | 47 |
| 39000 | 62.7 | 38937.3 | 127 | 47 |
| 400 | 62.7 | 337.3 | 128 | 47 |
| 53900 | 62.7 | 53837.3 | 129 | 47 |
| 65300 | 62.7 | 65237.3 | 130 | 47 |
| 47770 | 62.7 | 47707.3 | 131 | 47 |
| 307.2 | 62.7 | 244.5 | 132 | 47 |
| 50180 | 62.7 | 50117.3 | 133 | 47 |
| 499.8 | 62.7 | 437.1 | 134 | 47 |
| 8125 | 62.7 | 8062.3 | 135 | 47 |
| | | | | |
| 23.4 | 2840 | -2816.6 | 135 | 48 |
| 1650 | 2840 | -1190 | 135 | 49 |
| 39.8 | 2840 | -2800.2 | 135 | 50 |
| 70.6 | 2840 | -2769.4 | 135 | 51 |
| 756 | 2840 | -2084 | 135 | 52 |
| 26300 | 2840 | 23460 | 136 | 52 |
| 12200 | 2840 | 9360 | 137 | 52 |
| 24800 | 2840 | 21960 | 138 | 52 |
| 24200 | 2840 | 21360 | 139 | 52 |
| 132000 | 2840 | 129160 | 140 | 52 |
| 136000 | 2840 | 133160 | 141 | 52 |
| 48300 | 2840 | 45460 | 142 | 52 |
| 16600 | 2840 | 13760 | 143 | 52 |
| 39000 | 2840 | 36160 | 144 | 52 |
| 400 | 2840 | -2440 | 144 | 53 |
| 53900 | 2840 | 51060 | 145 | 53 |
| 65300 | 2840 | 62460 | 146 | 53 |
| 47770 | 2840 | 44930 | 147 | 53 |
| 307.2 | 2840 | -2532.8 | 147 | 54 |
| 50180 | 2840 | 47340 | 148 | 54 |
| 499.8 | 2840 | -2340.2 | 148 | 55 |
| 8125 | 2840 | 5285 | 149 | 55 |
| | | | | |
| 1650 | 23.4 | 1626.6 | 150 | 55 |
| 39.8 | 23.4 | 16.4 | 151 | 55 |
| 70.6 | 23.4 | 47.2 | 152 | 55 |
| 756 | 23.4 | 732.6 | 153 | 55 |
| 26300 | 23.4 | 26276.6 | 154 | 55 |
| 12200 | 23.4 | 12176.6 | 155 | 55 |

| | | | | |
|---|---|---|---|---|
| 24800 | 23.4 | 24776.6 | 156 | 55 |
| 24200 | 23.4 | 24176.6 | 157 | 55 |
| 132000 | 23.4 | 131977 | 158 | 55 |
| 136000 | 23.4 | 135977 | 159 | 55 |
| 48300 | 23.4 | 48276.6 | 160 | 55 |
| 16600 | 23.4 | 16576.6 | 161 | 55 |
| 39000 | 23.4 | 38976.6 | 162 | 55 |
| 400 | 23.4 | 376.6 | 163 | 55 |
| 53900 | 23.4 | 53876.6 | 164 | 55 |
| 65300 | 23.4 | 65276.6 | 165 | 55 |
| 47770 | 23.4 | 47746.6 | 166 | 55 |
| 307.2 | 23.4 | 283.8 | 167 | 55 |
| 50180 | 23.4 | 50156.6 | 168 | 55 |
| 499.8 | 23.4 | 476.4 | 169 | 55 |
| 8125 | 23.4 | 8101.6 | 170 | 55 |
| | | | | |
| 39.8 | 1650 | -1610.2 | 170 | 56 |
| 70.6 | 1650 | -1579.4 | 170 | 57 |
| 756 | 1650 | -894 | 170 | 58 |
| 26300 | 1650 | 24650 | 171 | 58 |
| 12200 | 1650 | 10550 | 172 | 58 |
| 24800 | 1650 | 23150 | 173 | 58 |
| 24200 | 1650 | 22550 | 174 | 58 |
| 132000 | 1650 | 130350 | 175 | 58 |
| 136000 | 1650 | 134350 | 176 | 58 |
| 48300 | 1650 | 46650 | 177 | 58 |
| 16600 | 1650 | 14950 | 178 | 58 |
| 39000 | 1650 | 37350 | 179 | 58 |
| 400 | 1650 | -1250 | 179 | 59 |
| 53900 | 1650 | 52250 | 180 | 59 |
| 65300 | 1650 | 63650 | 181 | 59 |
| 47770 | 1650 | 46120 | 182 | 59 |
| 307.2 | 1650 | -1342.8 | 182 | 60 |
| 50180 | 1650 | 48530 | 183 | 60 |
| 499.8 | 1650 | -1150.2 | 183 | 61 |
| 8125 | 1650 | 6475 | 184 | 61 |
| | | | | |
| 70.6 | 39.8 | 30.8 | 185 | 61 |
| 756 | 39.8 | 716.2 | 186 | 61 |
| 26300 | 39.8 | 26260.2 | 187 | 61 |
| 12200 | 39.8 | 12160.2 | 188 | 61 |
| 24800 | 39.8 | 24760.2 | 189 | 61 |
| 24200 | 39.8 | 24160.2 | 190 | 61 |
| 132000 | 39.8 | 131960 | 191 | 61 |
| 136000 | 39.8 | 135960 | 192 | 61 |
| 48300 | 39.8 | 48260.2 | 193 | 61 |
| 16600 | 39.8 | 16560.2 | 194 | 61 |
| 39000 | 39.8 | 38960.2 | 195 | 61 |
| 400 | 39.8 | 360.2 | 196 | 61 |
| 53900 | 39.8 | 53860.2 | 197 | 61 |
| 65300 | 39.8 | 65260.2 | 198 | 61 |
| 47770 | 39.8 | 47730.2 | 199 | 61 |
| 307.2 | 39.8 | 267.4 | 200 | 61 |
| 50180 | 39.8 | 50140.2 | 201 | 61 |
| 499.8 | 39.8 | 460 | 202 | 61 |
| 8125 | 39.8 | 8085.2 | 203 | 61 |

| | | | | |
|---|---|---|---|---|
| 756 | 70.6 | 685.4 | 204 | 61 |
| 26300 | 70.6 | 26229.4 | 205 | 61 |
| 12200 | 70.6 | 12129.4 | 206 | 61 |
| 24800 | 70.6 | 24729.4 | 207 | 61 |
| 24200 | 70.6 | 24129.4 | 208 | 61 |
| 132000 | 70.6 | 131929 | 209 | 61 |
| 136000 | 70.6 | 135929 | 210 | 61 |
| 48300 | 70.6 | 48229.4 | 211 | 61 |
| 16600 | 70.6 | 16529.4 | 212 | 61 |
| 39000 | 70.6 | 38929.4 | 213 | 61 |
| 400 | 70.6 | 329.4 | 214 | 61 |
| 53900 | 70.6 | 53829.4 | 215 | 61 |
| 65300 | 70.6 | 65229.4 | 216 | 61 |
| 47770 | 70.6 | 47699.4 | 217 | 61 |
| 307.2 | 70.6 | 236.6 | 218 | 61 |
| 50180 | 70.6 | 50109.4 | 219 | 61 |
| 499.8 | 70.6 | 429.2 | 220 | 61 |
| 8125 | 70.6 | 8054.4 | 221 | 61 |
| | | | | |
| 26300 | 756 | 25544 | 222 | 61 |
| 12200 | 756 | 11444 | 223 | 61 |
| 24800 | 756 | 24044 | 224 | 61 |
| 24200 | 756 | 23444 | 225 | 61 |
| 132000 | 756 | 131244 | 226 | 61 |
| 136000 | 756 | 135244 | 227 | 61 |
| 48300 | 756 | 47544 | 228 | 61 |
| 16600 | 756 | 15844 | 229 | 61 |
| 39000 | 756 | 38244 | 230 | 61 |
| 400 | 756 | -356 | 230 | 62 |
| 53900 | 756 | 53144 | 231 | 62 |
| 65300 | 756 | 64544 | 232 | 62 |
| 47770 | 756 | 47014 | 233 | 62 |
| 307.2 | 756 | -448.8 | 233 | 63 |
| 50180 | 756 | 49424 | 234 | 63 |
| 499.8 | 756 | -256.2 | 234 | 64 |
| 8125 | 756 | 7369 | 235 | 64 |
| | | | | |
| 12200 | 26300 | -14100 | 235 | 65 |
| 24800 | 26300 | -1500 | 235 | 66 |
| 24200 | 26300 | -2100 | 235 | 67 |
| 132000 | 26300 | 105700 | 236 | 67 |
| 136000 | 26300 | 109700 | 237 | 67 |
| 48300 | 26300 | 22000 | 238 | 67 |
| 16600 | 26300 | -9700 | 238 | 68 |
| 39000 | 26300 | 12700 | 239 | 68 |
| 400 | 26300 | -25900 | 239 | 69 |
| 53900 | 26300 | 27600 | 240 | 69 |
| 65300 | 26300 | 39000 | 241 | 69 |
| 47770 | 26300 | 21470 | 242 | 69 |
| 307.2 | 26300 | -25992.8 | 242 | 70 |
| 50180 | 26300 | 23880 | 243 | 70 |
| 499.8 | 26300 | -25800.2 | 243 | 71 |
| 8125 | 26300 | -18175 | 243 | 72 |
| | | | | |
| 24800 | 12200 | 12600 | 244 | 72 |
| 24200 | 12200 | 12000 | 245 | 72 |
| 132000 | 12200 | 119800 | 246 | 72 |

| | | | | |
|---|---|---|---|---|
| 136000 | 12200 | 123800 | 247 | 72 |
| 48300 | 12200 | 36100 | 248 | 72 |
| 16600 | 12200 | 4400 | 249 | 72 |
| 39000 | 12200 | 26800 | 250 | 72 |
| 400 | 12200 | -11800 | 250 | 73 |
| 53900 | 12200 | 41700 | 251 | 73 |
| 65300 | 12200 | 53100 | 252 | 73 |
| 47770 | 12200 | 35570 | 253 | 73 |
| 307.2 | 12200 | -11892.8 | 253 | 74 |
| 50180 | 12200 | 37980 | 254 | 74 |
| 499.8 | 12200 | -11700.2 | 254 | 75 |
| 8125 | 12200 | -4075 | 254 | 76 |
| | | | | |
| 24200 | 24800 | Same Date | 254 | 76 |
| 132000 | 24800 | 107200 | 255 | 76 |
| 136000 | 24800 | 111200 | 256 | 76 |
| 48300 | 24800 | 23500 | 257 | 76 |
| 16600 | 24800 | -8200 | 257 | 77 |
| 39000 | 24800 | 14200 | 258 | 77 |
| 400 | 24800 | -24400 | 258 | 78 |
| 53900 | 24800 | 29100 | 259 | 78 |
| 65300 | 24800 | 40500 | 260 | 78 |
| 47770 | 24800 | 22970 | 261 | 78 |
| 307.2 | 24800 | -24492.8 | 261 | 79 |
| 50180 | 24800 | 25380 | 262 | 79 |
| 499.8 | 24800 | -24300.2 | 262 | 80 |
| 8125 | 24800 | -16675 | 262 | 81 |
| | | | | |
| 132000 | 24200 | 107800 | 263 | 81 |
| 136000 | 24200 | 111800 | 264 | 81 |
| 48300 | 24200 | 24100 | 265 | 81 |
| 16600 | 24200 | -7600 | 265 | 82 |
| 39000 | 24200 | 14800 | 266 | 82 |
| 400 | 24200 | -23800 | 266 | 83 |
| 53900 | 24200 | 29700 | 267 | 83 |
| 65300 | 24200 | 41100 | 268 | 83 |
| 47770 | 24200 | 23570 | 269 | 83 |
| 307.2 | 24200 | -23892.8 | 269 | 84 |
| 50180 | 24200 | 25980 | 270 | 84 |
| 499.8 | 24200 | -23700.2 | 270 | 85 |
| 8125 | 24200 | -16075 | 270 | 86 |
| | | | | |
| 136000 | 132000 | Same Date | 270 | 86 |
| 48300 | 132000 | -83700 | 270 | 87 |
| 16600 | 132000 | -115400 | 270 | 88 |
| 39000 | 132000 | -93000 | 270 | 89 |
| 400 | 132000 | -131600 | 270 | 90 |
| 53900 | 132000 | -78100 | 270 | 91 |
| 65300 | 132000 | -66700 | 270 | 92 |
| 47770 | 132000 | -84230 | 270 | 93 |
| 307.2 | 132000 | -131693 | 270 | 94 |
| 50180 | 132000 | -81820 | 270 | 95 |
| 499.8 | 132000 | -131500 | 270 | 96 |
| 8125 | 132000 | -123875 | 270 | 97 |
| | | | | |
| 48300 | 136000 | -87700 | 270 | 98 |
| 16600 | 136000 | -119400 | 270 | 99 |

| | | | | |
|---|---|---|---|---|
| 39000 | 136000 | -97000 | 270 | 100 |
| 400 | 136000 | -135600 | 270 | 101 |
| 53900 | 136000 | -82100 | 270 | 102 |
| 65300 | 136000 | -70700 | 270 | 103 |
| 47770 | 136000 | -88230 | 270 | 104 |
| 307.2 | 136000 | -135693 | 270 | 105 |
| 50180 | 136000 | -85820 | 270 | 106 |
| 499.8 | 136000 | -135500 | 270 | 107 |
| 8125 | 136000 | -127875 | 270 | 108 |
| | | | | |
| 16600 | 48300 | -31700 | 270 | 109 |
| 39000 | 48300 | -9300 | 270 | 110 |
| 400 | 48300 | -47900 | 270 | 111 |
| 53900 | 48300 | 5600 | 271 | 111 |
| 65300 | 48300 | 17000 | 272 | 111 |
| 47770 | 48300 | -530 | 272 | 112 |
| 307.2 | 48300 | -47992.8 | 272 | 113 |
| 50180 | 48300 | 1880 | 273 | 113 |
| 499.8 | 48300 | -47800.2 | 273 | 114 |
| 8125 | 48300 | -40175 | 273 | 115 |
| | | | | |
| 39000 | 16600 | 22400 | 274 | 115 |
| 400 | 16600 | -16200 | 274 | 116 |
| 53900 | 16600 | 37300 | 275 | 116 |
| 65300 | 16600 | 48700 | 276 | 116 |
| 47770 | 16600 | 31170 | 277 | 116 |
| 307.2 | 16600 | -16292.8 | 277 | 117 |
| 50180 | 16600 | 33580 | 278 | 117 |
| 499.8 | 16600 | -16100.2 | 278 | 118 |
| 8125 | 16600 | -8475 | 278 | 119 |
| | | | | |
| 400 | 39000 | -38600 | 278 | 120 |
| 53900 | 39000 | 14900 | 279 | 120 |
| 65300 | 39000 | 26300 | 280 | 120 |
| 47770 | 39000 | 8770 | 281 | 120 |
| 307.2 | 39000 | -38692.8 | 281 | 121 |
| 50180 | 39000 | 11180 | 282 | 121 |
| 499.8 | 39000 | -38500.2 | 282 | 122 |
| 8125 | 39000 | -30875 | 282 | 123 |
| | | | | |
| 53900 | 400 | 53500 | 283 | 123 |
| 65300 | 400 | 64900 | 284 | 123 |
| 47770 | 400 | 47370 | 285 | 123 |
| 307.2 | 400 | -92.8 | 285 | 124 |
| 50180 | 400 | 49780 | 286 | 124 |
| 499.8 | 400 | 99.8 | 287 | 124 |
| 8125 | 400 | 7725 | 288 | 124 |
| | | | | |
| 65300 | 53900 | 11400 | 289 | 124 |
| 47770 | 53900 | -6130 | 289 | 125 |
| 307.2 | 53900 | -53592.8 | 289 | 126 |
| 50180 | 53900 | -3720 | 289 | 127 |
| 499.8 | 53900 | -53400.2 | 289 | 128 |
| 8125 | 53900 | -45775 | 289 | 129 |
| | | | | |
| 47770 | 65300 | -17530 | 289 | 130 |
| 307.2 | 65300 | -64992.8 | 289 | 131 |

| | | | | |
|---|---|---|---|---|
| 50180 | 65300 | -15120 | 289 | 132 |
| 499.8 | 65300 | -64800.2 | 289 | 133 |
| 8125 | 65300 | -57175 | 289 | 134 |
| | | | | |
| 307.2 | 47770 | -47462.8 | 289 | 135 |
| 50180 | 47770 | 2410 | 290 | 135 |
| 499.8 | 47770 | -47270.2 | 290 | 136 |
| 8125 | 47770 | -39645 | 290 | 137 |
| | | | | |
| 50180 | 307.2 | 49872.8 | 291 | 137 |
| 499.8 | 307.2 | 192.6 | 292 | 137 |
| 8125 | 307.2 | 7817.8 | 293 | 137 |
| | | | | |
| 499.8 | 50180 | -49680.2 | 293 | 138 |
| 8125 | 50180 | -42055 | 293 | 139 |
| | | | | |
| 8125 | 499.8 | 7625.2 | 294 | 139 |

S Statistic = 294 - 139 = 155

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 2/1/2017 | 1 |
| 3/1/2017 | 1 |
| 4/1/2017 | 1 |
| 5/1/2017 | 1 |
| 6/1/2017 | 1 |
| 7/1/2017 | 1 |
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 2 time periods with multiple data

A = 0
B = 36
C = 0

D = 0
E = 0
F = 4
a = 56550
b = 219240
c = 1740
Group Variance = 3139.67
Z-Score = 2.74839
Comparison Level at 95% confidence level = -1.65463 (downward trend)
2.74839 >= -1.65463 indicating no evidence of a downward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RW08-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 44.6 | 178 | -133.4 | 0 | 1 |
| 85 | 178 | -93 | 0 | 2 |
| 188 | 178 | 10 | 1 | 2 |
| 71.9 | 178 | -106.1 | 1 | 3 |
| 153 | 178 | -25 | 1 | 4 |
| 49.8 | 178 | -128.2 | 1 | 5 |
| 69.4 | 178 | -108.6 | 1 | 6 |
| 16.9 | 178 | -161.1 | 1 | 7 |
| 21.5 | 178 | -156.5 | 1 | 8 |
| 21.4 | 178 | -156.6 | 1 | 9 |
| 108 | 178 | -70 | 1 | 10 |
| 1050 | 178 | 872 | 2 | 10 |
| 2540 | 178 | 2362 | 3 | 10 |
| 256 | 178 | 78 | 4 | 10 |
| ND<5 U2c | 178 | -173 | 4 | 11 |
| 112 1c | 178 | -66 | 4 | 12 |
| ND<5 U | 178 | -173 | 4 | 13 |
| 43.9 | 178 | -134.1 | 4 | 14 |
| 11.2 B | 178 | -166.8 | 4 | 15 |
| 48.9 | 178 | -129.1 | 4 | 16 |
| 33.4 | 178 | -144.6 | 4 | 17 |
| 4.5 J | 178 | -173.5 | 4 | 18 |
| 5.4 J1c | 178 | -172.6 | 4 | 19 |
| 28.3 | 178 | -149.7 | 4 | 20 |
| 2.6 JB | 178 | -175.4 | 4 | 21 |
| ND<10 U | 178 | -168 | 4 | 22 |
| ND<5 U | 178 | -173 | 4 | 23 |
| 62090 | 178 | 61912 | 5 | 23 |
| | | | | |
| 85 | 44.6 | 40.4 | 6 | 23 |
| 188 | 44.6 | 143.4 | 7 | 23 |
| 71.9 | 44.6 | 27.3 | 8 | 23 |
| 153 | 44.6 | 108.4 | 9 | 23 |
| 49.8 | 44.6 | 5.2 | 10 | 23 |
| 69.4 | 44.6 | 24.8 | 11 | 23 |
| 16.9 | 44.6 | -27.7 | 11 | 24 |
| 21.5 | 44.6 | -23.1 | 11 | 25 |
| 21.4 | 44.6 | -23.2 | 11 | 26 |
| 108 | 44.6 | 63.4 | 12 | 26 |
| 1050 | 44.6 | 1005.4 | 13 | 26 |
| 2540 | 44.6 | 2495.4 | 14 | 26 |
| 256 | 44.6 | 211.4 | 15 | 26 |
| ND<5 U2c | 44.6 | -39.6 | 15 | 27 |
| 112 1c | 44.6 | 67.4 | 16 | 27 |
| ND<5 U | 44.6 | -39.6 | 16 | 28 |
| 43.9 | 44.6 | -0.7 | 16 | 29 |
| 11.2 B | 44.6 | -33.4 | 16 | 30 |

| | | | | |
|---|---|---|---|---|
| 48.9 | 44.6 | 4.3 | 17 | 30 |
| 33.4 | 44.6 | -11.2 | 17 | 31 |
| 4.5 J | 44.6 | -40.1 | 17 | 32 |
| 5.4 J1c | 44.6 | -39.2 | 17 | 33 |
| 28.3 | 44.6 | -16.3 | 17 | 34 |
| 2.6 JB | 44.6 | -42 | 17 | 35 |
| ND<10 U | 44.6 | -34.6 | 17 | 36 |
| ND<5 U | 44.6 | -39.6 | 17 | 37 |
| 62090 | 44.6 | 62045.4 | 18 | 37 |
| | | | | |
| 188 | 85 | 103 | 19 | 37 |
| 71.9 | 85 | -13.1 | 19 | 38 |
| 153 | 85 | 68 | 20 | 38 |
| 49.8 | 85 | -35.2 | 20 | 39 |
| 69.4 | 85 | -15.6 | 20 | 40 |
| 16.9 | 85 | -68.1 | 20 | 41 |
| 21.5 | 85 | -63.5 | 20 | 42 |
| 21.4 | 85 | -63.6 | 20 | 43 |
| 108 | 85 | 23 | 21 | 43 |
| 1050 | 85 | 965 | 22 | 43 |
| 2540 | 85 | 2455 | 23 | 43 |
| 256 | 85 | 171 | 24 | 43 |
| ND<5 U2c | 85 | -80 | 24 | 44 |
| 112 1c | 85 | 27 | 25 | 44 |
| ND<5 U | 85 | -80 | 25 | 45 |
| 43.9 | 85 | -41.1 | 25 | 46 |
| 11.2 B | 85 | -73.8 | 25 | 47 |
| 48.9 | 85 | -36.1 | 25 | 48 |
| 33.4 | 85 | -51.6 | 25 | 49 |
| 4.5 J | 85 | -80.5 | 25 | 50 |
| 5.4 J1c | 85 | -79.6 | 25 | 51 |
| 28.3 | 85 | -56.7 | 25 | 52 |
| 2.6 JB | 85 | -82.4 | 25 | 53 |
| ND<10 U | 85 | -75 | 25 | 54 |
| ND<5 U | 85 | -80 | 25 | 55 |
| 62090 | 85 | 62005 | 26 | 55 |
| | | | | |
| 71.9 | 188 | -116.1 | 26 | 56 |
| 153 | 188 | -35 | 26 | 57 |
| 49.8 | 188 | -138.2 | 26 | 58 |
| 69.4 | 188 | -118.6 | 26 | 59 |
| 16.9 | 188 | -171.1 | 26 | 60 |
| 21.5 | 188 | -166.5 | 26 | 61 |
| 21.4 | 188 | -166.6 | 26 | 62 |
| 108 | 188 | -80 | 26 | 63 |
| 1050 | 188 | 862 | 27 | 63 |
| 2540 | 188 | 2352 | 28 | 63 |
| 256 | 188 | 68 | 29 | 63 |
| ND<5 U2c | 188 | -183 | 29 | 64 |
| 112 1c | 188 | -76 | 29 | 65 |
| ND<5 U | 188 | -183 | 29 | 66 |
| 43.9 | 188 | -144.1 | 29 | 67 |
| 11.2 B | 188 | -176.8 | 29 | 68 |
| 48.9 | 188 | -139.1 | 29 | 69 |
| 33.4 | 188 | -154.6 | 29 | 70 |
| 4.5 J | 188 | -183.5 | 29 | 71 |
| 5.4 J1c | 188 | -182.6 | 29 | 72 |

| | | | | |
|---|---|---|---|---|
| 28.3 | 188 | -159.7 | 29 | 73 |
| 2.6 JB | 188 | -185.4 | 29 | 74 |
| ND<10 U | 188 | -178 | 29 | 75 |
| ND<5 U | 188 | -183 | 29 | 76 |
| 62090 | 188 | 61902 | 30 | 76 |
| | | | | |
| 153 | 71.9 | 81.1 | 31 | 76 |
| 49.8 | 71.9 | -22.1 | 31 | 77 |
| 69.4 | 71.9 | -2.5 | 31 | 78 |
| 16.9 | 71.9 | -55 | 31 | 79 |
| 21.5 | 71.9 | -50.4 | 31 | 80 |
| 21.4 | 71.9 | -50.5 | 31 | 81 |
| 108 | 71.9 | 36.1 | 32 | 81 |
| 1050 | 71.9 | 978.1 | 33 | 81 |
| 2540 | 71.9 | 2468.1 | 34 | 81 |
| 256 | 71.9 | 184.1 | 35 | 81 |
| ND<5 U2c | 71.9 | -66.9 | 35 | 82 |
| 112 1c | 71.9 | 40.1 | 36 | 82 |
| ND<5 U | 71.9 | -66.9 | 36 | 83 |
| 43.9 | 71.9 | -28 | 36 | 84 |
| 11.2 B | 71.9 | -60.7 | 36 | 85 |
| 48.9 | 71.9 | -23 | 36 | 86 |
| 33.4 | 71.9 | -38.5 | 36 | 87 |
| 4.5 J | 71.9 | -67.4 | 36 | 88 |
| 5.4 J1c | 71.9 | -66.5 | 36 | 89 |
| 28.3 | 71.9 | -43.6 | 36 | 90 |
| 2.6 JB | 71.9 | -69.3 | 36 | 91 |
| ND<10 U | 71.9 | -61.9 | 36 | 92 |
| ND<5 U | 71.9 | -66.9 | 36 | 93 |
| 62090 | 71.9 | 62018.1 | 37 | 93 |
| | | | | |
| 49.8 | 153 | -103.2 | 37 | 94 |
| 69.4 | 153 | -83.6 | 37 | 95 |
| 16.9 | 153 | -136.1 | 37 | 96 |
| 21.5 | 153 | -131.5 | 37 | 97 |
| 21.4 | 153 | -131.6 | 37 | 98 |
| 108 | 153 | -45 | 37 | 99 |
| 1050 | 153 | 897 | 38 | 99 |
| 2540 | 153 | 2387 | 39 | 99 |
| 256 | 153 | 103 | 40 | 99 |
| ND<5 U2c | 153 | -148 | 40 | 100 |
| 112 1c | 153 | -41 | 40 | 101 |
| ND<5 U | 153 | -148 | 40 | 102 |
| 43.9 | 153 | -109.1 | 40 | 103 |
| 11.2 B | 153 | -141.8 | 40 | 104 |
| 48.9 | 153 | -104.1 | 40 | 105 |
| 33.4 | 153 | -119.6 | 40 | 106 |
| 4.5 J | 153 | -148.5 | 40 | 107 |
| 5.4 J1c | 153 | -147.6 | 40 | 108 |
| 28.3 | 153 | -124.7 | 40 | 109 |
| 2.6 JB | 153 | -150.4 | 40 | 110 |
| ND<10 U | 153 | -143 | 40 | 111 |
| ND<5 U | 153 | -148 | 40 | 112 |
| 62090 | 153 | 61937 | 41 | 112 |
| | | | | |
| 69.4 | 49.8 | 19.6 | 42 | 112 |
| 16.9 | 49.8 | -32.9 | 42 | 113 |

| | | | | |
|---|---|---|---|---|
| 21.5 | 49.8 | -28.3 | 42 | 114 |
| 21.4 | 49.8 | -28.4 | 42 | 115 |
| 108 | 49.8 | 58.2 | 43 | 115 |
| 1050 | 49.8 | 1000.2 | 44 | 115 |
| 2540 | 49.8 | 2490.2 | 45 | 115 |
| 256 | 49.8 | 206.2 | 46 | 115 |
| ND<5 U2c | 49.8 | -44.8 | 46 | 116 |
| 112 1c | 49.8 | 62.2 | 47 | 116 |
| ND<5 U | 49.8 | -44.8 | 47 | 117 |
| 43.9 | 49.8 | -5.9 | 47 | 118 |
| 11.2 B | 49.8 | -38.6 | 47 | 119 |
| 48.9 | 49.8 | -0.9 | 47 | 120 |
| 33.4 | 49.8 | -16.4 | 47 | 121 |
| 4.5 J | 49.8 | -45.3 | 47 | 122 |
| 5.4 J1c | 49.8 | -44.4 | 47 | 123 |
| 28.3 | 49.8 | -21.5 | 47 | 124 |
| 2.6 JB | 49.8 | -47.2 | 47 | 125 |
| ND<10 U | 49.8 | -39.8 | 47 | 126 |
| ND<5 U | 49.8 | -44.8 | 47 | 127 |
| 62090 | 49.8 | 62040.2 | 48 | 127 |
| | | | | |
| 16.9 | 69.4 | -52.5 | 48 | 128 |
| 21.5 | 69.4 | -47.9 | 48 | 129 |
| 21.4 | 69.4 | -48 | 48 | 130 |
| 108 | 69.4 | 38.6 | 49 | 130 |
| 1050 | 69.4 | 980.6 | 50 | 130 |
| 2540 | 69.4 | 2470.6 | 51 | 130 |
| 256 | 69.4 | 186.6 | 52 | 130 |
| ND<5 U2c | 69.4 | -64.4 | 52 | 131 |
| 112 1c | 69.4 | 42.6 | 53 | 131 |
| ND<5 U | 69.4 | -64.4 | 53 | 132 |
| 43.9 | 69.4 | -25.5 | 53 | 133 |
| 11.2 B | 69.4 | -58.2 | 53 | 134 |
| 48.9 | 69.4 | -20.5 | 53 | 135 |
| 33.4 | 69.4 | -36 | 53 | 136 |
| 4.5 J | 69.4 | -64.9 | 53 | 137 |
| 5.4 J1c | 69.4 | -64 | 53 | 138 |
| 28.3 | 69.4 | -41.1 | 53 | 139 |
| 2.6 JB | 69.4 | -66.8 | 53 | 140 |
| ND<10 U | 69.4 | -59.4 | 53 | 141 |
| ND<5 U | 69.4 | -64.4 | 53 | 142 |
| 62090 | 69.4 | 62020.6 | 54 | 142 |
| | | | | |
| 21.5 | 16.9 | 4.6 | 55 | 142 |
| 21.4 | 16.9 | 4.5 | 56 | 142 |
| 108 | 16.9 | 91.1 | 57 | 142 |
| 1050 | 16.9 | 1033.1 | 58 | 142 |
| 2540 | 16.9 | 2523.1 | 59 | 142 |
| 256 | 16.9 | 239.1 | 60 | 142 |
| ND<5 U2c | 16.9 | -11.9 | 60 | 143 |
| 112 1c | 16.9 | 95.1 | 61 | 143 |
| ND<5 U | 16.9 | -11.9 | 61 | 144 |
| 43.9 | 16.9 | 27 | 62 | 144 |
| 11.2 B | 16.9 | -5.7 | 62 | 145 |
| 48.9 | 16.9 | 32 | 63 | 145 |
| 33.4 | 16.9 | 16.5 | 64 | 145 |
| 4.5 J | 16.9 | -12.4 | 64 | 146 |

| | | | | |
|---|---|---|---|---|
| 5.4 J1c | 16.9 | -11.5 | 64 | 147 |
| 28.3 | 16.9 | 11.4 | 65 | 147 |
| 2.6 JB | 16.9 | -14.3 | 65 | 148 |
| ND<10 U | 16.9 | -6.9 | 65 | 149 |
| ND<5 U | 16.9 | -11.9 | 65 | 150 |
| 62090 | 16.9 | 62073.1 | 66 | 150 |
| | | | | |
| 21.4 | 21.5 | -0.1 | 66 | 151 |
| 108 | 21.5 | 86.5 | 67 | 151 |
| 1050 | 21.5 | 1028.5 | 68 | 151 |
| 2540 | 21.5 | 2518.5 | 69 | 151 |
| 256 | 21.5 | 234.5 | 70 | 151 |
| ND<5 U2c | 21.5 | -16.5 | 70 | 152 |
| 112 1c | 21.5 | 90.5 | 71 | 152 |
| ND<5 U | 21.5 | -16.5 | 71 | 153 |
| 43.9 | 21.5 | 22.4 | 72 | 153 |
| 11.2 B | 21.5 | -10.3 | 72 | 154 |
| 48.9 | 21.5 | 27.4 | 73 | 154 |
| 33.4 | 21.5 | 11.9 | 74 | 154 |
| 4.5 J | 21.5 | -17 | 74 | 155 |
| 5.4 J1c | 21.5 | -16.1 | 74 | 156 |
| 28.3 | 21.5 | 6.8 | 75 | 156 |
| 2.6 JB | 21.5 | -18.9 | 75 | 157 |
| ND<10 U | 21.5 | -11.5 | 75 | 158 |
| ND<5 U | 21.5 | -16.5 | 75 | 159 |
| 62090 | 21.5 | 62068.5 | 76 | 159 |
| | | | | |
| 108 | 21.4 | 86.6 | 77 | 159 |
| 1050 | 21.4 | 1028.6 | 78 | 159 |
| 2540 | 21.4 | 2518.6 | 79 | 159 |
| 256 | 21.4 | 234.6 | 80 | 159 |
| ND<5 U2c | 21.4 | -16.4 | 80 | 160 |
| 112 1c | 21.4 | 90.6 | 81 | 160 |
| ND<5 U | 21.4 | -16.4 | 81 | 161 |
| 43.9 | 21.4 | 22.5 | 82 | 161 |
| 11.2 B | 21.4 | -10.2 | 82 | 162 |
| 48.9 | 21.4 | 27.5 | 83 | 162 |
| 33.4 | 21.4 | 12 | 84 | 162 |
| 4.5 J | 21.4 | -16.9 | 84 | 163 |
| 5.4 J1c | 21.4 | -16 | 84 | 164 |
| 28.3 | 21.4 | 6.9 | 85 | 164 |
| 2.6 JB | 21.4 | -18.8 | 85 | 165 |
| ND<10 U | 21.4 | -11.4 | 85 | 166 |
| ND<5 U | 21.4 | -16.4 | 85 | 167 |
| 62090 | 21.4 | 62068.6 | 86 | 167 |
| | | | | |
| 1050 | 108 | 942 | 87 | 167 |
| 2540 | 108 | 2432 | 88 | 167 |
| 256 | 108 | 148 | 89 | 167 |
| ND<5 U2c | 108 | -103 | 89 | 168 |
| 112 1c | 108 | 4 | 90 | 168 |
| ND<5 U | 108 | -103 | 90 | 169 |
| 43.9 | 108 | -64.1 | 90 | 170 |
| 11.2 B | 108 | -96.8 | 90 | 171 |
| 48.9 | 108 | -59.1 | 90 | 172 |
| 33.4 | 108 | -74.6 | 90 | 173 |
| 4.5 J | 108 | -103.5 | 90 | 174 |

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|---|---|---|---|---|
| 5.4 J1c | 108 | -102.6 | 90 | 175 |
| 28.3 | 108 | -79.7 | 90 | 176 |
| 2.6 JB | 108 | -105.4 | 90 | 177 |
| ND<10 U | 108 | -98 | 90 | 178 |
| ND<5 U | 108 | -103 | 90 | 179 |
| 62090 | 108 | 61982 | 91 | 179 |
| | | | | |
| 2540 | 1050 | 1490 | 92 | 179 |
| 256 | 1050 | -794 | 92 | 180 |
| ND<5 U2c | 1050 | -1045 | 92 | 181 |
| 112 1c | 1050 | -938 | 92 | 182 |
| ND<5 U | 1050 | -1045 | 92 | 183 |
| 43.9 | 1050 | -1006.1 | 92 | 184 |
| 11.2 B | 1050 | -1038.8 | 92 | 185 |
| 48.9 | 1050 | -1001.1 | 92 | 186 |
| 33.4 | 1050 | -1016.6 | 92 | 187 |
| 4.5 J | 1050 | -1045.5 | 92 | 188 |
| 5.4 J1c | 1050 | -1044.6 | 92 | 189 |
| 28.3 | 1050 | -1021.7 | 92 | 190 |
| 2.6 JB | 1050 | -1047.4 | 92 | 191 |
| ND<10 U | 1050 | -1040 | 92 | 192 |
| ND<5 U | 1050 | -1045 | 92 | 193 |
| 62090 | 1050 | 61040 | 93 | 193 |
| | | | | |
| 256 | 2540 | -2284 | 93 | 194 |
| ND<5 U2c | 2540 | -2535 | 93 | 195 |
| 112 1c | 2540 | -2428 | 93 | 196 |
| ND<5 U | 2540 | -2535 | 93 | 197 |
| 43.9 | 2540 | -2496.1 | 93 | 198 |
| 11.2 B | 2540 | -2528.8 | 93 | 199 |
| 48.9 | 2540 | -2491.1 | 93 | 200 |
| 33.4 | 2540 | -2506.6 | 93 | 201 |
| 4.5 J | 2540 | -2535.5 | 93 | 202 |
| 5.4 J1c | 2540 | -2534.6 | 93 | 203 |
| 28.3 | 2540 | -2511.7 | 93 | 204 |
| 2.6 JB | 2540 | -2537.4 | 93 | 205 |
| ND<10 U | 2540 | -2530 | 93 | 206 |
| ND<5 U | 2540 | -2535 | 93 | 207 |
| 62090 | 2540 | 59550 | 94 | 207 |
| | | | | |
| ND<5 U2c | 256 | -251 | 94 | 208 |
| 112 1c | 256 | -144 | 94 | 209 |
| ND<5 U | 256 | -251 | 94 | 210 |
| 43.9 | 256 | -212.1 | 94 | 211 |
| 11.2 B | 256 | -244.8 | 94 | 212 |
| 48.9 | 256 | -207.1 | 94 | 213 |
| 33.4 | 256 | -222.6 | 94 | 214 |
| 4.5 J | 256 | -251.5 | 94 | 215 |
| 5.4 J1c | 256 | -250.6 | 94 | 216 |
| 28.3 | 256 | -227.7 | 94 | 217 |
| 2.6 JB | 256 | -253.4 | 94 | 218 |
| ND<10 U | 256 | -246 | 94 | 219 |
| ND<5 U | 256 | -251 | 94 | 220 |
| 62090 | 256 | 61834 | 95 | 220 |
| | | | | |
| 112 1c | ND<5 U2c | Same Date | 95 | 220 |
| ND<5 U | ND<5 U2c | 0 | 95 | 220 |

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|---|---|---|---|---|
| 43.9 | ND<5 U2c | 38.9 | 96 | 220 |
| 11.2 B | ND<5 U2c | 6.2 | 97 | 220 |
| 48.9 | ND<5 U2c | 43.9 | 98 | 220 |
| 33.4 | ND<5 U2c | 28.4 | 99 | 220 |
| 4.5 J | ND<5 U2c | -0.5 | 99 | 221 |
| 5.4 J1c | ND<5 U2c | 0.4 | 100 | 221 |
| 28.3 | ND<5 U2c | 23.3 | 101 | 221 |
| 2.6 JB | ND<5 U2c | -2.4 | 101 | 222 |
| ND<10 U | ND<5 U2c | 5 | 102 | 222 |
| ND<5 U | ND<5 U2c | 0 | 102 | 222 |
| 62090 | ND<5 U2c | 62085 | 103 | 222 |
| | | | | |
| ND<5 U | 112 1c | -107 | 103 | 223 |
| 43.9 | 112 1c | -68.1 | 103 | 224 |
| 11.2 B | 112 1c | -100.8 | 103 | 225 |
| 48.9 | 112 1c | -63.1 | 103 | 226 |
| 33.4 | 112 1c | -78.6 | 103 | 227 |
| 4.5 J | 112 1c | -107.5 | 103 | 228 |
| 5.4 J1c | 112 1c | -106.6 | 103 | 229 |
| 28.3 | 112 1c | -83.7 | 103 | 230 |
| 2.6 JB | 112 1c | -109.4 | 103 | 231 |
| ND<10 U | 112 1c | -102 | 103 | 232 |
| ND<5 U | 112 1c | -107 | 103 | 233 |
| 62090 | 112 1c | 61978 | 104 | 233 |
| | | | | |
| 43.9 | ND<5 U | Same Date | 104 | 233 |
| 11.2 B | ND<5 U | 6.2 | 105 | 233 |
| 48.9 | ND<5 U | 43.9 | 106 | 233 |
| 33.4 | ND<5 U | 28.4 | 107 | 233 |
| 4.5 J | ND<5 U | -0.5 | 107 | 234 |
| 5.4 J1c | ND<5 U | 0.4 | 108 | 234 |
| 28.3 | ND<5 U | 23.3 | 109 | 234 |
| 2.6 JB | ND<5 U | -2.4 | 109 | 235 |
| ND<10 U | ND<5 U | 5 | 110 | 235 |
| ND<5 U | ND<5 U | 0 | 110 | 235 |
| 62090 | ND<5 U | 62085 | 111 | 235 |
| | | | | |
| 11.2 B | 43.9 | -32.7 | 111 | 236 |
| 48.9 | 43.9 | 5 | 112 | 236 |
| 33.4 | 43.9 | -10.5 | 112 | 237 |
| 4.5 J | 43.9 | -39.4 | 112 | 238 |
| 5.4 J1c | 43.9 | -38.5 | 112 | 239 |
| 28.3 | 43.9 | -15.6 | 112 | 240 |
| 2.6 JB | 43.9 | -41.3 | 112 | 241 |
| ND<10 U | 43.9 | -33.9 | 112 | 242 |
| ND<5 U | 43.9 | -38.9 | 112 | 243 |
| 62090 | 43.9 | 62046.1 | 113 | 243 |
| | | | | |
| 48.9 | 11.2 B | 37.7 | 114 | 243 |
| 33.4 | 11.2 B | 22.2 | 115 | 243 |
| 4.5 J | 11.2 B | -6.7 | 115 | 244 |
| 5.4 J1c | 11.2 B | -5.8 | 115 | 245 |
| 28.3 | 11.2 B | 17.1 | 116 | 245 |
| 2.6 JB | 11.2 B | -8.6 | 116 | 246 |
| ND<10 U | 11.2 B | -1.2 | 116 | 247 |
| ND<5 U | 11.2 B | -6.2 | 116 | 248 |
| 62090 | 11.2 B | 62078.8 | 117 | 248 |

| | | | | |
|---|---|---|---|---|
| 33.4 | 48.9 | -15.5 | 117 | 249 |
| 4.5 J | 48.9 | -44.4 | 117 | 250 |
| 5.4 J1c | 48.9 | -43.5 | 117 | 251 |
| 28.3 | 48.9 | -20.6 | 117 | 252 |
| 2.6 JB | 48.9 | -46.3 | 117 | 253 |
| ND<10 U | 48.9 | -38.9 | 117 | 254 |
| ND<5 U | 48.9 | -43.9 | 117 | 255 |
| 62090 | 48.9 | 62041.1 | 118 | 255 |
| | | | | |
| 4.5 J | 33.4 | -28.9 | 118 | 256 |
| 5.4 J1c | 33.4 | -28 | 118 | 257 |
| 28.3 | 33.4 | -5.1 | 118 | 258 |
| 2.6 JB | 33.4 | -30.8 | 118 | 259 |
| ND<10 U | 33.4 | -23.4 | 118 | 260 |
| ND<5 U | 33.4 | -28.4 | 118 | 261 |
| 62090 | 33.4 | 62056.6 | 119 | 261 |
| | | | | |
| 5.4 J1c | 4.5 J | 0.9 | 120 | 261 |
| 28.3 | 4.5 J | 23.8 | 121 | 261 |
| 2.6 JB | 4.5 J | -1.9 | 121 | 262 |
| ND<10 U | 4.5 J | 5.5 | 122 | 262 |
| ND<5 U | 4.5 J | 0.5 | 123 | 262 |
| 62090 | 4.5 J | 62085.5 | 124 | 262 |
| | | | | |
| 28.3 | 5.4 J1c | 22.9 | 125 | 262 |
| 2.6 JB | 5.4 J1c | -2.8 | 125 | 263 |
| ND<10 U | 5.4 J1c | 4.6 | 126 | 263 |
| ND<5 U | 5.4 J1c | -0.4 | 126 | 264 |
| 62090 | 5.4 J1c | 62084.6 | 127 | 264 |
| | | | | |
| 2.6 JB | 28.3 | -25.7 | 127 | 265 |
| ND<10 U | 28.3 | -18.3 | 127 | 266 |
| ND<5 U | 28.3 | -23.3 | 127 | 267 |
| 62090 | 28.3 | 62061.7 | 128 | 267 |
| | | | | |
| ND<10 U | 2.6 JB | 7.4 | 129 | 267 |
| ND<5 U | 2.6 JB | 2.4 | 130 | 267 |
| 62090 | 2.6 JB | 62087.4 | 131 | 267 |
| | | | | |
| ND<5 U | ND<10 U | -5 | 131 | 268 |
| 62090 | ND<10 U | 62080 | 132 | 268 |
| | | | | |
| 62090 | ND<5 U | 62085 | 133 | 268 |

S Statistic = 133 - 268 = -135

| Tied Group | Value | Members |
|---|---|---|
| 1 | 5 | 3 |

| Time Period | Observations |
|---|---|
| 2/1/2017 | 1 |
| 3/1/2017 | 1 |
| 4/1/2017 | 1 |
| 5/1/2017 | 1 |
| 6/1/2017 | 1 |

| | |
|---|---|
| 7/1/2017 | 1 |
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 3/1/2022 | 1 |
| 3/1/2023 | 1 |
| 3/1/2024 | 1 |

There are 2 time periods with multiple data

---

A = 66
B = 36
C = 6
D = 0
E = 6
F = 4
a = 51156
b = 197316
c = 1624
Group Variance = 2836.35
Z-Score = -2.51608
Comparison Level at 95% confidence level = -1.65463 (downward trend)
**-2.51608 < -1.65463 indicating a downward trend**

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RW09-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 51900 | 51000 | 900 | 1 | 0 |
| 57500 | 51000 | 6500 | 2 | 0 |
| 57200 | 51000 | 6200 | 3 | 0 |
| 51900 | 51000 | 900 | 4 | 0 |
| 65600 | 51000 | 14600 | 5 | 0 |
| 55500 | 51000 | 4500 | 6 | 0 |
| 39400 | 51000 | -11600 | 6 | 1 |
| 49700 | 51000 | -1300 | 6 | 2 |
| 67900 | 51000 | 16900 | 7 | 2 |
| 44500 | 51000 | -6500 | 7 | 3 |
| 54700 | 51000 | 3700 | 8 | 3 |
| 38400 | 51000 | -12600 | 8 | 4 |
| 54700 | 51000 | 3700 | 9 | 4 |
| 53800 | 51000 | 2800 | 10 | 4 |
| 59800 1c | 51000 | 8800 | 11 | 4 |
| 57500 2c | 51000 | 6500 | 12 | 4 |
| 68400 M6 | 51000 | 17400 | 13 | 4 |
| 64200 M6 | 51000 | 13200 | 14 | 4 |
| 53300 1c | 51000 | 2300 | 15 | 4 |
| 82000 | 51000 | 31000 | 16 | 4 |
| 65600 | 51000 | 14600 | 17 | 4 |
| 77800 1c | 51000 | 26800 | 18 | 4 |
| 79100 | 51000 | 28100 | 19 | 4 |
| 73700 | 51000 | 22700 | 20 | 4 |
| 93600 B | 51000 | 42600 | 21 | 4 |
| 63000 | 51000 | 12000 | 22 | 4 |
| 78950 | 51000 | 27950 | 23 | 4 |
| 57500 | 51000 | 6500 | 24 | 4 |
| | | | | |
| 57500 | 51900 | 5600 | 25 | 4 |
| 57200 | 51900 | 5300 | 26 | 4 |
| 51900 | 51900 | 0 | 26 | 4 |
| 65600 | 51900 | 13700 | 27 | 4 |
| 55500 | 51900 | 3600 | 28 | 4 |
| 39400 | 51900 | -12500 | 28 | 5 |
| 49700 | 51900 | -2200 | 28 | 6 |
| 67900 | 51900 | 16000 | 29 | 6 |
| 44500 | 51900 | -7400 | 29 | 7 |
| 54700 | 51900 | 2800 | 30 | 7 |
| 38400 | 51900 | -13500 | 30 | 8 |
| 54700 | 51900 | 2800 | 31 | 8 |
| 53800 | 51900 | 1900 | 32 | 8 |
| 59800 1c | 51900 | 7900 | 33 | 8 |
| 57500 2c | 51900 | 5600 | 34 | 8 |
| 68400 M6 | 51900 | 16500 | 35 | 8 |
| 64200 M6 | 51900 | 12300 | 36 | 8 |
| 53300 1c | 51900 | 1400 | 37 | 8 |

| | | | | |
|---|---|---|---|---|
| 82000 | 51900 | 30100 | 38 | 8 |
| 65600 | 51900 | 13700 | 39 | 8 |
| 77800 1c | 51900 | 25900 | 40 | 8 |
| 79100 | 51900 | 27200 | 41 | 8 |
| 73700 | 51900 | 21800 | 42 | 8 |
| 93600 B | 51900 | 41700 | 43 | 8 |
| 63000 | 51900 | 11100 | 44 | 8 |
| 78950 | 51900 | 27050 | 45 | 8 |
| 57500 | 51900 | 5600 | 46 | 8 |
| | | | | |
| 57200 | 57500 | -300 | 46 | 9 |
| 51900 | 57500 | -5600 | 46 | 10 |
| 65600 | 57500 | 8100 | 47 | 10 |
| 55500 | 57500 | -2000 | 47 | 11 |
| 39400 | 57500 | -18100 | 47 | 12 |
| 49700 | 57500 | -7800 | 47 | 13 |
| 67900 | 57500 | 10400 | 48 | 13 |
| 44500 | 57500 | -13000 | 48 | 14 |
| 54700 | 57500 | -2800 | 48 | 15 |
| 38400 | 57500 | -19100 | 48 | 16 |
| 54700 | 57500 | -2800 | 48 | 17 |
| 53800 | 57500 | -3700 | 48 | 18 |
| 59800 1c | 57500 | 2300 | 49 | 18 |
| 57500 2c | 57500 | 0 | 49 | 18 |
| 68400 M6 | 57500 | 10900 | 50 | 18 |
| 64200 M6 | 57500 | 6700 | 51 | 18 |
| 53300 1c | 57500 | -4200 | 51 | 19 |
| 82000 | 57500 | 24500 | 52 | 19 |
| 65600 | 57500 | 8100 | 53 | 19 |
| 77800 1c | 57500 | 20300 | 54 | 19 |
| 79100 | 57500 | 21600 | 55 | 19 |
| 73700 | 57500 | 16200 | 56 | 19 |
| 93600 B | 57500 | 36100 | 57 | 19 |
| 63000 | 57500 | 5500 | 58 | 19 |
| 78950 | 57500 | 21450 | 59 | 19 |
| 57500 | 57500 | 0 | 59 | 19 |
| | | | | |
| 51900 | 57200 | -5300 | 59 | 20 |
| 65600 | 57200 | 8400 | 60 | 20 |
| 55500 | 57200 | -1700 | 60 | 21 |
| 39400 | 57200 | -17800 | 60 | 22 |
| 49700 | 57200 | -7500 | 60 | 23 |
| 67900 | 57200 | 10700 | 61 | 23 |
| 44500 | 57200 | -12700 | 61 | 24 |
| 54700 | 57200 | -2500 | 61 | 25 |
| 38400 | 57200 | -18800 | 61 | 26 |
| 54700 | 57200 | -2500 | 61 | 27 |
| 53800 | 57200 | -3400 | 61 | 28 |
| 59800 1c | 57200 | 2600 | 62 | 28 |
| 57500 2c | 57200 | 300 | 63 | 28 |
| 68400 M6 | 57200 | 11200 | 64 | 28 |
| 64200 M6 | 57200 | 7000 | 65 | 28 |
| 53300 1c | 57200 | -3900 | 65 | 29 |
| 82000 | 57200 | 24800 | 66 | 29 |
| 65600 | 57200 | 8400 | 67 | 29 |
| 77800 1c | 57200 | 20600 | 68 | 29 |
| 79100 | 57200 | 21900 | 69 | 29 |

| | | | | |
|---|---|---|---|---|
| 73700 | 57200 | 16500 | 70 | 29 |
| 93600 B | 57200 | 36400 | 71 | 29 |
| 63000 | 57200 | 5800 | 72 | 29 |
| 78950 | 57200 | 21750 | 73 | 29 |
| 57500 | 57200 | 300 | 74 | 29 |
| | | | | |
| 65600 | 51900 | 13700 | 75 | 29 |
| 55500 | 51900 | 3600 | 76 | 29 |
| 39400 | 51900 | -12500 | 76 | 30 |
| 49700 | 51900 | -2200 | 76 | 31 |
| 67900 | 51900 | 16000 | 77 | 31 |
| 44500 | 51900 | -7400 | 77 | 32 |
| 54700 | 51900 | 2800 | 78 | 32 |
| 38400 | 51900 | -13500 | 78 | 33 |
| 54700 | 51900 | 2800 | 79 | 33 |
| 53800 | 51900 | 1900 | 80 | 33 |
| 59800 1c | 51900 | 7900 | 81 | 33 |
| 57500 2c | 51900 | 5600 | 82 | 33 |
| 68400 M6 | 51900 | 16500 | 83 | 33 |
| 64200 M6 | 51900 | 12300 | 84 | 33 |
| 53300 1c | 51900 | 1400 | 85 | 33 |
| 82000 | 51900 | 30100 | 86 | 33 |
| 65600 | 51900 | 13700 | 87 | 33 |
| 77800 1c | 51900 | 25900 | 88 | 33 |
| 79100 | 51900 | 27200 | 89 | 33 |
| 73700 | 51900 | 21800 | 90 | 33 |
| 93600 B | 51900 | 41700 | 91 | 33 |
| 63000 | 51900 | 11100 | 92 | 33 |
| 78950 | 51900 | 27050 | 93 | 33 |
| 57500 | 51900 | 5600 | 94 | 33 |
| | | | | |
| 55500 | 65600 | -10100 | 94 | 34 |
| 39400 | 65600 | -26200 | 94 | 35 |
| 49700 | 65600 | -15900 | 94 | 36 |
| 67900 | 65600 | 2300 | 95 | 36 |
| 44500 | 65600 | -21100 | 95 | 37 |
| 54700 | 65600 | -10900 | 95 | 38 |
| 38400 | 65600 | -27200 | 95 | 39 |
| 54700 | 65600 | -10900 | 95 | 40 |
| 53800 | 65600 | -11800 | 95 | 41 |
| 59800 1c | 65600 | -5800 | 95 | 42 |
| 57500 2c | 65600 | -8100 | 95 | 43 |
| 68400 M6 | 65600 | 2800 | 96 | 43 |
| 64200 M6 | 65600 | -1400 | 96 | 44 |
| 53300 1c | 65600 | -12300 | 96 | 45 |
| 82000 | 65600 | 16400 | 97 | 45 |
| 65600 | 65600 | 0 | 97 | 45 |
| 77800 1c | 65600 | 12200 | 98 | 45 |
| 79100 | 65600 | 13500 | 99 | 45 |
| 73700 | 65600 | 8100 | 100 | 45 |
| 93600 B | 65600 | 28000 | 101 | 45 |
| 63000 | 65600 | -2600 | 101 | 46 |
| 78950 | 65600 | 13350 | 102 | 46 |
| 57500 | 65600 | -8100 | 102 | 47 |
| | | | | |
| 39400 | 55500 | -16100 | 102 | 48 |
| 49700 | 55500 | -5800 | 102 | 49 |

| | | | | |
|---|---|---|---|---|
| 67900 | 55500 | 12400 | 103 | 49 |
| 44500 | 55500 | -11000 | 103 | 50 |
| 54700 | 55500 | -800 | 103 | 51 |
| 38400 | 55500 | -17100 | 103 | 52 |
| 54700 | 55500 | -800 | 103 | 53 |
| 53800 | 55500 | -1700 | 103 | 54 |
| 59800 1c | 55500 | 4300 | 104 | 54 |
| 57500 2c | 55500 | 2000 | 105 | 54 |
| 68400 M6 | 55500 | 12900 | 106 | 54 |
| 64200 M6 | 55500 | 8700 | 107 | 54 |
| 53300 1c | 55500 | -2200 | 107 | 55 |
| 82000 | 55500 | 26500 | 108 | 55 |
| 65600 | 55500 | 10100 | 109 | 55 |
| 77800 1c | 55500 | 22300 | 110 | 55 |
| 79100 | 55500 | 23600 | 111 | 55 |
| 73700 | 55500 | 18200 | 112 | 55 |
| 93600 B | 55500 | 38100 | 113 | 55 |
| 63000 | 55500 | 7500 | 114 | 55 |
| 78950 | 55500 | 23450 | 115 | 55 |
| 57500 | 55500 | 2000 | 116 | 55 |
| | | | | |
| 49700 | 39400 | 10300 | 117 | 55 |
| 67900 | 39400 | 28500 | 118 | 55 |
| 44500 | 39400 | 5100 | 119 | 55 |
| 54700 | 39400 | 15300 | 120 | 55 |
| 38400 | 39400 | -1000 | 120 | 56 |
| 54700 | 39400 | 15300 | 121 | 56 |
| 53800 | 39400 | 14400 | 122 | 56 |
| 59800 1c | 39400 | 20400 | 123 | 56 |
| 57500 2c | 39400 | 18100 | 124 | 56 |
| 68400 M6 | 39400 | 29000 | 125 | 56 |
| 64200 M6 | 39400 | 24800 | 126 | 56 |
| 53300 1c | 39400 | 13900 | 127 | 56 |
| 82000 | 39400 | 42600 | 128 | 56 |
| 65600 | 39400 | 26200 | 129 | 56 |
| 77800 1c | 39400 | 38400 | 130 | 56 |
| 79100 | 39400 | 39700 | 131 | 56 |
| 73700 | 39400 | 34300 | 132 | 56 |
| 93600 B | 39400 | 54200 | 133 | 56 |
| 63000 | 39400 | 23600 | 134 | 56 |
| 78950 | 39400 | 39550 | 135 | 56 |
| 57500 | 39400 | 18100 | 136 | 56 |
| | | | | |
| 67900 | 49700 | 18200 | 137 | 56 |
| 44500 | 49700 | -5200 | 137 | 57 |
| 54700 | 49700 | 5000 | 138 | 57 |
| 38400 | 49700 | -11300 | 138 | 58 |
| 54700 | 49700 | 5000 | 139 | 58 |
| 53800 | 49700 | 4100 | 140 | 58 |
| 59800 1c | 49700 | 10100 | 141 | 58 |
| 57500 2c | 49700 | 7800 | 142 | 58 |
| 68400 M6 | 49700 | 18700 | 143 | 58 |
| 64200 M6 | 49700 | 14500 | 144 | 58 |
| 53300 1c | 49700 | 3600 | 145 | 58 |
| 82000 | 49700 | 32300 | 146 | 58 |
| 65600 | 49700 | 15900 | 147 | 58 |
| 77800 1c | 49700 | 28100 | 148 | 58 |

| | | | | |
|---|---|---|---|---|
| 79100 | 49700 | 29400 | 149 | 58 |
| 73700 | 49700 | 24000 | 150 | 58 |
| 93600 B | 49700 | 43900 | 151 | 58 |
| 63000 | 49700 | 13300 | 152 | 58 |
| 78950 | 49700 | 29250 | 153 | 58 |
| 57500 | 49700 | 7800 | 154 | 58 |
| | | | | |
| 44500 | 67900 | -23400 | 154 | 59 |
| 54700 | 67900 | -13200 | 154 | 60 |
| 38400 | 67900 | -29500 | 154 | 61 |
| 54700 | 67900 | -13200 | 154 | 62 |
| 53800 | 67900 | -14100 | 154 | 63 |
| 59800 1c | 67900 | -8100 | 154 | 64 |
| 57500 2c | 67900 | -10400 | 154 | 65 |
| 68400 M6 | 67900 | 500 | 155 | 65 |
| 64200 M6 | 67900 | -3700 | 155 | 66 |
| 53300 1c | 67900 | -14600 | 155 | 67 |
| 82000 | 67900 | 14100 | 156 | 67 |
| 65600 | 67900 | -2300 | 156 | 68 |
| 77800 1c | 67900 | 9900 | 157 | 68 |
| 79100 | 67900 | 11200 | 158 | 68 |
| 73700 | 67900 | 5800 | 159 | 68 |
| 93600 B | 67900 | 25700 | 160 | 68 |
| 63000 | 67900 | -4900 | 160 | 69 |
| 78950 | 67900 | 11050 | 161 | 69 |
| 57500 | 67900 | -10400 | 161 | 70 |
| | | | | |
| 54700 | 44500 | 10200 | 162 | 70 |
| 38400 | 44500 | -6100 | 162 | 71 |
| 54700 | 44500 | 10200 | 163 | 71 |
| 53800 | 44500 | 9300 | 164 | 71 |
| 59800 1c | 44500 | 15300 | 165 | 71 |
| 57500 2c | 44500 | 13000 | 166 | 71 |
| 68400 M6 | 44500 | 23900 | 167 | 71 |
| 64200 M6 | 44500 | 19700 | 168 | 71 |
| 53300 1c | 44500 | 8800 | 169 | 71 |
| 82000 | 44500 | 37500 | 170 | 71 |
| 65600 | 44500 | 21100 | 171 | 71 |
| 77800 1c | 44500 | 33300 | 172 | 71 |
| 79100 | 44500 | 34600 | 173 | 71 |
| 73700 | 44500 | 29200 | 174 | 71 |
| 93600 B | 44500 | 49100 | 175 | 71 |
| 63000 | 44500 | 18500 | 176 | 71 |
| 78950 | 44500 | 34450 | 177 | 71 |
| 57500 | 44500 | 13000 | 178 | 71 |
| | | | | |
| 38400 | 54700 | -16300 | 178 | 72 |
| 54700 | 54700 | 0 | 178 | 72 |
| 53800 | 54700 | -900 | 178 | 73 |
| 59800 1c | 54700 | 5100 | 179 | 73 |
| 57500 2c | 54700 | 2800 | 180 | 73 |
| 68400 M6 | 54700 | 13700 | 181 | 73 |
| 64200 M6 | 54700 | 9500 | 182 | 73 |
| 53300 1c | 54700 | -1400 | 182 | 74 |
| 82000 | 54700 | 27300 | 183 | 74 |
| 65600 | 54700 | 10900 | 184 | 74 |
| 77800 1c | 54700 | 23100 | 185 | 74 |

| | | | | |
|---|---|---|---|---|
| 79100 | 54700 | 24400 | 186 | 74 |
| 73700 | 54700 | 19000 | 187 | 74 |
| 93600 B | 54700 | 38900 | 188 | 74 |
| 63000 | 54700 | 8300 | 189 | 74 |
| 78950 | 54700 | 24250 | 190 | 74 |
| 57500 | 54700 | 2800 | 191 | 74 |
| | | | | |
| 54700 | 38400 | 16300 | 192 | 74 |
| 53800 | 38400 | 15400 | 193 | 74 |
| 59800 1c | 38400 | 21400 | 194 | 74 |
| 57500 2c | 38400 | 19100 | 195 | 74 |
| 68400 M6 | 38400 | 30000 | 196 | 74 |
| 64200 M6 | 38400 | 25800 | 197 | 74 |
| 53300 1c | 38400 | 14900 | 198 | 74 |
| 82000 | 38400 | 43600 | 199 | 74 |
| 65600 | 38400 | 27200 | 200 | 74 |
| 77800 1c | 38400 | 39400 | 201 | 74 |
| 79100 | 38400 | 40700 | 202 | 74 |
| 73700 | 38400 | 35300 | 203 | 74 |
| 93600 B | 38400 | 55200 | 204 | 74 |
| 63000 | 38400 | 24600 | 205 | 74 |
| 78950 | 38400 | 40550 | 206 | 74 |
| 57500 | 38400 | 19100 | 207 | 74 |
| | | | | |
| 53800 | 54700 | -900 | 207 | 75 |
| 59800 1c | 54700 | 5100 | 208 | 75 |
| 57500 2c | 54700 | 2800 | 209 | 75 |
| 68400 M6 | 54700 | 13700 | 210 | 75 |
| 64200 M6 | 54700 | 9500 | 211 | 75 |
| 53300 1c | 54700 | -1400 | 211 | 76 |
| 82000 | 54700 | 27300 | 212 | 76 |
| 65600 | 54700 | 10900 | 213 | 76 |
| 77800 1c | 54700 | 23100 | 214 | 76 |
| 79100 | 54700 | 24400 | 215 | 76 |
| 73700 | 54700 | 19000 | 216 | 76 |
| 93600 B | 54700 | 38900 | 217 | 76 |
| 63000 | 54700 | 8300 | 218 | 76 |
| 78950 | 54700 | 24250 | 219 | 76 |
| 57500 | 54700 | 2800 | 220 | 76 |
| | | | | |
| 59800 1c | 53800 | 6000 | 221 | 76 |
| 57500 2c | 53800 | 3700 | 222 | 76 |
| 68400 M6 | 53800 | 14600 | 223 | 76 |
| 64200 M6 | 53800 | 10400 | 224 | 76 |
| 53300 1c | 53800 | -500 | 224 | 77 |
| 82000 | 53800 | 28200 | 225 | 77 |
| 65600 | 53800 | 11800 | 226 | 77 |
| 77800 1c | 53800 | 24000 | 227 | 77 |
| 79100 | 53800 | 25300 | 228 | 77 |
| 73700 | 53800 | 19900 | 229 | 77 |
| 93600 B | 53800 | 39800 | 230 | 77 |
| 63000 | 53800 | 9200 | 231 | 77 |
| 78950 | 53800 | 25150 | 232 | 77 |
| 57500 | 53800 | 3700 | 233 | 77 |
| | | | | |
| 57500 2c | 59800 1c | Same Date | 233 | 77 |
| 68400 M6 | 59800 1c | 8600 | 234 | 77 |

| | | | | |
|---|---|---|---|---|
| 64200 M6 | 59800 1c | 4400 | 235 | 77 |
| 53300 1c | 59800 1c | -6500 | 235 | 78 |
| 82000 | 59800 1c | 22200 | 236 | 78 |
| 65600 | 59800 1c | 5800 | 237 | 78 |
| 77800 1c | 59800 1c | 18000 | 238 | 78 |
| 79100 | 59800 1c | 19300 | 239 | 78 |
| 73700 | 59800 1c | 13900 | 240 | 78 |
| 93600 B | 59800 1c | 33800 | 241 | 78 |
| 63000 | 59800 1c | 3200 | 242 | 78 |
| 78950 | 59800 1c | 19150 | 243 | 78 |
| 57500 | 59800 1c | -2300 | 243 | 79 |
| | | | | |
| 68400 M6 | 57500 2c | 10900 | 244 | 79 |
| 64200 M6 | 57500 2c | 6700 | 245 | 79 |
| 53300 1c | 57500 2c | -4200 | 245 | 80 |
| 82000 | 57500 2c | 24500 | 246 | 80 |
| 65600 | 57500 2c | 8100 | 247 | 80 |
| 77800 1c | 57500 2c | 20300 | 248 | 80 |
| 79100 | 57500 2c | 21600 | 249 | 80 |
| 73700 | 57500 2c | 16200 | 250 | 80 |
| 93600 B | 57500 2c | 36100 | 251 | 80 |
| 63000 | 57500 2c | 5500 | 252 | 80 |
| 78950 | 57500 2c | 21450 | 253 | 80 |
| 57500 | 57500 2c | 0 | 253 | 80 |
| | | | | |
| 64200 M6 | 68400 M6 | Same Date | 253 | 80 |
| 53300 1c | 68400 M6 | -15100 | 253 | 81 |
| 82000 | 68400 M6 | 13600 | 254 | 81 |
| 65600 | 68400 M6 | -2800 | 254 | 82 |
| 77800 1c | 68400 M6 | 9400 | 255 | 82 |
| 79100 | 68400 M6 | 10700 | 256 | 82 |
| 73700 | 68400 M6 | 5300 | 257 | 82 |
| 93600 B | 68400 M6 | 25200 | 258 | 82 |
| 63000 | 68400 M6 | -5400 | 258 | 83 |
| 78950 | 68400 M6 | 10550 | 259 | 83 |
| 57500 | 68400 M6 | -10900 | 259 | 84 |
| | | | | |
| 53300 1c | 64200 M6 | -10900 | 259 | 85 |
| 82000 | 64200 M6 | 17800 | 260 | 85 |
| 65600 | 64200 M6 | 1400 | 261 | 85 |
| 77800 1c | 64200 M6 | 13600 | 262 | 85 |
| 79100 | 64200 M6 | 14900 | 263 | 85 |
| 73700 | 64200 M6 | 9500 | 264 | 85 |
| 93600 B | 64200 M6 | 29400 | 265 | 85 |
| 63000 | 64200 M6 | -1200 | 265 | 86 |
| 78950 | 64200 M6 | 14750 | 266 | 86 |
| 57500 | 64200 M6 | -6700 | 266 | 87 |
| | | | | |
| 82000 | 53300 1c | 28700 | 267 | 87 |
| 65600 | 53300 1c | 12300 | 268 | 87 |
| 77800 1c | 53300 1c | 24500 | 269 | 87 |
| 79100 | 53300 1c | 25800 | 270 | 87 |
| 73700 | 53300 1c | 20400 | 271 | 87 |
| 93600 B | 53300 1c | 40300 | 272 | 87 |
| 63000 | 53300 1c | 9700 | 273 | 87 |
| 78950 | 53300 1c | 25650 | 274 | 87 |
| 57500 | 53300 1c | 4200 | 275 | 87 |

| | | | | |
|---|---|---|---|---|
| 65600 | 82000 | -16400 | 275 | 88 |
| 77800 1c | 82000 | -4200 | 275 | 89 |
| 79100 | 82000 | -2900 | 275 | 90 |
| 73700 | 82000 | -8300 | 275 | 91 |
| 93600 B | 82000 | 11600 | 276 | 91 |
| 63000 | 82000 | -19000 | 276 | 92 |
| 78950 | 82000 | -3050 | 276 | 93 |
| 57500 | 82000 | -24500 | 276 | 94 |
| | | | | |
| 77800 1c | 65600 | 12200 | 277 | 94 |
| 79100 | 65600 | 13500 | 278 | 94 |
| 73700 | 65600 | 8100 | 279 | 94 |
| 93600 B | 65600 | 28000 | 280 | 94 |
| 63000 | 65600 | -2600 | 280 | 95 |
| 78950 | 65600 | 13350 | 281 | 95 |
| 57500 | 65600 | -8100 | 281 | 96 |
| | | | | |
| 79100 | 77800 1c | 1300 | 282 | 96 |
| 73700 | 77800 1c | -4100 | 282 | 97 |
| 93600 B | 77800 1c | 15800 | 283 | 97 |
| 63000 | 77800 1c | -14800 | 283 | 98 |
| 78950 | 77800 1c | 1150 | 284 | 98 |
| 57500 | 77800 1c | -20300 | 284 | 99 |
| | | | | |
| 73700 | 79100 | -5400 | 284 | 100 |
| 93600 B | 79100 | 14500 | 285 | 100 |
| 63000 | 79100 | -16100 | 285 | 101 |
| 78950 | 79100 | -150 | 285 | 102 |
| 57500 | 79100 | -21600 | 285 | 103 |
| | | | | |
| 93600 B | 73700 | 19900 | 286 | 103 |
| 63000 | 73700 | -10700 | 286 | 104 |
| 78950 | 73700 | 5250 | 287 | 104 |
| 57500 | 73700 | -16200 | 287 | 105 |
| | | | | |
| 63000 | 93600 B | -30600 | 287 | 106 |
| 78950 | 93600 B | -14650 | 287 | 107 |
| 57500 | 93600 B | -36100 | 287 | 108 |
| | | | | |
| 78950 | 63000 | 15950 | 288 | 108 |
| 57500 | 63000 | -5500 | 288 | 109 |
| | | | | |
| 57500 | 78950 | -21450 | 288 | 110 |

S Statistic = 288 - 110 = 178

| Tied Group | Value | Members |
|---|---|---|
| 1 | 51900 | 2 |
| 2 | 57500 | 3 |
| 3 | 65600 | 2 |
| 4 | 54700 | 2 |

| Time Period | Observations |
|---|---|
| 2/1/2017 | 1 |
| 3/1/2017 | 1 |

| | |
|---|---|
| 4/1/2017 | 1 |
| 5/1/2017 | 1 |
| 6/1/2017 | 1 |
| 7/1/2017 | 1 |
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 3/1/2022 | 1 |
| 3/1/2023 | 1 |
| 3/1/2024 | 1 |

There are 2 time periods with multiple data

---

A = 120
B = 36
C = 6
D = 0
E = 12
F = 4
a = 51156
b = 197316
c = 1624
Group Variance = 2833.36
Z-Score = 3.32523
Comparison Level at 95% confidence level = -1.65463 (downward trend)
3.32523 >= -1.65463 indicating no evidence of a downward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RW10-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 104000 | 111000 | Same Date | 0 | 0 |
| 20.4 | 111000 | -110980 | 0 | 1 |
| 75800 | 111000 | -35200 | 0 | 2 |
| 1150 | 111000 | -109850 | 0 | 3 |
| 34600 | 111000 | -76400 | 0 | 4 |
| 25900 | 111000 | -85100 | 0 | 5 |
| 79.7 | 111000 | -110920 | 0 | 6 |
| 8220 | 111000 | -102780 | 0 | 7 |
| 31000 | 111000 | -80000 | 0 | 8 |
| 39000 | 111000 | -72000 | 0 | 9 |
| 158 | 111000 | -110842 | 0 | 10 |
| 26.5 | 111000 | -110974 | 0 | 11 |
| 13500 | 111000 | -97500 | 0 | 12 |
| 17600 MH | 111000 | -93400 | 0 | 13 |
| 16600 | 111000 | -94400 | 0 | 14 |
| 591 | 111000 | -110409 | 0 | 15 |
| 914 | 111000 | -110086 | 0 | 16 |
| 6150 | 111000 | -104850 | 0 | 17 |
| 5560 | 111000 | -105440 | 0 | 18 |
| 7730 1c | 111000 | -103270 | 0 | 19 |
| 6020 | 111000 | -104980 | 0 | 20 |
| 940 1c | 111000 | -110060 | 0 | 21 |
| 1090 2c | 111000 | -109910 | 0 | 22 |
| 550 | 111000 | -110450 | 0 | 23 |
| 6130 | 111000 | -104870 | 0 | 24 |
| 7440 | 111000 | -103560 | 0 | 25 |
| 102.7 | 111000 | -110897 | 0 | 26 |
| 43.23 | 111000 | -110957 | 0 | 27 |
| | | | | |
| 20.4 | 104000 | -103980 | 0 | 28 |
| 75800 | 104000 | -28200 | 0 | 29 |
| 1150 | 104000 | -102850 | 0 | 30 |
| 34600 | 104000 | -69400 | 0 | 31 |
| 25900 | 104000 | -78100 | 0 | 32 |
| 79.7 | 104000 | -103920 | 0 | 33 |
| 8220 | 104000 | -95780 | 0 | 34 |
| 31000 | 104000 | -73000 | 0 | 35 |
| 39000 | 104000 | -65000 | 0 | 36 |
| 158 | 104000 | -103842 | 0 | 37 |
| 26.5 | 104000 | -103974 | 0 | 38 |
| 13500 | 104000 | -90500 | 0 | 39 |
| 17600 MH | 104000 | -86400 | 0 | 40 |
| 16600 | 104000 | -87400 | 0 | 41 |
| 591 | 104000 | -103409 | 0 | 42 |
| 914 | 104000 | -103086 | 0 | 43 |
| 6150 | 104000 | -97850 | 0 | 44 |
| 5560 | 104000 | -98440 | 0 | 45 |

| | | | | |
|---|---|---|---|---|
| 7730 1c | 104000 | -96270 | 0 | 46 |
| 6020 | 104000 | -97980 | 0 | 47 |
| 940 1c | 104000 | -103060 | 0 | 48 |
| 1090 2c | 104000 | -102910 | 0 | 49 |
| 550 | 104000 | -103450 | 0 | 50 |
| 6130 | 104000 | -97870 | 0 | 51 |
| 7440 | 104000 | -96560 | 0 | 52 |
| 102.7 | 104000 | -103897 | 0 | 53 |
| 43.23 | 104000 | -103957 | 0 | 54 |
| | | | | |
| 75800 | 20.4 | 75779.6 | 1 | 54 |
| 1150 | 20.4 | 1129.6 | 2 | 54 |
| 34600 | 20.4 | 34579.6 | 3 | 54 |
| 25900 | 20.4 | 25879.6 | 4 | 54 |
| 79.7 | 20.4 | 59.3 | 5 | 54 |
| 8220 | 20.4 | 8199.6 | 6 | 54 |
| 31000 | 20.4 | 30979.6 | 7 | 54 |
| 39000 | 20.4 | 38979.6 | 8 | 54 |
| 158 | 20.4 | 137.6 | 9 | 54 |
| 26.5 | 20.4 | 6.1 | 10 | 54 |
| 13500 | 20.4 | 13479.6 | 11 | 54 |
| 17600 MH | 20.4 | 17579.6 | 12 | 54 |
| 16600 | 20.4 | 16579.6 | 13 | 54 |
| 591 | 20.4 | 570.6 | 14 | 54 |
| 914 | 20.4 | 893.6 | 15 | 54 |
| 6150 | 20.4 | 6129.6 | 16 | 54 |
| 5560 | 20.4 | 5539.6 | 17 | 54 |
| 7730 1c | 20.4 | 7709.6 | 18 | 54 |
| 6020 | 20.4 | 5999.6 | 19 | 54 |
| 940 1c | 20.4 | 919.6 | 20 | 54 |
| 1090 2c | 20.4 | 1069.6 | 21 | 54 |
| 550 | 20.4 | 529.6 | 22 | 54 |
| 6130 | 20.4 | 6109.6 | 23 | 54 |
| 7440 | 20.4 | 7419.6 | 24 | 54 |
| 102.7 | 20.4 | 82.3 | 25 | 54 |
| 43.23 | 20.4 | 22.83 | 26 | 54 |
| | | | | |
| 1150 | 75800 | -74650 | 26 | 55 |
| 34600 | 75800 | -41200 | 26 | 56 |
| 25900 | 75800 | -49900 | 26 | 57 |
| 79.7 | 75800 | -75720.3 | 26 | 58 |
| 8220 | 75800 | -67580 | 26 | 59 |
| 31000 | 75800 | -44800 | 26 | 60 |
| 39000 | 75800 | -36800 | 26 | 61 |
| 158 | 75800 | -75642 | 26 | 62 |
| 26.5 | 75800 | -75773.5 | 26 | 63 |
| 13500 | 75800 | -62300 | 26 | 64 |
| 17600 MH | 75800 | -58200 | 26 | 65 |
| 16600 | 75800 | -59200 | 26 | 66 |
| 591 | 75800 | -75209 | 26 | 67 |
| 914 | 75800 | -74886 | 26 | 68 |
| 6150 | 75800 | -69650 | 26 | 69 |
| 5560 | 75800 | -70240 | 26 | 70 |
| 7730 1c | 75800 | -68070 | 26 | 71 |
| 6020 | 75800 | -69780 | 26 | 72 |
| 940 1c | 75800 | -74860 | 26 | 73 |
| 1090 2c | 75800 | -74710 | 26 | 74 |

| | | | | |
|---|---|---|---|---|
| 550 | 75800 | -75250 | 26 | 75 |
| 6130 | 75800 | -69670 | 26 | 76 |
| 7440 | 75800 | -68360 | 26 | 77 |
| 102.7 | 75800 | -75697.3 | 26 | 78 |
| 43.23 | 75800 | -75756.8 | 26 | 79 |
| | | | | |
| 34600 | 1150 | 33450 | 27 | 79 |
| 25900 | 1150 | 24750 | 28 | 79 |
| 79.7 | 1150 | -1070.3 | 28 | 80 |
| 8220 | 1150 | 7070 | 29 | 80 |
| 31000 | 1150 | 29850 | 30 | 80 |
| 39000 | 1150 | 37850 | 31 | 80 |
| 158 | 1150 | -992 | 31 | 81 |
| 26.5 | 1150 | -1123.5 | 31 | 82 |
| 13500 | 1150 | 12350 | 32 | 82 |
| 17600 MH | 1150 | 16450 | 33 | 82 |
| 16600 | 1150 | 15450 | 34 | 82 |
| 591 | 1150 | -559 | 34 | 83 |
| 914 | 1150 | -236 | 34 | 84 |
| 6150 | 1150 | 5000 | 35 | 84 |
| 5560 | 1150 | 4410 | 36 | 84 |
| 7730 1c | 1150 | 6580 | 37 | 84 |
| 6020 | 1150 | 4870 | 38 | 84 |
| 940 1c | 1150 | -210 | 38 | 85 |
| 1090 2c | 1150 | -60 | 38 | 86 |
| 550 | 1150 | -600 | 38 | 87 |
| 6130 | 1150 | 4980 | 39 | 87 |
| 7440 | 1150 | 6290 | 40 | 87 |
| 102.7 | 1150 | -1047.3 | 40 | 88 |
| 43.23 | 1150 | -1106.77 | 40 | 89 |
| | | | | |
| 25900 | 34600 | -8700 | 40 | 90 |
| 79.7 | 34600 | -34520.3 | 40 | 91 |
| 8220 | 34600 | -26380 | 40 | 92 |
| 31000 | 34600 | -3600 | 40 | 93 |
| 39000 | 34600 | 4400 | 41 | 93 |
| 158 | 34600 | -34442 | 41 | 94 |
| 26.5 | 34600 | -34573.5 | 41 | 95 |
| 13500 | 34600 | -21100 | 41 | 96 |
| 17600 MH | 34600 | -17000 | 41 | 97 |
| 16600 | 34600 | -18000 | 41 | 98 |
| 591 | 34600 | -34009 | 41 | 99 |
| 914 | 34600 | -33686 | 41 | 100 |
| 6150 | 34600 | -28450 | 41 | 101 |
| 5560 | 34600 | -29040 | 41 | 102 |
| 7730 1c | 34600 | -26870 | 41 | 103 |
| 6020 | 34600 | -28580 | 41 | 104 |
| 940 1c | 34600 | -33660 | 41 | 105 |
| 1090 2c | 34600 | -33510 | 41 | 106 |
| 550 | 34600 | -34050 | 41 | 107 |
| 6130 | 34600 | -28470 | 41 | 108 |
| 7440 | 34600 | -27160 | 41 | 109 |
| 102.7 | 34600 | -34497.3 | 41 | 110 |
| 43.23 | 34600 | -34556.8 | 41 | 111 |
| | | | | |
| 79.7 | 25900 | -25820.3 | 41 | 112 |
| 8220 | 25900 | -17680 | 41 | 113 |

| | | | | |
|---|---|---|---|---|
| 31000 | 25900 | 5100 | 42 | 113 |
| 39000 | 25900 | 13100 | 43 | 113 |
| 158 | 25900 | -25742 | 43 | 114 |
| 26.5 | 25900 | -25873.5 | 43 | 115 |
| 13500 | 25900 | -12400 | 43 | 116 |
| 17600 MH | 25900 | -8300 | 43 | 117 |
| 16600 | 25900 | -9300 | 43 | 118 |
| 591 | 25900 | -25309 | 43 | 119 |
| 914 | 25900 | -24986 | 43 | 120 |
| 6150 | 25900 | -19750 | 43 | 121 |
| 5560 | 25900 | -20340 | 43 | 122 |
| 7730 1c | 25900 | -18170 | 43 | 123 |
| 6020 | 25900 | -19880 | 43 | 124 |
| 940 1c | 25900 | -24960 | 43 | 125 |
| 1090 2c | 25900 | -24810 | 43 | 126 |
| 550 | 25900 | -25350 | 43 | 127 |
| 6130 | 25900 | -19770 | 43 | 128 |
| 7440 | 25900 | -18460 | 43 | 129 |
| 102.7 | 25900 | -25797.3 | 43 | 130 |
| 43.23 | 25900 | -25856.8 | 43 | 131 |
| | | | | |
| 8220 | 79.7 | 8140.3 | 44 | 131 |
| 31000 | 79.7 | 30920.3 | 45 | 131 |
| 39000 | 79.7 | 38920.3 | 46 | 131 |
| 158 | 79.7 | 78.3 | 47 | 131 |
| 26.5 | 79.7 | -53.2 | 47 | 132 |
| 13500 | 79.7 | 13420.3 | 48 | 132 |
| 17600 MH | 79.7 | 17520.3 | 49 | 132 |
| 16600 | 79.7 | 16520.3 | 50 | 132 |
| 591 | 79.7 | 511.3 | 51 | 132 |
| 914 | 79.7 | 834.3 | 52 | 132 |
| 6150 | 79.7 | 6070.3 | 53 | 132 |
| 5560 | 79.7 | 5480.3 | 54 | 132 |
| 7730 1c | 79.7 | 7650.3 | 55 | 132 |
| 6020 | 79.7 | 5940.3 | 56 | 132 |
| 940 1c | 79.7 | 860.3 | 57 | 132 |
| 1090 2c | 79.7 | 1010.3 | 58 | 132 |
| 550 | 79.7 | 470.3 | 59 | 132 |
| 6130 | 79.7 | 6050.3 | 60 | 132 |
| 7440 | 79.7 | 7360.3 | 61 | 132 |
| 102.7 | 79.7 | 23 | 62 | 132 |
| 43.23 | 79.7 | -36.47 | 62 | 133 |
| | | | | |
| 31000 | 8220 | 22780 | 63 | 133 |
| 39000 | 8220 | 30780 | 64 | 133 |
| 158 | 8220 | -8062 | 64 | 134 |
| 26.5 | 8220 | -8193.5 | 64 | 135 |
| 13500 | 8220 | 5280 | 65 | 135 |
| 17600 MH | 8220 | 9380 | 66 | 135 |
| 16600 | 8220 | 8380 | 67 | 135 |
| 591 | 8220 | -7629 | 67 | 136 |
| 914 | 8220 | -7306 | 67 | 137 |
| 6150 | 8220 | -2070 | 67 | 138 |
| 5560 | 8220 | -2660 | 67 | 139 |
| 7730 1c | 8220 | -490 | 67 | 140 |
| 6020 | 8220 | -2200 | 67 | 141 |
| 940 1c | 8220 | -7280 | 67 | 142 |

| | | | | |
|---|---|---|---|---|
| 1090 2c | 8220 | -7130 | 67 | 143 |
| 550 | 8220 | -7670 | 67 | 144 |
| 6130 | 8220 | -2090 | 67 | 145 |
| 7440 | 8220 | -780 | 67 | 146 |
| 102.7 | 8220 | -8117.3 | 67 | 147 |
| 43.23 | 8220 | -8176.77 | 67 | 148 |
| | | | | |
| 39000 | 31000 | 8000 | 68 | 148 |
| 158 | 31000 | -30842 | 68 | 149 |
| 26.5 | 31000 | -30973.5 | 68 | 150 |
| 13500 | 31000 | -17500 | 68 | 151 |
| 17600 MH | 31000 | -13400 | 68 | 152 |
| 16600 | 31000 | -14400 | 68 | 153 |
| 591 | 31000 | -30409 | 68 | 154 |
| 914 | 31000 | -30086 | 68 | 155 |
| 6150 | 31000 | -24850 | 68 | 156 |
| 5560 | 31000 | -25440 | 68 | 157 |
| 7730 1c | 31000 | -23270 | 68 | 158 |
| 6020 | 31000 | -24980 | 68 | 159 |
| 940 1c | 31000 | -30060 | 68 | 160 |
| 1090 2c | 31000 | -29910 | 68 | 161 |
| 550 | 31000 | -30450 | 68 | 162 |
| 6130 | 31000 | -24870 | 68 | 163 |
| 7440 | 31000 | -23560 | 68 | 164 |
| 102.7 | 31000 | -30897.3 | 68 | 165 |
| 43.23 | 31000 | -30956.8 | 68 | 166 |
| | | | | |
| 158 | 39000 | -38842 | 68 | 167 |
| 26.5 | 39000 | -38973.5 | 68 | 168 |
| 13500 | 39000 | -25500 | 68 | 169 |
| 17600 MH | 39000 | -21400 | 68 | 170 |
| 16600 | 39000 | -22400 | 68 | 171 |
| 591 | 39000 | -38409 | 68 | 172 |
| 914 | 39000 | -38086 | 68 | 173 |
| 6150 | 39000 | -32850 | 68 | 174 |
| 5560 | 39000 | -33440 | 68 | 175 |
| 7730 1c | 39000 | -31270 | 68 | 176 |
| 6020 | 39000 | -32980 | 68 | 177 |
| 940 1c | 39000 | -38060 | 68 | 178 |
| 1090 2c | 39000 | -37910 | 68 | 179 |
| 550 | 39000 | -38450 | 68 | 180 |
| 6130 | 39000 | -32870 | 68 | 181 |
| 7440 | 39000 | -31560 | 68 | 182 |
| 102.7 | 39000 | -38897.3 | 68 | 183 |
| 43.23 | 39000 | -38956.8 | 68 | 184 |
| | | | | |
| 26.5 | 158 | -131.5 | 68 | 185 |
| 13500 | 158 | 13342 | 69 | 185 |
| 17600 MH | 158 | 17442 | 70 | 185 |
| 16600 | 158 | 16442 | 71 | 185 |
| 591 | 158 | 433 | 72 | 185 |
| 914 | 158 | 756 | 73 | 185 |
| 6150 | 158 | 5992 | 74 | 185 |
| 5560 | 158 | 5402 | 75 | 185 |
| 7730 1c | 158 | 7572 | 76 | 185 |
| 6020 | 158 | 5862 | 77 | 185 |
| 940 1c | 158 | 782 | 78 | 185 |

| | | | | |
|---|---|---|---|---|
| 1090 2c | 158 | 932 | 79 | 185 |
| 550 | 158 | 392 | 80 | 185 |
| 6130 | 158 | 5972 | 81 | 185 |
| 7440 | 158 | 7282 | 82 | 185 |
| 102.7 | 158 | -55.3 | 82 | 186 |
| 43.23 | 158 | -114.77 | 82 | 187 |
| | | | | |
| 13500 | 26.5 | 13473.5 | 83 | 187 |
| 17600 MH | 26.5 | 17573.5 | 84 | 187 |
| 16600 | 26.5 | 16573.5 | 85 | 187 |
| 591 | 26.5 | 564.5 | 86 | 187 |
| 914 | 26.5 | 887.5 | 87 | 187 |
| 6150 | 26.5 | 6123.5 | 88 | 187 |
| 5560 | 26.5 | 5533.5 | 89 | 187 |
| 7730 1c | 26.5 | 7703.5 | 90 | 187 |
| 6020 | 26.5 | 5993.5 | 91 | 187 |
| 940 1c | 26.5 | 913.5 | 92 | 187 |
| 1090 2c | 26.5 | 1063.5 | 93 | 187 |
| 550 | 26.5 | 523.5 | 94 | 187 |
| 6130 | 26.5 | 6103.5 | 95 | 187 |
| 7440 | 26.5 | 7413.5 | 96 | 187 |
| 102.7 | 26.5 | 76.2 | 97 | 187 |
| 43.23 | 26.5 | 16.73 | 98 | 187 |
| | | | | |
| 17600 MH | 13500 | 4100 | 99 | 187 |
| 16600 | 13500 | 3100 | 100 | 187 |
| 591 | 13500 | -12909 | 100 | 188 |
| 914 | 13500 | -12586 | 100 | 189 |
| 6150 | 13500 | -7350 | 100 | 190 |
| 5560 | 13500 | -7940 | 100 | 191 |
| 7730 1c | 13500 | -5770 | 100 | 192 |
| 6020 | 13500 | -7480 | 100 | 193 |
| 940 1c | 13500 | -12560 | 100 | 194 |
| 1090 2c | 13500 | -12410 | 100 | 195 |
| 550 | 13500 | -12950 | 100 | 196 |
| 6130 | 13500 | -7370 | 100 | 197 |
| 7440 | 13500 | -6060 | 100 | 198 |
| 102.7 | 13500 | -13397.3 | 100 | 199 |
| 43.23 | 13500 | -13456.8 | 100 | 200 |
| | | | | |
| 16600 | 17600 MH | -1000 | 100 | 201 |
| 591 | 17600 MH | -17009 | 100 | 202 |
| 914 | 17600 MH | -16686 | 100 | 203 |
| 6150 | 17600 MH | -11450 | 100 | 204 |
| 5560 | 17600 MH | -12040 | 100 | 205 |
| 7730 1c | 17600 MH | -9870 | 100 | 206 |
| 6020 | 17600 MH | -11580 | 100 | 207 |
| 940 1c | 17600 MH | -16660 | 100 | 208 |
| 1090 2c | 17600 MH | -16510 | 100 | 209 |
| 550 | 17600 MH | -17050 | 100 | 210 |
| 6130 | 17600 MH | -11470 | 100 | 211 |
| 7440 | 17600 MH | -10160 | 100 | 212 |
| 102.7 | 17600 MH | -17497.3 | 100 | 213 |
| 43.23 | 17600 MH | -17556.8 | 100 | 214 |
| | | | | |
| 591 | 16600 | -16009 | 100 | 215 |
| 914 | 16600 | -15686 | 100 | 216 |

| | | | | |
|---|---|---|---|---|
| 6150 | 16600 | -10450 | 100 | 217 |
| 5560 | 16600 | -11040 | 100 | 218 |
| 7730 1c | 16600 | -8870 | 100 | 219 |
| 6020 | 16600 | -10580 | 100 | 220 |
| 940 1c | 16600 | -15660 | 100 | 221 |
| 1090 2c | 16600 | -15510 | 100 | 222 |
| 550 | 16600 | -16050 | 100 | 223 |
| 6130 | 16600 | -10470 | 100 | 224 |
| 7440 | 16600 | -9160 | 100 | 225 |
| 102.7 | 16600 | -16497.3 | 100 | 226 |
| 43.23 | 16600 | -16556.8 | 100 | 227 |
| | | | | |
| 914 | 591 | Same Date | 100 | 227 |
| 6150 | 591 | 5559 | 101 | 227 |
| 5560 | 591 | 4969 | 102 | 227 |
| 7730 1c | 591 | 7139 | 103 | 227 |
| 6020 | 591 | 5429 | 104 | 227 |
| 940 1c | 591 | 349 | 105 | 227 |
| 1090 2c | 591 | 499 | 106 | 227 |
| 550 | 591 | -41 | 106 | 228 |
| 6130 | 591 | 5539 | 107 | 228 |
| 7440 | 591 | 6849 | 108 | 228 |
| 102.7 | 591 | -488.3 | 108 | 229 |
| 43.23 | 591 | -547.77 | 108 | 230 |
| | | | | |
| 6150 | 914 | 5236 | 109 | 230 |
| 5560 | 914 | 4646 | 110 | 230 |
| 7730 1c | 914 | 6816 | 111 | 230 |
| 6020 | 914 | 5106 | 112 | 230 |
| 940 1c | 914 | 26 | 113 | 230 |
| 1090 2c | 914 | 176 | 114 | 230 |
| 550 | 914 | -364 | 114 | 231 |
| 6130 | 914 | 5216 | 115 | 231 |
| 7440 | 914 | 6526 | 116 | 231 |
| 102.7 | 914 | -811.3 | 116 | 232 |
| 43.23 | 914 | -870.77 | 116 | 233 |
| | | | | |
| 5560 | 6150 | Same Date | 116 | 233 |
| 7730 1c | 6150 | 1580 | 117 | 233 |
| 6020 | 6150 | -130 | 117 | 234 |
| 940 1c | 6150 | -5210 | 117 | 235 |
| 1090 2c | 6150 | -5060 | 117 | 236 |
| 550 | 6150 | -5600 | 117 | 237 |
| 6130 | 6150 | -20 | 117 | 238 |
| 7440 | 6150 | 1290 | 118 | 238 |
| 102.7 | 6150 | -6047.3 | 118 | 239 |
| 43.23 | 6150 | -6106.77 | 118 | 240 |
| | | | | |
| 7730 1c | 5560 | 2170 | 119 | 240 |
| 6020 | 5560 | 460 | 120 | 240 |
| 940 1c | 5560 | -4620 | 120 | 241 |
| 1090 2c | 5560 | -4470 | 120 | 242 |
| 550 | 5560 | -5010 | 120 | 243 |
| 6130 | 5560 | 570 | 121 | 243 |
| 7440 | 5560 | 1880 | 122 | 243 |
| 102.7 | 5560 | -5457.3 | 122 | 244 |
| 43.23 | 5560 | -5516.77 | 122 | 245 |

| | | | | |
|---|---|---|---|---|
| 6020 | 7730 1c | -1710 | 122 | 246 |
| 940 1c | 7730 1c | -6790 | 122 | 247 |
| 1090 2c | 7730 1c | -6640 | 122 | 248 |
| 550 | 7730 1c | -7180 | 122 | 249 |
| 6130 | 7730 1c | -1600 | 122 | 250 |
| 7440 | 7730 1c | -290 | 122 | 251 |
| 102.7 | 7730 1c | -7627.3 | 122 | 252 |
| 43.23 | 7730 1c | -7686.77 | 122 | 253 |
| | | | | |
| 940 1c | 6020 | -5080 | 122 | 254 |
| 1090 2c | 6020 | -4930 | 122 | 255 |
| 550 | 6020 | -5470 | 122 | 256 |
| 6130 | 6020 | 110 | 123 | 256 |
| 7440 | 6020 | 1420 | 124 | 256 |
| 102.7 | 6020 | -5917.3 | 124 | 257 |
| 43.23 | 6020 | -5976.77 | 124 | 258 |
| | | | | |
| 1090 2c | 940 1c | 150 | 125 | 258 |
| 550 | 940 1c | -390 | 125 | 259 |
| 6130 | 940 1c | 5190 | 126 | 259 |
| 7440 | 940 1c | 6500 | 127 | 259 |
| 102.7 | 940 1c | -837.3 | 127 | 260 |
| 43.23 | 940 1c | -896.77 | 127 | 261 |
| | | | | |
| 550 | 1090 2c | -540 | 127 | 262 |
| 6130 | 1090 2c | 5040 | 128 | 262 |
| 7440 | 1090 2c | 6350 | 129 | 262 |
| 102.7 | 1090 2c | -987.3 | 129 | 263 |
| 43.23 | 1090 2c | -1046.77 | 129 | 264 |
| | | | | |
| 6130 | 550 | 5580 | 130 | 264 |
| 7440 | 550 | 6890 | 131 | 264 |
| 102.7 | 550 | -447.3 | 131 | 265 |
| 43.23 | 550 | -506.77 | 131 | 266 |
| | | | | |
| 7440 | 6130 | 1310 | 132 | 266 |
| 102.7 | 6130 | -6027.3 | 132 | 267 |
| 43.23 | 6130 | -6086.77 | 132 | 268 |
| | | | | |
| 102.7 | 7440 | -7337.3 | 132 | 269 |
| 43.23 | 7440 | -7396.77 | 132 | 270 |
| | | | | |
| 43.23 | 102.7 | -59.47 | 132 | 271 |

S Statistic = 132 - 271 = -139

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 2/1/2017 | 2 |
| 3/1/2017 | 1 |
| 4/1/2017 | 1 |
| 5/1/2017 | 1 |
| 6/1/2017 | 1 |
| 7/1/2017 | 1 |

| | |
|---|---|
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 3/1/2022 | 1 |
| 3/1/2023 | 1 |
| 3/1/2024 | 1 |

There are 3 time periods with multiple data

---

A = 0
B = 54
C = 0
D = 0
E = 0
F = 6
a = 51156
b = 197316
c = 1624
Group Variance = 2839
Z-Score = -2.58998
Comparison Level at 95% confidence level = -1.65463 (downward trend)
**-2.58998 < -1.65463 indicating a downward trend**

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RW11-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 301000 | 368000 ML | -67000 | 0 | 1 |
| 288000 | 368000 ML | -80000 | 0 | 2 |
| 336000 | 368000 ML | -32000 | 0 | 3 |
| 201000 | 368000 ML | -167000 | 0 | 4 |
| 192000 | 368000 ML | -176000 | 0 | 5 |
| 147000 | 368000 ML | -221000 | 0 | 6 |
| 134000 | 368000 ML | -234000 | 0 | 7 |
| 111000 | 368000 ML | -257000 | 0 | 8 |
| 207000 | 368000 ML | -161000 | 0 | 9 |
| 197000 | 368000 ML | -171000 | 0 | 10 |
| 225000 ML | 368000 ML | -143000 | 0 | 11 |
| 215000 | 368000 ML | -153000 | 0 | 12 |
| 15700 | 368000 ML | -352300 | 0 | 13 |
| 174000 | 368000 ML | -194000 | 0 | 14 |
| 142000 2c | 368000 ML | -226000 | 0 | 15 |
| 137000 1c | 368000 ML | -231000 | 0 | 16 |
| 121000 M6 | 368000 ML | -247000 | 0 | 17 |
| 122000 M6 | 368000 ML | -246000 | 0 | 18 |
| 120000 | 368000 ML | -248000 | 0 | 19 |
| 173000 | 368000 ML | -195000 | 0 | 20 |
| 151000 | 368000 ML | -217000 | 0 | 21 |
| 128000 | 368000 ML | -240000 | 0 | 22 |
| 166000 | 368000 ML | -202000 | 0 | 23 |
| 188000 B | 368000 ML | -180000 | 0 | 24 |
| 141000 | 368000 ML | -227000 | 0 | 25 |
| 101800 | 368000 ML | -266200 | 0 | 26 |
| 264.3 | 368000 ML | -367736 | 0 | 27 |
| | | | | |
| 288000 | 301000 | -13000 | 0 | 28 |
| 336000 | 301000 | 35000 | 1 | 28 |
| 201000 | 301000 | -100000 | 1 | 29 |
| 192000 | 301000 | -109000 | 1 | 30 |
| 147000 | 301000 | -154000 | 1 | 31 |
| 134000 | 301000 | -167000 | 1 | 32 |
| 111000 | 301000 | -190000 | 1 | 33 |
| 207000 | 301000 | -94000 | 1 | 34 |
| 197000 | 301000 | -104000 | 1 | 35 |
| 225000 ML | 301000 | -76000 | 1 | 36 |
| 215000 | 301000 | -86000 | 1 | 37 |
| 15700 | 301000 | -285300 | 1 | 38 |
| 174000 | 301000 | -127000 | 1 | 39 |
| 142000 2c | 301000 | -159000 | 1 | 40 |
| 137000 1c | 301000 | -164000 | 1 | 41 |
| 121000 M6 | 301000 | -180000 | 1 | 42 |
| 122000 M6 | 301000 | -179000 | 1 | 43 |
| 120000 | 301000 | -181000 | 1 | 44 |
| 173000 | 301000 | -128000 | 1 | 45 |

| | | | | |
|---|---|---|---|---|
| 151000 | 301000 | -150000 | 1 | 46 |
| 128000 | 301000 | -173000 | 1 | 47 |
| 166000 | 301000 | -135000 | 1 | 48 |
| 188000 B | 301000 | -113000 | 1 | 49 |
| 141000 | 301000 | -160000 | 1 | 50 |
| 101800 | 301000 | -199200 | 1 | 51 |
| 264.3 | 301000 | -300736 | 1 | 52 |
| | | | | |
| 336000 | 288000 | 48000 | 2 | 52 |
| 201000 | 288000 | -87000 | 2 | 53 |
| 192000 | 288000 | -96000 | 2 | 54 |
| 147000 | 288000 | -141000 | 2 | 55 |
| 134000 | 288000 | -154000 | 2 | 56 |
| 111000 | 288000 | -177000 | 2 | 57 |
| 207000 | 288000 | -81000 | 2 | 58 |
| 197000 | 288000 | -91000 | 2 | 59 |
| 225000 ML | 288000 | -63000 | 2 | 60 |
| 215000 | 288000 | -73000 | 2 | 61 |
| 15700 | 288000 | -272300 | 2 | 62 |
| 174000 | 288000 | -114000 | 2 | 63 |
| 142000 2c | 288000 | -146000 | 2 | 64 |
| 137000 1c | 288000 | -151000 | 2 | 65 |
| 121000 M6 | 288000 | -167000 | 2 | 66 |
| 122000 M6 | 288000 | -166000 | 2 | 67 |
| 120000 | 288000 | -168000 | 2 | 68 |
| 173000 | 288000 | -115000 | 2 | 69 |
| 151000 | 288000 | -137000 | 2 | 70 |
| 128000 | 288000 | -160000 | 2 | 71 |
| 166000 | 288000 | -122000 | 2 | 72 |
| 188000 B | 288000 | -100000 | 2 | 73 |
| 141000 | 288000 | -147000 | 2 | 74 |
| 101800 | 288000 | -186200 | 2 | 75 |
| 264.3 | 288000 | -287736 | 2 | 76 |
| | | | | |
| 201000 | 336000 | -135000 | 2 | 77 |
| 192000 | 336000 | -144000 | 2 | 78 |
| 147000 | 336000 | -189000 | 2 | 79 |
| 134000 | 336000 | -202000 | 2 | 80 |
| 111000 | 336000 | -225000 | 2 | 81 |
| 207000 | 336000 | -129000 | 2 | 82 |
| 197000 | 336000 | -139000 | 2 | 83 |
| 225000 ML | 336000 | -111000 | 2 | 84 |
| 215000 | 336000 | -121000 | 2 | 85 |
| 15700 | 336000 | -320300 | 2 | 86 |
| 174000 | 336000 | -162000 | 2 | 87 |
| 142000 2c | 336000 | -194000 | 2 | 88 |
| 137000 1c | 336000 | -199000 | 2 | 89 |
| 121000 M6 | 336000 | -215000 | 2 | 90 |
| 122000 M6 | 336000 | -214000 | 2 | 91 |
| 120000 | 336000 | -216000 | 2 | 92 |
| 173000 | 336000 | -163000 | 2 | 93 |
| 151000 | 336000 | -185000 | 2 | 94 |
| 128000 | 336000 | -208000 | 2 | 95 |
| 166000 | 336000 | -170000 | 2 | 96 |
| 188000 B | 336000 | -148000 | 2 | 97 |
| 141000 | 336000 | -195000 | 2 | 98 |
| 101800 | 336000 | -234200 | 2 | 99 |

| | | | | |
|---|---|---|---|---|
| 264.3 | 336000 | -335736 | 2 | 100 |
| | | | | |
| 192000 | 201000 | -9000 | 2 | 101 |
| 147000 | 201000 | -54000 | 2 | 102 |
| 134000 | 201000 | -67000 | 2 | 103 |
| 111000 | 201000 | -90000 | 2 | 104 |
| 207000 | 201000 | 6000 | 3 | 104 |
| 197000 | 201000 | -4000 | 3 | 105 |
| 225000 ML | 201000 | 24000 | 4 | 105 |
| 215000 | 201000 | 14000 | 5 | 105 |
| 15700 | 201000 | -185300 | 5 | 106 |
| 174000 | 201000 | -27000 | 5 | 107 |
| 142000 2c | 201000 | -59000 | 5 | 108 |
| 137000 1c | 201000 | -64000 | 5 | 109 |
| 121000 M6 | 201000 | -80000 | 5 | 110 |
| 122000 M6 | 201000 | -79000 | 5 | 111 |
| 120000 | 201000 | -81000 | 5 | 112 |
| 173000 | 201000 | -28000 | 5 | 113 |
| 151000 | 201000 | -50000 | 5 | 114 |
| 128000 | 201000 | -73000 | 5 | 115 |
| 166000 | 201000 | -35000 | 5 | 116 |
| 188000 B | 201000 | -13000 | 5 | 117 |
| 141000 | 201000 | -60000 | 5 | 118 |
| 101800 | 201000 | -99200 | 5 | 119 |
| 264.3 | 201000 | -200736 | 5 | 120 |
| | | | | |
| 147000 | 192000 | -45000 | 5 | 121 |
| 134000 | 192000 | -58000 | 5 | 122 |
| 111000 | 192000 | -81000 | 5 | 123 |
| 207000 | 192000 | 15000 | 6 | 123 |
| 197000 | 192000 | 5000 | 7 | 123 |
| 225000 ML | 192000 | 33000 | 8 | 123 |
| 215000 | 192000 | 23000 | 9 | 123 |
| 15700 | 192000 | -176300 | 9 | 124 |
| 174000 | 192000 | -18000 | 9 | 125 |
| 142000 2c | 192000 | -50000 | 9 | 126 |
| 137000 1c | 192000 | -55000 | 9 | 127 |
| 121000 M6 | 192000 | -71000 | 9 | 128 |
| 122000 M6 | 192000 | -70000 | 9 | 129 |
| 120000 | 192000 | -72000 | 9 | 130 |
| 173000 | 192000 | -19000 | 9 | 131 |
| 151000 | 192000 | -41000 | 9 | 132 |
| 128000 | 192000 | -64000 | 9 | 133 |
| 166000 | 192000 | -26000 | 9 | 134 |
| 188000 B | 192000 | -4000 | 9 | 135 |
| 141000 | 192000 | -51000 | 9 | 136 |
| 101800 | 192000 | -90200 | 9 | 137 |
| 264.3 | 192000 | -191736 | 9 | 138 |
| | | | | |
| 134000 | 147000 | -13000 | 9 | 139 |
| 111000 | 147000 | -36000 | 9 | 140 |
| 207000 | 147000 | 60000 | 10 | 140 |
| 197000 | 147000 | 50000 | 11 | 140 |
| 225000 ML | 147000 | 78000 | 12 | 140 |
| 215000 | 147000 | 68000 | 13 | 140 |
| 15700 | 147000 | -131300 | 13 | 141 |
| 174000 | 147000 | 27000 | 14 | 141 |

| | | | | |
|---|---|---|---|---|
| 142000 2c | 147000 | -5000 | 14 | 142 |
| 137000 1c | 147000 | -10000 | 14 | 143 |
| 121000 M6 | 147000 | -26000 | 14 | 144 |
| 122000 M6 | 147000 | -25000 | 14 | 145 |
| 120000 | 147000 | -27000 | 14 | 146 |
| 173000 | 147000 | 26000 | 15 | 146 |
| 151000 | 147000 | 4000 | 16 | 146 |
| 128000 | 147000 | -19000 | 16 | 147 |
| 166000 | 147000 | 19000 | 17 | 147 |
| 188000 B | 147000 | 41000 | 18 | 147 |
| 141000 | 147000 | -6000 | 18 | 148 |
| 101800 | 147000 | -45200 | 18 | 149 |
| 264.3 | 147000 | -146736 | 18 | 150 |
| | | | | |
| 111000 | 134000 | -23000 | 18 | 151 |
| 207000 | 134000 | 73000 | 19 | 151 |
| 197000 | 134000 | 63000 | 20 | 151 |
| 225000 ML | 134000 | 91000 | 21 | 151 |
| 215000 | 134000 | 81000 | 22 | 151 |
| 15700 | 134000 | -118300 | 22 | 152 |
| 174000 | 134000 | 40000 | 23 | 152 |
| 142000 2c | 134000 | 8000 | 24 | 152 |
| 137000 1c | 134000 | 3000 | 25 | 152 |
| 121000 M6 | 134000 | -13000 | 25 | 153 |
| 122000 M6 | 134000 | -12000 | 25 | 154 |
| 120000 | 134000 | -14000 | 25 | 155 |
| 173000 | 134000 | 39000 | 26 | 155 |
| 151000 | 134000 | 17000 | 27 | 155 |
| 128000 | 134000 | -6000 | 27 | 156 |
| 166000 | 134000 | 32000 | 28 | 156 |
| 188000 B | 134000 | 54000 | 29 | 156 |
| 141000 | 134000 | 7000 | 30 | 156 |
| 101800 | 134000 | -32200 | 30 | 157 |
| 264.3 | 134000 | -133736 | 30 | 158 |
| | | | | |
| 207000 | 111000 | 96000 | 31 | 158 |
| 197000 | 111000 | 86000 | 32 | 158 |
| 225000 ML | 111000 | 114000 | 33 | 158 |
| 215000 | 111000 | 104000 | 34 | 158 |
| 15700 | 111000 | -95300 | 34 | 159 |
| 174000 | 111000 | 63000 | 35 | 159 |
| 142000 2c | 111000 | 31000 | 36 | 159 |
| 137000 1c | 111000 | 26000 | 37 | 159 |
| 121000 M6 | 111000 | 10000 | 38 | 159 |
| 122000 M6 | 111000 | 11000 | 39 | 159 |
| 120000 | 111000 | 9000 | 40 | 159 |
| 173000 | 111000 | 62000 | 41 | 159 |
| 151000 | 111000 | 40000 | 42 | 159 |
| 128000 | 111000 | 17000 | 43 | 159 |
| 166000 | 111000 | 55000 | 44 | 159 |
| 188000 B | 111000 | 77000 | 45 | 159 |
| 141000 | 111000 | 30000 | 46 | 159 |
| 101800 | 111000 | -9200 | 46 | 160 |
| 264.3 | 111000 | -110736 | 46 | 161 |
| | | | | |
| 197000 | 207000 | -10000 | 46 | 162 |
| 225000 ML | 207000 | 18000 | 47 | 162 |

| | | | | |
|---|---|---|---|---|
| 215000 | 207000 | 8000 | 48 | 162 |
| 15700 | 207000 | -191300 | 48 | 163 |
| 174000 | 207000 | -33000 | 48 | 164 |
| 142000 2c | 207000 | -65000 | 48 | 165 |
| 137000 1c | 207000 | -70000 | 48 | 166 |
| 121000 M6 | 207000 | -86000 | 48 | 167 |
| 122000 M6 | 207000 | -85000 | 48 | 168 |
| 120000 | 207000 | -87000 | 48 | 169 |
| 173000 | 207000 | -34000 | 48 | 170 |
| 151000 | 207000 | -56000 | 48 | 171 |
| 128000 | 207000 | -79000 | 48 | 172 |
| 166000 | 207000 | -41000 | 48 | 173 |
| 188000 B | 207000 | -19000 | 48 | 174 |
| 141000 | 207000 | -66000 | 48 | 175 |
| 101800 | 207000 | -105200 | 48 | 176 |
| 264.3 | 207000 | -206736 | 48 | 177 |
| | | | | |
| 225000 ML | 197000 | 28000 | 49 | 177 |
| 215000 | 197000 | 18000 | 50 | 177 |
| 15700 | 197000 | -181300 | 50 | 178 |
| 174000 | 197000 | -23000 | 50 | 179 |
| 142000 2c | 197000 | -55000 | 50 | 180 |
| 137000 1c | 197000 | -60000 | 50 | 181 |
| 121000 M6 | 197000 | -76000 | 50 | 182 |
| 122000 M6 | 197000 | -75000 | 50 | 183 |
| 120000 | 197000 | -77000 | 50 | 184 |
| 173000 | 197000 | -24000 | 50 | 185 |
| 151000 | 197000 | -46000 | 50 | 186 |
| 128000 | 197000 | -69000 | 50 | 187 |
| 166000 | 197000 | -31000 | 50 | 188 |
| 188000 B | 197000 | -9000 | 50 | 189 |
| 141000 | 197000 | -56000 | 50 | 190 |
| 101800 | 197000 | -95200 | 50 | 191 |
| 264.3 | 197000 | -196736 | 50 | 192 |
| | | | | |
| 215000 | 225000 ML | -10000 | 50 | 193 |
| 15700 | 225000 ML | -209300 | 50 | 194 |
| 174000 | 225000 ML | -51000 | 50 | 195 |
| 142000 2c | 225000 ML | -83000 | 50 | 196 |
| 137000 1c | 225000 ML | -88000 | 50 | 197 |
| 121000 M6 | 225000 ML | -104000 | 50 | 198 |
| 122000 M6 | 225000 ML | -103000 | 50 | 199 |
| 120000 | 225000 ML | -105000 | 50 | 200 |
| 173000 | 225000 ML | -52000 | 50 | 201 |
| 151000 | 225000 ML | -74000 | 50 | 202 |
| 128000 | 225000 ML | -97000 | 50 | 203 |
| 166000 | 225000 ML | -59000 | 50 | 204 |
| 188000 B | 225000 ML | -37000 | 50 | 205 |
| 141000 | 225000 ML | -84000 | 50 | 206 |
| 101800 | 225000 ML | -123200 | 50 | 207 |
| 264.3 | 225000 ML | -224736 | 50 | 208 |
| | | | | |
| 15700 | 215000 | -199300 | 50 | 209 |
| 174000 | 215000 | -41000 | 50 | 210 |
| 142000 2c | 215000 | -73000 | 50 | 211 |
| 137000 1c | 215000 | -78000 | 50 | 212 |
| 121000 M6 | 215000 | -94000 | 50 | 213 |

| | | | | |
|---|---|---|---|---|
| 122000 M6 | 215000 | -93000 | 50 | 214 |
| 120000 | 215000 | -95000 | 50 | 215 |
| 173000 | 215000 | -42000 | 50 | 216 |
| 151000 | 215000 | -64000 | 50 | 217 |
| 128000 | 215000 | -87000 | 50 | 218 |
| 166000 | 215000 | -49000 | 50 | 219 |
| 188000 B | 215000 | -27000 | 50 | 220 |
| 141000 | 215000 | -74000 | 50 | 221 |
| 101800 | 215000 | -113200 | 50 | 222 |
| 264.3 | 215000 | -214736 | 50 | 223 |
| | | | | |
| 174000 | 15700 | 158300 | 51 | 223 |
| 142000 2c | 15700 | 126300 | 52 | 223 |
| 137000 1c | 15700 | 121300 | 53 | 223 |
| 121000 M6 | 15700 | 105300 | 54 | 223 |
| 122000 M6 | 15700 | 106300 | 55 | 223 |
| 120000 | 15700 | 104300 | 56 | 223 |
| 173000 | 15700 | 157300 | 57 | 223 |
| 151000 | 15700 | 135300 | 58 | 223 |
| 128000 | 15700 | 112300 | 59 | 223 |
| 166000 | 15700 | 150300 | 60 | 223 |
| 188000 B | 15700 | 172300 | 61 | 223 |
| 141000 | 15700 | 125300 | 62 | 223 |
| 101800 | 15700 | 86100 | 63 | 223 |
| 264.3 | 15700 | -15435.7 | 63 | 224 |
| | | | | |
| 142000 2c | 174000 | -32000 | 63 | 225 |
| 137000 1c | 174000 | -37000 | 63 | 226 |
| 121000 M6 | 174000 | -53000 | 63 | 227 |
| 122000 M6 | 174000 | -52000 | 63 | 228 |
| 120000 | 174000 | -54000 | 63 | 229 |
| 173000 | 174000 | -1000 | 63 | 230 |
| 151000 | 174000 | -23000 | 63 | 231 |
| 128000 | 174000 | -46000 | 63 | 232 |
| 166000 | 174000 | -8000 | 63 | 233 |
| 188000 B | 174000 | 14000 | 64 | 233 |
| 141000 | 174000 | -33000 | 64 | 234 |
| 101800 | 174000 | -72200 | 64 | 235 |
| 264.3 | 174000 | -173736 | 64 | 236 |
| | | | | |
| 137000 1c | 142000 2c | Same Date | 64 | 236 |
| 121000 M6 | 142000 2c | -21000 | 64 | 237 |
| 122000 M6 | 142000 2c | -20000 | 64 | 238 |
| 120000 | 142000 2c | -22000 | 64 | 239 |
| 173000 | 142000 2c | 31000 | 65 | 239 |
| 151000 | 142000 2c | 9000 | 66 | 239 |
| 128000 | 142000 2c | -14000 | 66 | 240 |
| 166000 | 142000 2c | 24000 | 67 | 240 |
| 188000 B | 142000 2c | 46000 | 68 | 240 |
| 141000 | 142000 2c | -1000 | 68 | 241 |
| 101800 | 142000 2c | -40200 | 68 | 242 |
| 264.3 | 142000 2c | -141736 | 68 | 243 |
| | | | | |
| 121000 M6 | 137000 1c | -16000 | 68 | 244 |
| 122000 M6 | 137000 1c | -15000 | 68 | 245 |
| 120000 | 137000 1c | -17000 | 68 | 246 |
| 173000 | 137000 1c | 36000 | 69 | 246 |

| | | | | |
|---|---|---|---|---|
| 151000 | 137000 1c | 14000 | 70 | 246 |
| 128000 | 137000 1c | -9000 | 70 | 247 |
| 166000 | 137000 1c | 29000 | 71 | 247 |
| 188000 B | 137000 1c | 51000 | 72 | 247 |
| 141000 | 137000 1c | 4000 | 73 | 247 |
| 101800 | 137000 1c | -35200 | 73 | 248 |
| 264.3 | 137000 1c | -136736 | 73 | 249 |
| | | | | |
| 122000 M6 | 121000 M6 | Same Date | 73 | 249 |
| 120000 | 121000 M6 | -1000 | 73 | 250 |
| 173000 | 121000 M6 | 52000 | 74 | 250 |
| 151000 | 121000 M6 | 30000 | 75 | 250 |
| 128000 | 121000 M6 | 7000 | 76 | 250 |
| 166000 | 121000 M6 | 45000 | 77 | 250 |
| 188000 B | 121000 M6 | 67000 | 78 | 250 |
| 141000 | 121000 M6 | 20000 | 79 | 250 |
| 101800 | 121000 M6 | -19200 | 79 | 251 |
| 264.3 | 121000 M6 | -120736 | 79 | 252 |
| | | | | |
| 120000 | 122000 M6 | -2000 | 79 | 253 |
| 173000 | 122000 M6 | 51000 | 80 | 253 |
| 151000 | 122000 M6 | 29000 | 81 | 253 |
| 128000 | 122000 M6 | 6000 | 82 | 253 |
| 166000 | 122000 M6 | 44000 | 83 | 253 |
| 188000 B | 122000 M6 | 66000 | 84 | 253 |
| 141000 | 122000 M6 | 19000 | 85 | 253 |
| 101800 | 122000 M6 | -20200 | 85 | 254 |
| 264.3 | 122000 M6 | -121736 | 85 | 255 |
| | | | | |
| 173000 | 120000 | 53000 | 86 | 255 |
| 151000 | 120000 | 31000 | 87 | 255 |
| 128000 | 120000 | 8000 | 88 | 255 |
| 166000 | 120000 | 46000 | 89 | 255 |
| 188000 B | 120000 | 68000 | 90 | 255 |
| 141000 | 120000 | 21000 | 91 | 255 |
| 101800 | 120000 | -18200 | 91 | 256 |
| 264.3 | 120000 | -119736 | 91 | 257 |
| | | | | |
| 151000 | 173000 | -22000 | 91 | 258 |
| 128000 | 173000 | -45000 | 91 | 259 |
| 166000 | 173000 | -7000 | 91 | 260 |
| 188000 B | 173000 | 15000 | 92 | 260 |
| 141000 | 173000 | -32000 | 92 | 261 |
| 101800 | 173000 | -71200 | 92 | 262 |
| 264.3 | 173000 | -172736 | 92 | 263 |
| | | | | |
| 128000 | 151000 | -23000 | 92 | 264 |
| 166000 | 151000 | 15000 | 93 | 264 |
| 188000 B | 151000 | 37000 | 94 | 264 |
| 141000 | 151000 | -10000 | 94 | 265 |
| 101800 | 151000 | -49200 | 94 | 266 |
| 264.3 | 151000 | -150736 | 94 | 267 |
| | | | | |
| 166000 | 128000 | 38000 | 95 | 267 |
| 188000 B | 128000 | 60000 | 96 | 267 |
| 141000 | 128000 | 13000 | 97 | 267 |
| 101800 | 128000 | -26200 | 97 | 268 |

| | | | | |
|---|---|---|---|---|
| 264.3 | 128000 | -127736 | 97 | 269 |
| | | | | |
| 188000 B | 166000 | 22000 | 98 | 269 |
| 141000 | 166000 | -25000 | 98 | 270 |
| 101800 | 166000 | -64200 | 98 | 271 |
| 264.3 | 166000 | -165736 | 98 | 272 |
| | | | | |
| 141000 | 188000 B | -47000 | 98 | 273 |
| 101800 | 188000 B | -86200 | 98 | 274 |
| 264.3 | 188000 B | -187736 | 98 | 275 |
| | | | | |
| 101800 | 141000 | -39200 | 98 | 276 |
| 264.3 | 141000 | -140736 | 98 | 277 |
| | | | | |
| 264.3 | 101800 | -101536 | 98 | 278 |

S Statistic = 98 - 278 = -180

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 2/1/2017 | 1 |
| 3/1/2017 | 1 |
| 4/1/2017 | 1 |
| 5/1/2017 | 1 |
| 6/1/2017 | 1 |
| 7/1/2017 | 1 |
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 3/1/2022 | 1 |
| 3/1/2023 | 1 |
| 3/1/2024 | 1 |

There are 2 time periods with multiple data

A = 0
B = 36
C = 0
D = 0
E = 0
F = 4
a = 46116

b = 176904
c = 1512
Group Variance = 2560
Z-Score = -3.5378
Comparison Level at 95% confidence level = -1.65463 (downward trend)
**-3.5378 < -1.65463 indicating a downward trend**

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RW12-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 216000 | 249000 MH | -33000 | 0 | 1 |
| 188000 | 249000 MH | -61000 | 0 | 2 |
| 232000 | 249000 MH | -17000 | 0 | 3 |
| 226000 | 249000 MH | -23000 | 0 | 4 |
| 219000 | 249000 MH | -30000 | 0 | 5 |
| 156000 | 249000 MH | -93000 | 0 | 6 |
| 156000 | 249000 MH | -93000 | 0 | 7 |
| 150000 ML | 249000 MH | -99000 | 0 | 8 |
| 140000 | 249000 MH | -109000 | 0 | 9 |
| 157000 ML | 249000 MH | -92000 | 0 | 10 |
| 117000 | 249000 MH | -132000 | 0 | 11 |
| 103000 | 249000 MH | -146000 | 0 | 12 |
| 2410 | 249000 MH | -246590 | 0 | 13 |
| 14300 | 249000 MH | -234700 | 0 | 14 |
| 110000 | 249000 MH | -139000 | 0 | 15 |
| 111000 | 249000 MH | -138000 | 0 | 16 |
| 111000 M6 | 249000 MH | -138000 | 0 | 17 |
| 120000 | 249000 MH | -129000 | 0 | 18 |
| 104000 | 249000 MH | -145000 | 0 | 19 |
| 43500 M6 | 249000 MH | -205500 | 0 | 20 |
| 86400 | 249000 MH | -162600 | 0 | 21 |
| 81000 | 249000 MH | -168000 | 0 | 22 |
| 99550 | 249000 MH | -149450 | 0 | 23 |
| 28220 | 249000 MH | -220780 | 0 | 24 |
| 78100 | 249000 MH | -170900 | 0 | 25 |
| 1418 | 249000 MH | -247582 | 0 | 26 |
| 87040 | 249000 MH | -161960 | 0 | 27 |
| | | | | |
| 188000 | 216000 | -28000 | 0 | 28 |
| 232000 | 216000 | 16000 | 1 | 28 |
| 226000 | 216000 | 10000 | 2 | 28 |
| 219000 | 216000 | 3000 | 3 | 28 |
| 156000 | 216000 | -60000 | 3 | 29 |
| 156000 | 216000 | -60000 | 3 | 30 |
| 150000 ML | 216000 | -66000 | 3 | 31 |
| 140000 | 216000 | -76000 | 3 | 32 |
| 157000 ML | 216000 | -59000 | 3 | 33 |
| 117000 | 216000 | -99000 | 3 | 34 |
| 103000 | 216000 | -113000 | 3 | 35 |
| 2410 | 216000 | -213590 | 3 | 36 |
| 14300 | 216000 | -201700 | 3 | 37 |
| 110000 | 216000 | -106000 | 3 | 38 |
| 111000 | 216000 | -105000 | 3 | 39 |
| 111000 M6 | 216000 | -105000 | 3 | 40 |
| 120000 | 216000 | -96000 | 3 | 41 |
| 104000 | 216000 | -112000 | 3 | 42 |
| 43500 M6 | 216000 | -172500 | 3 | 43 |

| | | | | |
|---|---|---|---|---|
| 86400 | 216000 | -129600 | 3 | 44 |
| 81000 | 216000 | -135000 | 3 | 45 |
| 99550 | 216000 | -116450 | 3 | 46 |
| 28220 | 216000 | -187780 | 3 | 47 |
| 78100 | 216000 | -137900 | 3 | 48 |
| 1418 | 216000 | -214582 | 3 | 49 |
| 87040 | 216000 | -128960 | 3 | 50 |
| | | | | |
| 232000 | 188000 | 44000 | 4 | 50 |
| 226000 | 188000 | 38000 | 5 | 50 |
| 219000 | 188000 | 31000 | 6 | 50 |
| 156000 | 188000 | -32000 | 6 | 51 |
| 156000 | 188000 | -32000 | 6 | 52 |
| 150000 ML | 188000 | -38000 | 6 | 53 |
| 140000 | 188000 | -48000 | 6 | 54 |
| 157000 ML | 188000 | -31000 | 6 | 55 |
| 117000 | 188000 | -71000 | 6 | 56 |
| 103000 | 188000 | -85000 | 6 | 57 |
| 2410 | 188000 | -185590 | 6 | 58 |
| 14300 | 188000 | -173700 | 6 | 59 |
| 110000 | 188000 | -78000 | 6 | 60 |
| 111000 | 188000 | -77000 | 6 | 61 |
| 111000 M6 | 188000 | -77000 | 6 | 62 |
| 120000 | 188000 | -68000 | 6 | 63 |
| 104000 | 188000 | -84000 | 6 | 64 |
| 43500 M6 | 188000 | -144500 | 6 | 65 |
| 86400 | 188000 | -101600 | 6 | 66 |
| 81000 | 188000 | -107000 | 6 | 67 |
| 99550 | 188000 | -88450 | 6 | 68 |
| 28220 | 188000 | -159780 | 6 | 69 |
| 78100 | 188000 | -109900 | 6 | 70 |
| 1418 | 188000 | -186582 | 6 | 71 |
| 87040 | 188000 | -100960 | 6 | 72 |
| | | | | |
| 226000 | 232000 | -6000 | 6 | 73 |
| 219000 | 232000 | -13000 | 6 | 74 |
| 156000 | 232000 | -76000 | 6 | 75 |
| 156000 | 232000 | -76000 | 6 | 76 |
| 150000 ML | 232000 | -82000 | 6 | 77 |
| 140000 | 232000 | -92000 | 6 | 78 |
| 157000 ML | 232000 | -75000 | 6 | 79 |
| 117000 | 232000 | -115000 | 6 | 80 |
| 103000 | 232000 | -129000 | 6 | 81 |
| 2410 | 232000 | -229590 | 6 | 82 |
| 14300 | 232000 | -217700 | 6 | 83 |
| 110000 | 232000 | -122000 | 6 | 84 |
| 111000 | 232000 | -121000 | 6 | 85 |
| 111000 M6 | 232000 | -121000 | 6 | 86 |
| 120000 | 232000 | -112000 | 6 | 87 |
| 104000 | 232000 | -128000 | 6 | 88 |
| 43500 M6 | 232000 | -188500 | 6 | 89 |
| 86400 | 232000 | -145600 | 6 | 90 |
| 81000 | 232000 | -151000 | 6 | 91 |
| 99550 | 232000 | -132450 | 6 | 92 |
| 28220 | 232000 | -203780 | 6 | 93 |
| 78100 | 232000 | -153900 | 6 | 94 |
| 1418 | 232000 | -230582 | 6 | 95 |

| | | | | |
|---|---|---|---|---|
| 87040 | 232000 | -144960 | 6 | 96 |
| | | | | |
| 219000 | 226000 | -7000 | 6 | 97 |
| 156000 | 226000 | -70000 | 6 | 98 |
| 156000 | 226000 | -70000 | 6 | 99 |
| 150000 ML | 226000 | -76000 | 6 | 100 |
| 140000 | 226000 | -86000 | 6 | 101 |
| 157000 ML | 226000 | -69000 | 6 | 102 |
| 117000 | 226000 | -109000 | 6 | 103 |
| 103000 | 226000 | -123000 | 6 | 104 |
| 2410 | 226000 | -223590 | 6 | 105 |
| 14300 | 226000 | -211700 | 6 | 106 |
| 110000 | 226000 | -116000 | 6 | 107 |
| 111000 | 226000 | -115000 | 6 | 108 |
| 111000 M6 | 226000 | -115000 | 6 | 109 |
| 120000 | 226000 | -106000 | 6 | 110 |
| 104000 | 226000 | -122000 | 6 | 111 |
| 43500 M6 | 226000 | -182500 | 6 | 112 |
| 86400 | 226000 | -139600 | 6 | 113 |
| 81000 | 226000 | -145000 | 6 | 114 |
| 99550 | 226000 | -126450 | 6 | 115 |
| 28220 | 226000 | -197780 | 6 | 116 |
| 78100 | 226000 | -147900 | 6 | 117 |
| 1418 | 226000 | -224582 | 6 | 118 |
| 87040 | 226000 | -138960 | 6 | 119 |
| | | | | |
| 156000 | 219000 | -63000 | 6 | 120 |
| 156000 | 219000 | -63000 | 6 | 121 |
| 150000 ML | 219000 | -69000 | 6 | 122 |
| 140000 | 219000 | -79000 | 6 | 123 |
| 157000 ML | 219000 | -62000 | 6 | 124 |
| 117000 | 219000 | -102000 | 6 | 125 |
| 103000 | 219000 | -116000 | 6 | 126 |
| 2410 | 219000 | -216590 | 6 | 127 |
| 14300 | 219000 | -204700 | 6 | 128 |
| 110000 | 219000 | -109000 | 6 | 129 |
| 111000 | 219000 | -108000 | 6 | 130 |
| 111000 M6 | 219000 | -108000 | 6 | 131 |
| 120000 | 219000 | -99000 | 6 | 132 |
| 104000 | 219000 | -115000 | 6 | 133 |
| 43500 M6 | 219000 | -175500 | 6 | 134 |
| 86400 | 219000 | -132600 | 6 | 135 |
| 81000 | 219000 | -138000 | 6 | 136 |
| 99550 | 219000 | -119450 | 6 | 137 |
| 28220 | 219000 | -190780 | 6 | 138 |
| 78100 | 219000 | -140900 | 6 | 139 |
| 1418 | 219000 | -217582 | 6 | 140 |
| 87040 | 219000 | -131960 | 6 | 141 |
| | | | | |
| 156000 | 156000 | 0 | 6 | 141 |
| 150000 ML | 156000 | -6000 | 6 | 142 |
| 140000 | 156000 | -16000 | 6 | 143 |
| 157000 ML | 156000 | 1000 | 7 | 143 |
| 117000 | 156000 | -39000 | 7 | 144 |
| 103000 | 156000 | -53000 | 7 | 145 |
| 2410 | 156000 | -153590 | 7 | 146 |
| 14300 | 156000 | -141700 | 7 | 147 |

| | | | | |
|---|---|---|---|---|
| 110000 | 156000 | -46000 | 7 | 148 |
| 111000 | 156000 | -45000 | 7 | 149 |
| 111000 M6 | 156000 | -45000 | 7 | 150 |
| 120000 | 156000 | -36000 | 7 | 151 |
| 104000 | 156000 | -52000 | 7 | 152 |
| 43500 M6 | 156000 | -112500 | 7 | 153 |
| 86400 | 156000 | -69600 | 7 | 154 |
| 81000 | 156000 | -75000 | 7 | 155 |
| 99550 | 156000 | -56450 | 7 | 156 |
| 28220 | 156000 | -127780 | 7 | 157 |
| 78100 | 156000 | -77900 | 7 | 158 |
| 1418 | 156000 | -154582 | 7 | 159 |
| 87040 | 156000 | -68960 | 7 | 160 |
| | | | | |
| 150000 ML | 156000 | -6000 | 7 | 161 |
| 140000 | 156000 | -16000 | 7 | 162 |
| 157000 ML | 156000 | 1000 | 8 | 162 |
| 117000 | 156000 | -39000 | 8 | 163 |
| 103000 | 156000 | -53000 | 8 | 164 |
| 2410 | 156000 | -153590 | 8 | 165 |
| 14300 | 156000 | -141700 | 8 | 166 |
| 110000 | 156000 | -46000 | 8 | 167 |
| 111000 | 156000 | -45000 | 8 | 168 |
| 111000 M6 | 156000 | -45000 | 8 | 169 |
| 120000 | 156000 | -36000 | 8 | 170 |
| 104000 | 156000 | -52000 | 8 | 171 |
| 43500 M6 | 156000 | -112500 | 8 | 172 |
| 86400 | 156000 | -69600 | 8 | 173 |
| 81000 | 156000 | -75000 | 8 | 174 |
| 99550 | 156000 | -56450 | 8 | 175 |
| 28220 | 156000 | -127780 | 8 | 176 |
| 78100 | 156000 | -77900 | 8 | 177 |
| 1418 | 156000 | -154582 | 8 | 178 |
| 87040 | 156000 | -68960 | 8 | 179 |
| | | | | |
| 140000 | 150000 ML | -10000 | 8 | 180 |
| 157000 ML | 150000 ML | 7000 | 9 | 180 |
| 117000 | 150000 ML | -33000 | 9 | 181 |
| 103000 | 150000 ML | -47000 | 9 | 182 |
| 2410 | 150000 ML | -147590 | 9 | 183 |
| 14300 | 150000 ML | -135700 | 9 | 184 |
| 110000 | 150000 ML | -40000 | 9 | 185 |
| 111000 | 150000 ML | -39000 | 9 | 186 |
| 111000 M6 | 150000 ML | -39000 | 9 | 187 |
| 120000 | 150000 ML | -30000 | 9 | 188 |
| 104000 | 150000 ML | -46000 | 9 | 189 |
| 43500 M6 | 150000 ML | -106500 | 9 | 190 |
| 86400 | 150000 ML | -63600 | 9 | 191 |
| 81000 | 150000 ML | -69000 | 9 | 192 |
| 99550 | 150000 ML | -50450 | 9 | 193 |
| 28220 | 150000 ML | -121780 | 9 | 194 |
| 78100 | 150000 ML | -71900 | 9 | 195 |
| 1418 | 150000 ML | -148582 | 9 | 196 |
| 87040 | 150000 ML | -62960 | 9 | 197 |
| | | | | |
| 157000 ML | 140000 | 17000 | 10 | 197 |
| 117000 | 140000 | -23000 | 10 | 198 |

| | | | | |
|---|---|---|---|---|
| 103000 | 140000 | -37000 | 10 | 199 |
| 2410 | 140000 | -137590 | 10 | 200 |
| 14300 | 140000 | -125700 | 10 | 201 |
| 110000 | 140000 | -30000 | 10 | 202 |
| 111000 | 140000 | -29000 | 10 | 203 |
| 111000 M6 | 140000 | -29000 | 10 | 204 |
| 120000 | 140000 | -20000 | 10 | 205 |
| 104000 | 140000 | -36000 | 10 | 206 |
| 43500 M6 | 140000 | -96500 | 10 | 207 |
| 86400 | 140000 | -53600 | 10 | 208 |
| 81000 | 140000 | -59000 | 10 | 209 |
| 99550 | 140000 | -40450 | 10 | 210 |
| 28220 | 140000 | -111780 | 10 | 211 |
| 78100 | 140000 | -61900 | 10 | 212 |
| 1418 | 140000 | -138582 | 10 | 213 |
| 87040 | 140000 | -52960 | 10 | 214 |
| | | | | |
| 117000 | 157000 ML | -40000 | 10 | 215 |
| 103000 | 157000 ML | -54000 | 10 | 216 |
| 2410 | 157000 ML | -154590 | 10 | 217 |
| 14300 | 157000 ML | -142700 | 10 | 218 |
| 110000 | 157000 ML | -47000 | 10 | 219 |
| 111000 | 157000 ML | -46000 | 10 | 220 |
| 111000 M6 | 157000 ML | -46000 | 10 | 221 |
| 120000 | 157000 ML | -37000 | 10 | 222 |
| 104000 | 157000 ML | -53000 | 10 | 223 |
| 43500 M6 | 157000 ML | -113500 | 10 | 224 |
| 86400 | 157000 ML | -70600 | 10 | 225 |
| 81000 | 157000 ML | -76000 | 10 | 226 |
| 99550 | 157000 ML | -57450 | 10 | 227 |
| 28220 | 157000 ML | -128780 | 10 | 228 |
| 78100 | 157000 ML | -78900 | 10 | 229 |
| 1418 | 157000 ML | -155582 | 10 | 230 |
| 87040 | 157000 ML | -69960 | 10 | 231 |
| | | | | |
| 103000 | 117000 | -14000 | 10 | 232 |
| 2410 | 117000 | -114590 | 10 | 233 |
| 14300 | 117000 | -102700 | 10 | 234 |
| 110000 | 117000 | -7000 | 10 | 235 |
| 111000 | 117000 | -6000 | 10 | 236 |
| 111000 M6 | 117000 | -6000 | 10 | 237 |
| 120000 | 117000 | 3000 | 11 | 237 |
| 104000 | 117000 | -13000 | 11 | 238 |
| 43500 M6 | 117000 | -73500 | 11 | 239 |
| 86400 | 117000 | -30600 | 11 | 240 |
| 81000 | 117000 | -36000 | 11 | 241 |
| 99550 | 117000 | -17450 | 11 | 242 |
| 28220 | 117000 | -88780 | 11 | 243 |
| 78100 | 117000 | -38900 | 11 | 244 |
| 1418 | 117000 | -115582 | 11 | 245 |
| 87040 | 117000 | -29960 | 11 | 246 |
| | | | | |
| 2410 | 103000 | -100590 | 11 | 247 |
| 14300 | 103000 | -88700 | 11 | 248 |
| 110000 | 103000 | 7000 | 12 | 248 |
| 111000 | 103000 | 8000 | 13 | 248 |
| 111000 M6 | 103000 | 8000 | 14 | 248 |

| | | | | |
|---|---|---|---|---|
| 120000 | 103000 | 17000 | 15 | 248 |
| 104000 | 103000 | 1000 | 16 | 248 |
| 43500 M6 | 103000 | -59500 | 16 | 249 |
| 86400 | 103000 | -16600 | 16 | 250 |
| 81000 | 103000 | -22000 | 16 | 251 |
| 99550 | 103000 | -3450 | 16 | 252 |
| 28220 | 103000 | -74780 | 16 | 253 |
| 78100 | 103000 | -24900 | 16 | 254 |
| 1418 | 103000 | -101582 | 16 | 255 |
| 87040 | 103000 | -15960 | 16 | 256 |
| | | | | |
| 14300 | 2410 | 11890 | 17 | 256 |
| 110000 | 2410 | 107590 | 18 | 256 |
| 111000 | 2410 | 108590 | 19 | 256 |
| 111000 M6 | 2410 | 108590 | 20 | 256 |
| 120000 | 2410 | 117590 | 21 | 256 |
| 104000 | 2410 | 101590 | 22 | 256 |
| 43500 M6 | 2410 | 41090 | 23 | 256 |
| 86400 | 2410 | 83990 | 24 | 256 |
| 81000 | 2410 | 78590 | 25 | 256 |
| 99550 | 2410 | 97140 | 26 | 256 |
| 28220 | 2410 | 25810 | 27 | 256 |
| 78100 | 2410 | 75690 | 28 | 256 |
| 1418 | 2410 | -992 | 28 | 257 |
| 87040 | 2410 | 84630 | 29 | 257 |
| | | | | |
| 110000 | 14300 | 95700 | 30 | 257 |
| 111000 | 14300 | 96700 | 31 | 257 |
| 111000 M6 | 14300 | 96700 | 32 | 257 |
| 120000 | 14300 | 105700 | 33 | 257 |
| 104000 | 14300 | 89700 | 34 | 257 |
| 43500 M6 | 14300 | 29200 | 35 | 257 |
| 86400 | 14300 | 72100 | 36 | 257 |
| 81000 | 14300 | 66700 | 37 | 257 |
| 99550 | 14300 | 85250 | 38 | 257 |
| 28220 | 14300 | 13920 | 39 | 257 |
| 78100 | 14300 | 63800 | 40 | 257 |
| 1418 | 14300 | -12882 | 40 | 258 |
| 87040 | 14300 | 72740 | 41 | 258 |
| | | | | |
| 111000 | 110000 | Same Date | 41 | 258 |
| 111000 M6 | 110000 | 1000 | 42 | 258 |
| 120000 | 110000 | 10000 | 43 | 258 |
| 104000 | 110000 | -6000 | 43 | 259 |
| 43500 M6 | 110000 | -66500 | 43 | 260 |
| 86400 | 110000 | -23600 | 43 | 261 |
| 81000 | 110000 | -29000 | 43 | 262 |
| 99550 | 110000 | -10450 | 43 | 263 |
| 28220 | 110000 | -81780 | 43 | 264 |
| 78100 | 110000 | -31900 | 43 | 265 |
| 1418 | 110000 | -108582 | 43 | 266 |
| 87040 | 110000 | -22960 | 43 | 267 |
| | | | | |
| 111000 M6 | 111000 | 0 | 43 | 267 |
| 120000 | 111000 | 9000 | 44 | 267 |
| 104000 | 111000 | -7000 | 44 | 268 |
| 43500 M6 | 111000 | -67500 | 44 | 269 |

| | | | | |
|---|---|---|---|---|
| 86400 | 111000 | -24600 | 44 | 270 |
| 81000 | 111000 | -30000 | 44 | 271 |
| 99550 | 111000 | -11450 | 44 | 272 |
| 28220 | 111000 | -82780 | 44 | 273 |
| 78100 | 111000 | -32900 | 44 | 274 |
| 1418 | 111000 | -109582 | 44 | 275 |
| 87040 | 111000 | -23960 | 44 | 276 |
| | | | | |
| 120000 | 111000 M6 | Same Date | 44 | 276 |
| 104000 | 111000 M6 | -7000 | 44 | 277 |
| 43500 M6 | 111000 M6 | -67500 | 44 | 278 |
| 86400 | 111000 M6 | -24600 | 44 | 279 |
| 81000 | 111000 M6 | -30000 | 44 | 280 |
| 99550 | 111000 M6 | -11450 | 44 | 281 |
| 28220 | 111000 M6 | -82780 | 44 | 282 |
| 78100 | 111000 M6 | -32900 | 44 | 283 |
| 1418 | 111000 M6 | -109582 | 44 | 284 |
| 87040 | 111000 M6 | -23960 | 44 | 285 |
| | | | | |
| 104000 | 120000 | -16000 | 44 | 286 |
| 43500 M6 | 120000 | -76500 | 44 | 287 |
| 86400 | 120000 | -33600 | 44 | 288 |
| 81000 | 120000 | -39000 | 44 | 289 |
| 99550 | 120000 | -20450 | 44 | 290 |
| 28220 | 120000 | -91780 | 44 | 291 |
| 78100 | 120000 | -41900 | 44 | 292 |
| 1418 | 120000 | -118582 | 44 | 293 |
| 87040 | 120000 | -32960 | 44 | 294 |
| | | | | |
| 43500 M6 | 104000 | -60500 | 44 | 295 |
| 86400 | 104000 | -17600 | 44 | 296 |
| 81000 | 104000 | -23000 | 44 | 297 |
| 99550 | 104000 | -4450 | 44 | 298 |
| 28220 | 104000 | -75780 | 44 | 299 |
| 78100 | 104000 | -25900 | 44 | 300 |
| 1418 | 104000 | -102582 | 44 | 301 |
| 87040 | 104000 | -16960 | 44 | 302 |
| | | | | |
| 86400 | 43500 M6 | 42900 | 45 | 302 |
| 81000 | 43500 M6 | 37500 | 46 | 302 |
| 99550 | 43500 M6 | 56050 | 47 | 302 |
| 28220 | 43500 M6 | -15280 | 47 | 303 |
| 78100 | 43500 M6 | 34600 | 48 | 303 |
| 1418 | 43500 M6 | -42082 | 48 | 304 |
| 87040 | 43500 M6 | 43540 | 49 | 304 |
| | | | | |
| 81000 | 86400 | -5400 | 49 | 305 |
| 99550 | 86400 | 13150 | 50 | 305 |
| 28220 | 86400 | -58180 | 50 | 306 |
| 78100 | 86400 | -8300 | 50 | 307 |
| 1418 | 86400 | -84982 | 50 | 308 |
| 87040 | 86400 | 640 | 51 | 308 |
| | | | | |
| 99550 | 81000 | 18550 | 52 | 308 |
| 28220 | 81000 | -52780 | 52 | 309 |
| 78100 | 81000 | -2900 | 52 | 310 |
| 1418 | 81000 | -79582 | 52 | 311 |

| | | | | |
|---|---|---|---|---|
| 87040 | 81000 | 6040 | 53 | 311 |
| | | | | |
| 28220 | 99550 | -71330 | 53 | 312 |
| 78100 | 99550 | -21450 | 53 | 313 |
| 1418 | 99550 | -98132 | 53 | 314 |
| 87040 | 99550 | -12510 | 53 | 315 |
| | | | | |
| 78100 | 28220 | 49880 | 54 | 315 |
| 1418 | 28220 | -26802 | 54 | 316 |
| 87040 | 28220 | 58820 | 55 | 316 |
| | | | | |
| 1418 | 78100 | -76682 | 55 | 317 |
| 87040 | 78100 | 8940 | 56 | 317 |
| | | | | |
| 87040 | 1418 | 85622 | 57 | 317 |

S Statistic = 57 - 317 = -260

| Tied Group | Value | Members |
|---|---|---|
| 1 | 156000 | 2 |
| 2 | 111000 | 2 |

| Time Period | Observations |
|---|---|
| 2/1/2017 | 1 |
| 3/1/2017 | 1 |
| 4/1/2017 | 1 |
| 5/1/2017 | 1 |
| 6/1/2017 | 1 |
| 7/1/2017 | 1 |
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 6/1/2020 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 2 time periods with multiple data

A = 36
B = 36
C = 0
D = 0
E = 4

F = 4
a = 46116
b = 176904
c = 1512
Group Variance = 2558.01
Z-Score = -5.12093
Comparison Level at 95% confidence level = -1.65463 (downward trend)
**-5.12093 < -1.65463 indicating a downward trend**

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RW13-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 1160 | 308000 | -306840 | 0 | 1 |
| 204000 | 308000 | -104000 | 0 | 2 |
| 172000 | 308000 | -136000 | 0 | 3 |
| 237 | 308000 | -307763 | 0 | 4 |
| 8600 | 308000 | -299400 | 0 | 5 |
| 201000 | 308000 | -107000 | 0 | 6 |
| 274000 | 308000 | -34000 | 0 | 7 |
| 33.4 | 308000 | -307967 | 0 | 8 |
| 328000 | 308000 | 20000 | 1 | 8 |
| 321000 | 308000 | 13000 | 2 | 8 |
| 380 | 308000 | -307620 | 2 | 9 |
| 97.7 | 308000 | -307902 | 2 | 10 |
| 122 1c | 308000 | -307878 | 2 | 11 |
| 246000 | 308000 | -62000 | 2 | 12 |
| 250000 | 308000 | -58000 | 2 | 13 |
| 27 | 308000 | -307973 | 2 | 14 |
| 296000 ML | 308000 | -12000 | 2 | 15 |
| 19.8 1c | 308000 | -307980 | 2 | 16 |
| 363000 | 308000 | 55000 | 3 | 16 |
| 435000 | 308000 | 127000 | 4 | 16 |
| 479900 | 308000 | 171900 | 5 | 16 |
| 540700 | 308000 | 232700 | 6 | 16 |
| | | | | |
| 204000 | 1160 | 202840 | 7 | 16 |
| 172000 | 1160 | 170840 | 8 | 16 |
| 237 | 1160 | -923 | 8 | 17 |
| 8600 | 1160 | 7440 | 9 | 17 |
| 201000 | 1160 | 199840 | 10 | 17 |
| 274000 | 1160 | 272840 | 11 | 17 |
| 33.4 | 1160 | -1126.6 | 11 | 18 |
| 328000 | 1160 | 326840 | 12 | 18 |
| 321000 | 1160 | 319840 | 13 | 18 |
| 380 | 1160 | -780 | 13 | 19 |
| 97.7 | 1160 | -1062.3 | 13 | 20 |
| 122 1c | 1160 | -1038 | 13 | 21 |
| 246000 | 1160 | 244840 | 14 | 21 |
| 250000 | 1160 | 248840 | 15 | 21 |
| 27 | 1160 | -1133 | 15 | 22 |
| 296000 ML | 1160 | 294840 | 16 | 22 |
| 19.8 1c | 1160 | -1140.2 | 16 | 23 |
| 363000 | 1160 | 361840 | 17 | 23 |
| 435000 | 1160 | 433840 | 18 | 23 |
| 479900 | 1160 | 478740 | 19 | 23 |
| 540700 | 1160 | 539540 | 20 | 23 |
| | | | | |
| 172000 | 204000 | -32000 | 20 | 24 |
| 237 | 204000 | -203763 | 20 | 25 |

| | | | | |
|---|---|---|---|---|
| 8600 | 204000 | -195400 | 20 | 26 |
| 201000 | 204000 | -3000 | 20 | 27 |
| 274000 | 204000 | 70000 | 21 | 27 |
| 33.4 | 204000 | -203967 | 21 | 28 |
| 328000 | 204000 | 124000 | 22 | 28 |
| 321000 | 204000 | 117000 | 23 | 28 |
| 380 | 204000 | -203620 | 23 | 29 |
| 97.7 | 204000 | -203902 | 23 | 30 |
| 122 1c | 204000 | -203878 | 23 | 31 |
| 246000 | 204000 | 42000 | 24 | 31 |
| 250000 | 204000 | 46000 | 25 | 31 |
| 27 | 204000 | -203973 | 25 | 32 |
| 296000 ML | 204000 | 92000 | 26 | 32 |
| 19.8 1c | 204000 | -203980 | 26 | 33 |
| 363000 | 204000 | 159000 | 27 | 33 |
| 435000 | 204000 | 231000 | 28 | 33 |
| 479900 | 204000 | 275900 | 29 | 33 |
| 540700 | 204000 | 336700 | 30 | 33 |
| | | | | |
| 237 | 172000 | -171763 | 30 | 34 |
| 8600 | 172000 | -163400 | 30 | 35 |
| 201000 | 172000 | 29000 | 31 | 35 |
| 274000 | 172000 | 102000 | 32 | 35 |
| 33.4 | 172000 | -171967 | 32 | 36 |
| 328000 | 172000 | 156000 | 33 | 36 |
| 321000 | 172000 | 149000 | 34 | 36 |
| 380 | 172000 | -171620 | 34 | 37 |
| 97.7 | 172000 | -171902 | 34 | 38 |
| 122 1c | 172000 | -171878 | 34 | 39 |
| 246000 | 172000 | 74000 | 35 | 39 |
| 250000 | 172000 | 78000 | 36 | 39 |
| 27 | 172000 | -171973 | 36 | 40 |
| 296000 ML | 172000 | 124000 | 37 | 40 |
| 19.8 1c | 172000 | -171980 | 37 | 41 |
| 363000 | 172000 | 191000 | 38 | 41 |
| 435000 | 172000 | 263000 | 39 | 41 |
| 479900 | 172000 | 307900 | 40 | 41 |
| 540700 | 172000 | 368700 | 41 | 41 |
| | | | | |
| 8600 | 237 | 8363 | 42 | 41 |
| 201000 | 237 | 200763 | 43 | 41 |
| 274000 | 237 | 273763 | 44 | 41 |
| 33.4 | 237 | -203.6 | 44 | 42 |
| 328000 | 237 | 327763 | 45 | 42 |
| 321000 | 237 | 320763 | 46 | 42 |
| 380 | 237 | 143 | 47 | 42 |
| 97.7 | 237 | -139.3 | 47 | 43 |
| 122 1c | 237 | -115 | 47 | 44 |
| 246000 | 237 | 245763 | 48 | 44 |
| 250000 | 237 | 249763 | 49 | 44 |
| 27 | 237 | -210 | 49 | 45 |
| 296000 ML | 237 | 295763 | 50 | 45 |
| 19.8 1c | 237 | -217.2 | 50 | 46 |
| 363000 | 237 | 362763 | 51 | 46 |
| 435000 | 237 | 434763 | 52 | 46 |
| 479900 | 237 | 479663 | 53 | 46 |
| 540700 | 237 | 540463 | 54 | 46 |

| | | | | |
|---|---|---|---|---|
| 201000 | 8600 | 192400 | 55 | 46 |
| 274000 | 8600 | 265400 | 56 | 46 |
| 33.4 | 8600 | -8566.6 | 56 | 47 |
| 328000 | 8600 | 319400 | 57 | 47 |
| 321000 | 8600 | 312400 | 58 | 47 |
| 380 | 8600 | -8220 | 58 | 48 |
| 97.7 | 8600 | -8502.3 | 58 | 49 |
| 122 1c | 8600 | -8478 | 58 | 50 |
| 246000 | 8600 | 237400 | 59 | 50 |
| 250000 | 8600 | 241400 | 60 | 50 |
| 27 | 8600 | -8573 | 60 | 51 |
| 296000 ML | 8600 | 287400 | 61 | 51 |
| 19.8 1c | 8600 | -8580.2 | 61 | 52 |
| 363000 | 8600 | 354400 | 62 | 52 |
| 435000 | 8600 | 426400 | 63 | 52 |
| 479900 | 8600 | 471300 | 64 | 52 |
| 540700 | 8600 | 532100 | 65 | 52 |
| | | | | |
| 274000 | 201000 | 73000 | 66 | 52 |
| 33.4 | 201000 | -200967 | 66 | 53 |
| 328000 | 201000 | 127000 | 67 | 53 |
| 321000 | 201000 | 120000 | 68 | 53 |
| 380 | 201000 | -200620 | 68 | 54 |
| 97.7 | 201000 | -200902 | 68 | 55 |
| 122 1c | 201000 | -200878 | 68 | 56 |
| 246000 | 201000 | 45000 | 69 | 56 |
| 250000 | 201000 | 49000 | 70 | 56 |
| 27 | 201000 | -200973 | 70 | 57 |
| 296000 ML | 201000 | 95000 | 71 | 57 |
| 19.8 1c | 201000 | -200980 | 71 | 58 |
| 363000 | 201000 | 162000 | 72 | 58 |
| 435000 | 201000 | 234000 | 73 | 58 |
| 479900 | 201000 | 278900 | 74 | 58 |
| 540700 | 201000 | 339700 | 75 | 58 |
| | | | | |
| 33.4 | 274000 | -273967 | 75 | 59 |
| 328000 | 274000 | 54000 | 76 | 59 |
| 321000 | 274000 | 47000 | 77 | 59 |
| 380 | 274000 | -273620 | 77 | 60 |
| 97.7 | 274000 | -273902 | 77 | 61 |
| 122 1c | 274000 | -273878 | 77 | 62 |
| 246000 | 274000 | -28000 | 77 | 63 |
| 250000 | 274000 | -24000 | 77 | 64 |
| 27 | 274000 | -273973 | 77 | 65 |
| 296000 ML | 274000 | 22000 | 78 | 65 |
| 19.8 1c | 274000 | -273980 | 78 | 66 |
| 363000 | 274000 | 89000 | 79 | 66 |
| 435000 | 274000 | 161000 | 80 | 66 |
| 479900 | 274000 | 205900 | 81 | 66 |
| 540700 | 274000 | 266700 | 82 | 66 |
| | | | | |
| 328000 | 33.4 | 327967 | 83 | 66 |
| 321000 | 33.4 | 320967 | 84 | 66 |
| 380 | 33.4 | 346.6 | 85 | 66 |
| 97.7 | 33.4 | 64.3 | 86 | 66 |
| 122 1c | 33.4 | 88.6 | 87 | 66 |

| | | | | |
|---|---|---|---|---|
| 246000 | 33.4 | 245967 | 88 | 66 |
| 250000 | 33.4 | 249967 | 89 | 66 |
| 27 | 33.4 | -6.4 | 89 | 67 |
| 296000 ML | 33.4 | 295967 | 90 | 67 |
| 19.8 1c | 33.4 | -13.6 | 90 | 68 |
| 363000 | 33.4 | 362967 | 91 | 68 |
| 435000 | 33.4 | 434967 | 92 | 68 |
| 479900 | 33.4 | 479867 | 93 | 68 |
| 540700 | 33.4 | 540667 | 94 | 68 |
| | | | | |
| 321000 | 328000 | Same Date | 94 | 68 |
| 380 | 328000 | -327620 | 94 | 69 |
| 97.7 | 328000 | -327902 | 94 | 70 |
| 122 1c | 328000 | -327878 | 94 | 71 |
| 246000 | 328000 | -82000 | 94 | 72 |
| 250000 | 328000 | -78000 | 94 | 73 |
| 27 | 328000 | -327973 | 94 | 74 |
| 296000 ML | 328000 | -32000 | 94 | 75 |
| 19.8 1c | 328000 | -327980 | 94 | 76 |
| 363000 | 328000 | 35000 | 95 | 76 |
| 435000 | 328000 | 107000 | 96 | 76 |
| 479900 | 328000 | 151900 | 97 | 76 |
| 540700 | 328000 | 212700 | 98 | 76 |
| | | | | |
| 380 | 321000 | -320620 | 98 | 77 |
| 97.7 | 321000 | -320902 | 98 | 78 |
| 122 1c | 321000 | -320878 | 98 | 79 |
| 246000 | 321000 | -75000 | 98 | 80 |
| 250000 | 321000 | -71000 | 98 | 81 |
| 27 | 321000 | -320973 | 98 | 82 |
| 296000 ML | 321000 | -25000 | 98 | 83 |
| 19.8 1c | 321000 | -320980 | 98 | 84 |
| 363000 | 321000 | 42000 | 99 | 84 |
| 435000 | 321000 | 114000 | 100 | 84 |
| 479900 | 321000 | 158900 | 101 | 84 |
| 540700 | 321000 | 219700 | 102 | 84 |
| | | | | |
| 97.7 | 380 | Same Date | 102 | 84 |
| 122 1c | 380 | -258 | 102 | 85 |
| 246000 | 380 | 245620 | 103 | 85 |
| 250000 | 380 | 249620 | 104 | 85 |
| 27 | 380 | -353 | 104 | 86 |
| 296000 ML | 380 | 295620 | 105 | 86 |
| 19.8 1c | 380 | -360.2 | 105 | 87 |
| 363000 | 380 | 362620 | 106 | 87 |
| 435000 | 380 | 434620 | 107 | 87 |
| 479900 | 380 | 479520 | 108 | 87 |
| 540700 | 380 | 540320 | 109 | 87 |
| | | | | |
| 122 1c | 97.7 | 24.3 | 110 | 87 |
| 246000 | 97.7 | 245902 | 111 | 87 |
| 250000 | 97.7 | 249902 | 112 | 87 |
| 27 | 97.7 | -70.7 | 112 | 88 |
| 296000 ML | 97.7 | 295902 | 113 | 88 |
| 19.8 1c | 97.7 | -77.9 | 113 | 89 |
| 363000 | 97.7 | 362902 | 114 | 89 |
| 435000 | 97.7 | 434902 | 115 | 89 |

| | | | | |
|---|---|---|---|---|
| 479900 | 97.7 | 479802 | 116 | 89 |
| 540700 | 97.7 | 540602 | 117 | 89 |
| | | | | |
| 246000 | 122 1c | 245878 | 118 | 89 |
| 250000 | 122 1c | 249878 | 119 | 89 |
| 27 | 122 1c | -95 | 119 | 90 |
| 296000 ML | 122 1c | 295878 | 120 | 90 |
| 19.8 1c | 122 1c | -102.2 | 120 | 91 |
| 363000 | 122 1c | 362878 | 121 | 91 |
| 435000 | 122 1c | 434878 | 122 | 91 |
| 479900 | 122 1c | 479778 | 123 | 91 |
| 540700 | 122 1c | 540578 | 124 | 91 |
| | | | | |
| 250000 | 246000 | 4000 | 125 | 91 |
| 27 | 246000 | -245973 | 125 | 92 |
| 296000 ML | 246000 | 50000 | 126 | 92 |
| 19.8 1c | 246000 | -245980 | 126 | 93 |
| 363000 | 246000 | 117000 | 127 | 93 |
| 435000 | 246000 | 189000 | 128 | 93 |
| 479900 | 246000 | 233900 | 129 | 93 |
| 540700 | 246000 | 294700 | 130 | 93 |
| | | | | |
| 27 | 250000 | -249973 | 130 | 94 |
| 296000 ML | 250000 | 46000 | 131 | 94 |
| 19.8 1c | 250000 | -249980 | 131 | 95 |
| 363000 | 250000 | 113000 | 132 | 95 |
| 435000 | 250000 | 185000 | 133 | 95 |
| 479900 | 250000 | 229900 | 134 | 95 |
| 540700 | 250000 | 290700 | 135 | 95 |
| | | | | |
| 296000 ML | 27 | 295973 | 136 | 95 |
| 19.8 1c | 27 | -7.2 | 136 | 96 |
| 363000 | 27 | 362973 | 137 | 96 |
| 435000 | 27 | 434973 | 138 | 96 |
| 479900 | 27 | 479873 | 139 | 96 |
| 540700 | 27 | 540673 | 140 | 96 |
| | | | | |
| 19.8 1c | 296000 ML | -295980 | 140 | 97 |
| 363000 | 296000 ML | 67000 | 141 | 97 |
| 435000 | 296000 ML | 139000 | 142 | 97 |
| 479900 | 296000 ML | 183900 | 143 | 97 |
| 540700 | 296000 ML | 244700 | 144 | 97 |
| | | | | |
| 363000 | 19.8 1c | 362980 | 145 | 97 |
| 435000 | 19.8 1c | 434980 | 146 | 97 |
| 479900 | 19.8 1c | 479880 | 147 | 97 |
| 540700 | 19.8 1c | 540680 | 148 | 97 |
| | | | | |
| 435000 | 363000 | 72000 | 149 | 97 |
| 479900 | 363000 | 116900 | 150 | 97 |
| 540700 | 363000 | 177700 | 151 | 97 |
| | | | | |
| 479900 | 435000 | 44900 | 152 | 97 |
| 540700 | 435000 | 105700 | 153 | 97 |
| | | | | |
| 540700 | 479900 | 60800 | 154 | 97 |

S Statistic = 154 - 97 = 57

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 3/1/2022 | 1 |
| 3/1/2023 | 1 |
| 3/1/2024 | 1 |

There are 2 time periods with multiple data

A = 0
B = 36
C = 0
D = 0
E = 0
F = 4
a = 25806
b = 95634
c = 1012
Group Variance = 1431.67
Z-Score = 1.48002
Comparison Level at 95% confidence level = -1.65463 (downward trend)
1.48002 >= -1.65463 indicating no evidence of a downward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RW15-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 71.1 | 3210 | -3138.9 | 0 | 1 |
| 295 | 3210 | -2915 | 0 | 2 |
| 825 | 3210 | -2385 | 0 | 3 |
| 1070 | 3210 | -2140 | 0 | 4 |
| 5540 | 3210 | 2330 | 1 | 4 |
| 252 | 3210 | -2958 | 1 | 5 |
| 18600 | 3210 | 15390 | 2 | 5 |
| 736 | 3210 | -2474 | 2 | 6 |
| 109000 | 3210 | 105790 | 3 | 6 |
| 110000 | 3210 | 106790 | 4 | 6 |
| 16500 | 3210 | 13290 | 5 | 6 |
| 16400 | 3210 | 13190 | 6 | 6 |
| 168000 | 3210 | 164790 | 7 | 6 |
| 179000 M6 | 3210 | 175790 | 8 | 6 |
| 17.9 | 3210 | -3192.1 | 8 | 7 |
| 5.8 J | 3210 | -3204.2 | 8 | 8 |
| 3210 1c | 3210 | 0 | 8 | 8 |
| 137 1c | 3210 | -3073 | 8 | 9 |
| 16400 | 3210 | 13190 | 9 | 9 |
| 49300 | 3210 | 46090 | 10 | 9 |
| 100800 | 3210 | 97590 | 11 | 9 |
| 31.51 | 3210 | -3178.49 | 11 | 10 |
| | | | | |
| 295 | 71.1 | 223.9 | 12 | 10 |
| 825 | 71.1 | 753.9 | 13 | 10 |
| 1070 | 71.1 | 998.9 | 14 | 10 |
| 5540 | 71.1 | 5468.9 | 15 | 10 |
| 252 | 71.1 | 180.9 | 16 | 10 |
| 18600 | 71.1 | 18528.9 | 17 | 10 |
| 736 | 71.1 | 664.9 | 18 | 10 |
| 109000 | 71.1 | 108929 | 19 | 10 |
| 110000 | 71.1 | 109929 | 20 | 10 |
| 16500 | 71.1 | 16428.9 | 21 | 10 |
| 16400 | 71.1 | 16328.9 | 22 | 10 |
| 168000 | 71.1 | 167929 | 23 | 10 |
| 179000 M6 | 71.1 | 178929 | 24 | 10 |
| 17.9 | 71.1 | -53.2 | 24 | 11 |
| 5.8 J | 71.1 | -65.3 | 24 | 12 |
| 3210 1c | 71.1 | 3138.9 | 25 | 12 |
| 137 1c | 71.1 | 65.9 | 26 | 12 |
| 16400 | 71.1 | 16328.9 | 27 | 12 |
| 49300 | 71.1 | 49228.9 | 28 | 12 |
| 100800 | 71.1 | 100729 | 29 | 12 |
| 31.51 | 71.1 | -39.59 | 29 | 13 |
| | | | | |
| 825 | 295 | 530 | 30 | 13 |
| 1070 | 295 | 775 | 31 | 13 |

| | | | | |
|---|---|---|---|---|
| 5540 | 295 | 5245 | 32 | 13 |
| 252 | 295 | -43 | 32 | 14 |
| 18600 | 295 | 18305 | 33 | 14 |
| 736 | 295 | 441 | 34 | 14 |
| 109000 | 295 | 108705 | 35 | 14 |
| 110000 | 295 | 109705 | 36 | 14 |
| 16500 | 295 | 16205 | 37 | 14 |
| 16400 | 295 | 16105 | 38 | 14 |
| 168000 | 295 | 167705 | 39 | 14 |
| 179000 M6 | 295 | 178705 | 40 | 14 |
| 17.9 | 295 | -277.1 | 40 | 15 |
| 5.8 J | 295 | -289.2 | 40 | 16 |
| 3210 1c | 295 | 2915 | 41 | 16 |
| 137 1c | 295 | -158 | 41 | 17 |
| 16400 | 295 | 16105 | 42 | 17 |
| 49300 | 295 | 49005 | 43 | 17 |
| 100800 | 295 | 100505 | 44 | 17 |
| 31.51 | 295 | -263.49 | 44 | 18 |
| | | | | |
| 1070 | 825 | 245 | 45 | 18 |
| 5540 | 825 | 4715 | 46 | 18 |
| 252 | 825 | -573 | 46 | 19 |
| 18600 | 825 | 17775 | 47 | 19 |
| 736 | 825 | -89 | 47 | 20 |
| 109000 | 825 | 108175 | 48 | 20 |
| 110000 | 825 | 109175 | 49 | 20 |
| 16500 | 825 | 15675 | 50 | 20 |
| 16400 | 825 | 15575 | 51 | 20 |
| 168000 | 825 | 167175 | 52 | 20 |
| 179000 M6 | 825 | 178175 | 53 | 20 |
| 17.9 | 825 | -807.1 | 53 | 21 |
| 5.8 J | 825 | -819.2 | 53 | 22 |
| 3210 1c | 825 | 2385 | 54 | 22 |
| 137 1c | 825 | -688 | 54 | 23 |
| 16400 | 825 | 15575 | 55 | 23 |
| 49300 | 825 | 48475 | 56 | 23 |
| 100800 | 825 | 99975 | 57 | 23 |
| 31.51 | 825 | -793.49 | 57 | 24 |
| | | | | |
| 5540 | 1070 | 4470 | 58 | 24 |
| 252 | 1070 | -818 | 58 | 25 |
| 18600 | 1070 | 17530 | 59 | 25 |
| 736 | 1070 | -334 | 59 | 26 |
| 109000 | 1070 | 107930 | 60 | 26 |
| 110000 | 1070 | 108930 | 61 | 26 |
| 16500 | 1070 | 15430 | 62 | 26 |
| 16400 | 1070 | 15330 | 63 | 26 |
| 168000 | 1070 | 166930 | 64 | 26 |
| 179000 M6 | 1070 | 177930 | 65 | 26 |
| 17.9 | 1070 | -1052.1 | 65 | 27 |
| 5.8 J | 1070 | -1064.2 | 65 | 28 |
| 3210 1c | 1070 | 2140 | 66 | 28 |
| 137 1c | 1070 | -933 | 66 | 29 |
| 16400 | 1070 | 15330 | 67 | 29 |
| 49300 | 1070 | 48230 | 68 | 29 |
| 100800 | 1070 | 99730 | 69 | 29 |
| 31.51 | 1070 | -1038.49 | 69 | 30 |

| | | | | |
|---|---|---|---|---|
| 252 | 5540 | -5288 | 69 | 31 |
| 18600 | 5540 | 13060 | 70 | 31 |
| 736 | 5540 | -4804 | 70 | 32 |
| 109000 | 5540 | 103460 | 71 | 32 |
| 110000 | 5540 | 104460 | 72 | 32 |
| 16500 | 5540 | 10960 | 73 | 32 |
| 16400 | 5540 | 10860 | 74 | 32 |
| 168000 | 5540 | 162460 | 75 | 32 |
| 179000 M6 | 5540 | 173460 | 76 | 32 |
| 17.9 | 5540 | -5522.1 | 76 | 33 |
| 5.8 J | 5540 | -5534.2 | 76 | 34 |
| 3210 1c | 5540 | -2330 | 76 | 35 |
| 137 1c | 5540 | -5403 | 76 | 36 |
| 16400 | 5540 | 10860 | 77 | 36 |
| 49300 | 5540 | 43760 | 78 | 36 |
| 100800 | 5540 | 95260 | 79 | 36 |
| 31.51 | 5540 | -5508.49 | 79 | 37 |
| | | | | |
| 18600 | 252 | 18348 | 80 | 37 |
| 736 | 252 | 484 | 81 | 37 |
| 109000 | 252 | 108748 | 82 | 37 |
| 110000 | 252 | 109748 | 83 | 37 |
| 16500 | 252 | 16248 | 84 | 37 |
| 16400 | 252 | 16148 | 85 | 37 |
| 168000 | 252 | 167748 | 86 | 37 |
| 179000 M6 | 252 | 178748 | 87 | 37 |
| 17.9 | 252 | -234.1 | 87 | 38 |
| 5.8 J | 252 | -246.2 | 87 | 39 |
| 3210 1c | 252 | 2958 | 88 | 39 |
| 137 1c | 252 | -115 | 88 | 40 |
| 16400 | 252 | 16148 | 89 | 40 |
| 49300 | 252 | 49048 | 90 | 40 |
| 100800 | 252 | 100548 | 91 | 40 |
| 31.51 | 252 | -220.49 | 91 | 41 |
| | | | | |
| 736 | 18600 | -17864 | 91 | 42 |
| 109000 | 18600 | 90400 | 92 | 42 |
| 110000 | 18600 | 91400 | 93 | 42 |
| 16500 | 18600 | -2100 | 93 | 43 |
| 16400 | 18600 | -2200 | 93 | 44 |
| 168000 | 18600 | 149400 | 94 | 44 |
| 179000 M6 | 18600 | 160400 | 95 | 44 |
| 17.9 | 18600 | -18582.1 | 95 | 45 |
| 5.8 J | 18600 | -18594.2 | 95 | 46 |
| 3210 1c | 18600 | -15390 | 95 | 47 |
| 137 1c | 18600 | -18463 | 95 | 48 |
| 16400 | 18600 | -2200 | 95 | 49 |
| 49300 | 18600 | 30700 | 96 | 49 |
| 100800 | 18600 | 82200 | 97 | 49 |
| 31.51 | 18600 | -18568.5 | 97 | 50 |
| | | | | |
| 109000 | 736 | 108264 | 98 | 50 |
| 110000 | 736 | 109264 | 99 | 50 |
| 16500 | 736 | 15764 | 100 | 50 |
| 16400 | 736 | 15664 | 101 | 50 |
| 168000 | 736 | 167264 | 102 | 50 |

| | | | | |
|---|---|---|---|---|
| 179000 M6 | 736 | 178264 | 103 | 50 |
| 17.9 | 736 | -718.1 | 103 | 51 |
| 5.8 J | 736 | -730.2 | 103 | 52 |
| 3210 1c | 736 | 2474 | 104 | 52 |
| 137 1c | 736 | -599 | 104 | 53 |
| 16400 | 736 | 15664 | 105 | 53 |
| 49300 | 736 | 48564 | 106 | 53 |
| 100800 | 736 | 100064 | 107 | 53 |
| 31.51 | 736 | -704.49 | 107 | 54 |
| | | | | |
| 110000 | 109000 | Same Date | 107 | 54 |
| 16500 | 109000 | -92500 | 107 | 55 |
| 16400 | 109000 | -92600 | 107 | 56 |
| 168000 | 109000 | 59000 | 108 | 56 |
| 179000 M6 | 109000 | 70000 | 109 | 56 |
| 17.9 | 109000 | -108982 | 109 | 57 |
| 5.8 J | 109000 | -108994 | 109 | 58 |
| 3210 1c | 109000 | -105790 | 109 | 59 |
| 137 1c | 109000 | -108863 | 109 | 60 |
| 16400 | 109000 | -92600 | 109 | 61 |
| 49300 | 109000 | -59700 | 109 | 62 |
| 100800 | 109000 | -8200 | 109 | 63 |
| 31.51 | 109000 | -108968 | 109 | 64 |
| | | | | |
| 16500 | 110000 | -93500 | 109 | 65 |
| 16400 | 110000 | -93600 | 109 | 66 |
| 168000 | 110000 | 58000 | 110 | 66 |
| 179000 M6 | 110000 | 69000 | 111 | 66 |
| 17.9 | 110000 | -109982 | 111 | 67 |
| 5.8 J | 110000 | -109994 | 111 | 68 |
| 3210 1c | 110000 | -106790 | 111 | 69 |
| 137 1c | 110000 | -109863 | 111 | 70 |
| 16400 | 110000 | -93600 | 111 | 71 |
| 49300 | 110000 | -60700 | 111 | 72 |
| 100800 | 110000 | -9200 | 111 | 73 |
| 31.51 | 110000 | -109968 | 111 | 74 |
| | | | | |
| 16400 | 16500 | Same Date | 111 | 74 |
| 168000 | 16500 | 151500 | 112 | 74 |
| 179000 M6 | 16500 | 162500 | 113 | 74 |
| 17.9 | 16500 | -16482.1 | 113 | 75 |
| 5.8 J | 16500 | -16494.2 | 113 | 76 |
| 3210 1c | 16500 | -13290 | 113 | 77 |
| 137 1c | 16500 | -16363 | 113 | 78 |
| 16400 | 16500 | -100 | 113 | 79 |
| 49300 | 16500 | 32800 | 114 | 79 |
| 100800 | 16500 | 84300 | 115 | 79 |
| 31.51 | 16500 | -16468.5 | 115 | 80 |
| | | | | |
| 168000 | 16400 | 151600 | 116 | 80 |
| 179000 M6 | 16400 | 162600 | 117 | 80 |
| 17.9 | 16400 | -16382.1 | 117 | 81 |
| 5.8 J | 16400 | -16394.2 | 117 | 82 |
| 3210 1c | 16400 | -13190 | 117 | 83 |
| 137 1c | 16400 | -16263 | 117 | 84 |
| 16400 | 16400 | 0 | 117 | 84 |
| 49300 | 16400 | 32900 | 118 | 84 |

| | | | | |
|---|---|---|---|---|
| 100800 | 16400 | 84400 | 119 | 84 |
| 31.51 | 16400 | -16368.5 | 119 | 85 |
| | | | | |
| 179000 M6 | 168000 | 11000 | 120 | 85 |
| 17.9 | 168000 | -167982 | 120 | 86 |
| 5.8 J | 168000 | -167994 | 120 | 87 |
| 3210 1c | 168000 | -164790 | 120 | 88 |
| 137 1c | 168000 | -167863 | 120 | 89 |
| 16400 | 168000 | -151600 | 120 | 90 |
| 49300 | 168000 | -118700 | 120 | 91 |
| 100800 | 168000 | -67200 | 120 | 92 |
| 31.51 | 168000 | -167968 | 120 | 93 |
| | | | | |
| 17.9 | 179000 M6 | -178982 | 120 | 94 |
| 5.8 J | 179000 M6 | -178994 | 120 | 95 |
| 3210 1c | 179000 M6 | -175790 | 120 | 96 |
| 137 1c | 179000 M6 | -178863 | 120 | 97 |
| 16400 | 179000 M6 | -162600 | 120 | 98 |
| 49300 | 179000 M6 | -129700 | 120 | 99 |
| 100800 | 179000 M6 | -78200 | 120 | 100 |
| 31.51 | 179000 M6 | -178968 | 120 | 101 |
| | | | | |
| 5.8 J | 17.9 | -12.1 | 120 | 102 |
| 3210 1c | 17.9 | 3192.1 | 121 | 102 |
| 137 1c | 17.9 | 119.1 | 122 | 102 |
| 16400 | 17.9 | 16382.1 | 123 | 102 |
| 49300 | 17.9 | 49282.1 | 124 | 102 |
| 100800 | 17.9 | 100782 | 125 | 102 |
| 31.51 | 17.9 | 13.61 | 126 | 102 |
| | | | | |
| 3210 1c | 5.8 J | 3204.2 | 127 | 102 |
| 137 1c | 5.8 J | 131.2 | 128 | 102 |
| 16400 | 5.8 J | 16394.2 | 129 | 102 |
| 49300 | 5.8 J | 49294.2 | 130 | 102 |
| 100800 | 5.8 J | 100794 | 131 | 102 |
| 31.51 | 5.8 J | 25.71 | 132 | 102 |
| | | | | |
| 137 1c | 3210 1c | -3073 | 132 | 103 |
| 16400 | 3210 1c | 13190 | 133 | 103 |
| 49300 | 3210 1c | 46090 | 134 | 103 |
| 100800 | 3210 1c | 97590 | 135 | 103 |
| 31.51 | 3210 1c | -3178.49 | 135 | 104 |
| | | | | |
| 16400 | 137 1c | 16263 | 136 | 104 |
| 49300 | 137 1c | 49163 | 137 | 104 |
| 100800 | 137 1c | 100663 | 138 | 104 |
| 31.51 | 137 1c | -105.49 | 138 | 105 |
| | | | | |
| 49300 | 16400 | 32900 | 139 | 105 |
| 100800 | 16400 | 84400 | 140 | 105 |
| 31.51 | 16400 | -16368.5 | 140 | 106 |
| | | | | |
| 100800 | 49300 | 51500 | 141 | 106 |
| 31.51 | 49300 | -49268.5 | 141 | 107 |
| | | | | |
| 31.51 | 100800 | -100768 | 141 | 108 |

S Statistic = 141 - 108 = 33

| Tied Group | Value | Members |
|---|---|---|
| 1 | 3210 | 2 |
| 2 | 16400 | 2 |

| Time Period | Observations |
|---|---|
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 3/1/2022 | 1 |
| 3/1/2023 | 1 |
| 3/1/2024 | 1 |

There are 2 time periods with multiple data

A = 36
B = 36
C = 0
D = 0
E = 4
F = 4
a = 25806
b = 95634
c = 1012
Group Variance = 1429.68
Z-Score = 0.846311
Comparison Level at 95% confidence level = -1.65463 (downward trend)
0.846311 >= -1.65463 indicating no evidence of a downward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RW16-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 90300 | 86300 | 4000 | 1 | 0 |
| 314000 | 86300 | 227700 | 2 | 0 |
| 207000 | 86300 | 120700 | 3 | 0 |
| 20200 | 86300 | -66100 | 3 | 1 |
| 2000 | 86300 | -84300 | 3 | 2 |
| 441 | 86300 | -85859 | 3 | 3 |
| 19200 | 86300 | -67100 | 3 | 4 |
| 16200 | 86300 | -70100 | 3 | 5 |
| 11200 | 86300 | -75100 | 3 | 6 |
| 1230 | 86300 | -85070 | 3 | 7 |
| 320 | 86300 | -85980 | 3 | 8 |
| 4.7 J | 86300 | -86295.3 | 3 | 9 |
| 131 | 86300 | -86169 | 3 | 10 |
| 135 | 86300 | -86165 | 3 | 11 |
| 4.9 J | 86300 | -86295.1 | 3 | 12 |
| 13.1 | 86300 | -86286.9 | 3 | 13 |
| 460 | 86300 | -85840 | 3 | 14 |
| 16.2 | 86300 | -86283.8 | 3 | 15 |
| 7.3 J | 86300 | -86292.7 | 3 | 16 |
| 63.1 | 86300 | -86236.9 | 3 | 17 |
| 10.2 1c | 86300 | -86289.8 | 3 | 18 |
| 62.4 | 86300 | -86237.6 | 3 | 19 |
| 120 | 86300 | -86180 | 3 | 20 |
| ND<5 U | 86300 | -86295 | 3 | 21 |
| ND<5 U | 86300 | -86295 | 3 | 22 |
| | | | | |
| 314000 | 90300 | 223700 | 4 | 22 |
| 207000 | 90300 | 116700 | 5 | 22 |
| 20200 | 90300 | -70100 | 5 | 23 |
| 2000 | 90300 | -88300 | 5 | 24 |
| 441 | 90300 | -89859 | 5 | 25 |
| 19200 | 90300 | -71100 | 5 | 26 |
| 16200 | 90300 | -74100 | 5 | 27 |
| 11200 | 90300 | -79100 | 5 | 28 |
| 1230 | 90300 | -89070 | 5 | 29 |
| 320 | 90300 | -89980 | 5 | 30 |
| 4.7 J | 90300 | -90295.3 | 5 | 31 |
| 131 | 90300 | -90169 | 5 | 32 |
| 135 | 90300 | -90165 | 5 | 33 |
| 4.9 J | 90300 | -90295.1 | 5 | 34 |
| 13.1 | 90300 | -90286.9 | 5 | 35 |
| 460 | 90300 | -89840 | 5 | 36 |
| 16.2 | 90300 | -90283.8 | 5 | 37 |
| 7.3 J | 90300 | -90292.7 | 5 | 38 |
| 63.1 | 90300 | -90236.9 | 5 | 39 |
| 10.2 1c | 90300 | -90289.8 | 5 | 40 |
| 62.4 | 90300 | -90237.6 | 5 | 41 |

| | | | | |
|---|---|---|---|---|
| 120 | 90300 | -90180 | 5 | 42 |
| ND<5 U | 90300 | -90295 | 5 | 43 |
| ND<5 U | 90300 | -90295 | 5 | 44 |
| | | | | |
| 207000 | 314000 | -107000 | 5 | 45 |
| 20200 | 314000 | -293800 | 5 | 46 |
| 2000 | 314000 | -312000 | 5 | 47 |
| 441 | 314000 | -313559 | 5 | 48 |
| 19200 | 314000 | -294800 | 5 | 49 |
| 16200 | 314000 | -297800 | 5 | 50 |
| 11200 | 314000 | -302800 | 5 | 51 |
| 1230 | 314000 | -312770 | 5 | 52 |
| 320 | 314000 | -313680 | 5 | 53 |
| 4.7 J | 314000 | -313995 | 5 | 54 |
| 131 | 314000 | -313869 | 5 | 55 |
| 135 | 314000 | -313865 | 5 | 56 |
| 4.9 J | 314000 | -313995 | 5 | 57 |
| 13.1 | 314000 | -313987 | 5 | 58 |
| 460 | 314000 | -313540 | 5 | 59 |
| 16.2 | 314000 | -313984 | 5 | 60 |
| 7.3 J | 314000 | -313993 | 5 | 61 |
| 63.1 | 314000 | -313937 | 5 | 62 |
| 10.2 1c | 314000 | -313990 | 5 | 63 |
| 62.4 | 314000 | -313938 | 5 | 64 |
| 120 | 314000 | -313880 | 5 | 65 |
| ND<5 U | 314000 | -313995 | 5 | 66 |
| ND<5 U | 314000 | -313995 | 5 | 67 |
| | | | | |
| 20200 | 207000 | -186800 | 5 | 68 |
| 2000 | 207000 | -205000 | 5 | 69 |
| 441 | 207000 | -206559 | 5 | 70 |
| 19200 | 207000 | -187800 | 5 | 71 |
| 16200 | 207000 | -190800 | 5 | 72 |
| 11200 | 207000 | -195800 | 5 | 73 |
| 1230 | 207000 | -205770 | 5 | 74 |
| 320 | 207000 | -206680 | 5 | 75 |
| 4.7 J | 207000 | -206995 | 5 | 76 |
| 131 | 207000 | -206869 | 5 | 77 |
| 135 | 207000 | -206865 | 5 | 78 |
| 4.9 J | 207000 | -206995 | 5 | 79 |
| 13.1 | 207000 | -206987 | 5 | 80 |
| 460 | 207000 | -206540 | 5 | 81 |
| 16.2 | 207000 | -206984 | 5 | 82 |
| 7.3 J | 207000 | -206993 | 5 | 83 |
| 63.1 | 207000 | -206937 | 5 | 84 |
| 10.2 1c | 207000 | -206990 | 5 | 85 |
| 62.4 | 207000 | -206938 | 5 | 86 |
| 120 | 207000 | -206880 | 5 | 87 |
| ND<5 U | 207000 | -206995 | 5 | 88 |
| ND<5 U | 207000 | -206995 | 5 | 89 |
| | | | | |
| 2000 | 20200 | -18200 | 5 | 90 |
| 441 | 20200 | -19759 | 5 | 91 |
| 19200 | 20200 | -1000 | 5 | 92 |
| 16200 | 20200 | -4000 | 5 | 93 |
| 11200 | 20200 | -9000 | 5 | 94 |
| 1230 | 20200 | -18970 | 5 | 95 |

| | | | | |
|---|---|---|---|---|
| 320 | 20200 | -19880 | 5 | 96 |
| 4.7 J | 20200 | -20195.3 | 5 | 97 |
| 131 | 20200 | -20069 | 5 | 98 |
| 135 | 20200 | -20065 | 5 | 99 |
| 4.9 J | 20200 | -20195.1 | 5 | 100 |
| 13.1 | 20200 | -20186.9 | 5 | 101 |
| 460 | 20200 | -19740 | 5 | 102 |
| 16.2 | 20200 | -20183.8 | 5 | 103 |
| 7.3 J | 20200 | -20192.7 | 5 | 104 |
| 63.1 | 20200 | -20136.9 | 5 | 105 |
| 10.2 1c | 20200 | -20189.8 | 5 | 106 |
| 62.4 | 20200 | -20137.6 | 5 | 107 |
| 120 | 20200 | -20080 | 5 | 108 |
| ND<5 U | 20200 | -20195 | 5 | 109 |
| ND<5 U | 20200 | -20195 | 5 | 110 |
| | | | | |
| 441 | 2000 | -1559 | 5 | 111 |
| 19200 | 2000 | 17200 | 6 | 111 |
| 16200 | 2000 | 14200 | 7 | 111 |
| 11200 | 2000 | 9200 | 8 | 111 |
| 1230 | 2000 | -770 | 8 | 112 |
| 320 | 2000 | -1680 | 8 | 113 |
| 4.7 J | 2000 | -1995.3 | 8 | 114 |
| 131 | 2000 | -1869 | 8 | 115 |
| 135 | 2000 | -1865 | 8 | 116 |
| 4.9 J | 2000 | -1995.1 | 8 | 117 |
| 13.1 | 2000 | -1986.9 | 8 | 118 |
| 460 | 2000 | -1540 | 8 | 119 |
| 16.2 | 2000 | -1983.8 | 8 | 120 |
| 7.3 J | 2000 | -1992.7 | 8 | 121 |
| 63.1 | 2000 | -1936.9 | 8 | 122 |
| 10.2 1c | 2000 | -1989.8 | 8 | 123 |
| 62.4 | 2000 | -1937.6 | 8 | 124 |
| 120 | 2000 | -1880 | 8 | 125 |
| ND<5 U | 2000 | -1995 | 8 | 126 |
| ND<5 U | 2000 | -1995 | 8 | 127 |
| | | | | |
| 19200 | 441 | 18759 | 9 | 127 |
| 16200 | 441 | 15759 | 10 | 127 |
| 11200 | 441 | 10759 | 11 | 127 |
| 1230 | 441 | 789 | 12 | 127 |
| 320 | 441 | -121 | 12 | 128 |
| 4.7 J | 441 | -436.3 | 12 | 129 |
| 131 | 441 | -310 | 12 | 130 |
| 135 | 441 | -306 | 12 | 131 |
| 4.9 J | 441 | -436.1 | 12 | 132 |
| 13.1 | 441 | -427.9 | 12 | 133 |
| 460 | 441 | 19 | 13 | 133 |
| 16.2 | 441 | -424.8 | 13 | 134 |
| 7.3 J | 441 | -433.7 | 13 | 135 |
| 63.1 | 441 | -377.9 | 13 | 136 |
| 10.2 1c | 441 | -430.8 | 13 | 137 |
| 62.4 | 441 | -378.6 | 13 | 138 |
| 120 | 441 | -321 | 13 | 139 |
| ND<5 U | 441 | -436 | 13 | 140 |
| ND<5 U | 441 | -436 | 13 | 141 |

| | | | | |
|---|---|---|---|---|
| 16200 | 19200 | -3000 | 13 | 142 |
| 11200 | 19200 | -8000 | 13 | 143 |
| 1230 | 19200 | -17970 | 13 | 144 |
| 320 | 19200 | -18880 | 13 | 145 |
| 4.7 J | 19200 | -19195.3 | 13 | 146 |
| 131 | 19200 | -19069 | 13 | 147 |
| 135 | 19200 | -19065 | 13 | 148 |
| 4.9 J | 19200 | -19195.1 | 13 | 149 |
| 13.1 | 19200 | -19186.9 | 13 | 150 |
| 460 | 19200 | -18740 | 13 | 151 |
| 16.2 | 19200 | -19183.8 | 13 | 152 |
| 7.3 J | 19200 | -19192.7 | 13 | 153 |
| 63.1 | 19200 | -19136.9 | 13 | 154 |
| 10.2 1c | 19200 | -19189.8 | 13 | 155 |
| 62.4 | 19200 | -19137.6 | 13 | 156 |
| 120 | 19200 | -19080 | 13 | 157 |
| ND<5 U | 19200 | -19195 | 13 | 158 |
| ND<5 U | 19200 | -19195 | 13 | 159 |
| | | | | |
| 11200 | 16200 | -5000 | 13 | 160 |
| 1230 | 16200 | -14970 | 13 | 161 |
| 320 | 16200 | -15880 | 13 | 162 |
| 4.7 J | 16200 | -16195.3 | 13 | 163 |
| 131 | 16200 | -16069 | 13 | 164 |
| 135 | 16200 | -16065 | 13 | 165 |
| 4.9 J | 16200 | -16195.1 | 13 | 166 |
| 13.1 | 16200 | -16186.9 | 13 | 167 |
| 460 | 16200 | -15740 | 13 | 168 |
| 16.2 | 16200 | -16183.8 | 13 | 169 |
| 7.3 J | 16200 | -16192.7 | 13 | 170 |
| 63.1 | 16200 | -16136.9 | 13 | 171 |
| 10.2 1c | 16200 | -16189.8 | 13 | 172 |
| 62.4 | 16200 | -16137.6 | 13 | 173 |
| 120 | 16200 | -16080 | 13 | 174 |
| ND<5 U | 16200 | -16195 | 13 | 175 |
| ND<5 U | 16200 | -16195 | 13 | 176 |
| | | | | |
| 1230 | 11200 | -9970 | 13 | 177 |
| 320 | 11200 | -10880 | 13 | 178 |
| 4.7 J | 11200 | -11195.3 | 13 | 179 |
| 131 | 11200 | -11069 | 13 | 180 |
| 135 | 11200 | -11065 | 13 | 181 |
| 4.9 J | 11200 | -11195.1 | 13 | 182 |
| 13.1 | 11200 | -11186.9 | 13 | 183 |
| 460 | 11200 | -10740 | 13 | 184 |
| 16.2 | 11200 | -11183.8 | 13 | 185 |
| 7.3 J | 11200 | -11192.7 | 13 | 186 |
| 63.1 | 11200 | -11136.9 | 13 | 187 |
| 10.2 1c | 11200 | -11189.8 | 13 | 188 |
| 62.4 | 11200 | -11137.6 | 13 | 189 |
| 120 | 11200 | -11080 | 13 | 190 |
| ND<5 U | 11200 | -11195 | 13 | 191 |
| ND<5 U | 11200 | -11195 | 13 | 192 |
| | | | | |
| 320 | 1230 | -910 | 13 | 193 |
| 4.7 J | 1230 | -1225.3 | 13 | 194 |
| 131 | 1230 | -1099 | 13 | 195 |

| | | | | |
|---|---|---|---|---|
| 135 | 1230 | -1095 | 13 | 196 |
| 4.9 J | 1230 | -1225.1 | 13 | 197 |
| 13.1 | 1230 | -1216.9 | 13 | 198 |
| 460 | 1230 | -770 | 13 | 199 |
| 16.2 | 1230 | -1213.8 | 13 | 200 |
| 7.3 J | 1230 | -1222.7 | 13 | 201 |
| 63.1 | 1230 | -1166.9 | 13 | 202 |
| 10.2 1c | 1230 | -1219.8 | 13 | 203 |
| 62.4 | 1230 | -1167.6 | 13 | 204 |
| 120 | 1230 | -1110 | 13 | 205 |
| ND<5 U | 1230 | -1225 | 13 | 206 |
| ND<5 U | 1230 | -1225 | 13 | 207 |
| | | | | |
| 4.7 J | 320 | -315.3 | 13 | 208 |
| 131 | 320 | -189 | 13 | 209 |
| 135 | 320 | -185 | 13 | 210 |
| 4.9 J | 320 | -315.1 | 13 | 211 |
| 13.1 | 320 | -306.9 | 13 | 212 |
| 460 | 320 | 140 | 14 | 212 |
| 16.2 | 320 | -303.8 | 14 | 213 |
| 7.3 J | 320 | -312.7 | 14 | 214 |
| 63.1 | 320 | -256.9 | 14 | 215 |
| 10.2 1c | 320 | -309.8 | 14 | 216 |
| 62.4 | 320 | -257.6 | 14 | 217 |
| 120 | 320 | -200 | 14 | 218 |
| ND<5 U | 320 | -315 | 14 | 219 |
| ND<5 U | 320 | -315 | 14 | 220 |
| | | | | |
| 131 | 4.7 J | Same Date | 14 | 220 |
| 135 | 4.7 J | 130.3 | 15 | 220 |
| 4.9 J | 4.7 J | 0.2 | 16 | 220 |
| 13.1 | 4.7 J | 8.4 | 17 | 220 |
| 460 | 4.7 J | 455.3 | 18 | 220 |
| 16.2 | 4.7 J | 11.5 | 19 | 220 |
| 7.3 J | 4.7 J | 2.6 | 20 | 220 |
| 63.1 | 4.7 J | 58.4 | 21 | 220 |
| 10.2 1c | 4.7 J | 5.5 | 22 | 220 |
| 62.4 | 4.7 J | 57.7 | 23 | 220 |
| 120 | 4.7 J | 115.3 | 24 | 220 |
| ND<5 U | 4.7 J | 0.3 | 25 | 220 |
| ND<5 U | 4.7 J | 0.3 | 26 | 220 |
| | | | | |
| 135 | 131 | 4 | 27 | 220 |
| 4.9 J | 131 | -126.1 | 27 | 221 |
| 13.1 | 131 | -117.9 | 27 | 222 |
| 460 | 131 | 329 | 28 | 222 |
| 16.2 | 131 | -114.8 | 28 | 223 |
| 7.3 J | 131 | -123.7 | 28 | 224 |
| 63.1 | 131 | -67.9 | 28 | 225 |
| 10.2 1c | 131 | -120.8 | 28 | 226 |
| 62.4 | 131 | -68.6 | 28 | 227 |
| 120 | 131 | -11 | 28 | 228 |
| ND<5 U | 131 | -126 | 28 | 229 |
| ND<5 U | 131 | -126 | 28 | 230 |
| | | | | |
| 4.9 J | 135 | Same Date | 28 | 230 |
| 13.1 | 135 | -121.9 | 28 | 231 |

| | | | | |
|---|---|---|---|---|
| 460 | 135 | 325 | 29 | 231 |
| 16.2 | 135 | -118.8 | 29 | 232 |
| 7.3 J | 135 | -127.7 | 29 | 233 |
| 63.1 | 135 | -71.9 | 29 | 234 |
| 10.2 1c | 135 | -124.8 | 29 | 235 |
| 62.4 | 135 | -72.6 | 29 | 236 |
| 120 | 135 | -15 | 29 | 237 |
| ND<5 U | 135 | -130 | 29 | 238 |
| ND<5 U | 135 | -130 | 29 | 239 |
| | | | | |
| 13.1 | 4.9 J | 8.2 | 30 | 239 |
| 460 | 4.9 J | 455.1 | 31 | 239 |
| 16.2 | 4.9 J | 11.3 | 32 | 239 |
| 7.3 J | 4.9 J | 2.4 | 33 | 239 |
| 63.1 | 4.9 J | 58.2 | 34 | 239 |
| 10.2 1c | 4.9 J | 5.3 | 35 | 239 |
| 62.4 | 4.9 J | 57.5 | 36 | 239 |
| 120 | 4.9 J | 115.1 | 37 | 239 |
| ND<5 U | 4.9 J | 0.1 | 38 | 239 |
| ND<5 U | 4.9 J | 0.1 | 39 | 239 |
| | | | | |
| 460 | 13.1 | 446.9 | 40 | 239 |
| 16.2 | 13.1 | 3.1 | 41 | 239 |
| 7.3 J | 13.1 | -5.8 | 41 | 240 |
| 63.1 | 13.1 | 50 | 42 | 240 |
| 10.2 1c | 13.1 | -2.9 | 42 | 241 |
| 62.4 | 13.1 | 49.3 | 43 | 241 |
| 120 | 13.1 | 106.9 | 44 | 241 |
| ND<5 U | 13.1 | -8.1 | 44 | 242 |
| ND<5 U | 13.1 | -8.1 | 44 | 243 |
| | | | | |
| 16.2 | 460 | -443.8 | 44 | 244 |
| 7.3 J | 460 | -452.7 | 44 | 245 |
| 63.1 | 460 | -396.9 | 44 | 246 |
| 10.2 1c | 460 | -449.8 | 44 | 247 |
| 62.4 | 460 | -397.6 | 44 | 248 |
| 120 | 460 | -340 | 44 | 249 |
| ND<5 U | 460 | -455 | 44 | 250 |
| ND<5 U | 460 | -455 | 44 | 251 |
| | | | | |
| 7.3 J | 16.2 | -8.9 | 44 | 252 |
| 63.1 | 16.2 | 46.9 | 45 | 252 |
| 10.2 1c | 16.2 | -6 | 45 | 253 |
| 62.4 | 16.2 | 46.2 | 46 | 253 |
| 120 | 16.2 | 103.8 | 47 | 253 |
| ND<5 U | 16.2 | -11.2 | 47 | 254 |
| ND<5 U | 16.2 | -11.2 | 47 | 255 |
| | | | | |
| 63.1 | 7.3 J | 55.8 | 48 | 255 |
| 10.2 1c | 7.3 J | 2.9 | 49 | 255 |
| 62.4 | 7.3 J | 55.1 | 50 | 255 |
| 120 | 7.3 J | 112.7 | 51 | 255 |
| ND<5 U | 7.3 J | -2.3 | 51 | 256 |
| ND<5 U | 7.3 J | -2.3 | 51 | 257 |
| | | | | |
| 10.2 1c | 63.1 | -52.9 | 51 | 258 |
| 62.4 | 63.1 | -0.7 | 51 | 259 |

| | | | | |
|---|---|---|---|---|
| 120 | 63.1 | 56.9 | 52 | 259 |
| ND<5 U | 63.1 | -58.1 | 52 | 260 |
| ND<5 U | 63.1 | -58.1 | 52 | 261 |
| | | | | |
| 62.4 | 10.2 1c | 52.2 | 53 | 261 |
| 120 | 10.2 1c | 109.8 | 54 | 261 |
| ND<5 U | 10.2 1c | -5.2 | 54 | 262 |
| ND<5 U | 10.2 1c | -5.2 | 54 | 263 |
| | | | | |
| 120 | 62.4 | 57.6 | 55 | 263 |
| ND<5 U | 62.4 | -57.4 | 55 | 264 |
| ND<5 U | 62.4 | -57.4 | 55 | 265 |
| | | | | |
| ND<5 U | 120 | -115 | 55 | 266 |
| ND<5 U | 120 | -115 | 55 | 267 |
| | | | | |
| ND<5 U | ND<5 U | 0 | 55 | 267 |

S Statistic = 55 - 267 = -212

| Tied Group | Value | Members |
|---|---|---|
| 1 | 5 | 2 |

| Time Period | Observations |
|---|---|
| 2/1/2017 | 1 |
| 3/1/2017 | 1 |
| 4/1/2017 | 1 |
| 5/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 3/1/2022 | 1 |
| 3/1/2023 | 1 |
| 3/1/2024 | 1 |

There are 2 time periods with multiple data

A = 18
B = 36
C = 0
D = 0
E = 2
F = 4

a = 37050
b = 140400
c = 1300
Group Variance = 2055.34
Z-Score = -4.65415
Comparison Level at 95% confidence level = -1.65463 (downward trend)
**-4.65415 < -1.65463 indicating a downward trend**

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RW18-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 592000 | 728000 | -136000 | 0 | 1 |
| 633000 | 728000 | -95000 | 0 | 2 |
| 246000 | 728000 | -482000 | 0 | 3 |
| 694000 | 728000 | -34000 | 0 | 4 |
| 575000 | 728000 | -153000 | 0 | 5 |
| 290000 | 728000 | -438000 | 0 | 6 |
| 382000 MHML | 728000 | -346000 | 0 | 7 |
| 393000 | 728000 | -335000 | 0 | 8 |
| 323000 | 728000 | -405000 | 0 | 9 |
| 369000 | 728000 | -359000 | 0 | 10 |
| 370000 | 728000 | -358000 | 0 | 11 |
| 396000 | 728000 | -332000 | 0 | 12 |
| 330000 | 728000 | -398000 | 0 | 13 |
| 247000 | 728000 | -481000 | 0 | 14 |
| 846000 | 728000 | 118000 | 1 | 14 |
| 822000 | 728000 | 94000 | 2 | 14 |
| 279000 | 728000 | -449000 | 2 | 15 |
| 276000 | 728000 | -452000 | 2 | 16 |
| 640000 | 728000 | -88000 | 2 | 17 |
| 849000 | 728000 | 121000 | 3 | 17 |
| 545000 | 728000 | -183000 | 3 | 18 |
| 252000 | 728000 | -476000 | 3 | 19 |
| 753000 1c | 728000 | 25000 | 4 | 19 |
| 534000 1c | 728000 | -194000 | 4 | 20 |
| 4380 | 728000 | -723620 | 4 | 21 |
| 434000 | 728000 | -294000 | 4 | 22 |
| 406100 | 728000 | -321900 | 4 | 23 |
| 252600 | 728000 | -475400 | 4 | 24 |
| | | | | |
| 633000 | 592000 | 41000 | 5 | 24 |
| 246000 | 592000 | -346000 | 5 | 25 |
| 694000 | 592000 | 102000 | 6 | 25 |
| 575000 | 592000 | -17000 | 6 | 26 |
| 290000 | 592000 | -302000 | 6 | 27 |
| 382000 MHML | 592000 | -210000 | 6 | 28 |
| 393000 | 592000 | -199000 | 6 | 29 |
| 323000 | 592000 | -269000 | 6 | 30 |
| 369000 | 592000 | -223000 | 6 | 31 |
| 370000 | 592000 | -222000 | 6 | 32 |
| 396000 | 592000 | -196000 | 6 | 33 |
| 330000 | 592000 | -262000 | 6 | 34 |
| 247000 | 592000 | -345000 | 6 | 35 |
| 846000 | 592000 | 254000 | 7 | 35 |
| 822000 | 592000 | 230000 | 8 | 35 |
| 279000 | 592000 | -313000 | 8 | 36 |
| 276000 | 592000 | -316000 | 8 | 37 |
| 640000 | 592000 | 48000 | 9 | 37 |

| | | | | |
|---|---|---|---|---|
| 849000 | 592000 | 257000 | 10 | 37 |
| 545000 | 592000 | -47000 | 10 | 38 |
| 252000 | 592000 | -340000 | 10 | 39 |
| 753000 1c | 592000 | 161000 | 11 | 39 |
| 534000 1c | 592000 | -58000 | 11 | 40 |
| 4380 | 592000 | -587620 | 11 | 41 |
| 434000 | 592000 | -158000 | 11 | 42 |
| 406100 | 592000 | -185900 | 11 | 43 |
| 252600 | 592000 | -339400 | 11 | 44 |
| | | | | |
| 246000 | 633000 | -387000 | 11 | 45 |
| 694000 | 633000 | 61000 | 12 | 45 |
| 575000 | 633000 | -58000 | 12 | 46 |
| 290000 | 633000 | -343000 | 12 | 47 |
| 382000 MHML | 633000 | -251000 | 12 | 48 |
| 393000 | 633000 | -240000 | 12 | 49 |
| 323000 | 633000 | -310000 | 12 | 50 |
| 369000 | 633000 | -264000 | 12 | 51 |
| 370000 | 633000 | -263000 | 12 | 52 |
| 396000 | 633000 | -237000 | 12 | 53 |
| 330000 | 633000 | -303000 | 12 | 54 |
| 247000 | 633000 | -386000 | 12 | 55 |
| 846000 | 633000 | 213000 | 13 | 55 |
| 822000 | 633000 | 189000 | 14 | 55 |
| 279000 | 633000 | -354000 | 14 | 56 |
| 276000 | 633000 | -357000 | 14 | 57 |
| 640000 | 633000 | 7000 | 15 | 57 |
| 849000 | 633000 | 216000 | 16 | 57 |
| 545000 | 633000 | -88000 | 16 | 58 |
| 252000 | 633000 | -381000 | 16 | 59 |
| 753000 1c | 633000 | 120000 | 17 | 59 |
| 534000 1c | 633000 | -99000 | 17 | 60 |
| 4380 | 633000 | -628620 | 17 | 61 |
| 434000 | 633000 | -199000 | 17 | 62 |
| 406100 | 633000 | -226900 | 17 | 63 |
| 252600 | 633000 | -380400 | 17 | 64 |
| | | | | |
| 694000 | 246000 | 448000 | 18 | 64 |
| 575000 | 246000 | 329000 | 19 | 64 |
| 290000 | 246000 | 44000 | 20 | 64 |
| 382000 MHML | 246000 | 136000 | 21 | 64 |
| 393000 | 246000 | 147000 | 22 | 64 |
| 323000 | 246000 | 77000 | 23 | 64 |
| 369000 | 246000 | 123000 | 24 | 64 |
| 370000 | 246000 | 124000 | 25 | 64 |
| 396000 | 246000 | 150000 | 26 | 64 |
| 330000 | 246000 | 84000 | 27 | 64 |
| 247000 | 246000 | 1000 | 28 | 64 |
| 846000 | 246000 | 600000 | 29 | 64 |
| 822000 | 246000 | 576000 | 30 | 64 |
| 279000 | 246000 | 33000 | 31 | 64 |
| 276000 | 246000 | 30000 | 32 | 64 |
| 640000 | 246000 | 394000 | 33 | 64 |
| 849000 | 246000 | 603000 | 34 | 64 |
| 545000 | 246000 | 299000 | 35 | 64 |
| 252000 | 246000 | 6000 | 36 | 64 |
| 753000 1c | 246000 | 507000 | 37 | 64 |

| | | | | |
|---|---|---|---|---|
| 534000 1c | 246000 | 288000 | 38 | 64 |
| 4380 | 246000 | -241620 | 38 | 65 |
| 434000 | 246000 | 188000 | 39 | 65 |
| 406100 | 246000 | 160100 | 40 | 65 |
| 252600 | 246000 | 6600 | 41 | 65 |
| | | | | |
| 575000 | 694000 | -119000 | 41 | 66 |
| 290000 | 694000 | -404000 | 41 | 67 |
| 382000 MHML | 694000 | -312000 | 41 | 68 |
| 393000 | 694000 | -301000 | 41 | 69 |
| 323000 | 694000 | -371000 | 41 | 70 |
| 369000 | 694000 | -325000 | 41 | 71 |
| 370000 | 694000 | -324000 | 41 | 72 |
| 396000 | 694000 | -298000 | 41 | 73 |
| 330000 | 694000 | -364000 | 41 | 74 |
| 247000 | 694000 | -447000 | 41 | 75 |
| 846000 | 694000 | 152000 | 42 | 75 |
| 822000 | 694000 | 128000 | 43 | 75 |
| 279000 | 694000 | -415000 | 43 | 76 |
| 276000 | 694000 | -418000 | 43 | 77 |
| 640000 | 694000 | -54000 | 43 | 78 |
| 849000 | 694000 | 155000 | 44 | 78 |
| 545000 | 694000 | -149000 | 44 | 79 |
| 252000 | 694000 | -442000 | 44 | 80 |
| 753000 1c | 694000 | 59000 | 45 | 80 |
| 534000 1c | 694000 | -160000 | 45 | 81 |
| 4380 | 694000 | -689620 | 45 | 82 |
| 434000 | 694000 | -260000 | 45 | 83 |
| 406100 | 694000 | -287900 | 45 | 84 |
| 252600 | 694000 | -441400 | 45 | 85 |
| | | | | |
| 290000 | 575000 | -285000 | 45 | 86 |
| 382000 MHML | 575000 | -193000 | 45 | 87 |
| 393000 | 575000 | -182000 | 45 | 88 |
| 323000 | 575000 | -252000 | 45 | 89 |
| 369000 | 575000 | -206000 | 45 | 90 |
| 370000 | 575000 | -205000 | 45 | 91 |
| 396000 | 575000 | -179000 | 45 | 92 |
| 330000 | 575000 | -245000 | 45 | 93 |
| 247000 | 575000 | -328000 | 45 | 94 |
| 846000 | 575000 | 271000 | 46 | 94 |
| 822000 | 575000 | 247000 | 47 | 94 |
| 279000 | 575000 | -296000 | 47 | 95 |
| 276000 | 575000 | -299000 | 47 | 96 |
| 640000 | 575000 | 65000 | 48 | 96 |
| 849000 | 575000 | 274000 | 49 | 96 |
| 545000 | 575000 | -30000 | 49 | 97 |
| 252000 | 575000 | -323000 | 49 | 98 |
| 753000 1c | 575000 | 178000 | 50 | 98 |
| 534000 1c | 575000 | -41000 | 50 | 99 |
| 4380 | 575000 | -570620 | 50 | 100 |
| 434000 | 575000 | -141000 | 50 | 101 |
| 406100 | 575000 | -168900 | 50 | 102 |
| 252600 | 575000 | -322400 | 50 | 103 |
| | | | | |
| 382000 MHML | 290000 | 92000 | 51 | 103 |
| 393000 | 290000 | 103000 | 52 | 103 |

| | | | | |
|---|---|---|---|---|
| 323000 | 290000 | 33000 | 53 | 103 |
| 369000 | 290000 | 79000 | 54 | 103 |
| 370000 | 290000 | 80000 | 55 | 103 |
| 396000 | 290000 | 106000 | 56 | 103 |
| 330000 | 290000 | 40000 | 57 | 103 |
| 247000 | 290000 | -43000 | 57 | 104 |
| 846000 | 290000 | 556000 | 58 | 104 |
| 822000 | 290000 | 532000 | 59 | 104 |
| 279000 | 290000 | -11000 | 59 | 105 |
| 276000 | 290000 | -14000 | 59 | 106 |
| 640000 | 290000 | 350000 | 60 | 106 |
| 849000 | 290000 | 559000 | 61 | 106 |
| 545000 | 290000 | 255000 | 62 | 106 |
| 252000 | 290000 | -38000 | 62 | 107 |
| 753000 1c | 290000 | 463000 | 63 | 107 |
| 534000 1c | 290000 | 244000 | 64 | 107 |
| 4380 | 290000 | -285620 | 64 | 108 |
| 434000 | 290000 | 144000 | 65 | 108 |
| 406100 | 290000 | 116100 | 66 | 108 |
| 252600 | 290000 | -37400 | 66 | 109 |
| | | | | |
| 393000 | 382000 MHML | 11000 | 67 | 109 |
| 323000 | 382000 MHML | -59000 | 67 | 110 |
| 369000 | 382000 MHML | -13000 | 67 | 111 |
| 370000 | 382000 MHML | -12000 | 67 | 112 |
| 396000 | 382000 MHML | 14000 | 68 | 112 |
| 330000 | 382000 MHML | -52000 | 68 | 113 |
| 247000 | 382000 MHML | -135000 | 68 | 114 |
| 846000 | 382000 MHML | 464000 | 69 | 114 |
| 822000 | 382000 MHML | 440000 | 70 | 114 |
| 279000 | 382000 MHML | -103000 | 70 | 115 |
| 276000 | 382000 MHML | -106000 | 70 | 116 |
| 640000 | 382000 MHML | 258000 | 71 | 116 |
| 849000 | 382000 MHML | 467000 | 72 | 116 |
| 545000 | 382000 MHML | 163000 | 73 | 116 |
| 252000 | 382000 MHML | -130000 | 73 | 117 |
| 753000 1c | 382000 MHML | 371000 | 74 | 117 |
| 534000 1c | 382000 MHML | 152000 | 75 | 117 |
| 4380 | 382000 MHML | -377620 | 75 | 118 |
| 434000 | 382000 MHML | 52000 | 76 | 118 |
| 406100 | 382000 MHML | 24100 | 77 | 118 |
| 252600 | 382000 MHML | -129400 | 77 | 119 |
| | | | | |
| 323000 | 393000 | -70000 | 77 | 120 |
| 369000 | 393000 | -24000 | 77 | 121 |
| 370000 | 393000 | -23000 | 77 | 122 |
| 396000 | 393000 | 3000 | 78 | 122 |
| 330000 | 393000 | -63000 | 78 | 123 |
| 247000 | 393000 | -146000 | 78 | 124 |
| 846000 | 393000 | 453000 | 79 | 124 |
| 822000 | 393000 | 429000 | 80 | 124 |
| 279000 | 393000 | -114000 | 80 | 125 |
| 276000 | 393000 | -117000 | 80 | 126 |
| 640000 | 393000 | 247000 | 81 | 126 |
| 849000 | 393000 | 456000 | 82 | 126 |
| 545000 | 393000 | 152000 | 83 | 126 |
| 252000 | 393000 | -141000 | 83 | 127 |

| | | | | |
|---|---|---|---|---|
| 753000 1c | 393000 | 360000 | 84 | 127 |
| 534000 1c | 393000 | 141000 | 85 | 127 |
| 4380 | 393000 | -388620 | 85 | 128 |
| 434000 | 393000 | 41000 | 86 | 128 |
| 406100 | 393000 | 13100 | 87 | 128 |
| 252600 | 393000 | -140400 | 87 | 129 |
| | | | | |
| 369000 | 323000 | 46000 | 88 | 129 |
| 370000 | 323000 | 47000 | 89 | 129 |
| 396000 | 323000 | 73000 | 90 | 129 |
| 330000 | 323000 | 7000 | 91 | 129 |
| 247000 | 323000 | -76000 | 91 | 130 |
| 846000 | 323000 | 523000 | 92 | 130 |
| 822000 | 323000 | 499000 | 93 | 130 |
| 279000 | 323000 | -44000 | 93 | 131 |
| 276000 | 323000 | -47000 | 93 | 132 |
| 640000 | 323000 | 317000 | 94 | 132 |
| 849000 | 323000 | 526000 | 95 | 132 |
| 545000 | 323000 | 222000 | 96 | 132 |
| 252000 | 323000 | -71000 | 96 | 133 |
| 753000 1c | 323000 | 430000 | 97 | 133 |
| 534000 1c | 323000 | 211000 | 98 | 133 |
| 4380 | 323000 | -318620 | 98 | 134 |
| 434000 | 323000 | 111000 | 99 | 134 |
| 406100 | 323000 | 83100 | 100 | 134 |
| 252600 | 323000 | -70400 | 100 | 135 |
| | | | | |
| 370000 | 369000 | 1000 | 101 | 135 |
| 396000 | 369000 | 27000 | 102 | 135 |
| 330000 | 369000 | -39000 | 102 | 136 |
| 247000 | 369000 | -122000 | 102 | 137 |
| 846000 | 369000 | 477000 | 103 | 137 |
| 822000 | 369000 | 453000 | 104 | 137 |
| 279000 | 369000 | -90000 | 104 | 138 |
| 276000 | 369000 | -93000 | 104 | 139 |
| 640000 | 369000 | 271000 | 105 | 139 |
| 849000 | 369000 | 480000 | 106 | 139 |
| 545000 | 369000 | 176000 | 107 | 139 |
| 252000 | 369000 | -117000 | 107 | 140 |
| 753000 1c | 369000 | 384000 | 108 | 140 |
| 534000 1c | 369000 | 165000 | 109 | 140 |
| 4380 | 369000 | -364620 | 109 | 141 |
| 434000 | 369000 | 65000 | 110 | 141 |
| 406100 | 369000 | 37100 | 111 | 141 |
| 252600 | 369000 | -116400 | 111 | 142 |
| | | | | |
| 396000 | 370000 | 26000 | 112 | 142 |
| 330000 | 370000 | -40000 | 112 | 143 |
| 247000 | 370000 | -123000 | 112 | 144 |
| 846000 | 370000 | 476000 | 113 | 144 |
| 822000 | 370000 | 452000 | 114 | 144 |
| 279000 | 370000 | -91000 | 114 | 145 |
| 276000 | 370000 | -94000 | 114 | 146 |
| 640000 | 370000 | 270000 | 115 | 146 |
| 849000 | 370000 | 479000 | 116 | 146 |
| 545000 | 370000 | 175000 | 117 | 146 |
| 252000 | 370000 | -118000 | 117 | 147 |

| | | | | |
|---|---|---|---|---|
| 753000 1c | 370000 | 383000 | 118 | 147 |
| 534000 1c | 370000 | 164000 | 119 | 147 |
| 4380 | 370000 | -365620 | 119 | 148 |
| 434000 | 370000 | 64000 | 120 | 148 |
| 406100 | 370000 | 36100 | 121 | 148 |
| 252600 | 370000 | -117400 | 121 | 149 |
| | | | | |
| 330000 | 396000 | -66000 | 121 | 150 |
| 247000 | 396000 | -149000 | 121 | 151 |
| 846000 | 396000 | 450000 | 122 | 151 |
| 822000 | 396000 | 426000 | 123 | 151 |
| 279000 | 396000 | -117000 | 123 | 152 |
| 276000 | 396000 | -120000 | 123 | 153 |
| 640000 | 396000 | 244000 | 124 | 153 |
| 849000 | 396000 | 453000 | 125 | 153 |
| 545000 | 396000 | 149000 | 126 | 153 |
| 252000 | 396000 | -144000 | 126 | 154 |
| 753000 1c | 396000 | 357000 | 127 | 154 |
| 534000 1c | 396000 | 138000 | 128 | 154 |
| 4380 | 396000 | -391620 | 128 | 155 |
| 434000 | 396000 | 38000 | 129 | 155 |
| 406100 | 396000 | 10100 | 130 | 155 |
| 252600 | 396000 | -143400 | 130 | 156 |
| | | | | |
| 247000 | 330000 | -83000 | 130 | 157 |
| 846000 | 330000 | 516000 | 131 | 157 |
| 822000 | 330000 | 492000 | 132 | 157 |
| 279000 | 330000 | -51000 | 132 | 158 |
| 276000 | 330000 | -54000 | 132 | 159 |
| 640000 | 330000 | 310000 | 133 | 159 |
| 849000 | 330000 | 519000 | 134 | 159 |
| 545000 | 330000 | 215000 | 135 | 159 |
| 252000 | 330000 | -78000 | 135 | 160 |
| 753000 1c | 330000 | 423000 | 136 | 160 |
| 534000 1c | 330000 | 204000 | 137 | 160 |
| 4380 | 330000 | -325620 | 137 | 161 |
| 434000 | 330000 | 104000 | 138 | 161 |
| 406100 | 330000 | 76100 | 139 | 161 |
| 252600 | 330000 | -77400 | 139 | 162 |
| | | | | |
| 846000 | 247000 | 599000 | 140 | 162 |
| 822000 | 247000 | 575000 | 141 | 162 |
| 279000 | 247000 | 32000 | 142 | 162 |
| 276000 | 247000 | 29000 | 143 | 162 |
| 640000 | 247000 | 393000 | 144 | 162 |
| 849000 | 247000 | 602000 | 145 | 162 |
| 545000 | 247000 | 298000 | 146 | 162 |
| 252000 | 247000 | 5000 | 147 | 162 |
| 753000 1c | 247000 | 506000 | 148 | 162 |
| 534000 1c | 247000 | 287000 | 149 | 162 |
| 4380 | 247000 | -242620 | 149 | 163 |
| 434000 | 247000 | 187000 | 150 | 163 |
| 406100 | 247000 | 159100 | 151 | 163 |
| 252600 | 247000 | 5600 | 152 | 163 |
| | | | | |
| 822000 | 846000 | Same Date | 152 | 163 |
| 279000 | 846000 | -567000 | 152 | 164 |

| | | | | |
|---|---|---|---|---|
| 276000 | 846000 | -570000 | 152 | 165 |
| 640000 | 846000 | -206000 | 152 | 166 |
| 849000 | 846000 | 3000 | 153 | 166 |
| 545000 | 846000 | -301000 | 153 | 167 |
| 252000 | 846000 | -594000 | 153 | 168 |
| 753000 1c | 846000 | -93000 | 153 | 169 |
| 534000 1c | 846000 | -312000 | 153 | 170 |
| 4380 | 846000 | -841620 | 153 | 171 |
| 434000 | 846000 | -412000 | 153 | 172 |
| 406100 | 846000 | -439900 | 153 | 173 |
| 252600 | 846000 | -593400 | 153 | 174 |
| | | | | |
| 279000 | 822000 | -543000 | 153 | 175 |
| 276000 | 822000 | -546000 | 153 | 176 |
| 640000 | 822000 | -182000 | 153 | 177 |
| 849000 | 822000 | 27000 | 154 | 177 |
| 545000 | 822000 | -277000 | 154 | 178 |
| 252000 | 822000 | -570000 | 154 | 179 |
| 753000 1c | 822000 | -69000 | 154 | 180 |
| 534000 1c | 822000 | -288000 | 154 | 181 |
| 4380 | 822000 | -817620 | 154 | 182 |
| 434000 | 822000 | -388000 | 154 | 183 |
| 406100 | 822000 | -415900 | 154 | 184 |
| 252600 | 822000 | -569400 | 154 | 185 |
| | | | | |
| 276000 | 279000 | Same Date | 154 | 185 |
| 640000 | 279000 | 361000 | 155 | 185 |
| 849000 | 279000 | 570000 | 156 | 185 |
| 545000 | 279000 | 266000 | 157 | 185 |
| 252000 | 279000 | -27000 | 157 | 186 |
| 753000 1c | 279000 | 474000 | 158 | 186 |
| 534000 1c | 279000 | 255000 | 159 | 186 |
| 4380 | 279000 | -274620 | 159 | 187 |
| 434000 | 279000 | 155000 | 160 | 187 |
| 406100 | 279000 | 127100 | 161 | 187 |
| 252600 | 279000 | -26400 | 161 | 188 |
| | | | | |
| 640000 | 276000 | 364000 | 162 | 188 |
| 849000 | 276000 | 573000 | 163 | 188 |
| 545000 | 276000 | 269000 | 164 | 188 |
| 252000 | 276000 | -24000 | 164 | 189 |
| 753000 1c | 276000 | 477000 | 165 | 189 |
| 534000 1c | 276000 | 258000 | 166 | 189 |
| 4380 | 276000 | -271620 | 166 | 190 |
| 434000 | 276000 | 158000 | 167 | 190 |
| 406100 | 276000 | 130100 | 168 | 190 |
| 252600 | 276000 | -23400 | 168 | 191 |
| | | | | |
| 849000 | 640000 | 209000 | 169 | 191 |
| 545000 | 640000 | -95000 | 169 | 192 |
| 252000 | 640000 | -388000 | 169 | 193 |
| 753000 1c | 640000 | 113000 | 170 | 193 |
| 534000 1c | 640000 | -106000 | 170 | 194 |
| 4380 | 640000 | -635620 | 170 | 195 |
| 434000 | 640000 | -206000 | 170 | 196 |
| 406100 | 640000 | -233900 | 170 | 197 |
| 252600 | 640000 | -387400 | 170 | 198 |

| | | | | |
|---|---|---|---|---|
| 545000 | 849000 | -304000 | 170 | 199 |
| 252000 | 849000 | -597000 | 170 | 200 |
| 753000 1c | 849000 | -96000 | 170 | 201 |
| 534000 1c | 849000 | -315000 | 170 | 202 |
| 4380 | 849000 | -844620 | 170 | 203 |
| 434000 | 849000 | -415000 | 170 | 204 |
| 406100 | 849000 | -442900 | 170 | 205 |
| 252600 | 849000 | -596400 | 170 | 206 |
| | | | | |
| 252000 | 545000 | -293000 | 170 | 207 |
| 753000 1c | 545000 | 208000 | 171 | 207 |
| 534000 1c | 545000 | -11000 | 171 | 208 |
| 4380 | 545000 | -540620 | 171 | 209 |
| 434000 | 545000 | -111000 | 171 | 210 |
| 406100 | 545000 | -138900 | 171 | 211 |
| 252600 | 545000 | -292400 | 171 | 212 |
| | | | | |
| 753000 1c | 252000 | 501000 | 172 | 212 |
| 534000 1c | 252000 | 282000 | 173 | 212 |
| 4380 | 252000 | -247620 | 173 | 213 |
| 434000 | 252000 | 182000 | 174 | 213 |
| 406100 | 252000 | 154100 | 175 | 213 |
| 252600 | 252000 | 600 | 176 | 213 |
| | | | | |
| 534000 1c | 753000 1c | -219000 | 176 | 214 |
| 4380 | 753000 1c | -748620 | 176 | 215 |
| 434000 | 753000 1c | -319000 | 176 | 216 |
| 406100 | 753000 1c | -346900 | 176 | 217 |
| 252600 | 753000 1c | -500400 | 176 | 218 |
| | | | | |
| 4380 | 534000 1c | -529620 | 176 | 219 |
| 434000 | 534000 1c | -100000 | 176 | 220 |
| 406100 | 534000 1c | -127900 | 176 | 221 |
| 252600 | 534000 1c | -281400 | 176 | 222 |
| | | | | |
| 434000 | 4380 | 429620 | 177 | 222 |
| 406100 | 4380 | 401720 | 178 | 222 |
| 252600 | 4380 | 248220 | 179 | 222 |
| | | | | |
| 406100 | 434000 | -27900 | 179 | 223 |
| 252600 | 434000 | -181400 | 179 | 224 |
| | | | | |
| 252600 | 406100 | -153500 | 179 | 225 |

S Statistic = 179 - 225 = -46

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 2/1/2017 | 1 |
| 3/1/2017 | 1 |
| 4/1/2017 | 1 |
| 5/1/2017 | 1 |
| 6/1/2017 | 1 |
| 7/1/2017 | 1 |

| | |
|---|---|
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 3/1/2022 | 1 |
| 3/1/2023 | 1 |
| 3/1/2024 | 1 |

There are 2 time periods with multiple data

---

A = 0
B = 36
C = 0
D = 0
E = 0
F = 4
a = 51156
b = 197316
c = 1624
Group Variance = 2840
Z-Score = -0.84441
Comparison Level at 95% confidence level = -1.65463 (downward trend)
-0.84441 >= -1.65463 indicating no evidence of a downward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RW19-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 4.65e+006 | 5.9e+006 | -1.25e+006 | 0 | 1 |
| 7.01e+006 MH | 5.9e+006 | 1.11e+006 | 1 | 1 |
| 5.37e+006 ML | 5.9e+006 | -530000 | 1 | 2 |
| 6.72e+006 | 5.9e+006 | 820000 | 2 | 2 |
| 5.33e+006 | 5.9e+006 | -570000 | 2 | 3 |
| 3.36e+006 | 5.9e+006 | -2.54e+006 | 2 | 4 |
| 2.5e+006 | 5.9e+006 | -3.4e+006 | 2 | 5 |
| 3.67e+006 | 5.9e+006 | -2.23e+006 | 2 | 6 |
| 3.4e+006 | 5.9e+006 | -2.5e+006 | 2 | 7 |
| 3.97e+006 | 5.9e+006 | -1.93e+006 | 2 | 8 |
| 3.84e+006 ML | 5.9e+006 | -2.06e+006 | 2 | 9 |
| 4.19e+006 | 5.9e+006 | -1.71e+006 | 2 | 10 |
| 4.88e+006 | 5.9e+006 | -1.02e+006 | 2 | 11 |
| 5.88e+006 | 5.9e+006 | -20000 | 2 | 12 |
| 3.77e+006 | 5.9e+006 | -2.13e+006 | 2 | 13 |
| 3.66e+006 | 5.9e+006 | -2.24e+006 | 2 | 14 |
| 7.27e+006 | 5.9e+006 | 1.37e+006 | 3 | 14 |
| 7.28e+006 | 5.9e+006 | 1.38e+006 | 4 | 14 |
| 3.46e+006 | 5.9e+006 | -2.44e+006 | 4 | 15 |
| 5.69e+006 | 5.9e+006 | -210000 | 4 | 16 |
| 6.05e+006 ML | 5.9e+006 | 150000 | 5 | 16 |
| 6.45e+006 | 5.9e+006 | 550000 | 6 | 16 |
| 6.22e+006 | 5.9e+006 | 320000 | 7 | 16 |
| 3.93e+006 | 5.9e+006 | -1.97e+006 | 7 | 17 |
| 212000 MH | 5.9e+006 | -5.688e+006 | 7 | 18 |
| 3.09e+006 | 5.9e+006 | -2.81e+006 | 7 | 19 |
| 9.943 J | 5.9e+006 | -5.89999e+006 | 7 | 20 |
| 4.833e+006 | 5.9e+006 | -1.067e+006 | 7 | 21 |
| | | | | |
| 7.01e+006 MH | 4.65e+006 | 2.36e+006 | 8 | 21 |
| 5.37e+006 ML | 4.65e+006 | 720000 | 9 | 21 |
| 6.72e+006 | 4.65e+006 | 2.07e+006 | 10 | 21 |
| 5.33e+006 | 4.65e+006 | 680000 | 11 | 21 |
| 3.36e+006 | 4.65e+006 | -1.29e+006 | 11 | 22 |
| 2.5e+006 | 4.65e+006 | -2.15e+006 | 11 | 23 |
| 3.67e+006 | 4.65e+006 | -980000 | 11 | 24 |
| 3.4e+006 | 4.65e+006 | -1.25e+006 | 11 | 25 |
| 3.97e+006 | 4.65e+006 | -680000 | 11 | 26 |
| 3.84e+006 ML | 4.65e+006 | -810000 | 11 | 27 |
| 4.19e+006 | 4.65e+006 | -460000 | 11 | 28 |
| 4.88e+006 | 4.65e+006 | 230000 | 12 | 28 |
| 5.88e+006 | 4.65e+006 | 1.23e+006 | 13 | 28 |
| 3.77e+006 | 4.65e+006 | -880000 | 13 | 29 |
| 3.66e+006 | 4.65e+006 | -990000 | 13 | 30 |
| 7.27e+006 | 4.65e+006 | 2.62e+006 | 14 | 30 |
| 7.28e+006 | 4.65e+006 | 2.63e+006 | 15 | 30 |
| 3.46e+006 | 4.65e+006 | -1.19e+006 | 15 | 31 |

| | | | | |
|---|---|---|---|---|
| 5.69e+006 | 4.65e+006 | 1.04e+006 | 16 | 31 |
| 6.05e+006 ML | 4.65e+006 | 1.4e+006 | 17 | 31 |
| 6.45e+006 | 4.65e+006 | 1.8e+006 | 18 | 31 |
| 6.22e+006 | 4.65e+006 | 1.57e+006 | 19 | 31 |
| 3.93e+006 | 4.65e+006 | -720000 | 19 | 32 |
| 212000 MH | 4.65e+006 | -4.438e+006 | 19 | 33 |
| 3.09e+006 | 4.65e+006 | -1.56e+006 | 19 | 34 |
| 9.943 J | 4.65e+006 | -4.64999e+006 | 19 | 35 |
| 4.833e+006 | 4.65e+006 | 183000 | 20 | 35 |
| | | | | |
| 5.37e+006 ML | 7.01e+006 MH | -1.64e+006 | 20 | 36 |
| 6.72e+006 | 7.01e+006 MH | -290000 | 20 | 37 |
| 5.33e+006 | 7.01e+006 MH | -1.68e+006 | 20 | 38 |
| 3.36e+006 | 7.01e+006 MH | -3.65e+006 | 20 | 39 |
| 2.5e+006 | 7.01e+006 MH | -4.51e+006 | 20 | 40 |
| 3.67e+006 | 7.01e+006 MH | -3.34e+006 | 20 | 41 |
| 3.4e+006 | 7.01e+006 MH | -3.61e+006 | 20 | 42 |
| 3.97e+006 | 7.01e+006 MH | -3.04e+006 | 20 | 43 |
| 3.84e+006 ML | 7.01e+006 MH | -3.17e+006 | 20 | 44 |
| 4.19e+006 | 7.01e+006 MH | -2.82e+006 | 20 | 45 |
| 4.88e+006 | 7.01e+006 MH | -2.13e+006 | 20 | 46 |
| 5.88e+006 | 7.01e+006 MH | -1.13e+006 | 20 | 47 |
| 3.77e+006 | 7.01e+006 MH | -3.24e+006 | 20 | 48 |
| 3.66e+006 | 7.01e+006 MH | -3.35e+006 | 20 | 49 |
| 7.27e+006 | 7.01e+006 MH | 260000 | 21 | 49 |
| 7.28e+006 | 7.01e+006 MH | 270000 | 22 | 49 |
| 3.46e+006 | 7.01e+006 MH | -3.55e+006 | 22 | 50 |
| 5.69e+006 | 7.01e+006 MH | -1.32e+006 | 22 | 51 |
| 6.05e+006 ML | 7.01e+006 MH | -960000 | 22 | 52 |
| 6.45e+006 | 7.01e+006 MH | -560000 | 22 | 53 |
| 6.22e+006 | 7.01e+006 MH | -790000 | 22 | 54 |
| 3.93e+006 | 7.01e+006 MH | -3.08e+006 | 22 | 55 |
| 212000 MH | 7.01e+006 MH | -6.798e+006 | 22 | 56 |
| 3.09e+006 | 7.01e+006 MH | -3.92e+006 | 22 | 57 |
| 9.943 J | 7.01e+006 MH | -7.00999e+006 | 22 | 58 |
| 4.833e+006 | 7.01e+006 MH | -2.177e+006 | 22 | 59 |
| | | | | |
| 6.72e+006 | 5.37e+006 ML | 1.35e+006 | 23 | 59 |
| 5.33e+006 | 5.37e+006 ML | -40000 | 23 | 60 |
| 3.36e+006 | 5.37e+006 ML | -2.01e+006 | 23 | 61 |
| 2.5e+006 | 5.37e+006 ML | -2.87e+006 | 23 | 62 |
| 3.67e+006 | 5.37e+006 ML | -1.7e+006 | 23 | 63 |
| 3.4e+006 | 5.37e+006 ML | -1.97e+006 | 23 | 64 |
| 3.97e+006 | 5.37e+006 ML | -1.4e+006 | 23 | 65 |
| 3.84e+006 ML | 5.37e+006 ML | -1.53e+006 | 23 | 66 |
| 4.19e+006 | 5.37e+006 ML | -1.18e+006 | 23 | 67 |
| 4.88e+006 | 5.37e+006 ML | -490000 | 23 | 68 |
| 5.88e+006 | 5.37e+006 ML | 510000 | 24 | 68 |
| 3.77e+006 | 5.37e+006 ML | -1.6e+006 | 24 | 69 |
| 3.66e+006 | 5.37e+006 ML | -1.71e+006 | 24 | 70 |
| 7.27e+006 | 5.37e+006 ML | 1.9e+006 | 25 | 70 |
| 7.28e+006 | 5.37e+006 ML | 1.91e+006 | 26 | 70 |
| 3.46e+006 | 5.37e+006 ML | -1.91e+006 | 26 | 71 |
| 5.69e+006 | 5.37e+006 ML | 320000 | 27 | 71 |
| 6.05e+006 ML | 5.37e+006 ML | 680000 | 28 | 71 |
| 6.45e+006 | 5.37e+006 ML | 1.08e+006 | 29 | 71 |
| 6.22e+006 | 5.37e+006 ML | 850000 | 30 | 71 |

| | | | | |
|---|---|---|---|---|
| 3.93e+006 | 5.37e+006 ML | -1.44e+006 | 30 | 72 |
| 212000 MH | 5.37e+006 ML | -5.158e+006 | 30 | 73 |
| 3.09e+006 | 5.37e+006 ML | -2.28e+006 | 30 | 74 |
| 9.943 J | 5.37e+006 ML | -5.36999e+006 | 30 | 75 |
| 4.833e+006 | 5.37e+006 ML | -537000 | 30 | 76 |
| | | | | |
| 5.33e+006 | 6.72e+006 | -1.39e+006 | 30 | 77 |
| 3.36e+006 | 6.72e+006 | -3.36e+006 | 30 | 78 |
| 2.5e+006 | 6.72e+006 | -4.22e+006 | 30 | 79 |
| 3.67e+006 | 6.72e+006 | -3.05e+006 | 30 | 80 |
| 3.4e+006 | 6.72e+006 | -3.32e+006 | 30 | 81 |
| 3.97e+006 | 6.72e+006 | -2.75e+006 | 30 | 82 |
| 3.84e+006 ML | 6.72e+006 | -2.88e+006 | 30 | 83 |
| 4.19e+006 | 6.72e+006 | -2.53e+006 | 30 | 84 |
| 4.88e+006 | 6.72e+006 | -1.84e+006 | 30 | 85 |
| 5.88e+006 | 6.72e+006 | -840000 | 30 | 86 |
| 3.77e+006 | 6.72e+006 | -2.95e+006 | 30 | 87 |
| 3.66e+006 | 6.72e+006 | -3.06e+006 | 30 | 88 |
| 7.27e+006 | 6.72e+006 | 550000 | 31 | 88 |
| 7.28e+006 | 6.72e+006 | 560000 | 32 | 88 |
| 3.46e+006 | 6.72e+006 | -3.26e+006 | 32 | 89 |
| 5.69e+006 | 6.72e+006 | -1.03e+006 | 32 | 90 |
| 6.05e+006 ML | 6.72e+006 | -670000 | 32 | 91 |
| 6.45e+006 | 6.72e+006 | -270000 | 32 | 92 |
| 6.22e+006 | 6.72e+006 | -500000 | 32 | 93 |
| 3.93e+006 | 6.72e+006 | -2.79e+006 | 32 | 94 |
| 212000 MH | 6.72e+006 | -6.508e+006 | 32 | 95 |
| 3.09e+006 | 6.72e+006 | -3.63e+006 | 32 | 96 |
| 9.943 J | 6.72e+006 | -6.71999e+006 | 32 | 97 |
| 4.833e+006 | 6.72e+006 | -1.887e+006 | 32 | 98 |
| | | | | |
| 3.36e+006 | 5.33e+006 | -1.97e+006 | 32 | 99 |
| 2.5e+006 | 5.33e+006 | -2.83e+006 | 32 | 100 |
| 3.67e+006 | 5.33e+006 | -1.66e+006 | 32 | 101 |
| 3.4e+006 | 5.33e+006 | -1.93e+006 | 32 | 102 |
| 3.97e+006 | 5.33e+006 | -1.36e+006 | 32 | 103 |
| 3.84e+006 ML | 5.33e+006 | -1.49e+006 | 32 | 104 |
| 4.19e+006 | 5.33e+006 | -1.14e+006 | 32 | 105 |
| 4.88e+006 | 5.33e+006 | -450000 | 32 | 106 |
| 5.88e+006 | 5.33e+006 | 550000 | 33 | 106 |
| 3.77e+006 | 5.33e+006 | -1.56e+006 | 33 | 107 |
| 3.66e+006 | 5.33e+006 | -1.67e+006 | 33 | 108 |
| 7.27e+006 | 5.33e+006 | 1.94e+006 | 34 | 108 |
| 7.28e+006 | 5.33e+006 | 1.95e+006 | 35 | 108 |
| 3.46e+006 | 5.33e+006 | -1.87e+006 | 35 | 109 |
| 5.69e+006 | 5.33e+006 | 360000 | 36 | 109 |
| 6.05e+006 ML | 5.33e+006 | 720000 | 37 | 109 |
| 6.45e+006 | 5.33e+006 | 1.12e+006 | 38 | 109 |
| 6.22e+006 | 5.33e+006 | 890000 | 39 | 109 |
| 3.93e+006 | 5.33e+006 | -1.4e+006 | 39 | 110 |
| 212000 MH | 5.33e+006 | -5.118e+006 | 39 | 111 |
| 3.09e+006 | 5.33e+006 | -2.24e+006 | 39 | 112 |
| 9.943 J | 5.33e+006 | -5.32999e+006 | 39 | 113 |
| 4.833e+006 | 5.33e+006 | -497000 | 39 | 114 |
| | | | | |
| 2.5e+006 | 3.36e+006 | -860000 | 39 | 115 |
| 3.67e+006 | 3.36e+006 | 310000 | 40 | 115 |

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|---|---|---|---|---|
| 3.4e+006 | 3.36e+006 | 40000 | 41 | 115 |
| 3.97e+006 | 3.36e+006 | 610000 | 42 | 115 |
| 3.84e+006 ML | 3.36e+006 | 480000 | 43 | 115 |
| 4.19e+006 | 3.36e+006 | 830000 | 44 | 115 |
| 4.88e+006 | 3.36e+006 | 1.52e+006 | 45 | 115 |
| 5.88e+006 | 3.36e+006 | 2.52e+006 | 46 | 115 |
| 3.77e+006 | 3.36e+006 | 410000 | 47 | 115 |
| 3.66e+006 | 3.36e+006 | 300000 | 48 | 115 |
| 7.27e+006 | 3.36e+006 | 3.91e+006 | 49 | 115 |
| 7.28e+006 | 3.36e+006 | 3.92e+006 | 50 | 115 |
| 3.46e+006 | 3.36e+006 | 100000 | 51 | 115 |
| 5.69e+006 | 3.36e+006 | 2.33e+006 | 52 | 115 |
| 6.05e+006 ML | 3.36e+006 | 2.69e+006 | 53 | 115 |
| 6.45e+006 | 3.36e+006 | 3.09e+006 | 54 | 115 |
| 6.22e+006 | 3.36e+006 | 2.86e+006 | 55 | 115 |
| 3.93e+006 | 3.36e+006 | 570000 | 56 | 115 |
| 212000 MH | 3.36e+006 | -3.148e+006 | 56 | 116 |
| 3.09e+006 | 3.36e+006 | -270000 | 56 | 117 |
| 9.943 J | 3.36e+006 | -3.35999e+006 | 56 | 118 |
| 4.833e+006 | 3.36e+006 | 1.473e+006 | 57 | 118 |
| | | | | |
| 3.67e+006 | 2.5e+006 | 1.17e+006 | 58 | 118 |
| 3.4e+006 | 2.5e+006 | 900000 | 59 | 118 |
| 3.97e+006 | 2.5e+006 | 1.47e+006 | 60 | 118 |
| 3.84e+006 ML | 2.5e+006 | 1.34e+006 | 61 | 118 |
| 4.19e+006 | 2.5e+006 | 1.69e+006 | 62 | 118 |
| 4.88e+006 | 2.5e+006 | 2.38e+006 | 63 | 118 |
| 5.88e+006 | 2.5e+006 | 3.38e+006 | 64 | 118 |
| 3.77e+006 | 2.5e+006 | 1.27e+006 | 65 | 118 |
| 3.66e+006 | 2.5e+006 | 1.16e+006 | 66 | 118 |
| 7.27e+006 | 2.5e+006 | 4.77e+006 | 67 | 118 |
| 7.28e+006 | 2.5e+006 | 4.78e+006 | 68 | 118 |
| 3.46e+006 | 2.5e+006 | 960000 | 69 | 118 |
| 5.69e+006 | 2.5e+006 | 3.19e+006 | 70 | 118 |
| 6.05e+006 ML | 2.5e+006 | 3.55e+006 | 71 | 118 |
| 6.45e+006 | 2.5e+006 | 3.95e+006 | 72 | 118 |
| 6.22e+006 | 2.5e+006 | 3.72e+006 | 73 | 118 |
| 3.93e+006 | 2.5e+006 | 1.43e+006 | 74 | 118 |
| 212000 MH | 2.5e+006 | -2.288e+006 | 74 | 119 |
| 3.09e+006 | 2.5e+006 | 590000 | 75 | 119 |
| 9.943 J | 2.5e+006 | -2.49999e+006 | 75 | 120 |
| 4.833e+006 | 2.5e+006 | 2.333e+006 | 76 | 120 |
| | | | | |
| 3.4e+006 | 3.67e+006 | -270000 | 76 | 121 |
| 3.97e+006 | 3.67e+006 | 300000 | 77 | 121 |
| 3.84e+006 ML | 3.67e+006 | 170000 | 78 | 121 |
| 4.19e+006 | 3.67e+006 | 520000 | 79 | 121 |
| 4.88e+006 | 3.67e+006 | 1.21e+006 | 80 | 121 |
| 5.88e+006 | 3.67e+006 | 2.21e+006 | 81 | 121 |
| 3.77e+006 | 3.67e+006 | 100000 | 82 | 121 |
| 3.66e+006 | 3.67e+006 | -10000 | 82 | 122 |
| 7.27e+006 | 3.67e+006 | 3.6e+006 | 83 | 122 |
| 7.28e+006 | 3.67e+006 | 3.61e+006 | 84 | 122 |
| 3.46e+006 | 3.67e+006 | -210000 | 84 | 123 |
| 5.69e+006 | 3.67e+006 | 2.02e+006 | 85 | 123 |
| 6.05e+006 ML | 3.67e+006 | 2.38e+006 | 86 | 123 |
| 6.45e+006 | 3.67e+006 | 2.78e+006 | 87 | 123 |

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|---|---|---|---|---|
| 6.22e+006 | 3.67e+006 | 2.55e+006 | 88 | 123 |
| 3.93e+006 | 3.67e+006 | 260000 | 89 | 123 |
| 212000 MH | 3.67e+006 | -3.458e+006 | 89 | 124 |
| 3.09e+006 | 3.67e+006 | -580000 | 89 | 125 |
| 9.943 J | 3.67e+006 | -3.66999e+006 | 89 | 126 |
| 4.833e+006 | 3.67e+006 | 1.163e+006 | 90 | 126 |
| | | | | |
| 3.97e+006 | 3.4e+006 | 570000 | 91 | 126 |
| 3.84e+006 ML | 3.4e+006 | 440000 | 92 | 126 |
| 4.19e+006 | 3.4e+006 | 790000 | 93 | 126 |
| 4.88e+006 | 3.4e+006 | 1.48e+006 | 94 | 126 |
| 5.88e+006 | 3.4e+006 | 2.48e+006 | 95 | 126 |
| 3.77e+006 | 3.4e+006 | 370000 | 96 | 126 |
| 3.66e+006 | 3.4e+006 | 260000 | 97 | 126 |
| 7.27e+006 | 3.4e+006 | 3.87e+006 | 98 | 126 |
| 7.28e+006 | 3.4e+006 | 3.88e+006 | 99 | 126 |
| 3.46e+006 | 3.4e+006 | 60000 | 100 | 126 |
| 5.69e+006 | 3.4e+006 | 2.29e+006 | 101 | 126 |
| 6.05e+006 ML | 3.4e+006 | 2.65e+006 | 102 | 126 |
| 6.45e+006 | 3.4e+006 | 3.05e+006 | 103 | 126 |
| 6.22e+006 | 3.4e+006 | 2.82e+006 | 104 | 126 |
| 3.93e+006 | 3.4e+006 | 530000 | 105 | 126 |
| 212000 MH | 3.4e+006 | -3.188e+006 | 105 | 127 |
| 3.09e+006 | 3.4e+006 | -310000 | 105 | 128 |
| 9.943 J | 3.4e+006 | -3.39999e+006 | 105 | 129 |
| 4.833e+006 | 3.4e+006 | 1.433e+006 | 106 | 129 |
| | | | | |
| 3.84e+006 ML | 3.97e+006 | -130000 | 106 | 130 |
| 4.19e+006 | 3.97e+006 | 220000 | 107 | 130 |
| 4.88e+006 | 3.97e+006 | 910000 | 108 | 130 |
| 5.88e+006 | 3.97e+006 | 1.91e+006 | 109 | 130 |
| 3.77e+006 | 3.97e+006 | -200000 | 109 | 131 |
| 3.66e+006 | 3.97e+006 | -310000 | 109 | 132 |
| 7.27e+006 | 3.97e+006 | 3.3e+006 | 110 | 132 |
| 7.28e+006 | 3.97e+006 | 3.31e+006 | 111 | 132 |
| 3.46e+006 | 3.97e+006 | -510000 | 111 | 133 |
| 5.69e+006 | 3.97e+006 | 1.72e+006 | 112 | 133 |
| 6.05e+006 ML | 3.97e+006 | 2.08e+006 | 113 | 133 |
| 6.45e+006 | 3.97e+006 | 2.48e+006 | 114 | 133 |
| 6.22e+006 | 3.97e+006 | 2.25e+006 | 115 | 133 |
| 3.93e+006 | 3.97e+006 | -40000 | 115 | 134 |
| 212000 MH | 3.97e+006 | -3.758e+006 | 115 | 135 |
| 3.09e+006 | 3.97e+006 | -880000 | 115 | 136 |
| 9.943 J | 3.97e+006 | -3.96999e+006 | 115 | 137 |
| 4.833e+006 | 3.97e+006 | 863000 | 116 | 137 |
| | | | | |
| 4.19e+006 | 3.84e+006 ML | 350000 | 117 | 137 |
| 4.88e+006 | 3.84e+006 ML | 1.04e+006 | 118 | 137 |
| 5.88e+006 | 3.84e+006 ML | 2.04e+006 | 119 | 137 |
| 3.77e+006 | 3.84e+006 ML | -70000 | 119 | 138 |
| 3.66e+006 | 3.84e+006 ML | -180000 | 119 | 139 |
| 7.27e+006 | 3.84e+006 ML | 3.43e+006 | 120 | 139 |
| 7.28e+006 | 3.84e+006 ML | 3.44e+006 | 121 | 139 |
| 3.46e+006 | 3.84e+006 ML | -380000 | 121 | 140 |
| 5.69e+006 | 3.84e+006 ML | 1.85e+006 | 122 | 140 |
| 6.05e+006 ML | 3.84e+006 ML | 2.21e+006 | 123 | 140 |
| 6.45e+006 | 3.84e+006 ML | 2.61e+006 | 124 | 140 |

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|---|---|---|---|---|
| 6.22e+006 | 3.84e+006 ML | 2.38e+006 | 125 | 140 |
| 3.93e+006 | 3.84e+006 ML | 90000 | 126 | 140 |
| 212000 MH | 3.84e+006 ML | -3.628e+006 | 126 | 141 |
| 3.09e+006 | 3.84e+006 ML | -750000 | 126 | 142 |
| 9.943 J | 3.84e+006 ML | -3.83999e+006 | 126 | 143 |
| 4.833e+006 | 3.84e+006 ML | 993000 | 127 | 143 |
| | | | | |
| 4.88e+006 | 4.19e+006 | 690000 | 128 | 143 |
| 5.88e+006 | 4.19e+006 | 1.69e+006 | 129 | 143 |
| 3.77e+006 | 4.19e+006 | -420000 | 129 | 144 |
| 3.66e+006 | 4.19e+006 | -530000 | 129 | 145 |
| 7.27e+006 | 4.19e+006 | 3.08e+006 | 130 | 145 |
| 7.28e+006 | 4.19e+006 | 3.09e+006 | 131 | 145 |
| 3.46e+006 | 4.19e+006 | -730000 | 131 | 146 |
| 5.69e+006 | 4.19e+006 | 1.5e+006 | 132 | 146 |
| 6.05e+006 ML | 4.19e+006 | 1.86e+006 | 133 | 146 |
| 6.45e+006 | 4.19e+006 | 2.26e+006 | 134 | 146 |
| 6.22e+006 | 4.19e+006 | 2.03e+006 | 135 | 146 |
| 3.93e+006 | 4.19e+006 | -260000 | 135 | 147 |
| 212000 MH | 4.19e+006 | -3.978e+006 | 135 | 148 |
| 3.09e+006 | 4.19e+006 | -1.1e+006 | 135 | 149 |
| 9.943 J | 4.19e+006 | -4.18999e+006 | 135 | 150 |
| 4.833e+006 | 4.19e+006 | 643000 | 136 | 150 |
| | | | | |
| 5.88e+006 | 4.88e+006 | 1e+006 | 137 | 150 |
| 3.77e+006 | 4.88e+006 | -1.11e+006 | 137 | 151 |
| 3.66e+006 | 4.88e+006 | -1.22e+006 | 137 | 152 |
| 7.27e+006 | 4.88e+006 | 2.39e+006 | 138 | 152 |
| 7.28e+006 | 4.88e+006 | 2.4e+006 | 139 | 152 |
| 3.46e+006 | 4.88e+006 | -1.42e+006 | 139 | 153 |
| 5.69e+006 | 4.88e+006 | 810000 | 140 | 153 |
| 6.05e+006 ML | 4.88e+006 | 1.17e+006 | 141 | 153 |
| 6.45e+006 | 4.88e+006 | 1.57e+006 | 142 | 153 |
| 6.22e+006 | 4.88e+006 | 1.34e+006 | 143 | 153 |
| 3.93e+006 | 4.88e+006 | -950000 | 143 | 154 |
| 212000 MH | 4.88e+006 | -4.668e+006 | 143 | 155 |
| 3.09e+006 | 4.88e+006 | -1.79e+006 | 143 | 156 |
| 9.943 J | 4.88e+006 | -4.87999e+006 | 143 | 157 |
| 4.833e+006 | 4.88e+006 | -47000 | 143 | 158 |
| | | | | |
| 3.77e+006 | 5.88e+006 | -2.11e+006 | 143 | 159 |
| 3.66e+006 | 5.88e+006 | -2.22e+006 | 143 | 160 |
| 7.27e+006 | 5.88e+006 | 1.39e+006 | 144 | 160 |
| 7.28e+006 | 5.88e+006 | 1.4e+006 | 145 | 160 |
| 3.46e+006 | 5.88e+006 | -2.42e+006 | 145 | 161 |
| 5.69e+006 | 5.88e+006 | -190000 | 145 | 162 |
| 6.05e+006 ML | 5.88e+006 | 170000 | 146 | 162 |
| 6.45e+006 | 5.88e+006 | 570000 | 147 | 162 |
| 6.22e+006 | 5.88e+006 | 340000 | 148 | 162 |
| 3.93e+006 | 5.88e+006 | -1.95e+006 | 148 | 163 |
| 212000 MH | 5.88e+006 | -5.668e+006 | 148 | 164 |
| 3.09e+006 | 5.88e+006 | -2.79e+006 | 148 | 165 |
| 9.943 J | 5.88e+006 | -5.87999e+006 | 148 | 166 |
| 4.833e+006 | 5.88e+006 | -1.047e+006 | 148 | 167 |
| | | | | |
| 3.66e+006 | 3.77e+006 | Same Date | 148 | 167 |
| 7.27e+006 | 3.77e+006 | 3.5e+006 | 149 | 167 |

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|---|---|---|---|---|
| 7.28e+006 | 3.77e+006 | 3.51e+006 | 150 | 167 |
| 3.46e+006 | 3.77e+006 | -310000 | 150 | 168 |
| 5.69e+006 | 3.77e+006 | 1.92e+006 | 151 | 168 |
| 6.05e+006 ML | 3.77e+006 | 2.28e+006 | 152 | 168 |
| 6.45e+006 | 3.77e+006 | 2.68e+006 | 153 | 168 |
| 6.22e+006 | 3.77e+006 | 2.45e+006 | 154 | 168 |
| 3.93e+006 | 3.77e+006 | 160000 | 155 | 168 |
| 212000 MH | 3.77e+006 | -3.558e+006 | 155 | 169 |
| 3.09e+006 | 3.77e+006 | -680000 | 155 | 170 |
| 9.943 J | 3.77e+006 | -3.76999e+006 | 155 | 171 |
| 4.833e+006 | 3.77e+006 | 1.063e+006 | 156 | 171 |
| | | | | |
| 7.27e+006 | 3.66e+006 | 3.61e+006 | 157 | 171 |
| 7.28e+006 | 3.66e+006 | 3.62e+006 | 158 | 171 |
| 3.46e+006 | 3.66e+006 | -200000 | 158 | 172 |
| 5.69e+006 | 3.66e+006 | 2.03e+006 | 159 | 172 |
| 6.05e+006 ML | 3.66e+006 | 2.39e+006 | 160 | 172 |
| 6.45e+006 | 3.66e+006 | 2.79e+006 | 161 | 172 |
| 6.22e+006 | 3.66e+006 | 2.56e+006 | 162 | 172 |
| 3.93e+006 | 3.66e+006 | 270000 | 163 | 172 |
| 212000 MH | 3.66e+006 | -3.448e+006 | 163 | 173 |
| 3.09e+006 | 3.66e+006 | -570000 | 163 | 174 |
| 9.943 J | 3.66e+006 | -3.65999e+006 | 163 | 175 |
| 4.833e+006 | 3.66e+006 | 1.173e+006 | 164 | 175 |
| | | | | |
| 7.28e+006 | 7.27e+006 | Same Date | 164 | 175 |
| 3.46e+006 | 7.27e+006 | -3.81e+006 | 164 | 176 |
| 5.69e+006 | 7.27e+006 | -1.58e+006 | 164 | 177 |
| 6.05e+006 ML | 7.27e+006 | -1.22e+006 | 164 | 178 |
| 6.45e+006 | 7.27e+006 | -820000 | 164 | 179 |
| 6.22e+006 | 7.27e+006 | -1.05e+006 | 164 | 180 |
| 3.93e+006 | 7.27e+006 | -3.34e+006 | 164 | 181 |
| 212000 MH | 7.27e+006 | -7.058e+006 | 164 | 182 |
| 3.09e+006 | 7.27e+006 | -4.18e+006 | 164 | 183 |
| 9.943 J | 7.27e+006 | -7.26999e+006 | 164 | 184 |
| 4.833e+006 | 7.27e+006 | -2.437e+006 | 164 | 185 |
| | | | | |
| 3.46e+006 | 7.28e+006 | -3.82e+006 | 164 | 186 |
| 5.69e+006 | 7.28e+006 | -1.59e+006 | 164 | 187 |
| 6.05e+006 ML | 7.28e+006 | -1.23e+006 | 164 | 188 |
| 6.45e+006 | 7.28e+006 | -830000 | 164 | 189 |
| 6.22e+006 | 7.28e+006 | -1.06e+006 | 164 | 190 |
| 3.93e+006 | 7.28e+006 | -3.35e+006 | 164 | 191 |
| 212000 MH | 7.28e+006 | -7.068e+006 | 164 | 192 |
| 3.09e+006 | 7.28e+006 | -4.19e+006 | 164 | 193 |
| 9.943 J | 7.28e+006 | -7.27999e+006 | 164 | 194 |
| 4.833e+006 | 7.28e+006 | -2.447e+006 | 164 | 195 |
| | | | | |
| 5.69e+006 | 3.46e+006 | 2.23e+006 | 165 | 195 |
| 6.05e+006 ML | 3.46e+006 | 2.59e+006 | 166 | 195 |
| 6.45e+006 | 3.46e+006 | 2.99e+006 | 167 | 195 |
| 6.22e+006 | 3.46e+006 | 2.76e+006 | 168 | 195 |
| 3.93e+006 | 3.46e+006 | 470000 | 169 | 195 |
| 212000 MH | 3.46e+006 | -3.248e+006 | 169 | 196 |
| 3.09e+006 | 3.46e+006 | -370000 | 169 | 197 |
| 9.943 J | 3.46e+006 | -3.45999e+006 | 169 | 198 |
| 4.833e+006 | 3.46e+006 | 1.373e+006 | 170 | 198 |

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|---|---|---|---|---|
| 6.05e+006 ML | 5.69e+006 | 360000 | 171 | 198 |
| 6.45e+006 | 5.69e+006 | 760000 | 172 | 198 |
| 6.22e+006 | 5.69e+006 | 530000 | 173 | 198 |
| 3.93e+006 | 5.69e+006 | -1.76e+006 | 173 | 199 |
| 212000 MH | 5.69e+006 | -5.478e+006 | 173 | 200 |
| 3.09e+006 | 5.69e+006 | -2.6e+006 | 173 | 201 |
| 9.943 J | 5.69e+006 | -5.68999e+006 | 173 | 202 |
| 4.833e+006 | 5.69e+006 | -857000 | 173 | 203 |
| | | | | |
| 6.45e+006 | 6.05e+006 ML | 400000 | 174 | 203 |
| 6.22e+006 | 6.05e+006 ML | 170000 | 175 | 203 |
| 3.93e+006 | 6.05e+006 ML | -2.12e+006 | 175 | 204 |
| 212000 MH | 6.05e+006 ML | -5.838e+006 | 175 | 205 |
| 3.09e+006 | 6.05e+006 ML | -2.96e+006 | 175 | 206 |
| 9.943 J | 6.05e+006 ML | -6.04999e+006 | 175 | 207 |
| 4.833e+006 | 6.05e+006 ML | -1.217e+006 | 175 | 208 |
| | | | | |
| 6.22e+006 | 6.45e+006 | -230000 | 175 | 209 |
| 3.93e+006 | 6.45e+006 | -2.52e+006 | 175 | 210 |
| 212000 MH | 6.45e+006 | -6.238e+006 | 175 | 211 |
| 3.09e+006 | 6.45e+006 | -3.36e+006 | 175 | 212 |
| 9.943 J | 6.45e+006 | -6.44999e+006 | 175 | 213 |
| 4.833e+006 | 6.45e+006 | -1.617e+006 | 175 | 214 |
| | | | | |
| 3.93e+006 | 6.22e+006 | -2.29e+006 | 175 | 215 |
| 212000 MH | 6.22e+006 | -6.008e+006 | 175 | 216 |
| 3.09e+006 | 6.22e+006 | -3.13e+006 | 175 | 217 |
| 9.943 J | 6.22e+006 | -6.21999e+006 | 175 | 218 |
| 4.833e+006 | 6.22e+006 | -1.387e+006 | 175 | 219 |
| | | | | |
| 212000 MH | 3.93e+006 | -3.718e+006 | 175 | 220 |
| 3.09e+006 | 3.93e+006 | -840000 | 175 | 221 |
| 9.943 J | 3.93e+006 | -3.92999e+006 | 175 | 222 |
| 4.833e+006 | 3.93e+006 | 903000 | 176 | 222 |
| | | | | |
| 3.09e+006 | 212000 MH | 2.878e+006 | 177 | 222 |
| 9.943 J | 212000 MH | -211990 | 177 | 223 |
| 4.833e+006 | 212000 MH | 4.621e+006 | 178 | 223 |
| | | | | |
| 9.943 J | 3.09e+006 | -3.08999e+006 | 178 | 224 |
| 4.833e+006 | 3.09e+006 | 1.743e+006 | 179 | 224 |
| | | | | |
| 4.833e+006 | 9.943 J | 4.83299e+006 | 180 | 224 |

S Statistic = 180 - 224 = -44

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 2/1/2017 | 1 |
| 3/1/2017 | 1 |
| 4/1/2017 | 1 |
| 5/1/2017 | 1 |
| 6/1/2017 | 1 |
| 7/1/2017 | 1 |

| | |
|---|---|
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 3/1/2022 | 1 |
| 3/1/2023 | 1 |
| 3/1/2024 | 1 |

There are 2 time periods with multiple data

---

A = 0
B = 36
C = 0
D = 0
E = 0
F = 4
a = 51156
b = 197316
c = 1624
Group Variance = 2840
Z-Score = -0.806881
Comparison Level at 95% confidence level = -1.65463 (downward trend)
-0.806881 >= -1.65463 indicating no evidence of a downward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RW21-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 630000 | 624000 | Same Date | 0 | 0 |
| 570000 1c | 624000 | -54000 | 0 | 1 |
| 539000 | 624000 | -85000 | 0 | 2 |
| 648000 | 624000 | 24000 | 1 | 2 |
| 470000 | 624000 | -154000 | 1 | 3 |
| 536000 ML3c | 624000 | -88000 | 1 | 4 |
| 4520 | 624000 | -619480 | 1 | 5 |
| 562000 | 624000 | -62000 | 1 | 6 |
| 527000 B | 624000 | -97000 | 1 | 7 |
| 5.07e+006 | 624000 | 4.446e+006 | 2 | 7 |
| 445600 | 624000 | -178400 | 2 | 8 |
| 348100 | 624000 | -275900 | 2 | 9 |
| | | | | |
| 570000 1c | 630000 | -60000 | 2 | 10 |
| 539000 | 630000 | -91000 | 2 | 11 |
| 648000 | 630000 | 18000 | 3 | 11 |
| 470000 | 630000 | -160000 | 3 | 12 |
| 536000 ML3c | 630000 | -94000 | 3 | 13 |
| 4520 | 630000 | -625480 | 3 | 14 |
| 562000 | 630000 | -68000 | 3 | 15 |
| 527000 B | 630000 | -103000 | 3 | 16 |
| 5.07e+006 | 630000 | 4.44e+006 | 4 | 16 |
| 445600 | 630000 | -184400 | 4 | 17 |
| 348100 | 630000 | -281900 | 4 | 18 |
| | | | | |
| 539000 | 570000 1c | -31000 | 4 | 19 |
| 648000 | 570000 1c | 78000 | 5 | 19 |
| 470000 | 570000 1c | -100000 | 5 | 20 |
| 536000 ML3c | 570000 1c | -34000 | 5 | 21 |
| 4520 | 570000 1c | -565480 | 5 | 22 |
| 562000 | 570000 1c | -8000 | 5 | 23 |
| 527000 B | 570000 1c | -43000 | 5 | 24 |
| 5.07e+006 | 570000 1c | 4.5e+006 | 6 | 24 |
| 445600 | 570000 1c | -124400 | 6 | 25 |
| 348100 | 570000 1c | -221900 | 6 | 26 |
| | | | | |
| 648000 | 539000 | 109000 | 7 | 26 |
| 470000 | 539000 | -69000 | 7 | 27 |
| 536000 ML3c | 539000 | -3000 | 7 | 28 |
| 4520 | 539000 | -534480 | 7 | 29 |
| 562000 | 539000 | 23000 | 8 | 29 |
| 527000 B | 539000 | -12000 | 8 | 30 |
| 5.07e+006 | 539000 | 4.531e+006 | 9 | 30 |
| 445600 | 539000 | -93400 | 9 | 31 |
| 348100 | 539000 | -190900 | 9 | 32 |
| | | | | |
| 470000 | 648000 | -178000 | 9 | 33 |

| | | | | |
|---|---|---|---|---|
| 536000 ML3c | 648000 | -112000 | 9 | 34 |
| 4520 | 648000 | -643480 | 9 | 35 |
| 562000 | 648000 | -86000 | 9 | 36 |
| 527000 B | 648000 | -121000 | 9 | 37 |
| 5.07e+006 | 648000 | 4.422e+006 | 10 | 37 |
| 445600 | 648000 | -202400 | 10 | 38 |
| 348100 | 648000 | -299900 | 10 | 39 |
| | | | | |
| 536000 ML3c | 470000 | 66000 | 11 | 39 |
| 4520 | 470000 | -465480 | 11 | 40 |
| 562000 | 470000 | 92000 | 12 | 40 |
| 527000 B | 470000 | 57000 | 13 | 40 |
| 5.07e+006 | 470000 | 4.6e+006 | 14 | 40 |
| 445600 | 470000 | -24400 | 14 | 41 |
| 348100 | 470000 | -121900 | 14 | 42 |
| | | | | |
| 4520 | 536000 ML3c | -531480 | 14 | 43 |
| 562000 | 536000 ML3c | 26000 | 15 | 43 |
| 527000 B | 536000 ML3c | -9000 | 15 | 44 |
| 5.07e+006 | 536000 ML3c | 4.534e+006 | 16 | 44 |
| 445600 | 536000 ML3c | -90400 | 16 | 45 |
| 348100 | 536000 ML3c | -187900 | 16 | 46 |
| | | | | |
| 562000 | 4520 | Same Date | 16 | 46 |
| 527000 B | 4520 | 522480 | 17 | 46 |
| 5.07e+006 | 4520 | 5.06548e+006 | 18 | 46 |
| 445600 | 4520 | 441080 | 19 | 46 |
| 348100 | 4520 | 343580 | 20 | 46 |
| | | | | |
| 527000 B | 562000 | -35000 | 20 | 47 |
| 5.07e+006 | 562000 | 4.508e+006 | 21 | 47 |
| 445600 | 562000 | -116400 | 21 | 48 |
| 348100 | 562000 | -213900 | 21 | 49 |
| | | | | |
| 5.07e+006 | 527000 B | 4.543e+006 | 22 | 49 |
| 445600 | 527000 B | -81400 | 22 | 50 |
| 348100 | 527000 B | -178900 | 22 | 51 |
| | | | | |
| 445600 | 5.07e+006 | -4.6244e+006 | 22 | 52 |
| 348100 | 5.07e+006 | -4.7219e+006 | 22 | 53 |
| | | | | |
| 348100 | 445600 | -97500 | 22 | 54 |

S Statistic = 22 - 54 = -32

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 2 |
| 6/1/2021 | 1 |

3/1/2022 1
3/1/2023 1
3/1/2024 1
There are 2 time periods with multiple data

---

A = 0
B = 36
C = 0
D = 0
E = 0
F = 4
a = 4836
b = 15444
c = 312
Group Variance = 266.667
Z-Score = -1.89835
Comparison Level at 95% confidence level = -1.65463 (downward trend)
**-1.89835 < -1.65463 indicating a downward trend**

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RW22R-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 3900 | 3900 | Same Date | 0 | 0 |
| 3940 | 3900 | Same Date | 0 | 0 |
| 3940 | 3900 | Same Date | 0 | 0 |
| 3900 | 3900 | Same Date | 0 | 0 |
| 3900 | 3900 | Same Date | 0 | 0 |
| 3940 | 3900 | Same Date | 0 | 0 |
| 3940 | 3900 | Same Date | 0 | 0 |
| 1030 2c | 3900 | Same Date | 0 | 0 |
| 1750 1c3c | 3900 | Same Date | 0 | 0 |
| 983 | 3900 | -2917 | 0 | 1 |
| 3000 | 3900 | -900 | 0 | 2 |
| 1810 | 3900 | -2090 | 0 | 3 |
| 4350 | 3900 | 450 | 1 | 3 |
| 5340 | 3900 | 1440 | 2 | 3 |
| 7730 | 3900 | 3830 | 3 | 3 |
| 9800 | 3900 | 5900 | 4 | 3 |
| 21700 | 3900 | 17800 | 5 | 3 |
| 38920 | 3900 | 35020 | 6 | 3 |
| 38920 | 3900 | 35020 | 7 | 3 |
| 68800 | 3900 | 64900 | 8 | 3 |
| 87290 | 3900 | 83390 | 9 | 3 |
| 82310 | 3900 | 78410 | 10 | 3 |
| 109100 | 3900 | 105200 | 11 | 3 |
| | | | | |
| 3940 | 3900 | Same Date | 11 | 3 |
| 3940 | 3900 | Same Date | 11 | 3 |
| 3900 | 3900 | Same Date | 11 | 3 |
| 3900 | 3900 | Same Date | 11 | 3 |
| 3940 | 3900 | Same Date | 11 | 3 |
| 3940 | 3900 | Same Date | 11 | 3 |
| 1030 2c | 3900 | Same Date | 11 | 3 |
| 1750 1c3c | 3900 | Same Date | 11 | 3 |
| 983 | 3900 | -2917 | 11 | 4 |
| 3000 | 3900 | -900 | 11 | 5 |
| 1810 | 3900 | -2090 | 11 | 6 |
| 4350 | 3900 | 450 | 12 | 6 |
| 5340 | 3900 | 1440 | 13 | 6 |
| 7730 | 3900 | 3830 | 14 | 6 |
| 9800 | 3900 | 5900 | 15 | 6 |
| 21700 | 3900 | 17800 | 16 | 6 |
| 38920 | 3900 | 35020 | 17 | 6 |
| 38920 | 3900 | 35020 | 18 | 6 |
| 68800 | 3900 | 64900 | 19 | 6 |
| 87290 | 3900 | 83390 | 20 | 6 |
| 82310 | 3900 | 78410 | 21 | 6 |
| 109100 | 3900 | 105200 | 22 | 6 |

| | | | | |
|---|---|---|---|---|
| 3940 | 3940 | Same Date | 22 | 6 |
| 3900 | 3940 | Same Date | 22 | 6 |
| 3900 | 3940 | Same Date | 22 | 6 |
| 3940 | 3940 | Same Date | 22 | 6 |
| 3940 | 3940 | Same Date | 22 | 6 |
| 1030 2c | 3940 | Same Date | 22 | 6 |
| 1750 1c3c | 3940 | Same Date | 22 | 6 |
| 983 | 3940 | -2957 | 22 | 7 |
| 3000 | 3940 | -940 | 22 | 8 |
| 1810 | 3940 | -2130 | 22 | 9 |
| 4350 | 3940 | 410 | 23 | 9 |
| 5340 | 3940 | 1400 | 24 | 9 |
| 7730 | 3940 | 3790 | 25 | 9 |
| 9800 | 3940 | 5860 | 26 | 9 |
| 21700 | 3940 | 17760 | 27 | 9 |
| 38920 | 3940 | 34980 | 28 | 9 |
| 38920 | 3940 | 34980 | 29 | 9 |
| 68800 | 3940 | 64860 | 30 | 9 |
| 87290 | 3940 | 83350 | 31 | 9 |
| 82310 | 3940 | 78370 | 32 | 9 |
| 109100 | 3940 | 105160 | 33 | 9 |
| | | | | |
| 3900 | 3940 | Same Date | 33 | 9 |
| 3900 | 3940 | Same Date | 33 | 9 |
| 3940 | 3940 | Same Date | 33 | 9 |
| 3940 | 3940 | Same Date | 33 | 9 |
| 1030 2c | 3940 | Same Date | 33 | 9 |
| 1750 1c3c | 3940 | Same Date | 33 | 9 |
| 983 | 3940 | -2957 | 33 | 10 |
| 3000 | 3940 | -940 | 33 | 11 |
| 1810 | 3940 | -2130 | 33 | 12 |
| 4350 | 3940 | 410 | 34 | 12 |
| 5340 | 3940 | 1400 | 35 | 12 |
| 7730 | 3940 | 3790 | 36 | 12 |
| 9800 | 3940 | 5860 | 37 | 12 |
| 21700 | 3940 | 17760 | 38 | 12 |
| 38920 | 3940 | 34980 | 39 | 12 |
| 38920 | 3940 | 34980 | 40 | 12 |
| 68800 | 3940 | 64860 | 41 | 12 |
| 87290 | 3940 | 83350 | 42 | 12 |
| 82310 | 3940 | 78370 | 43 | 12 |
| 109100 | 3940 | 105160 | 44 | 12 |
| | | | | |
| 3900 | 3900 | Same Date | 44 | 12 |
| 3940 | 3900 | Same Date | 44 | 12 |
| 3940 | 3900 | Same Date | 44 | 12 |
| 1030 2c | 3900 | Same Date | 44 | 12 |
| 1750 1c3c | 3900 | Same Date | 44 | 12 |
| 983 | 3900 | -2917 | 44 | 13 |
| 3000 | 3900 | -900 | 44 | 14 |
| 1810 | 3900 | -2090 | 44 | 15 |
| 4350 | 3900 | 450 | 45 | 15 |
| 5340 | 3900 | 1440 | 46 | 15 |
| 7730 | 3900 | 3830 | 47 | 15 |
| 9800 | 3900 | 5900 | 48 | 15 |
| 21700 | 3900 | 17800 | 49 | 15 |
| 38920 | 3900 | 35020 | 50 | 15 |

| | | | | |
|---|---|---|---|---|
| 38920 | 3900 | 35020 | 51 | 15 |
| 68800 | 3900 | 64900 | 52 | 15 |
| 87290 | 3900 | 83390 | 53 | 15 |
| 82310 | 3900 | 78410 | 54 | 15 |
| 109100 | 3900 | 105200 | 55 | 15 |
| | | | | |
| 3940 | 3900 | Same Date | 55 | 15 |
| 3940 | 3900 | Same Date | 55 | 15 |
| 1030 2c | 3900 | Same Date | 55 | 15 |
| 1750 1c3c | 3900 | Same Date | 55 | 15 |
| 983 | 3900 | -2917 | 55 | 16 |
| 3000 | 3900 | -900 | 55 | 17 |
| 1810 | 3900 | -2090 | 55 | 18 |
| 4350 | 3900 | 450 | 56 | 18 |
| 5340 | 3900 | 1440 | 57 | 18 |
| 7730 | 3900 | 3830 | 58 | 18 |
| 9800 | 3900 | 5900 | 59 | 18 |
| 21700 | 3900 | 17800 | 60 | 18 |
| 38920 | 3900 | 35020 | 61 | 18 |
| 38920 | 3900 | 35020 | 62 | 18 |
| 68800 | 3900 | 64900 | 63 | 18 |
| 87290 | 3900 | 83390 | 64 | 18 |
| 82310 | 3900 | 78410 | 65 | 18 |
| 109100 | 3900 | 105200 | 66 | 18 |
| | | | | |
| 3940 | 3940 | Same Date | 66 | 18 |
| 1030 2c | 3940 | Same Date | 66 | 18 |
| 1750 1c3c | 3940 | Same Date | 66 | 18 |
| 983 | 3940 | -2957 | 66 | 19 |
| 3000 | 3940 | -940 | 66 | 20 |
| 1810 | 3940 | -2130 | 66 | 21 |
| 4350 | 3940 | 410 | 67 | 21 |
| 5340 | 3940 | 1400 | 68 | 21 |
| 7730 | 3940 | 3790 | 69 | 21 |
| 9800 | 3940 | 5860 | 70 | 21 |
| 21700 | 3940 | 17760 | 71 | 21 |
| 38920 | 3940 | 34980 | 72 | 21 |
| 38920 | 3940 | 34980 | 73 | 21 |
| 68800 | 3940 | 64860 | 74 | 21 |
| 87290 | 3940 | 83350 | 75 | 21 |
| 82310 | 3940 | 78370 | 76 | 21 |
| 109100 | 3940 | 105160 | 77 | 21 |
| | | | | |
| 1030 2c | 3940 | Same Date | 77 | 21 |
| 1750 1c3c | 3940 | Same Date | 77 | 21 |
| 983 | 3940 | -2957 | 77 | 22 |
| 3000 | 3940 | -940 | 77 | 23 |
| 1810 | 3940 | -2130 | 77 | 24 |
| 4350 | 3940 | 410 | 78 | 24 |
| 5340 | 3940 | 1400 | 79 | 24 |
| 7730 | 3940 | 3790 | 80 | 24 |
| 9800 | 3940 | 5860 | 81 | 24 |
| 21700 | 3940 | 17760 | 82 | 24 |
| 38920 | 3940 | 34980 | 83 | 24 |
| 38920 | 3940 | 34980 | 84 | 24 |
| 68800 | 3940 | 64860 | 85 | 24 |
| 87290 | 3940 | 83350 | 86 | 24 |

| | | | | |
|---|---|---|---|---|
| 82310 | 3940 | 78370 | 87 | 24 |
| 109100 | 3940 | 105160 | 88 | 24 |
| | | | | |
| 1750 1c3c | 1030 2c | Same Date | 88 | 24 |
| 983 | 1030 2c | -47 | 88 | 25 |
| 3000 | 1030 2c | 1970 | 89 | 25 |
| 1810 | 1030 2c | 780 | 90 | 25 |
| 4350 | 1030 2c | 3320 | 91 | 25 |
| 5340 | 1030 2c | 4310 | 92 | 25 |
| 7730 | 1030 2c | 6700 | 93 | 25 |
| 9800 | 1030 2c | 8770 | 94 | 25 |
| 21700 | 1030 2c | 20670 | 95 | 25 |
| 38920 | 1030 2c | 37890 | 96 | 25 |
| 38920 | 1030 2c | 37890 | 97 | 25 |
| 68800 | 1030 2c | 67770 | 98 | 25 |
| 87290 | 1030 2c | 86260 | 99 | 25 |
| 82310 | 1030 2c | 81280 | 100 | 25 |
| 109100 | 1030 2c | 108070 | 101 | 25 |
| | | | | |
| 983 | 1750 1c3c | -767 | 101 | 26 |
| 3000 | 1750 1c3c | 1250 | 102 | 26 |
| 1810 | 1750 1c3c | 60 | 103 | 26 |
| 4350 | 1750 1c3c | 2600 | 104 | 26 |
| 5340 | 1750 1c3c | 3590 | 105 | 26 |
| 7730 | 1750 1c3c | 5980 | 106 | 26 |
| 9800 | 1750 1c3c | 8050 | 107 | 26 |
| 21700 | 1750 1c3c | 19950 | 108 | 26 |
| 38920 | 1750 1c3c | 37170 | 109 | 26 |
| 38920 | 1750 1c3c | 37170 | 110 | 26 |
| 68800 | 1750 1c3c | 67050 | 111 | 26 |
| 87290 | 1750 1c3c | 85540 | 112 | 26 |
| 82310 | 1750 1c3c | 80560 | 113 | 26 |
| 109100 | 1750 1c3c | 107350 | 114 | 26 |
| | | | | |
| 3000 | 983 | 2017 | 115 | 26 |
| 1810 | 983 | 827 | 116 | 26 |
| 4350 | 983 | 3367 | 117 | 26 |
| 5340 | 983 | 4357 | 118 | 26 |
| 7730 | 983 | 6747 | 119 | 26 |
| 9800 | 983 | 8817 | 120 | 26 |
| 21700 | 983 | 20717 | 121 | 26 |
| 38920 | 983 | 37937 | 122 | 26 |
| 38920 | 983 | 37937 | 123 | 26 |
| 68800 | 983 | 67817 | 124 | 26 |
| 87290 | 983 | 86307 | 125 | 26 |
| 82310 | 983 | 81327 | 126 | 26 |
| 109100 | 983 | 108117 | 127 | 26 |
| | | | | |
| 1810 | 3000 | -1190 | 127 | 27 |
| 4350 | 3000 | 1350 | 128 | 27 |
| 5340 | 3000 | 2340 | 129 | 27 |
| 7730 | 3000 | 4730 | 130 | 27 |
| 9800 | 3000 | 6800 | 131 | 27 |
| 21700 | 3000 | 18700 | 132 | 27 |
| 38920 | 3000 | 35920 | 133 | 27 |
| 38920 | 3000 | 35920 | 134 | 27 |
| 68800 | 3000 | 65800 | 135 | 27 |

| | | | | |
|---|---|---|---|---|
| 87290 | 3000 | 84290 | 136 | 27 |
| 82310 | 3000 | 79310 | 137 | 27 |
| 109100 | 3000 | 106100 | 138 | 27 |
| | | | | |
| 4350 | 1810 | 2540 | 139 | 27 |
| 5340 | 1810 | 3530 | 140 | 27 |
| 7730 | 1810 | 5920 | 141 | 27 |
| 9800 | 1810 | 7990 | 142 | 27 |
| 21700 | 1810 | 19890 | 143 | 27 |
| 38920 | 1810 | 37110 | 144 | 27 |
| 38920 | 1810 | 37110 | 145 | 27 |
| 68800 | 1810 | 66990 | 146 | 27 |
| 87290 | 1810 | 85480 | 147 | 27 |
| 82310 | 1810 | 80500 | 148 | 27 |
| 109100 | 1810 | 107290 | 149 | 27 |
| | | | | |
| 5340 | 4350 | 990 | 150 | 27 |
| 7730 | 4350 | 3380 | 151 | 27 |
| 9800 | 4350 | 5450 | 152 | 27 |
| 21700 | 4350 | 17350 | 153 | 27 |
| 38920 | 4350 | 34570 | 154 | 27 |
| 38920 | 4350 | 34570 | 155 | 27 |
| 68800 | 4350 | 64450 | 156 | 27 |
| 87290 | 4350 | 82940 | 157 | 27 |
| 82310 | 4350 | 77960 | 158 | 27 |
| 109100 | 4350 | 104750 | 159 | 27 |
| | | | | |
| 7730 | 5340 | 2390 | 160 | 27 |
| 9800 | 5340 | 4460 | 161 | 27 |
| 21700 | 5340 | 16360 | 162 | 27 |
| 38920 | 5340 | 33580 | 163 | 27 |
| 38920 | 5340 | 33580 | 164 | 27 |
| 68800 | 5340 | 63460 | 165 | 27 |
| 87290 | 5340 | 81950 | 166 | 27 |
| 82310 | 5340 | 76970 | 167 | 27 |
| 109100 | 5340 | 103760 | 168 | 27 |
| | | | | |
| 9800 | 7730 | 2070 | 169 | 27 |
| 21700 | 7730 | 13970 | 170 | 27 |
| 38920 | 7730 | 31190 | 171 | 27 |
| 38920 | 7730 | 31190 | 172 | 27 |
| 68800 | 7730 | 61070 | 173 | 27 |
| 87290 | 7730 | 79560 | 174 | 27 |
| 82310 | 7730 | 74580 | 175 | 27 |
| 109100 | 7730 | 101370 | 176 | 27 |
| | | | | |
| 21700 | 9800 | 11900 | 177 | 27 |
| 38920 | 9800 | 29120 | 178 | 27 |
| 38920 | 9800 | 29120 | 179 | 27 |
| 68800 | 9800 | 59000 | 180 | 27 |
| 87290 | 9800 | 77490 | 181 | 27 |
| 82310 | 9800 | 72510 | 182 | 27 |
| 109100 | 9800 | 99300 | 183 | 27 |
| | | | | |
| 38920 | 21700 | 17220 | 184 | 27 |
| 38920 | 21700 | 17220 | 185 | 27 |
| 68800 | 21700 | 47100 | 186 | 27 |

| | | | | |
|---|---|---|---|---|
| 87290 | 21700 | 65590 | 187 | 27 |
| 82310 | 21700 | 60610 | 188 | 27 |
| 109100 | 21700 | 87400 | 189 | 27 |
| | | | | |
| 38920 | 38920 | Same Date | 189 | 27 |
| 68800 | 38920 | 29880 | 190 | 27 |
| 87290 | 38920 | 48370 | 191 | 27 |
| 82310 | 38920 | 43390 | 192 | 27 |
| 109100 | 38920 | 70180 | 193 | 27 |
| | | | | |
| 68800 | 38920 | 29880 | 194 | 27 |
| 87290 | 38920 | 48370 | 195 | 27 |
| 82310 | 38920 | 43390 | 196 | 27 |
| 109100 | 38920 | 70180 | 197 | 27 |
| | | | | |
| 87290 | 68800 | 18490 | 198 | 27 |
| 82310 | 68800 | 13510 | 199 | 27 |
| 109100 | 68800 | 40300 | 200 | 27 |
| | | | | |
| 82310 | 87290 | -4980 | 200 | 28 |
| 109100 | 87290 | 21810 | 201 | 28 |
| | | | | |
| 109100 | 82310 | 26790 | 202 | 28 |

S Statistic = 202 - 28 = 174

| Tied Group | Value | Members |
|---|---|---|
| 1 | 3900 | 4 |
| 2 | 3940 | 4 |
| 3 | 38920 | 2 |

| Time Period | Observations |
|---|---|
| 5/1/2019 | 10 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 2 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 2 time periods with multiple data

A = 330
B = 2268
C = 48
D = 720
E = 26
F = 92
a = 29256
b = 109296

c = 1104
Group Variance = 1483.48
Z-Score = 4.49164
Comparison Level at 95% confidence level = -1.65463 (downward trend)
4.49164 >= -1.65463 indicating no evidence of a downward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RW23-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 109000 | 112000 M6 | Same Date | 0 | 0 |
| 125000 | 112000 M6 | 13000 | 1 | 0 |
| 111000 | 112000 M6 | -1000 | 1 | 1 |
| 100000 | 112000 M6 | -12000 | 1 | 2 |
| 116000 | 112000 M6 | 4000 | 2 | 2 |
| 105000 2c | 112000 M6 | -7000 | 2 | 3 |
| 95600 | 112000 M6 | -16400 | 2 | 4 |
| 124000 | 112000 M6 | 12000 | 3 | 4 |
| 110000 | 112000 M6 | -2000 | 3 | 5 |
| 85000 | 112000 M6 | -27000 | 3 | 6 |
| 113200 | 112000 M6 | 1200 | 4 | 6 |
| 114900 | 112000 M6 | 2900 | 5 | 6 |
| 135500 | 112000 M6 | 23500 | 6 | 6 |
| 139800 | 112000 M6 | 27800 | 7 | 6 |
| 144200 | 112000 M6 | 32200 | 8 | 6 |
| | | | | |
| 125000 | 109000 | 16000 | 9 | 6 |
| 111000 | 109000 | 2000 | 10 | 6 |
| 100000 | 109000 | -9000 | 10 | 7 |
| 116000 | 109000 | 7000 | 11 | 7 |
| 105000 2c | 109000 | -4000 | 11 | 8 |
| 95600 | 109000 | -13400 | 11 | 9 |
| 124000 | 109000 | 15000 | 12 | 9 |
| 110000 | 109000 | 1000 | 13 | 9 |
| 85000 | 109000 | -24000 | 13 | 10 |
| 113200 | 109000 | 4200 | 14 | 10 |
| 114900 | 109000 | 5900 | 15 | 10 |
| 135500 | 109000 | 26500 | 16 | 10 |
| 139800 | 109000 | 30800 | 17 | 10 |
| 144200 | 109000 | 35200 | 18 | 10 |
| | | | | |
| 111000 | 125000 | -14000 | 18 | 11 |
| 100000 | 125000 | -25000 | 18 | 12 |
| 116000 | 125000 | -9000 | 18 | 13 |
| 105000 2c | 125000 | -20000 | 18 | 14 |
| 95600 | 125000 | -29400 | 18 | 15 |
| 124000 | 125000 | -1000 | 18 | 16 |
| 110000 | 125000 | -15000 | 18 | 17 |
| 85000 | 125000 | -40000 | 18 | 18 |
| 113200 | 125000 | -11800 | 18 | 19 |
| 114900 | 125000 | -10100 | 18 | 20 |
| 135500 | 125000 | 10500 | 19 | 20 |
| 139800 | 125000 | 14800 | 20 | 20 |
| 144200 | 125000 | 19200 | 21 | 20 |
| | | | | |
| 100000 | 111000 | -11000 | 21 | 21 |
| 116000 | 111000 | 5000 | 22 | 21 |

| | | | | |
|---|---|---|---|---|
| 105000 2c | 111000 | -6000 | 22 | 22 |
| 95600 | 111000 | -15400 | 22 | 23 |
| 124000 | 111000 | 13000 | 23 | 23 |
| 110000 | 111000 | -1000 | 23 | 24 |
| 85000 | 111000 | -26000 | 23 | 25 |
| 113200 | 111000 | 2200 | 24 | 25 |
| 114900 | 111000 | 3900 | 25 | 25 |
| 135500 | 111000 | 24500 | 26 | 25 |
| 139800 | 111000 | 28800 | 27 | 25 |
| 144200 | 111000 | 33200 | 28 | 25 |
| | | | | |
| 116000 | 100000 | 16000 | 29 | 25 |
| 105000 2c | 100000 | 5000 | 30 | 25 |
| 95600 | 100000 | -4400 | 30 | 26 |
| 124000 | 100000 | 24000 | 31 | 26 |
| 110000 | 100000 | 10000 | 32 | 26 |
| 85000 | 100000 | -15000 | 32 | 27 |
| 113200 | 100000 | 13200 | 33 | 27 |
| 114900 | 100000 | 14900 | 34 | 27 |
| 135500 | 100000 | 35500 | 35 | 27 |
| 139800 | 100000 | 39800 | 36 | 27 |
| 144200 | 100000 | 44200 | 37 | 27 |
| | | | | |
| 105000 2c | 116000 | -11000 | 37 | 28 |
| 95600 | 116000 | -20400 | 37 | 29 |
| 124000 | 116000 | 8000 | 38 | 29 |
| 110000 | 116000 | -6000 | 38 | 30 |
| 85000 | 116000 | -31000 | 38 | 31 |
| 113200 | 116000 | -2800 | 38 | 32 |
| 114900 | 116000 | -1100 | 38 | 33 |
| 135500 | 116000 | 19500 | 39 | 33 |
| 139800 | 116000 | 23800 | 40 | 33 |
| 144200 | 116000 | 28200 | 41 | 33 |
| | | | | |
| 95600 | 105000 2c | -9400 | 41 | 34 |
| 124000 | 105000 2c | 19000 | 42 | 34 |
| 110000 | 105000 2c | 5000 | 43 | 34 |
| 85000 | 105000 2c | -20000 | 43 | 35 |
| 113200 | 105000 2c | 8200 | 44 | 35 |
| 114900 | 105000 2c | 9900 | 45 | 35 |
| 135500 | 105000 2c | 30500 | 46 | 35 |
| 139800 | 105000 2c | 34800 | 47 | 35 |
| 144200 | 105000 2c | 39200 | 48 | 35 |
| | | | | |
| 124000 | 95600 | 28400 | 49 | 35 |
| 110000 | 95600 | 14400 | 50 | 35 |
| 85000 | 95600 | -10600 | 50 | 36 |
| 113200 | 95600 | 17600 | 51 | 36 |
| 114900 | 95600 | 19300 | 52 | 36 |
| 135500 | 95600 | 39900 | 53 | 36 |
| 139800 | 95600 | 44200 | 54 | 36 |
| 144200 | 95600 | 48600 | 55 | 36 |
| | | | | |
| 110000 | 124000 | -14000 | 55 | 37 |
| 85000 | 124000 | -39000 | 55 | 38 |
| 113200 | 124000 | -10800 | 55 | 39 |
| 114900 | 124000 | -9100 | 55 | 40 |

| | | | | |
|---|---|---|---|---|
| 135500 | 124000 | 11500 | 56 | 40 |
| 139800 | 124000 | 15800 | 57 | 40 |
| 144200 | 124000 | 20200 | 58 | 40 |
| | | | | |
| 85000 | 110000 | -25000 | 58 | 41 |
| 113200 | 110000 | 3200 | 59 | 41 |
| 114900 | 110000 | 4900 | 60 | 41 |
| 135500 | 110000 | 25500 | 61 | 41 |
| 139800 | 110000 | 29800 | 62 | 41 |
| 144200 | 110000 | 34200 | 63 | 41 |
| | | | | |
| 113200 | 85000 | 28200 | 64 | 41 |
| 114900 | 85000 | 29900 | 65 | 41 |
| 135500 | 85000 | 50500 | 66 | 41 |
| 139800 | 85000 | 54800 | 67 | 41 |
| 144200 | 85000 | 59200 | 68 | 41 |
| | | | | |
| 114900 | 113200 | 1700 | 69 | 41 |
| 135500 | 113200 | 22300 | 70 | 41 |
| 139800 | 113200 | 26600 | 71 | 41 |
| 144200 | 113200 | 31000 | 72 | 41 |
| | | | | |
| 135500 | 114900 | 20600 | 73 | 41 |
| 139800 | 114900 | 24900 | 74 | 41 |
| 144200 | 114900 | 29300 | 75 | 41 |
| | | | | |
| 139800 | 135500 | 4300 | 76 | 41 |
| 144200 | 135500 | 8700 | 77 | 41 |
| | | | | |
| 144200 | 139800 | 4400 | 78 | 41 |

S Statistic = 78 - 41 = 37

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 0
B = 18
C = 0

D = 0
E = 0
F = 2
a = 8880
b = 30240
c = 480
Group Variance = 492.333
Z-Score = 1.62246
Comparison Level at 95% confidence level = -1.65463 (downward trend)
1.62246 >= -1.65463 indicating no evidence of a downward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RW24-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 695000 | 650000 | Same Date | 0 | 0 |
| 635000 | 650000 | -15000 | 0 | 1 |
| 538000 | 650000 | -112000 | 0 | 2 |
| 466000 | 650000 | -184000 | 0 | 3 |
| 378000 | 650000 | -272000 | 0 | 4 |
| 364000 | 650000 | -286000 | 0 | 5 |
| 258000 1c | 650000 | -392000 | 0 | 6 |
| 292000 B | 650000 | -358000 | 0 | 7 |
| 263000 | 650000 | -387000 | 0 | 8 |
| 294700 | 650000 | -355300 | 0 | 9 |
| 651300 | 650000 | 1300 | 1 | 9 |
| | | | | |
| 635000 | 695000 | -60000 | 1 | 10 |
| 538000 | 695000 | -157000 | 1 | 11 |
| 466000 | 695000 | -229000 | 1 | 12 |
| 378000 | 695000 | -317000 | 1 | 13 |
| 364000 | 695000 | -331000 | 1 | 14 |
| 258000 1c | 695000 | -437000 | 1 | 15 |
| 292000 B | 695000 | -403000 | 1 | 16 |
| 263000 | 695000 | -432000 | 1 | 17 |
| 294700 | 695000 | -400300 | 1 | 18 |
| 651300 | 695000 | -43700 | 1 | 19 |
| | | | | |
| 538000 | 635000 | -97000 | 1 | 20 |
| 466000 | 635000 | -169000 | 1 | 21 |
| 378000 | 635000 | -257000 | 1 | 22 |
| 364000 | 635000 | -271000 | 1 | 23 |
| 258000 1c | 635000 | -377000 | 1 | 24 |
| 292000 B | 635000 | -343000 | 1 | 25 |
| 263000 | 635000 | -372000 | 1 | 26 |
| 294700 | 635000 | -340300 | 1 | 27 |
| 651300 | 635000 | 16300 | 2 | 27 |
| | | | | |
| 466000 | 538000 | -72000 | 2 | 28 |
| 378000 | 538000 | -160000 | 2 | 29 |
| 364000 | 538000 | -174000 | 2 | 30 |
| 258000 1c | 538000 | -280000 | 2 | 31 |
| 292000 B | 538000 | -246000 | 2 | 32 |
| 263000 | 538000 | -275000 | 2 | 33 |
| 294700 | 538000 | -243300 | 2 | 34 |
| 651300 | 538000 | 113300 | 3 | 34 |
| | | | | |
| 378000 | 466000 | -88000 | 3 | 35 |
| 364000 | 466000 | -102000 | 3 | 36 |
| 258000 1c | 466000 | -208000 | 3 | 37 |
| 292000 B | 466000 | -174000 | 3 | 38 |
| 263000 | 466000 | -203000 | 3 | 39 |

| | | | | |
|---|---|---|---|---|
| 294700 | 466000 | -171300 | 3 | 40 |
| 651300 | 466000 | 185300 | 4 | 40 |
| | | | | |
| 364000 | 378000 | -14000 | 4 | 41 |
| 258000 1c | 378000 | -120000 | 4 | 42 |
| 292000 B | 378000 | -86000 | 4 | 43 |
| 263000 | 378000 | -115000 | 4 | 44 |
| 294700 | 378000 | -83300 | 4 | 45 |
| 651300 | 378000 | 273300 | 5 | 45 |
| | | | | |
| 258000 1c | 364000 | -106000 | 5 | 46 |
| 292000 B | 364000 | -72000 | 5 | 47 |
| 263000 | 364000 | -101000 | 5 | 48 |
| 294700 | 364000 | -69300 | 5 | 49 |
| 651300 | 364000 | 287300 | 6 | 49 |
| | | | | |
| 292000 B | 258000 1c | 34000 | 7 | 49 |
| 263000 | 258000 1c | 5000 | 8 | 49 |
| 294700 | 258000 1c | 36700 | 9 | 49 |
| 651300 | 258000 1c | 393300 | 10 | 49 |
| | | | | |
| 263000 | 292000 B | -29000 | 10 | 50 |
| 294700 | 292000 B | 2700 | 11 | 50 |
| 651300 | 292000 B | 359300 | 12 | 50 |
| | | | | |
| 294700 | 263000 | 31700 | 13 | 50 |
| 651300 | 263000 | 388300 | 14 | 50 |
| | | | | |
| 651300 | 294700 | 356600 | 15 | 50 |

S Statistic = 15 - 50 = -35

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 3/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 0
B = 18
C = 0
D = 0
E = 0
F = 2
a = 3828
b = 11880

c = 264
Group Variance = 211.667
Z-Score = -2.33697
Comparison Level at 95% confidence level = -1.65463 (downward trend)
**-2.33697 < -1.65463 indicating a downward trend**

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RW25-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 413000 | 421000 | Same Date | 0 | 0 |
| 7000 | 421000 | -414000 | 0 | 1 |
| 462000 | 421000 | 41000 | 1 | 1 |
| 355000 | 421000 | -66000 | 1 | 2 |
| 443000 | 421000 | 22000 | 2 | 2 |
| 477000 | 421000 | 56000 | 3 | 2 |
| 445000 1c | 421000 | 24000 | 4 | 2 |
| 338000 | 421000 | -83000 | 4 | 3 |
| 376000 | 421000 | -45000 | 4 | 4 |
| 419800 | 421000 | -1200 | 4 | 5 |
| 773300 | 421000 | 352300 | 5 | 5 |
| 7000 | 413000 | -406000 | 5 | 6 |
| 462000 | 413000 | 49000 | 6 | 6 |
| 355000 | 413000 | -58000 | 6 | 7 |
| 443000 | 413000 | 30000 | 7 | 7 |
| 477000 | 413000 | 64000 | 8 | 7 |
| 445000 1c | 413000 | 32000 | 9 | 7 |
| 338000 | 413000 | -75000 | 9 | 8 |
| 376000 | 413000 | -37000 | 9 | 9 |
| 419800 | 413000 | 6800 | 10 | 9 |
| 773300 | 413000 | 360300 | 11 | 9 |
| 462000 | 7000 | 455000 | 12 | 9 |
| 355000 | 7000 | 348000 | 13 | 9 |
| 443000 | 7000 | 436000 | 14 | 9 |
| 477000 | 7000 | 470000 | 15 | 9 |
| 445000 1c | 7000 | 438000 | 16 | 9 |
| 338000 | 7000 | 331000 | 17 | 9 |
| 376000 | 7000 | 369000 | 18 | 9 |
| 419800 | 7000 | 412800 | 19 | 9 |
| 773300 | 7000 | 766300 | 20 | 9 |
| 355000 | 462000 | -107000 | 20 | 10 |
| 443000 | 462000 | -19000 | 20 | 11 |
| 477000 | 462000 | 15000 | 21 | 11 |
| 445000 1c | 462000 | -17000 | 21 | 12 |
| 338000 | 462000 | -124000 | 21 | 13 |
| 376000 | 462000 | -86000 | 21 | 14 |
| 419800 | 462000 | -42200 | 21 | 15 |
| 773300 | 462000 | 311300 | 22 | 15 |
| 443000 | 355000 | 88000 | 23 | 15 |
| 477000 | 355000 | 122000 | 24 | 15 |
| 445000 1c | 355000 | 90000 | 25 | 15 |
| 338000 | 355000 | -17000 | 25 | 16 |
| 376000 | 355000 | 21000 | 26 | 16 |

| | | | | |
|---|---|---|---|---|
| 419800 | 355000 | 64800 | 27 | 16 |
| 773300 | 355000 | 418300 | 28 | 16 |
| | | | | |
| 477000 | 443000 | 34000 | 29 | 16 |
| 445000 1c | 443000 | 2000 | 30 | 16 |
| 338000 | 443000 | -105000 | 30 | 17 |
| 376000 | 443000 | -67000 | 30 | 18 |
| 419800 | 443000 | -23200 | 30 | 19 |
| 773300 | 443000 | 330300 | 31 | 19 |
| | | | | |
| 445000 1c | 477000 | -32000 | 31 | 20 |
| 338000 | 477000 | -139000 | 31 | 21 |
| 376000 | 477000 | -101000 | 31 | 22 |
| 419800 | 477000 | -57200 | 31 | 23 |
| 773300 | 477000 | 296300 | 32 | 23 |
| | | | | |
| 338000 | 445000 1c | -107000 | 32 | 24 |
| 376000 | 445000 1c | -69000 | 32 | 25 |
| 419800 | 445000 1c | -25200 | 32 | 26 |
| 773300 | 445000 1c | 328300 | 33 | 26 |
| | | | | |
| 376000 | 338000 | 38000 | 34 | 26 |
| 419800 | 338000 | 81800 | 35 | 26 |
| 773300 | 338000 | 435300 | 36 | 26 |
| | | | | |
| 419800 | 376000 | 43800 | 37 | 26 |
| 773300 | 376000 | 397300 | 38 | 26 |
| | | | | |
| 773300 | 419800 | 353500 | 39 | 26 |

S Statistic = 39 - 26 = 13

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 3/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 0
B = 18
C = 0
D = 0
E = 0
F = 2
a = 3828
b = 11880

c = 264
Group Variance = 211.667
Z-Score = 0.824812
Comparison Level at 95% confidence level = -1.65463 (downward trend)
0.824812 >= -1.65463 indicating no evidence of a downward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RWA-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 355000 M6 | 355000 M6 | Same Date | 0 | 0 |
| 363000 M6 | 355000 M6 | Same Date | 0 | 0 |
| 363000 M6 | 355000 M6 | Same Date | 0 | 0 |
| 375000 | 355000 M6 | Same Date | 0 | 0 |
| 391000 1c2c | 355000 M6 | Same Date | 0 | 0 |
| 355000 M6 | 355000 M6 | Same Date | 0 | 0 |
| 355000 M6 | 355000 M6 | Same Date | 0 | 0 |
| 363000 M6 | 355000 M6 | Same Date | 0 | 0 |
| 363000 M6 | 355000 M6 | Same Date | 0 | 0 |
| 349000 | 355000 M6 | -6000 | 0 | 1 |
| 396000 | 355000 M6 | 41000 | 1 | 1 |
| 521000 | 355000 M6 | 166000 | 2 | 1 |
| 441000 | 355000 M6 | 86000 | 3 | 1 |
| 452000 | 355000 M6 | 97000 | 4 | 1 |
| 406000 MHML1c | 355000 M6 | 51000 | 5 | 1 |
| 468000 | 355000 M6 | 113000 | 6 | 1 |
| 328000 | 355000 M6 | -27000 | 6 | 2 |
| 415000 | 355000 M6 | 60000 | 7 | 2 |
| 340500 | 355000 M6 | -14500 | 7 | 3 |
| 309600 | 355000 M6 | -45400 | 7 | 4 |
| 341900 | 355000 M6 | -13100 | 7 | 5 |
| 379700 | 355000 M6 | 24700 | 8 | 5 |
| 337700 | 355000 M6 | -17300 | 8 | 6 |
| 363000 M6 | 355000 M6 | Same Date | 8 | 6 |
| 363000 M6 | 355000 M6 | Same Date | 8 | 6 |
| 375000 | 355000 M6 | Same Date | 8 | 6 |
| 391000 1c2c | 355000 M6 | Same Date | 8 | 6 |
| 355000 M6 | 355000 M6 | Same Date | 8 | 6 |
| 355000 M6 | 355000 M6 | Same Date | 8 | 6 |
| 363000 M6 | 355000 M6 | Same Date | 8 | 6 |
| 363000 M6 | 355000 M6 | Same Date | 8 | 6 |
| 349000 | 355000 M6 | -6000 | 8 | 7 |
| 396000 | 355000 M6 | 41000 | 9 | 7 |
| 521000 | 355000 M6 | 166000 | 10 | 7 |
| 441000 | 355000 M6 | 86000 | 11 | 7 |
| 452000 | 355000 M6 | 97000 | 12 | 7 |
| 406000 MHML1c | 355000 M6 | 51000 | 13 | 7 |
| 468000 | 355000 M6 | 113000 | 14 | 7 |
| 328000 | 355000 M6 | -27000 | 14 | 8 |
| 415000 | 355000 M6 | 60000 | 15 | 8 |
| 340500 | 355000 M6 | -14500 | 15 | 9 |
| 309600 | 355000 M6 | -45400 | 15 | 10 |
| 341900 | 355000 M6 | -13100 | 15 | 11 |
| 379700 | 355000 M6 | 24700 | 16 | 11 |
| 337700 | 355000 M6 | -17300 | 16 | 12 |

| | | | | |
|---|---|---|---|---|
| 363000 M6 | 363000 M6 | Same Date | 16 | 12 |
| 375000 | 363000 M6 | Same Date | 16 | 12 |
| 391000 1c2c | 363000 M6 | Same Date | 16 | 12 |
| 355000 M6 | 363000 M6 | Same Date | 16 | 12 |
| 355000 M6 | 363000 M6 | Same Date | 16 | 12 |
| 363000 M6 | 363000 M6 | Same Date | 16 | 12 |
| 363000 M6 | 363000 M6 | Same Date | 16 | 12 |
| 349000 | 363000 M6 | -14000 | 16 | 13 |
| 396000 | 363000 M6 | 33000 | 17 | 13 |
| 521000 | 363000 M6 | 158000 | 18 | 13 |
| 441000 | 363000 M6 | 78000 | 19 | 13 |
| 452000 | 363000 M6 | 89000 | 20 | 13 |
| 406000 MHML1c | 363000 M6 | 43000 | 21 | 13 |
| 468000 | 363000 M6 | 105000 | 22 | 13 |
| 328000 | 363000 M6 | -35000 | 22 | 14 |
| 415000 | 363000 M6 | 52000 | 23 | 14 |
| 340500 | 363000 M6 | -22500 | 23 | 15 |
| 309600 | 363000 M6 | -53400 | 23 | 16 |
| 341900 | 363000 M6 | -21100 | 23 | 17 |
| 379700 | 363000 M6 | 16700 | 24 | 17 |
| 337700 | 363000 M6 | -25300 | 24 | 18 |
| | | | | |
| 375000 | 363000 M6 | Same Date | 24 | 18 |
| 391000 1c2c | 363000 M6 | Same Date | 24 | 18 |
| 355000 M6 | 363000 M6 | Same Date | 24 | 18 |
| 355000 M6 | 363000 M6 | Same Date | 24 | 18 |
| 363000 M6 | 363000 M6 | Same Date | 24 | 18 |
| 363000 M6 | 363000 M6 | Same Date | 24 | 18 |
| 349000 | 363000 M6 | -14000 | 24 | 19 |
| 396000 | 363000 M6 | 33000 | 25 | 19 |
| 521000 | 363000 M6 | 158000 | 26 | 19 |
| 441000 | 363000 M6 | 78000 | 27 | 19 |
| 452000 | 363000 M6 | 89000 | 28 | 19 |
| 406000 MHML1c | 363000 M6 | 43000 | 29 | 19 |
| 468000 | 363000 M6 | 105000 | 30 | 19 |
| 328000 | 363000 M6 | -35000 | 30 | 20 |
| 415000 | 363000 M6 | 52000 | 31 | 20 |
| 340500 | 363000 M6 | -22500 | 31 | 21 |
| 309600 | 363000 M6 | -53400 | 31 | 22 |
| 341900 | 363000 M6 | -21100 | 31 | 23 |
| 379700 | 363000 M6 | 16700 | 32 | 23 |
| 337700 | 363000 M6 | -25300 | 32 | 24 |
| | | | | |
| 391000 1c2c | 375000 | Same Date | 32 | 24 |
| 355000 M6 | 375000 | Same Date | 32 | 24 |
| 355000 M6 | 375000 | Same Date | 32 | 24 |
| 363000 M6 | 375000 | Same Date | 32 | 24 |
| 363000 M6 | 375000 | Same Date | 32 | 24 |
| 349000 | 375000 | -26000 | 32 | 25 |
| 396000 | 375000 | 21000 | 33 | 25 |
| 521000 | 375000 | 146000 | 34 | 25 |
| 441000 | 375000 | 66000 | 35 | 25 |
| 452000 | 375000 | 77000 | 36 | 25 |
| 406000 MHML1c | 375000 | 31000 | 37 | 25 |
| 468000 | 375000 | 93000 | 38 | 25 |
| 328000 | 375000 | -47000 | 38 | 26 |
| 415000 | 375000 | 40000 | 39 | 26 |

| | | | | |
|---|---|---|---|---|
| 340500 | 375000 | -34500 | 39 | 27 |
| 309600 | 375000 | -65400 | 39 | 28 |
| 341900 | 375000 | -33100 | 39 | 29 |
| 379700 | 375000 | 4700 | 40 | 29 |
| 337700 | 375000 | -37300 | 40 | 30 |
| | | | | |
| 355000 M6 | 391000 1c2c | Same Date | 40 | 30 |
| 355000 M6 | 391000 1c2c | Same Date | 40 | 30 |
| 363000 M6 | 391000 1c2c | Same Date | 40 | 30 |
| 363000 M6 | 391000 1c2c | Same Date | 40 | 30 |
| 349000 | 391000 1c2c | -42000 | 40 | 31 |
| 396000 | 391000 1c2c | 5000 | 41 | 31 |
| 521000 | 391000 1c2c | 130000 | 42 | 31 |
| 441000 | 391000 1c2c | 50000 | 43 | 31 |
| 452000 | 391000 1c2c | 61000 | 44 | 31 |
| 406000 MHML1c | 391000 1c2c | 15000 | 45 | 31 |
| 468000 | 391000 1c2c | 77000 | 46 | 31 |
| 328000 | 391000 1c2c | -63000 | 46 | 32 |
| 415000 | 391000 1c2c | 24000 | 47 | 32 |
| 340500 | 391000 1c2c | -50500 | 47 | 33 |
| 309600 | 391000 1c2c | -81400 | 47 | 34 |
| 341900 | 391000 1c2c | -49100 | 47 | 35 |
| 379700 | 391000 1c2c | -11300 | 47 | 36 |
| 337700 | 391000 1c2c | -53300 | 47 | 37 |
| | | | | |
| 355000 M6 | 355000 M6 | Same Date | 47 | 37 |
| 363000 M6 | 355000 M6 | Same Date | 47 | 37 |
| 363000 M6 | 355000 M6 | Same Date | 47 | 37 |
| 349000 | 355000 M6 | -6000 | 47 | 38 |
| 396000 | 355000 M6 | 41000 | 48 | 38 |
| 521000 | 355000 M6 | 166000 | 49 | 38 |
| 441000 | 355000 M6 | 86000 | 50 | 38 |
| 452000 | 355000 M6 | 97000 | 51 | 38 |
| 406000 MHML1c | 355000 M6 | 51000 | 52 | 38 |
| 468000 | 355000 M6 | 113000 | 53 | 38 |
| 328000 | 355000 M6 | -27000 | 53 | 39 |
| 415000 | 355000 M6 | 60000 | 54 | 39 |
| 340500 | 355000 M6 | -14500 | 54 | 40 |
| 309600 | 355000 M6 | -45400 | 54 | 41 |
| 341900 | 355000 M6 | -13100 | 54 | 42 |
| 379700 | 355000 M6 | 24700 | 55 | 42 |
| 337700 | 355000 M6 | -17300 | 55 | 43 |
| | | | | |
| 363000 M6 | 355000 M6 | Same Date | 55 | 43 |
| 363000 M6 | 355000 M6 | Same Date | 55 | 43 |
| 349000 | 355000 M6 | -6000 | 55 | 44 |
| 396000 | 355000 M6 | 41000 | 56 | 44 |
| 521000 | 355000 M6 | 166000 | 57 | 44 |
| 441000 | 355000 M6 | 86000 | 58 | 44 |
| 452000 | 355000 M6 | 97000 | 59 | 44 |
| 406000 MHML1c | 355000 M6 | 51000 | 60 | 44 |
| 468000 | 355000 M6 | 113000 | 61 | 44 |
| 328000 | 355000 M6 | -27000 | 61 | 45 |
| 415000 | 355000 M6 | 60000 | 62 | 45 |
| 340500 | 355000 M6 | -14500 | 62 | 46 |
| 309600 | 355000 M6 | -45400 | 62 | 47 |
| 341900 | 355000 M6 | -13100 | 62 | 48 |

| | | | | |
|---|---|---|---|---|
| 379700 | 355000 M6 | 24700 | 63 | 48 |
| 337700 | 355000 M6 | -17300 | 63 | 49 |
| | | | | |
| 363000 M6 | 363000 M6 | Same Date | 63 | 49 |
| 349000 | 363000 M6 | -14000 | 63 | 50 |
| 396000 | 363000 M6 | 33000 | 64 | 50 |
| 521000 | 363000 M6 | 158000 | 65 | 50 |
| 441000 | 363000 M6 | 78000 | 66 | 50 |
| 452000 | 363000 M6 | 89000 | 67 | 50 |
| 406000 MHML1c | 363000 M6 | 43000 | 68 | 50 |
| 468000 | 363000 M6 | 105000 | 69 | 50 |
| 328000 | 363000 M6 | -35000 | 69 | 51 |
| 415000 | 363000 M6 | 52000 | 70 | 51 |
| 340500 | 363000 M6 | -22500 | 70 | 52 |
| 309600 | 363000 M6 | -53400 | 70 | 53 |
| 341900 | 363000 M6 | -21100 | 70 | 54 |
| 379700 | 363000 M6 | 16700 | 71 | 54 |
| 337700 | 363000 M6 | -25300 | 71 | 55 |
| | | | | |
| 349000 | 363000 M6 | -14000 | 71 | 56 |
| 396000 | 363000 M6 | 33000 | 72 | 56 |
| 521000 | 363000 M6 | 158000 | 73 | 56 |
| 441000 | 363000 M6 | 78000 | 74 | 56 |
| 452000 | 363000 M6 | 89000 | 75 | 56 |
| 406000 MHML1c | 363000 M6 | 43000 | 76 | 56 |
| 468000 | 363000 M6 | 105000 | 77 | 56 |
| 328000 | 363000 M6 | -35000 | 77 | 57 |
| 415000 | 363000 M6 | 52000 | 78 | 57 |
| 340500 | 363000 M6 | -22500 | 78 | 58 |
| 309600 | 363000 M6 | -53400 | 78 | 59 |
| 341900 | 363000 M6 | -21100 | 78 | 60 |
| 379700 | 363000 M6 | 16700 | 79 | 60 |
| 337700 | 363000 M6 | -25300 | 79 | 61 |
| | | | | |
| 396000 | 349000 | 47000 | 80 | 61 |
| 521000 | 349000 | 172000 | 81 | 61 |
| 441000 | 349000 | 92000 | 82 | 61 |
| 452000 | 349000 | 103000 | 83 | 61 |
| 406000 MHML1c | 349000 | 57000 | 84 | 61 |
| 468000 | 349000 | 119000 | 85 | 61 |
| 328000 | 349000 | -21000 | 85 | 62 |
| 415000 | 349000 | 66000 | 86 | 62 |
| 340500 | 349000 | -8500 | 86 | 63 |
| 309600 | 349000 | -39400 | 86 | 64 |
| 341900 | 349000 | -7100 | 86 | 65 |
| 379700 | 349000 | 30700 | 87 | 65 |
| 337700 | 349000 | -11300 | 87 | 66 |
| | | | | |
| 521000 | 396000 | 125000 | 88 | 66 |
| 441000 | 396000 | 45000 | 89 | 66 |
| 452000 | 396000 | 56000 | 90 | 66 |
| 406000 MHML1c | 396000 | 10000 | 91 | 66 |
| 468000 | 396000 | 72000 | 92 | 66 |
| 328000 | 396000 | -68000 | 92 | 67 |
| 415000 | 396000 | 19000 | 93 | 67 |
| 340500 | 396000 | -55500 | 93 | 68 |
| 309600 | 396000 | -86400 | 93 | 69 |

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|---|---|---|---|---|
| 341900 | 396000 | -54100 | 93 | 70 |
| 379700 | 396000 | -16300 | 93 | 71 |
| 337700 | 396000 | -58300 | 93 | 72 |
| | | | | |
| 441000 | 521000 | -80000 | 93 | 73 |
| 452000 | 521000 | -69000 | 93 | 74 |
| 406000 MHML1c | 521000 | -115000 | 93 | 75 |
| 468000 | 521000 | -53000 | 93 | 76 |
| 328000 | 521000 | -193000 | 93 | 77 |
| 415000 | 521000 | -106000 | 93 | 78 |
| 340500 | 521000 | -180500 | 93 | 79 |
| 309600 | 521000 | -211400 | 93 | 80 |
| 341900 | 521000 | -179100 | 93 | 81 |
| 379700 | 521000 | -141300 | 93 | 82 |
| 337700 | 521000 | -183300 | 93 | 83 |
| | | | | |
| 452000 | 441000 | 11000 | 94 | 83 |
| 406000 MHML1c | 441000 | -35000 | 94 | 84 |
| 468000 | 441000 | 27000 | 95 | 84 |
| 328000 | 441000 | -113000 | 95 | 85 |
| 415000 | 441000 | -26000 | 95 | 86 |
| 340500 | 441000 | -100500 | 95 | 87 |
| 309600 | 441000 | -131400 | 95 | 88 |
| 341900 | 441000 | -99100 | 95 | 89 |
| 379700 | 441000 | -61300 | 95 | 90 |
| 337700 | 441000 | -103300 | 95 | 91 |
| | | | | |
| 406000 MHML1c | 452000 | -46000 | 95 | 92 |
| 468000 | 452000 | 16000 | 96 | 92 |
| 328000 | 452000 | -124000 | 96 | 93 |
| 415000 | 452000 | -37000 | 96 | 94 |
| 340500 | 452000 | -111500 | 96 | 95 |
| 309600 | 452000 | -142400 | 96 | 96 |
| 341900 | 452000 | -110100 | 96 | 97 |
| 379700 | 452000 | -72300 | 96 | 98 |
| 337700 | 452000 | -114300 | 96 | 99 |
| | | | | |
| 468000 | 406000 MHML1c | 62000 | 97 | 99 |
| 328000 | 406000 MHML1c | -78000 | 97 | 100 |
| 415000 | 406000 MHML1c | 9000 | 98 | 100 |
| 340500 | 406000 MHML1c | -65500 | 98 | 101 |
| 309600 | 406000 MHML1c | -96400 | 98 | 102 |
| 341900 | 406000 MHML1c | -64100 | 98 | 103 |
| 379700 | 406000 MHML1c | -26300 | 98 | 104 |
| 337700 | 406000 MHML1c | -68300 | 98 | 105 |
| | | | | |
| 328000 | 468000 | -140000 | 98 | 106 |
| 415000 | 468000 | -53000 | 98 | 107 |
| 340500 | 468000 | -127500 | 98 | 108 |
| 309600 | 468000 | -158400 | 98 | 109 |
| 341900 | 468000 | -126100 | 98 | 110 |
| 379700 | 468000 | -88300 | 98 | 111 |
| 337700 | 468000 | -130300 | 98 | 112 |
| | | | | |
| 415000 | 328000 | 87000 | 99 | 112 |
| 340500 | 328000 | 12500 | 100 | 112 |
| 309600 | 328000 | -18400 | 100 | 113 |

| | | | | |
|---|---|---|---|---|
| 341900 | 328000 | 13900 | 101 | 113 |
| 379700 | 328000 | 51700 | 102 | 113 |
| 337700 | 328000 | 9700 | 103 | 113 |
| | | | | |
| 340500 | 415000 | -74500 | 103 | 114 |
| 309600 | 415000 | -105400 | 103 | 115 |
| 341900 | 415000 | -73100 | 103 | 116 |
| 379700 | 415000 | -35300 | 103 | 117 |
| 337700 | 415000 | -77300 | 103 | 118 |
| | | | | |
| 309600 | 340500 | -30900 | 103 | 119 |
| 341900 | 340500 | 1400 | 104 | 119 |
| 379700 | 340500 | 39200 | 105 | 119 |
| 337700 | 340500 | -2800 | 105 | 120 |
| | | | | |
| 341900 | 309600 | 32300 | 106 | 120 |
| 379700 | 309600 | 70100 | 107 | 120 |
| 337700 | 309600 | 28100 | 108 | 120 |
| | | | | |
| 379700 | 341900 | 37800 | 109 | 120 |
| 337700 | 341900 | -4200 | 109 | 121 |
| | | | | |
| 337700 | 379700 | -42000 | 109 | 122 |

S Statistic = 109 - 122 = -13

| Tied Group | Value | Members |
|---|---|---|
| 1 | 355000 | 4 |
| 2 | 363000 | 4 |

| Time Period | Observations |
|---|---|
| 5/1/2019 | 10 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 312
B = 2250
C = 48
D = 720
E = 24
F = 90
a = 29256
b = 109296

c = 1104
Group Variance = 1485.27
Z-Score = -0.311371
Comparison Level at 95% confidence level = -1.65463 (downward trend)
-0.311371 >= -1.65463 indicating no evidence of a downward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RWB-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 18.4 | 17.6 1c2c | Same Date | 0 | 0 |
| 9.7 J | 17.6 1c2c | Same Date | 0 | 0 |
| 9.7 J | 17.6 1c2c | Same Date | 0 | 0 |
| 19.5 | 17.6 1c2c | Same Date | 0 | 0 |
| 19.5 | 17.6 1c2c | Same Date | 0 | 0 |
| 9.7 J | 17.6 1c2c | Same Date | 0 | 0 |
| 9.7 J | 17.6 1c2c | Same Date | 0 | 0 |
| 19.5 | 17.6 1c2c | Same Date | 0 | 0 |
| 19.5 | 17.6 1c2c | Same Date | 0 | 0 |
| 29.2 | 17.6 1c2c | 11.6 | 1 | 0 |
| 47.8 | 17.6 1c2c | 30.2 | 2 | 0 |
| 8.9 J | 17.6 1c2c | -8.7 | 2 | 1 |
| 8.4 J | 17.6 1c2c | -9.2 | 2 | 2 |
| 15.2 1c | 17.6 1c2c | -2.4 | 2 | 3 |
| 13.5 1c | 17.6 1c2c | -4.1 | 2 | 4 |
| 13.6 | 17.6 1c2c | -4 | 2 | 5 |
| 19.1 J | 17.6 1c2c | 1.5 | 3 | 5 |
| 16.7 J | 17.6 1c2c | -0.9 | 3 | 6 |
| 18.9 | 17.6 1c2c | 1.3 | 4 | 6 |
| 17.14 | 17.6 1c2c | -0.46 | 4 | 7 |
| 19.29 | 17.6 1c2c | 1.69 | 5 | 7 |
| 20.29 | 17.6 1c2c | 2.69 | 6 | 7 |
| 14.63 | 17.6 1c2c | -2.97 | 6 | 8 |
| | | | | |
| 9.7 J | 18.4 | Same Date | 6 | 8 |
| 9.7 J | 18.4 | Same Date | 6 | 8 |
| 19.5 | 18.4 | Same Date | 6 | 8 |
| 19.5 | 18.4 | Same Date | 6 | 8 |
| 9.7 J | 18.4 | Same Date | 6 | 8 |
| 9.7 J | 18.4 | Same Date | 6 | 8 |
| 19.5 | 18.4 | Same Date | 6 | 8 |
| 19.5 | 18.4 | Same Date | 6 | 8 |
| 29.2 | 18.4 | 10.8 | 7 | 8 |
| 47.8 | 18.4 | 29.4 | 8 | 8 |
| 8.9 J | 18.4 | -9.5 | 8 | 9 |
| 8.4 J | 18.4 | -10 | 8 | 10 |
| 15.2 1c | 18.4 | -3.2 | 8 | 11 |
| 13.5 1c | 18.4 | -4.9 | 8 | 12 |
| 13.6 | 18.4 | -4.8 | 8 | 13 |
| 19.1 J | 18.4 | 0.7 | 9 | 13 |
| 16.7 J | 18.4 | -1.7 | 9 | 14 |
| 18.9 | 18.4 | 0.5 | 10 | 14 |
| 17.14 | 18.4 | -1.26 | 10 | 15 |
| 19.29 | 18.4 | 0.89 | 11 | 15 |
| 20.29 | 18.4 | 1.89 | 12 | 15 |
| 14.63 | 18.4 | -3.77 | 12 | 16 |

| | | | | |
|---|---|---|---|---|
| 9.7 J | 9.7 J | Same Date | 12 | 16 |
| 19.5 | 9.7 J | Same Date | 12 | 16 |
| 19.5 | 9.7 J | Same Date | 12 | 16 |
| 9.7 J | 9.7 J | Same Date | 12 | 16 |
| 9.7 J | 9.7 J | Same Date | 12 | 16 |
| 19.5 | 9.7 J | Same Date | 12 | 16 |
| 19.5 | 9.7 J | Same Date | 12 | 16 |
| 29.2 | 9.7 J | 19.5 | 13 | 16 |
| 47.8 | 9.7 J | 38.1 | 14 | 16 |
| 8.9 J | 9.7 J | -0.8 | 14 | 17 |
| 8.4 J | 9.7 J | -1.3 | 14 | 18 |
| 15.2 1c | 9.7 J | 5.5 | 15 | 18 |
| 13.5 1c | 9.7 J | 3.8 | 16 | 18 |
| 13.6 | 9.7 J | 3.9 | 17 | 18 |
| 19.1 J | 9.7 J | 9.4 | 18 | 18 |
| 16.7 J | 9.7 J | 7 | 19 | 18 |
| 18.9 | 9.7 J | 9.2 | 20 | 18 |
| 17.14 | 9.7 J | 7.44 | 21 | 18 |
| 19.29 | 9.7 J | 9.59 | 22 | 18 |
| 20.29 | 9.7 J | 10.59 | 23 | 18 |
| 14.63 | 9.7 J | 4.93 | 24 | 18 |
| | | | | |
| 19.5 | 9.7 J | Same Date | 24 | 18 |
| 19.5 | 9.7 J | Same Date | 24 | 18 |
| 9.7 J | 9.7 J | Same Date | 24 | 18 |
| 9.7 J | 9.7 J | Same Date | 24 | 18 |
| 19.5 | 9.7 J | Same Date | 24 | 18 |
| 19.5 | 9.7 J | Same Date | 24 | 18 |
| 29.2 | 9.7 J | 19.5 | 25 | 18 |
| 47.8 | 9.7 J | 38.1 | 26 | 18 |
| 8.9 J | 9.7 J | -0.8 | 26 | 19 |
| 8.4 J | 9.7 J | -1.3 | 26 | 20 |
| 15.2 1c | 9.7 J | 5.5 | 27 | 20 |
| 13.5 1c | 9.7 J | 3.8 | 28 | 20 |
| 13.6 | 9.7 J | 3.9 | 29 | 20 |
| 19.1 J | 9.7 J | 9.4 | 30 | 20 |
| 16.7 J | 9.7 J | 7 | 31 | 20 |
| 18.9 | 9.7 J | 9.2 | 32 | 20 |
| 17.14 | 9.7 J | 7.44 | 33 | 20 |
| 19.29 | 9.7 J | 9.59 | 34 | 20 |
| 20.29 | 9.7 J | 10.59 | 35 | 20 |
| 14.63 | 9.7 J | 4.93 | 36 | 20 |
| | | | | |
| 19.5 | 19.5 | Same Date | 36 | 20 |
| 9.7 J | 19.5 | Same Date | 36 | 20 |
| 9.7 J | 19.5 | Same Date | 36 | 20 |
| 19.5 | 19.5 | Same Date | 36 | 20 |
| 19.5 | 19.5 | Same Date | 36 | 20 |
| 29.2 | 19.5 | 9.7 | 37 | 20 |
| 47.8 | 19.5 | 28.3 | 38 | 20 |
| 8.9 J | 19.5 | -10.6 | 38 | 21 |
| 8.4 J | 19.5 | -11.1 | 38 | 22 |
| 15.2 1c | 19.5 | -4.3 | 38 | 23 |
| 13.5 1c | 19.5 | -6 | 38 | 24 |
| 13.6 | 19.5 | -5.9 | 38 | 25 |
| 19.1 J | 19.5 | -0.4 | 38 | 26 |
| 16.7 J | 19.5 | -2.8 | 38 | 27 |

| | | | | |
|---|---|---|---|---|
| 18.9 | 19.5 | -0.6 | 38 | 28 |
| 17.14 | 19.5 | -2.36 | 38 | 29 |
| 19.29 | 19.5 | -0.21 | 38 | 30 |
| 20.29 | 19.5 | 0.79 | 39 | 30 |
| 14.63 | 19.5 | -4.87 | 39 | 31 |
| | | | | |
| 9.7 J | 19.5 | Same Date | 39 | 31 |
| 9.7 J | 19.5 | Same Date | 39 | 31 |
| 19.5 | 19.5 | Same Date | 39 | 31 |
| 19.5 | 19.5 | Same Date | 39 | 31 |
| 29.2 | 19.5 | 9.7 | 40 | 31 |
| 47.8 | 19.5 | 28.3 | 41 | 31 |
| 8.9 J | 19.5 | -10.6 | 41 | 32 |
| 8.4 J | 19.5 | -11.1 | 41 | 33 |
| 15.2 1c | 19.5 | -4.3 | 41 | 34 |
| 13.5 1c | 19.5 | -6 | 41 | 35 |
| 13.6 | 19.5 | -5.9 | 41 | 36 |
| 19.1 J | 19.5 | -0.4 | 41 | 37 |
| 16.7 J | 19.5 | -2.8 | 41 | 38 |
| 18.9 | 19.5 | -0.6 | 41 | 39 |
| 17.14 | 19.5 | -2.36 | 41 | 40 |
| 19.29 | 19.5 | -0.21 | 41 | 41 |
| 20.29 | 19.5 | 0.79 | 42 | 41 |
| 14.63 | 19.5 | -4.87 | 42 | 42 |
| | | | | |
| 9.7 J | 9.7 J | Same Date | 42 | 42 |
| 19.5 | 9.7 J | Same Date | 42 | 42 |
| 19.5 | 9.7 J | Same Date | 42 | 42 |
| 29.2 | 9.7 J | 19.5 | 43 | 42 |
| 47.8 | 9.7 J | 38.1 | 44 | 42 |
| 8.9 J | 9.7 J | -0.8 | 44 | 43 |
| 8.4 J | 9.7 J | -1.3 | 44 | 44 |
| 15.2 1c | 9.7 J | 5.5 | 45 | 44 |
| 13.5 1c | 9.7 J | 3.8 | 46 | 44 |
| 13.6 | 9.7 J | 3.9 | 47 | 44 |
| 19.1 J | 9.7 J | 9.4 | 48 | 44 |
| 16.7 J | 9.7 J | 7 | 49 | 44 |
| 18.9 | 9.7 J | 9.2 | 50 | 44 |
| 17.14 | 9.7 J | 7.44 | 51 | 44 |
| 19.29 | 9.7 J | 9.59 | 52 | 44 |
| 20.29 | 9.7 J | 10.59 | 53 | 44 |
| 14.63 | 9.7 J | 4.93 | 54 | 44 |
| | | | | |
| 19.5 | 9.7 J | Same Date | 54 | 44 |
| 19.5 | 9.7 J | Same Date | 54 | 44 |
| 29.2 | 9.7 J | 19.5 | 55 | 44 |
| 47.8 | 9.7 J | 38.1 | 56 | 44 |
| 8.9 J | 9.7 J | -0.8 | 56 | 45 |
| 8.4 J | 9.7 J | -1.3 | 56 | 46 |
| 15.2 1c | 9.7 J | 5.5 | 57 | 46 |
| 13.5 1c | 9.7 J | 3.8 | 58 | 46 |
| 13.6 | 9.7 J | 3.9 | 59 | 46 |
| 19.1 J | 9.7 J | 9.4 | 60 | 46 |
| 16.7 J | 9.7 J | 7 | 61 | 46 |
| 18.9 | 9.7 J | 9.2 | 62 | 46 |
| 17.14 | 9.7 J | 7.44 | 63 | 46 |
| 19.29 | 9.7 J | 9.59 | 64 | 46 |

| | | | | |
|---|---|---|---|---|
| 20.29 | 9.7 J | 10.59 | 65 | 46 |
| 14.63 | 9.7 J | 4.93 | 66 | 46 |
| | | | | |
| 19.5 | 19.5 | Same Date | 66 | 46 |
| 29.2 | 19.5 | 9.7 | 67 | 46 |
| 47.8 | 19.5 | 28.3 | 68 | 46 |
| 8.9 J | 19.5 | -10.6 | 68 | 47 |
| 8.4 J | 19.5 | -11.1 | 68 | 48 |
| 15.2 1c | 19.5 | -4.3 | 68 | 49 |
| 13.5 1c | 19.5 | -6 | 68 | 50 |
| 13.6 | 19.5 | -5.9 | 68 | 51 |
| 19.1 J | 19.5 | -0.4 | 68 | 52 |
| 16.7 J | 19.5 | -2.8 | 68 | 53 |
| 18.9 | 19.5 | -0.6 | 68 | 54 |
| 17.14 | 19.5 | -2.36 | 68 | 55 |
| 19.29 | 19.5 | -0.21 | 68 | 56 |
| 20.29 | 19.5 | 0.79 | 69 | 56 |
| 14.63 | 19.5 | -4.87 | 69 | 57 |
| | | | | |
| 29.2 | 19.5 | 9.7 | 70 | 57 |
| 47.8 | 19.5 | 28.3 | 71 | 57 |
| 8.9 J | 19.5 | -10.6 | 71 | 58 |
| 8.4 J | 19.5 | -11.1 | 71 | 59 |
| 15.2 1c | 19.5 | -4.3 | 71 | 60 |
| 13.5 1c | 19.5 | -6 | 71 | 61 |
| 13.6 | 19.5 | -5.9 | 71 | 62 |
| 19.1 J | 19.5 | -0.4 | 71 | 63 |
| 16.7 J | 19.5 | -2.8 | 71 | 64 |
| 18.9 | 19.5 | -0.6 | 71 | 65 |
| 17.14 | 19.5 | -2.36 | 71 | 66 |
| 19.29 | 19.5 | -0.21 | 71 | 67 |
| 20.29 | 19.5 | 0.79 | 72 | 67 |
| 14.63 | 19.5 | -4.87 | 72 | 68 |
| | | | | |
| 47.8 | 29.2 | 18.6 | 73 | 68 |
| 8.9 J | 29.2 | -20.3 | 73 | 69 |
| 8.4 J | 29.2 | -20.8 | 73 | 70 |
| 15.2 1c | 29.2 | -14 | 73 | 71 |
| 13.5 1c | 29.2 | -15.7 | 73 | 72 |
| 13.6 | 29.2 | -15.6 | 73 | 73 |
| 19.1 J | 29.2 | -10.1 | 73 | 74 |
| 16.7 J | 29.2 | -12.5 | 73 | 75 |
| 18.9 | 29.2 | -10.3 | 73 | 76 |
| 17.14 | 29.2 | -12.06 | 73 | 77 |
| 19.29 | 29.2 | -9.91 | 73 | 78 |
| 20.29 | 29.2 | -8.91 | 73 | 79 |
| 14.63 | 29.2 | -14.57 | 73 | 80 |
| | | | | |
| 8.9 J | 47.8 | -38.9 | 73 | 81 |
| 8.4 J | 47.8 | -39.4 | 73 | 82 |
| 15.2 1c | 47.8 | -32.6 | 73 | 83 |
| 13.5 1c | 47.8 | -34.3 | 73 | 84 |
| 13.6 | 47.8 | -34.2 | 73 | 85 |
| 19.1 J | 47.8 | -28.7 | 73 | 86 |
| 16.7 J | 47.8 | -31.1 | 73 | 87 |
| 18.9 | 47.8 | -28.9 | 73 | 88 |
| 17.14 | 47.8 | -30.66 | 73 | 89 |

| | | | | |
|---|---|---|---|---|
| 19.29 | 47.8 | -28.51 | 73 | 90 |
| 20.29 | 47.8 | -27.51 | 73 | 91 |
| 14.63 | 47.8 | -33.17 | 73 | 92 |
| | | | | |
| 8.4 J | 8.9 J | -0.5 | 73 | 93 |
| 15.2 1c | 8.9 J | 6.3 | 74 | 93 |
| 13.5 1c | 8.9 J | 4.6 | 75 | 93 |
| 13.6 | 8.9 J | 4.7 | 76 | 93 |
| 19.1 J | 8.9 J | 10.2 | 77 | 93 |
| 16.7 J | 8.9 J | 7.8 | 78 | 93 |
| 18.9 | 8.9 J | 10 | 79 | 93 |
| 17.14 | 8.9 J | 8.24 | 80 | 93 |
| 19.29 | 8.9 J | 10.39 | 81 | 93 |
| 20.29 | 8.9 J | 11.39 | 82 | 93 |
| 14.63 | 8.9 J | 5.73 | 83 | 93 |
| | | | | |
| 15.2 1c | 8.4 J | 6.8 | 84 | 93 |
| 13.5 1c | 8.4 J | 5.1 | 85 | 93 |
| 13.6 | 8.4 J | 5.2 | 86 | 93 |
| 19.1 J | 8.4 J | 10.7 | 87 | 93 |
| 16.7 J | 8.4 J | 8.3 | 88 | 93 |
| 18.9 | 8.4 J | 10.5 | 89 | 93 |
| 17.14 | 8.4 J | 8.74 | 90 | 93 |
| 19.29 | 8.4 J | 10.89 | 91 | 93 |
| 20.29 | 8.4 J | 11.89 | 92 | 93 |
| 14.63 | 8.4 J | 6.23 | 93 | 93 |
| | | | | |
| 13.5 1c | 15.2 1c | -1.7 | 93 | 94 |
| 13.6 | 15.2 1c | -1.6 | 93 | 95 |
| 19.1 J | 15.2 1c | 3.9 | 94 | 95 |
| 16.7 J | 15.2 1c | 1.5 | 95 | 95 |
| 18.9 | 15.2 1c | 3.7 | 96 | 95 |
| 17.14 | 15.2 1c | 1.94 | 97 | 95 |
| 19.29 | 15.2 1c | 4.09 | 98 | 95 |
| 20.29 | 15.2 1c | 5.09 | 99 | 95 |
| 14.63 | 15.2 1c | -0.57 | 99 | 96 |
| | | | | |
| 13.6 | 13.5 1c | 0.1 | 100 | 96 |
| 19.1 J | 13.5 1c | 5.6 | 101 | 96 |
| 16.7 J | 13.5 1c | 3.2 | 102 | 96 |
| 18.9 | 13.5 1c | 5.4 | 103 | 96 |
| 17.14 | 13.5 1c | 3.64 | 104 | 96 |
| 19.29 | 13.5 1c | 5.79 | 105 | 96 |
| 20.29 | 13.5 1c | 6.79 | 106 | 96 |
| 14.63 | 13.5 1c | 1.13 | 107 | 96 |
| | | | | |
| 19.1 J | 13.6 | 5.5 | 108 | 96 |
| 16.7 J | 13.6 | 3.1 | 109 | 96 |
| 18.9 | 13.6 | 5.3 | 110 | 96 |
| 17.14 | 13.6 | 3.54 | 111 | 96 |
| 19.29 | 13.6 | 5.69 | 112 | 96 |
| 20.29 | 13.6 | 6.69 | 113 | 96 |
| 14.63 | 13.6 | 1.03 | 114 | 96 |
| | | | | |
| 16.7 J | 19.1 J | -2.4 | 114 | 97 |
| 18.9 | 19.1 J | -0.2 | 114 | 98 |
| 17.14 | 19.1 J | -1.96 | 114 | 99 |

| | | | | |
|---|---|---|---|---|
| 19.29 | 19.1 J | 0.19 | 115 | 99 |
| 20.29 | 19.1 J | 1.19 | 116 | 99 |
| 14.63 | 19.1 J | -4.47 | 116 | 100 |
| | | | | |
| 18.9 | 16.7 J | 2.2 | 117 | 100 |
| 17.14 | 16.7 J | 0.44 | 118 | 100 |
| 19.29 | 16.7 J | 2.59 | 119 | 100 |
| 20.29 | 16.7 J | 3.59 | 120 | 100 |
| 14.63 | 16.7 J | -2.07 | 120 | 101 |
| | | | | |
| 17.14 | 18.9 | -1.76 | 120 | 102 |
| 19.29 | 18.9 | 0.39 | 121 | 102 |
| 20.29 | 18.9 | 1.39 | 122 | 102 |
| 14.63 | 18.9 | -4.27 | 122 | 103 |
| | | | | |
| 19.29 | 17.14 | 2.15 | 123 | 103 |
| 20.29 | 17.14 | 3.15 | 124 | 103 |
| 14.63 | 17.14 | -2.51 | 124 | 104 |
| | | | | |
| 20.29 | 19.29 | 1 | 125 | 104 |
| 14.63 | 19.29 | -4.66 | 125 | 105 |
| | | | | |
| 14.63 | 20.29 | -5.66 | 125 | 106 |

S Statistic = 125 - 106 = 19

| Tied Group | Value | Members |
|---|---|---|
| 1 | 9.7 | 4 |
| 2 | 19.5 | 4 |

| Time Period | Observations |
|---|---|
| 5/1/2019 | 10 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 312
B = 2250
C = 48
D = 720
E = 24
F = 90
a = 29256
b = 109296

c = 1104
Group Variance = 1485.27
Z-Score = 0.467056
Comparison Level at 95% confidence level = -1.65463 (downward trend)
0.467056 >= -1.65463 indicating no evidence of a downward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RWD-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 37700 1c3c | 36200 M62c | Same Date | 0 | 0 |
| 41900 | 36200 M62c | 5700 | 1 | 0 |
| 52600 | 36200 M62c | 16400 | 2 | 0 |
| 50400 | 36200 M62c | 14200 | 3 | 0 |
| 59300 | 36200 M62c | 23100 | 4 | 0 |
| 69300 1c | 36200 M62c | 33100 | 5 | 0 |
| 64200 1c | 36200 M62c | 28000 | 6 | 0 |
| 81900 | 36200 M62c | 45700 | 7 | 0 |
| 53400 | 36200 M62c | 17200 | 8 | 0 |
| 47200 | 36200 M62c | 11000 | 9 | 0 |
| 49020 | 36200 M62c | 12820 | 10 | 0 |
| 49020 | 36200 M62c | 12820 | 11 | 0 |
| 46840 | 36200 M62c | 10640 | 12 | 0 |
| 47480 | 36200 M62c | 11280 | 13 | 0 |
| 73990 | 36200 M62c | 37790 | 14 | 0 |
| 93910 | 36200 M62c | 57710 | 15 | 0 |
| | | | | |
| 41900 | 37700 1c3c | 4200 | 16 | 0 |
| 52600 | 37700 1c3c | 14900 | 17 | 0 |
| 50400 | 37700 1c3c | 12700 | 18 | 0 |
| 59300 | 37700 1c3c | 21600 | 19 | 0 |
| 69300 1c | 37700 1c3c | 31600 | 20 | 0 |
| 64200 1c | 37700 1c3c | 26500 | 21 | 0 |
| 81900 | 37700 1c3c | 44200 | 22 | 0 |
| 53400 | 37700 1c3c | 15700 | 23 | 0 |
| 47200 | 37700 1c3c | 9500 | 24 | 0 |
| 49020 | 37700 1c3c | 11320 | 25 | 0 |
| 49020 | 37700 1c3c | 11320 | 26 | 0 |
| 46840 | 37700 1c3c | 9140 | 27 | 0 |
| 47480 | 37700 1c3c | 9780 | 28 | 0 |
| 73990 | 37700 1c3c | 36290 | 29 | 0 |
| 93910 | 37700 1c3c | 56210 | 30 | 0 |
| | | | | |
| 52600 | 41900 | 10700 | 31 | 0 |
| 50400 | 41900 | 8500 | 32 | 0 |
| 59300 | 41900 | 17400 | 33 | 0 |
| 69300 1c | 41900 | 27400 | 34 | 0 |
| 64200 1c | 41900 | 22300 | 35 | 0 |
| 81900 | 41900 | 40000 | 36 | 0 |
| 53400 | 41900 | 11500 | 37 | 0 |
| 47200 | 41900 | 5300 | 38 | 0 |
| 49020 | 41900 | 7120 | 39 | 0 |
| 49020 | 41900 | 7120 | 40 | 0 |
| 46840 | 41900 | 4940 | 41 | 0 |
| 47480 | 41900 | 5580 | 42 | 0 |
| 73990 | 41900 | 32090 | 43 | 0 |
| 93910 | 41900 | 52010 | 44 | 0 |

| | | | | |
|---|---|---|---|---|
| 50400 | 52600 | -2200 | 44 | 1 |
| 59300 | 52600 | 6700 | 45 | 1 |
| 69300 1c | 52600 | 16700 | 46 | 1 |
| 64200 1c | 52600 | 11600 | 47 | 1 |
| 81900 | 52600 | 29300 | 48 | 1 |
| 53400 | 52600 | 800 | 49 | 1 |
| 47200 | 52600 | -5400 | 49 | 2 |
| 49020 | 52600 | -3580 | 49 | 3 |
| 49020 | 52600 | -3580 | 49 | 4 |
| 46840 | 52600 | -5760 | 49 | 5 |
| 47480 | 52600 | -5120 | 49 | 6 |
| 73990 | 52600 | 21390 | 50 | 6 |
| 93910 | 52600 | 41310 | 51 | 6 |
| | | | | |
| 59300 | 50400 | 8900 | 52 | 6 |
| 69300 1c | 50400 | 18900 | 53 | 6 |
| 64200 1c | 50400 | 13800 | 54 | 6 |
| 81900 | 50400 | 31500 | 55 | 6 |
| 53400 | 50400 | 3000 | 56 | 6 |
| 47200 | 50400 | -3200 | 56 | 7 |
| 49020 | 50400 | -1380 | 56 | 8 |
| 49020 | 50400 | -1380 | 56 | 9 |
| 46840 | 50400 | -3560 | 56 | 10 |
| 47480 | 50400 | -2920 | 56 | 11 |
| 73990 | 50400 | 23590 | 57 | 11 |
| 93910 | 50400 | 43510 | 58 | 11 |
| | | | | |
| 69300 1c | 59300 | 10000 | 59 | 11 |
| 64200 1c | 59300 | 4900 | 60 | 11 |
| 81900 | 59300 | 22600 | 61 | 11 |
| 53400 | 59300 | -5900 | 61 | 12 |
| 47200 | 59300 | -12100 | 61 | 13 |
| 49020 | 59300 | -10280 | 61 | 14 |
| 49020 | 59300 | -10280 | 61 | 15 |
| 46840 | 59300 | -12460 | 61 | 16 |
| 47480 | 59300 | -11820 | 61 | 17 |
| 73990 | 59300 | 14690 | 62 | 17 |
| 93910 | 59300 | 34610 | 63 | 17 |
| | | | | |
| 64200 1c | 69300 1c | -5100 | 63 | 18 |
| 81900 | 69300 1c | 12600 | 64 | 18 |
| 53400 | 69300 1c | -15900 | 64 | 19 |
| 47200 | 69300 1c | -22100 | 64 | 20 |
| 49020 | 69300 1c | -20280 | 64 | 21 |
| 49020 | 69300 1c | -20280 | 64 | 22 |
| 46840 | 69300 1c | -22460 | 64 | 23 |
| 47480 | 69300 1c | -21820 | 64 | 24 |
| 73990 | 69300 1c | 4690 | 65 | 24 |
| 93910 | 69300 1c | 24610 | 66 | 24 |
| | | | | |
| 81900 | 64200 1c | 17700 | 67 | 24 |
| 53400 | 64200 1c | -10800 | 67 | 25 |
| 47200 | 64200 1c | -17000 | 67 | 26 |
| 49020 | 64200 1c | -15180 | 67 | 27 |
| 49020 | 64200 1c | -15180 | 67 | 28 |
| 46840 | 64200 1c | -17360 | 67 | 29 |

| | | | | |
|---|---|---|---|---|
| 47480 | 64200 1c | -16720 | 67 | 30 |
| 73990 | 64200 1c | 9790 | 68 | 30 |
| 93910 | 64200 1c | 29710 | 69 | 30 |
| | | | | |
| 53400 | 81900 | -28500 | 69 | 31 |
| 47200 | 81900 | -34700 | 69 | 32 |
| 49020 | 81900 | -32880 | 69 | 33 |
| 49020 | 81900 | -32880 | 69 | 34 |
| 46840 | 81900 | -35060 | 69 | 35 |
| 47480 | 81900 | -34420 | 69 | 36 |
| 73990 | 81900 | -7910 | 69 | 37 |
| 93910 | 81900 | 12010 | 70 | 37 |
| | | | | |
| 47200 | 53400 | -6200 | 70 | 38 |
| 49020 | 53400 | -4380 | 70 | 39 |
| 49020 | 53400 | -4380 | 70 | 40 |
| 46840 | 53400 | -6560 | 70 | 41 |
| 47480 | 53400 | -5920 | 70 | 42 |
| 73990 | 53400 | 20590 | 71 | 42 |
| 93910 | 53400 | 40510 | 72 | 42 |
| | | | | |
| 49020 | 47200 | 1820 | 73 | 42 |
| 49020 | 47200 | 1820 | 74 | 42 |
| 46840 | 47200 | -360 | 74 | 43 |
| 47480 | 47200 | 280 | 75 | 43 |
| 73990 | 47200 | 26790 | 76 | 43 |
| 93910 | 47200 | 46710 | 77 | 43 |
| | | | | |
| 49020 | 49020 | Same Date | 77 | 43 |
| 46840 | 49020 | -2180 | 77 | 44 |
| 47480 | 49020 | -1540 | 77 | 45 |
| 73990 | 49020 | 24970 | 78 | 45 |
| 93910 | 49020 | 44890 | 79 | 45 |
| | | | | |
| 46840 | 49020 | -2180 | 79 | 46 |
| 47480 | 49020 | -1540 | 79 | 47 |
| 73990 | 49020 | 24970 | 80 | 47 |
| 93910 | 49020 | 44890 | 81 | 47 |
| | | | | |
| 47480 | 46840 | 640 | 82 | 47 |
| 73990 | 46840 | 27150 | 83 | 47 |
| 93910 | 46840 | 47070 | 84 | 47 |
| | | | | |
| 73990 | 47480 | 26510 | 85 | 47 |
| 93910 | 47480 | 46430 | 86 | 47 |
| | | | | |
| 93910 | 73990 | 19920 | 87 | 47 |

S Statistic = 87 - 47 = 40

| Tied Group | Value | Members |
|---|---|---|
| 1 | 49020 | 2 |

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |

| | |
|---|---|
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 2 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 2 time periods with multiple data

---

A = 18
B = 36
C = 0
D = 0
E = 2
F = 4
a = 10608
b = 36720
c = 544
Group Variance = 586.348
Z-Score = 1.6106
Comparison Level at 95% confidence level = -1.65463 (downward trend)
1.6106 >= -1.65463 indicating no evidence of a downward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RWE-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 121000 M61c3c | 112000 2c | Same Date | 0 | 0 |
| 109000 | 112000 2c | -3000 | 0 | 1 |
| 118000 | 112000 2c | 6000 | 1 | 1 |
| 102000 ML | 112000 2c | -10000 | 1 | 2 |
| 114000 ML | 112000 2c | 2000 | 2 | 2 |
| 110000 1c | 112000 2c | -2000 | 2 | 3 |
| 80800 1c | 112000 2c | -31200 | 2 | 4 |
| 102000 | 112000 2c | -10000 | 2 | 5 |
| 68000 | 112000 2c | -44000 | 2 | 6 |
| 62700 | 112000 2c | -49300 | 2 | 7 |
| 58890 | 112000 2c | -53110 | 2 | 8 |
| 58890 | 112000 2c | -53110 | 2 | 9 |
| 53380 | 112000 2c | -58620 | 2 | 10 |
| 61680 | 112000 2c | -50320 | 2 | 11 |
| 67550 | 112000 2c | -44450 | 2 | 12 |
| 70970 | 112000 2c | -41030 | 2 | 13 |
| | | | | |
| 109000 | 121000 M61c3c | -12000 | 2 | 14 |
| 118000 | 121000 M61c3c | -3000 | 2 | 15 |
| 102000 ML | 121000 M61c3c | -19000 | 2 | 16 |
| 114000 ML | 121000 M61c3c | -7000 | 2 | 17 |
| 110000 1c | 121000 M61c3c | -11000 | 2 | 18 |
| 80800 1c | 121000 M61c3c | -40200 | 2 | 19 |
| 102000 | 121000 M61c3c | -19000 | 2 | 20 |
| 68000 | 121000 M61c3c | -53000 | 2 | 21 |
| 62700 | 121000 M61c3c | -58300 | 2 | 22 |
| 58890 | 121000 M61c3c | -62110 | 2 | 23 |
| 58890 | 121000 M61c3c | -62110 | 2 | 24 |
| 53380 | 121000 M61c3c | -67620 | 2 | 25 |
| 61680 | 121000 M61c3c | -59320 | 2 | 26 |
| 67550 | 121000 M61c3c | -53450 | 2 | 27 |
| 70970 | 121000 M61c3c | -50030 | 2 | 28 |
| | | | | |
| 118000 | 109000 | 9000 | 3 | 28 |
| 102000 ML | 109000 | -7000 | 3 | 29 |
| 114000 ML | 109000 | 5000 | 4 | 29 |
| 110000 1c | 109000 | 1000 | 5 | 29 |
| 80800 1c | 109000 | -28200 | 5 | 30 |
| 102000 | 109000 | -7000 | 5 | 31 |
| 68000 | 109000 | -41000 | 5 | 32 |
| 62700 | 109000 | -46300 | 5 | 33 |
| 58890 | 109000 | -50110 | 5 | 34 |
| 58890 | 109000 | -50110 | 5 | 35 |
| 53380 | 109000 | -55620 | 5 | 36 |
| 61680 | 109000 | -47320 | 5 | 37 |
| 67550 | 109000 | -41450 | 5 | 38 |
| 70970 | 109000 | -38030 | 5 | 39 |

| | | | | |
|---|---|---|---|---|
| 102000 ML | 118000 | -16000 | 5 | 40 |
| 114000 ML | 118000 | -4000 | 5 | 41 |
| 110000 1c | 118000 | -8000 | 5 | 42 |
| 80800 1c | 118000 | -37200 | 5 | 43 |
| 102000 | 118000 | -16000 | 5 | 44 |
| 68000 | 118000 | -50000 | 5 | 45 |
| 62700 | 118000 | -55300 | 5 | 46 |
| 58890 | 118000 | -59110 | 5 | 47 |
| 58890 | 118000 | -59110 | 5 | 48 |
| 53380 | 118000 | -64620 | 5 | 49 |
| 61680 | 118000 | -56320 | 5 | 50 |
| 67550 | 118000 | -50450 | 5 | 51 |
| 70970 | 118000 | -47030 | 5 | 52 |
| | | | | |
| 114000 ML | 102000 ML | 12000 | 6 | 52 |
| 110000 1c | 102000 ML | 8000 | 7 | 52 |
| 80800 1c | 102000 ML | -21200 | 7 | 53 |
| 102000 | 102000 ML | 0 | 7 | 53 |
| 68000 | 102000 ML | -34000 | 7 | 54 |
| 62700 | 102000 ML | -39300 | 7 | 55 |
| 58890 | 102000 ML | -43110 | 7 | 56 |
| 58890 | 102000 ML | -43110 | 7 | 57 |
| 53380 | 102000 ML | -48620 | 7 | 58 |
| 61680 | 102000 ML | -40320 | 7 | 59 |
| 67550 | 102000 ML | -34450 | 7 | 60 |
| 70970 | 102000 ML | -31030 | 7 | 61 |
| | | | | |
| 110000 1c | 114000 ML | -4000 | 7 | 62 |
| 80800 1c | 114000 ML | -33200 | 7 | 63 |
| 102000 | 114000 ML | -12000 | 7 | 64 |
| 68000 | 114000 ML | -46000 | 7 | 65 |
| 62700 | 114000 ML | -51300 | 7 | 66 |
| 58890 | 114000 ML | -55110 | 7 | 67 |
| 58890 | 114000 ML | -55110 | 7 | 68 |
| 53380 | 114000 ML | -60620 | 7 | 69 |
| 61680 | 114000 ML | -52320 | 7 | 70 |
| 67550 | 114000 ML | -46450 | 7 | 71 |
| 70970 | 114000 ML | -43030 | 7 | 72 |
| | | | | |
| 80800 1c | 110000 1c | -29200 | 7 | 73 |
| 102000 | 110000 1c | -8000 | 7 | 74 |
| 68000 | 110000 1c | -42000 | 7 | 75 |
| 62700 | 110000 1c | -47300 | 7 | 76 |
| 58890 | 110000 1c | -51110 | 7 | 77 |
| 58890 | 110000 1c | -51110 | 7 | 78 |
| 53380 | 110000 1c | -56620 | 7 | 79 |
| 61680 | 110000 1c | -48320 | 7 | 80 |
| 67550 | 110000 1c | -42450 | 7 | 81 |
| 70970 | 110000 1c | -39030 | 7 | 82 |
| | | | | |
| 102000 | 80800 1c | 21200 | 8 | 82 |
| 68000 | 80800 1c | -12800 | 8 | 83 |
| 62700 | 80800 1c | -18100 | 8 | 84 |
| 58890 | 80800 1c | -21910 | 8 | 85 |
| 58890 | 80800 1c | -21910 | 8 | 86 |
| 53380 | 80800 1c | -27420 | 8 | 87 |

| | | | | |
|---|---|---|---|---|
| 61680 | 80800 1c | -19120 | 8 | 88 |
| 67550 | 80800 1c | -13250 | 8 | 89 |
| 70970 | 80800 1c | -9830 | 8 | 90 |
| | | | | |
| 68000 | 102000 | -34000 | 8 | 91 |
| 62700 | 102000 | -39300 | 8 | 92 |
| 58890 | 102000 | -43110 | 8 | 93 |
| 58890 | 102000 | -43110 | 8 | 94 |
| 53380 | 102000 | -48620 | 8 | 95 |
| 61680 | 102000 | -40320 | 8 | 96 |
| 67550 | 102000 | -34450 | 8 | 97 |
| 70970 | 102000 | -31030 | 8 | 98 |
| | | | | |
| 62700 | 68000 | -5300 | 8 | 99 |
| 58890 | 68000 | -9110 | 8 | 100 |
| 58890 | 68000 | -9110 | 8 | 101 |
| 53380 | 68000 | -14620 | 8 | 102 |
| 61680 | 68000 | -6320 | 8 | 103 |
| 67550 | 68000 | -450 | 8 | 104 |
| 70970 | 68000 | 2970 | 9 | 104 |
| | | | | |
| 58890 | 62700 | -3810 | 9 | 105 |
| 58890 | 62700 | -3810 | 9 | 106 |
| 53380 | 62700 | -9320 | 9 | 107 |
| 61680 | 62700 | -1020 | 9 | 108 |
| 67550 | 62700 | 4850 | 10 | 108 |
| 70970 | 62700 | 8270 | 11 | 108 |
| | | | | |
| 58890 | 58890 | Same Date | 11 | 108 |
| 53380 | 58890 | -5510 | 11 | 109 |
| 61680 | 58890 | 2790 | 12 | 109 |
| 67550 | 58890 | 8660 | 13 | 109 |
| 70970 | 58890 | 12080 | 14 | 109 |
| | | | | |
| 53380 | 58890 | -5510 | 14 | 110 |
| 61680 | 58890 | 2790 | 15 | 110 |
| 67550 | 58890 | 8660 | 16 | 110 |
| 70970 | 58890 | 12080 | 17 | 110 |
| | | | | |
| 61680 | 53380 | 8300 | 18 | 110 |
| 67550 | 53380 | 14170 | 19 | 110 |
| 70970 | 53380 | 17590 | 20 | 110 |
| | | | | |
| 67550 | 61680 | 5870 | 21 | 110 |
| 70970 | 61680 | 9290 | 22 | 110 |
| | | | | |
| 70970 | 67550 | 3420 | 23 | 110 |

S Statistic = 23 - 110 = -87

| Tied Group | Value | Members |
|---|---|---|
| 1 | 102000 | 2 |
| 2 | 58890 | 2 |

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |

| | |
|---|---|
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 2 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 2 time periods with multiple data

---

A = 36
B = 36
C = 0
D = 0
E = 4
F = 4
a = 10608
b = 36720
c = 544
Group Variance = 585.363
Z-Score = -3.55456
Comparison Level at 95% confidence level = -1.65463 (downward trend)
**-3.55456 < -1.65463 indicating a downward trend**

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RWF-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 41900 M6 | 40700 | Same Date | 0 | 0 |
| 42300 M6 | 40700 | 1600 | 1 | 0 |
| 58800 | 40700 | 18100 | 2 | 0 |
| 90400 | 40700 | 49700 | 3 | 0 |
| 108000 | 40700 | 67300 | 4 | 0 |
| 134000 1c | 40700 | 93300 | 5 | 0 |
| 110000 1c | 40700 | 69300 | 6 | 0 |
| 133000 B | 40700 | 92300 | 7 | 0 |
| 82500 | 40700 | 41800 | 8 | 0 |
| 86800 | 40700 | 46100 | 9 | 0 |
| 89070 | 40700 | 48370 | 10 | 0 |
| 70650 | 40700 | 29950 | 11 | 0 |
| 72380 | 40700 | 31680 | 12 | 0 |
| 58150 | 40700 | 17450 | 13 | 0 |
| 71140 | 40700 | 30440 | 14 | 0 |
| | | | | |
| 42300 M6 | 41900 M6 | 400 | 15 | 0 |
| 58800 | 41900 M6 | 16900 | 16 | 0 |
| 90400 | 41900 M6 | 48500 | 17 | 0 |
| 108000 | 41900 M6 | 66100 | 18 | 0 |
| 134000 1c | 41900 M6 | 92100 | 19 | 0 |
| 110000 1c | 41900 M6 | 68100 | 20 | 0 |
| 133000 B | 41900 M6 | 91100 | 21 | 0 |
| 82500 | 41900 M6 | 40600 | 22 | 0 |
| 86800 | 41900 M6 | 44900 | 23 | 0 |
| 89070 | 41900 M6 | 47170 | 24 | 0 |
| 70650 | 41900 M6 | 28750 | 25 | 0 |
| 72380 | 41900 M6 | 30480 | 26 | 0 |
| 58150 | 41900 M6 | 16250 | 27 | 0 |
| 71140 | 41900 M6 | 29240 | 28 | 0 |
| | | | | |
| 58800 | 42300 M6 | 16500 | 29 | 0 |
| 90400 | 42300 M6 | 48100 | 30 | 0 |
| 108000 | 42300 M6 | 65700 | 31 | 0 |
| 134000 1c | 42300 M6 | 91700 | 32 | 0 |
| 110000 1c | 42300 M6 | 67700 | 33 | 0 |
| 133000 B | 42300 M6 | 90700 | 34 | 0 |
| 82500 | 42300 M6 | 40200 | 35 | 0 |
| 86800 | 42300 M6 | 44500 | 36 | 0 |
| 89070 | 42300 M6 | 46770 | 37 | 0 |
| 70650 | 42300 M6 | 28350 | 38 | 0 |
| 72380 | 42300 M6 | 30080 | 39 | 0 |
| 58150 | 42300 M6 | 15850 | 40 | 0 |
| 71140 | 42300 M6 | 28840 | 41 | 0 |
| | | | | |
| 90400 | 58800 | 31600 | 42 | 0 |
| 108000 | 58800 | 49200 | 43 | 0 |

| | | | | |
|---|---|---|---|---|
| 134000 1c | 58800 | 75200 | 44 | 0 |
| 110000 1c | 58800 | 51200 | 45 | 0 |
| 133000 B | 58800 | 74200 | 46 | 0 |
| 82500 | 58800 | 23700 | 47 | 0 |
| 86800 | 58800 | 28000 | 48 | 0 |
| 89070 | 58800 | 30270 | 49 | 0 |
| 70650 | 58800 | 11850 | 50 | 0 |
| 72380 | 58800 | 13580 | 51 | 0 |
| 58150 | 58800 | -650 | 51 | 1 |
| 71140 | 58800 | 12340 | 52 | 1 |
| | | | | |
| 108000 | 90400 | 17600 | 53 | 1 |
| 134000 1c | 90400 | 43600 | 54 | 1 |
| 110000 1c | 90400 | 19600 | 55 | 1 |
| 133000 B | 90400 | 42600 | 56 | 1 |
| 82500 | 90400 | -7900 | 56 | 2 |
| 86800 | 90400 | -3600 | 56 | 3 |
| 89070 | 90400 | -1330 | 56 | 4 |
| 70650 | 90400 | -19750 | 56 | 5 |
| 72380 | 90400 | -18020 | 56 | 6 |
| 58150 | 90400 | -32250 | 56 | 7 |
| 71140 | 90400 | -19260 | 56 | 8 |
| | | | | |
| 134000 1c | 108000 | 26000 | 57 | 8 |
| 110000 1c | 108000 | 2000 | 58 | 8 |
| 133000 B | 108000 | 25000 | 59 | 8 |
| 82500 | 108000 | -25500 | 59 | 9 |
| 86800 | 108000 | -21200 | 59 | 10 |
| 89070 | 108000 | -18930 | 59 | 11 |
| 70650 | 108000 | -37350 | 59 | 12 |
| 72380 | 108000 | -35620 | 59 | 13 |
| 58150 | 108000 | -49850 | 59 | 14 |
| 71140 | 108000 | -36860 | 59 | 15 |
| | | | | |
| 110000 1c | 134000 1c | -24000 | 59 | 16 |
| 133000 B | 134000 1c | -1000 | 59 | 17 |
| 82500 | 134000 1c | -51500 | 59 | 18 |
| 86800 | 134000 1c | -47200 | 59 | 19 |
| 89070 | 134000 1c | -44930 | 59 | 20 |
| 70650 | 134000 1c | -63350 | 59 | 21 |
| 72380 | 134000 1c | -61620 | 59 | 22 |
| 58150 | 134000 1c | -75850 | 59 | 23 |
| 71140 | 134000 1c | -62860 | 59 | 24 |
| | | | | |
| 133000 B | 110000 1c | 23000 | 60 | 24 |
| 82500 | 110000 1c | -27500 | 60 | 25 |
| 86800 | 110000 1c | -23200 | 60 | 26 |
| 89070 | 110000 1c | -20930 | 60 | 27 |
| 70650 | 110000 1c | -39350 | 60 | 28 |
| 72380 | 110000 1c | -37620 | 60 | 29 |
| 58150 | 110000 1c | -51850 | 60 | 30 |
| 71140 | 110000 1c | -38860 | 60 | 31 |
| | | | | |
| 82500 | 133000 B | -50500 | 60 | 32 |
| 86800 | 133000 B | -46200 | 60 | 33 |
| 89070 | 133000 B | -43930 | 60 | 34 |
| 70650 | 133000 B | -62350 | 60 | 35 |

| | | | | |
|---|---|---|---|---|
| 72380 | 133000 B | -60620 | 60 | 36 |
| 58150 | 133000 B | -74850 | 60 | 37 |
| 71140 | 133000 B | -61860 | 60 | 38 |
| | | | | |
| 86800 | 82500 | 4300 | 61 | 38 |
| 89070 | 82500 | 6570 | 62 | 38 |
| 70650 | 82500 | -11850 | 62 | 39 |
| 72380 | 82500 | -10120 | 62 | 40 |
| 58150 | 82500 | -24350 | 62 | 41 |
| 71140 | 82500 | -11360 | 62 | 42 |
| | | | | |
| 89070 | 86800 | 2270 | 63 | 42 |
| 70650 | 86800 | -16150 | 63 | 43 |
| 72380 | 86800 | -14420 | 63 | 44 |
| 58150 | 86800 | -28650 | 63 | 45 |
| 71140 | 86800 | -15660 | 63 | 46 |
| | | | | |
| 70650 | 89070 | -18420 | 63 | 47 |
| 72380 | 89070 | -16690 | 63 | 48 |
| 58150 | 89070 | -30920 | 63 | 49 |
| 71140 | 89070 | -17930 | 63 | 50 |
| | | | | |
| 72380 | 70650 | 1730 | 64 | 50 |
| 58150 | 70650 | -12500 | 64 | 51 |
| 71140 | 70650 | 490 | 65 | 51 |
| | | | | |
| 58150 | 72380 | -14230 | 65 | 52 |
| 71140 | 72380 | -1240 | 65 | 53 |
| | | | | |
| 71140 | 58150 | 12990 | 66 | 53 |

S Statistic = 66 - 53 = 13

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 0
B = 18
C = 0

D = 0
E = 0
F = 2
a = 8880
b = 30240
c = 480
Group Variance = 492.333
Z-Score = 0.540819
Comparison Level at 95% confidence level = -1.65463 (downward trend)
0.540819 >= -1.65463 indicating no evidence of a downward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RWG-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 357 1c3c | 332 2c | Same Date | 0 | 0 |
| 291 | 332 2c | -41 | 0 | 1 |
| 362 | 332 2c | 30 | 1 | 1 |
| 411 | 332 2c | 79 | 2 | 1 |
| 465 | 332 2c | 133 | 3 | 1 |
| 545 1c | 332 2c | 213 | 4 | 1 |
| 522 1c | 332 2c | 190 | 5 | 1 |
| 319 | 332 2c | -13 | 5 | 2 |
| 1090 | 332 2c | 758 | 6 | 2 |
| 1872 | 332 2c | 1540 | 7 | 2 |
| 2787 | 332 2c | 2455 | 8 | 2 |
| | | | | |
| 291 | 357 1c3c | -66 | 8 | 3 |
| 362 | 357 1c3c | 5 | 9 | 3 |
| 411 | 357 1c3c | 54 | 10 | 3 |
| 465 | 357 1c3c | 108 | 11 | 3 |
| 545 1c | 357 1c3c | 188 | 12 | 3 |
| 522 1c | 357 1c3c | 165 | 13 | 3 |
| 319 | 357 1c3c | -38 | 13 | 4 |
| 1090 | 357 1c3c | 733 | 14 | 4 |
| 1872 | 357 1c3c | 1515 | 15 | 4 |
| 2787 | 357 1c3c | 2430 | 16 | 4 |
| | | | | |
| 362 | 291 | 71 | 17 | 4 |
| 411 | 291 | 120 | 18 | 4 |
| 465 | 291 | 174 | 19 | 4 |
| 545 1c | 291 | 254 | 20 | 4 |
| 522 1c | 291 | 231 | 21 | 4 |
| 319 | 291 | 28 | 22 | 4 |
| 1090 | 291 | 799 | 23 | 4 |
| 1872 | 291 | 1581 | 24 | 4 |
| 2787 | 291 | 2496 | 25 | 4 |
| | | | | |
| 411 | 362 | 49 | 26 | 4 |
| 465 | 362 | 103 | 27 | 4 |
| 545 1c | 362 | 183 | 28 | 4 |
| 522 1c | 362 | 160 | 29 | 4 |
| 319 | 362 | -43 | 29 | 5 |
| 1090 | 362 | 728 | 30 | 5 |
| 1872 | 362 | 1510 | 31 | 5 |
| 2787 | 362 | 2425 | 32 | 5 |
| | | | | |
| 465 | 411 | 54 | 33 | 5 |
| 545 1c | 411 | 134 | 34 | 5 |
| 522 1c | 411 | 111 | 35 | 5 |
| 319 | 411 | -92 | 35 | 6 |
| 1090 | 411 | 679 | 36 | 6 |

| | | | | |
|---|---|---|---|---|
| 1872 | 411 | 1461 | 37 | 6 |
| 2787 | 411 | 2376 | 38 | 6 |
| | | | | |
| 545 1c | 465 | 80 | 39 | 6 |
| 522 1c | 465 | 57 | 40 | 6 |
| 319 | 465 | -146 | 40 | 7 |
| 1090 | 465 | 625 | 41 | 7 |
| 1872 | 465 | 1407 | 42 | 7 |
| 2787 | 465 | 2322 | 43 | 7 |
| | | | | |
| 522 1c | 545 1c | -23 | 43 | 8 |
| 319 | 545 1c | -226 | 43 | 9 |
| 1090 | 545 1c | 545 | 44 | 9 |
| 1872 | 545 1c | 1327 | 45 | 9 |
| 2787 | 545 1c | 2242 | 46 | 9 |
| | | | | |
| 319 | 522 1c | -203 | 46 | 10 |
| 1090 | 522 1c | 568 | 47 | 10 |
| 1872 | 522 1c | 1350 | 48 | 10 |
| 2787 | 522 1c | 2265 | 49 | 10 |
| | | | | |
| 1090 | 319 | 771 | 50 | 10 |
| 1872 | 319 | 1553 | 51 | 10 |
| 2787 | 319 | 2468 | 52 | 10 |
| | | | | |
| 1872 | 1090 | 782 | 53 | 10 |
| 2787 | 1090 | 1697 | 54 | 10 |
| | | | | |
| 2787 | 1872 | 915 | 55 | 10 |

S Statistic = 55 - 10 = 45

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 11/1/2021 | 1 |
| 3/1/2022 | 1 |
| 3/1/2023 | 1 |
| 3/1/2024 | 1 |

There are 1 time periods with multiple data

A = 0
B = 18
C = 0
D = 0
E = 0
F = 2
a = 3828
b = 11880

c = 264
Group Variance = 211.667
Z-Score = 3.02431
Comparison Level at 95% confidence level = -1.65463 (downward trend)
3.02431 >= -1.65463 indicating no evidence of a downward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RWH-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 226000 | 234000 | Same Date | 0 | 0 |
| 378000 1c | 234000 | 144000 | 1 | 0 |
| 502000 | 234000 | 268000 | 2 | 0 |
| 406000 | 234000 | 172000 | 3 | 0 |
| 474000 M6 | 234000 | 240000 | 4 | 0 |
| 477000 | 234000 | 243000 | 5 | 0 |
| 618000 | 234000 | 384000 | 6 | 0 |
| 578000 | 234000 | 344000 | 7 | 0 |
| 388000 | 234000 | 154000 | 8 | 0 |
| 287000 EM1 | 234000 | 53000 | 9 | 0 |
| 328000 | 234000 | 94000 | 10 | 0 |
| 430500 | 234000 | 196500 | 11 | 0 |
| 397700 | 234000 | 163700 | 12 | 0 |
| 494000 | 234000 | 260000 | 13 | 0 |
| 638300 | 234000 | 404300 | 14 | 0 |
| | | | | |
| 378000 1c | 226000 | 152000 | 15 | 0 |
| 502000 | 226000 | 276000 | 16 | 0 |
| 406000 | 226000 | 180000 | 17 | 0 |
| 474000 M6 | 226000 | 248000 | 18 | 0 |
| 477000 | 226000 | 251000 | 19 | 0 |
| 618000 | 226000 | 392000 | 20 | 0 |
| 578000 | 226000 | 352000 | 21 | 0 |
| 388000 | 226000 | 162000 | 22 | 0 |
| 287000 EM1 | 226000 | 61000 | 23 | 0 |
| 328000 | 226000 | 102000 | 24 | 0 |
| 430500 | 226000 | 204500 | 25 | 0 |
| 397700 | 226000 | 171700 | 26 | 0 |
| 494000 | 226000 | 268000 | 27 | 0 |
| 638300 | 226000 | 412300 | 28 | 0 |
| | | | | |
| 502000 | 378000 1c | 124000 | 29 | 0 |
| 406000 | 378000 1c | 28000 | 30 | 0 |
| 474000 M6 | 378000 1c | 96000 | 31 | 0 |
| 477000 | 378000 1c | 99000 | 32 | 0 |
| 618000 | 378000 1c | 240000 | 33 | 0 |
| 578000 | 378000 1c | 200000 | 34 | 0 |
| 388000 | 378000 1c | 10000 | 35 | 0 |
| 287000 EM1 | 378000 1c | -91000 | 35 | 1 |
| 328000 | 378000 1c | -50000 | 35 | 2 |
| 430500 | 378000 1c | 52500 | 36 | 2 |
| 397700 | 378000 1c | 19700 | 37 | 2 |
| 494000 | 378000 1c | 116000 | 38 | 2 |
| 638300 | 378000 1c | 260300 | 39 | 2 |
| | | | | |
| 406000 | 502000 | -96000 | 39 | 3 |
| 474000 M6 | 502000 | -28000 | 39 | 4 |

| | | | | |
|---|---|---|---|---|
| 477000 | 502000 | -25000 | 39 | 5 |
| 618000 | 502000 | 116000 | 40 | 5 |
| 578000 | 502000 | 76000 | 41 | 5 |
| 388000 | 502000 | -114000 | 41 | 6 |
| 287000 EM1 | 502000 | -215000 | 41 | 7 |
| 328000 | 502000 | -174000 | 41 | 8 |
| 430500 | 502000 | -71500 | 41 | 9 |
| 397700 | 502000 | -104300 | 41 | 10 |
| 494000 | 502000 | -8000 | 41 | 11 |
| 638300 | 502000 | 136300 | 42 | 11 |
| | | | | |
| 474000 M6 | 406000 | 68000 | 43 | 11 |
| 477000 | 406000 | 71000 | 44 | 11 |
| 618000 | 406000 | 212000 | 45 | 11 |
| 578000 | 406000 | 172000 | 46 | 11 |
| 388000 | 406000 | -18000 | 46 | 12 |
| 287000 EM1 | 406000 | -119000 | 46 | 13 |
| 328000 | 406000 | -78000 | 46 | 14 |
| 430500 | 406000 | 24500 | 47 | 14 |
| 397700 | 406000 | -8300 | 47 | 15 |
| 494000 | 406000 | 88000 | 48 | 15 |
| 638300 | 406000 | 232300 | 49 | 15 |
| | | | | |
| 477000 | 474000 M6 | 3000 | 50 | 15 |
| 618000 | 474000 M6 | 144000 | 51 | 15 |
| 578000 | 474000 M6 | 104000 | 52 | 15 |
| 388000 | 474000 M6 | -86000 | 52 | 16 |
| 287000 EM1 | 474000 M6 | -187000 | 52 | 17 |
| 328000 | 474000 M6 | -146000 | 52 | 18 |
| 430500 | 474000 M6 | -43500 | 52 | 19 |
| 397700 | 474000 M6 | -76300 | 52 | 20 |
| 494000 | 474000 M6 | 20000 | 53 | 20 |
| 638300 | 474000 M6 | 164300 | 54 | 20 |
| | | | | |
| 618000 | 477000 | 141000 | 55 | 20 |
| 578000 | 477000 | 101000 | 56 | 20 |
| 388000 | 477000 | -89000 | 56 | 21 |
| 287000 EM1 | 477000 | -190000 | 56 | 22 |
| 328000 | 477000 | -149000 | 56 | 23 |
| 430500 | 477000 | -46500 | 56 | 24 |
| 397700 | 477000 | -79300 | 56 | 25 |
| 494000 | 477000 | 17000 | 57 | 25 |
| 638300 | 477000 | 161300 | 58 | 25 |
| | | | | |
| 578000 | 618000 | -40000 | 58 | 26 |
| 388000 | 618000 | -230000 | 58 | 27 |
| 287000 EM1 | 618000 | -331000 | 58 | 28 |
| 328000 | 618000 | -290000 | 58 | 29 |
| 430500 | 618000 | -187500 | 58 | 30 |
| 397700 | 618000 | -220300 | 58 | 31 |
| 494000 | 618000 | -124000 | 58 | 32 |
| 638300 | 618000 | 20300 | 59 | 32 |
| | | | | |
| 388000 | 578000 | -190000 | 59 | 33 |
| 287000 EM1 | 578000 | -291000 | 59 | 34 |
| 328000 | 578000 | -250000 | 59 | 35 |
| 430500 | 578000 | -147500 | 59 | 36 |

| | | | | |
|---|---|---|---|---|
| 397700 | 578000 | -180300 | 59 | 37 |
| 494000 | 578000 | -84000 | 59 | 38 |
| 638300 | 578000 | 60300 | 60 | 38 |
| | | | | |
| 287000 EM1 | 388000 | -101000 | 60 | 39 |
| 328000 | 388000 | -60000 | 60 | 40 |
| 430500 | 388000 | 42500 | 61 | 40 |
| 397700 | 388000 | 9700 | 62 | 40 |
| 494000 | 388000 | 106000 | 63 | 40 |
| 638300 | 388000 | 250300 | 64 | 40 |
| | | | | |
| 328000 | 287000 EM1 | 41000 | 65 | 40 |
| 430500 | 287000 EM1 | 143500 | 66 | 40 |
| 397700 | 287000 EM1 | 110700 | 67 | 40 |
| 494000 | 287000 EM1 | 207000 | 68 | 40 |
| 638300 | 287000 EM1 | 351300 | 69 | 40 |
| | | | | |
| 430500 | 328000 | 102500 | 70 | 40 |
| 397700 | 328000 | 69700 | 71 | 40 |
| 494000 | 328000 | 166000 | 72 | 40 |
| 638300 | 328000 | 310300 | 73 | 40 |
| | | | | |
| 397700 | 430500 | -32800 | 73 | 41 |
| 494000 | 430500 | 63500 | 74 | 41 |
| 638300 | 430500 | 207800 | 75 | 41 |
| | | | | |
| 494000 | 397700 | 96300 | 76 | 41 |
| 638300 | 397700 | 240600 | 77 | 41 |
| | | | | |
| 638300 | 494000 | 144300 | 78 | 41 |

S Statistic = 78 - 41 = 37

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 0
B = 18
C = 0

D = 0
E = 0
F = 2
a = 8880
b = 30240
c = 480
Group Variance = 492.333
Z-Score = 1.62246
Comparison Level at 95% confidence level = -1.65463 (downward trend)
1.62246 >= -1.65463 indicating no evidence of a downward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RWI-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 652000 | 632000 | Same Date | 0 | 0 |
| 519000 1c | 632000 | -113000 | 0 | 1 |
| 544000 | 632000 | -88000 | 0 | 2 |
| 875000 | 632000 | 243000 | 1 | 2 |
| 775000 | 632000 | 143000 | 2 | 2 |
| 542000 ML | 632000 | -90000 | 2 | 3 |
| 424000 P6 | 632000 | -208000 | 2 | 4 |
| 557800 | 632000 | -74200 | 2 | 5 |
| 563700 | 632000 | -68300 | 2 | 6 |
| | | | | |
| 519000 1c | 652000 | -133000 | 2 | 7 |
| 544000 | 652000 | -108000 | 2 | 8 |
| 875000 | 652000 | 223000 | 3 | 8 |
| 775000 | 652000 | 123000 | 4 | 8 |
| 542000 ML | 652000 | -110000 | 4 | 9 |
| 424000 P6 | 652000 | -228000 | 4 | 10 |
| 557800 | 652000 | -94200 | 4 | 11 |
| 563700 | 652000 | -88300 | 4 | 12 |
| | | | | |
| 544000 | 519000 1c | 25000 | 5 | 12 |
| 875000 | 519000 1c | 356000 | 6 | 12 |
| 775000 | 519000 1c | 256000 | 7 | 12 |
| 542000 ML | 519000 1c | 23000 | 8 | 12 |
| 424000 P6 | 519000 1c | -95000 | 8 | 13 |
| 557800 | 519000 1c | 38800 | 9 | 13 |
| 563700 | 519000 1c | 44700 | 10 | 13 |
| | | | | |
| 875000 | 544000 | 331000 | 11 | 13 |
| 775000 | 544000 | 231000 | 12 | 13 |
| 542000 ML | 544000 | -2000 | 12 | 14 |
| 424000 P6 | 544000 | -120000 | 12 | 15 |
| 557800 | 544000 | 13800 | 13 | 15 |
| 563700 | 544000 | 19700 | 14 | 15 |
| | | | | |
| 775000 | 875000 | -100000 | 14 | 16 |
| 542000 ML | 875000 | -333000 | 14 | 17 |
| 424000 P6 | 875000 | -451000 | 14 | 18 |
| 557800 | 875000 | -317200 | 14 | 19 |
| 563700 | 875000 | -311300 | 14 | 20 |
| | | | | |
| 542000 ML | 775000 | -233000 | 14 | 21 |
| 424000 P6 | 775000 | -351000 | 14 | 22 |
| 557800 | 775000 | -217200 | 14 | 23 |
| 563700 | 775000 | -211300 | 14 | 24 |
| | | | | |
| 424000 P6 | 542000 ML | -118000 | 14 | 25 |
| 557800 | 542000 ML | 15800 | 15 | 25 |

| | | | | |
|---|---|---|---|---|
| 563700 | 542000 ML | 21700 | 16 | 25 |
| 557800 | 424000 P6 | 133800 | 17 | 25 |
| 563700 | 424000 P6 | 139700 | 18 | 25 |
| 563700 | 557800 | 5900 | 19 | 25 |

S Statistic = 19 - 25 = -6

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 6/1/2021 | 1 |
| 3/1/2022 | 1 |
| 3/1/2023 | 1 |
| 3/1/2024 | 1 |

There are 1 time periods with multiple data

A = 0
B = 18
C = 0
D = 0
E = 0
F = 2
a = 2250
b = 6480
c = 180
Group Variance = 124
Z-Score = -0.449013
Comparison Level at 95% confidence level = -1.65463 (downward trend)
-0.449013 >= -1.65463 indicating no evidence of a downward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RWJ-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 3080 | 1580 1c | Same Date | 0 | 0 |
| 270 BM1 | 1580 1c | Same Date | 0 | 0 |
| 2150 1c | 1580 1c | 570 | 1 | 0 |
| 3140 | 1580 1c | 1560 | 2 | 0 |
| 3430 | 1580 1c | 1850 | 3 | 0 |
| 805 | 1580 1c | -775 | 3 | 1 |
| 744 | 1580 1c | -836 | 3 | 2 |
| 1060 | 1580 1c | -520 | 3 | 3 |
| 1990 | 1580 1c | 410 | 4 | 3 |
| 2840 | 1580 1c | 1260 | 5 | 3 |
| 6330 | 1580 1c | 4750 | 6 | 3 |
| 1325 | 1580 1c | -255 | 6 | 4 |
| 5894 | 1580 1c | 4314 | 7 | 4 |
| 6992 | 1580 1c | 5412 | 8 | 4 |
| 7502 | 1580 1c | 5922 | 9 | 4 |
| 3130 | 1580 1c | 1550 | 10 | 4 |
| | | | | |
| 270 BM1 | 3080 | Same Date | 10 | 4 |
| 2150 1c | 3080 | -930 | 10 | 5 |
| 3140 | 3080 | 60 | 11 | 5 |
| 3430 | 3080 | 350 | 12 | 5 |
| 805 | 3080 | -2275 | 12 | 6 |
| 744 | 3080 | -2336 | 12 | 7 |
| 1060 | 3080 | -2020 | 12 | 8 |
| 1990 | 3080 | -1090 | 12 | 9 |
| 2840 | 3080 | -240 | 12 | 10 |
| 6330 | 3080 | 3250 | 13 | 10 |
| 1325 | 3080 | -1755 | 13 | 11 |
| 5894 | 3080 | 2814 | 14 | 11 |
| 6992 | 3080 | 3912 | 15 | 11 |
| 7502 | 3080 | 4422 | 16 | 11 |
| 3130 | 3080 | 50 | 17 | 11 |
| | | | | |
| 2150 1c | 270 BM1 | 1880 | 18 | 11 |
| 3140 | 270 BM1 | 2870 | 19 | 11 |
| 3430 | 270 BM1 | 3160 | 20 | 11 |
| 805 | 270 BM1 | 535 | 21 | 11 |
| 744 | 270 BM1 | 474 | 22 | 11 |
| 1060 | 270 BM1 | 790 | 23 | 11 |
| 1990 | 270 BM1 | 1720 | 24 | 11 |
| 2840 | 270 BM1 | 2570 | 25 | 11 |
| 6330 | 270 BM1 | 6060 | 26 | 11 |
| 1325 | 270 BM1 | 1055 | 27 | 11 |
| 5894 | 270 BM1 | 5624 | 28 | 11 |
| 6992 | 270 BM1 | 6722 | 29 | 11 |
| 7502 | 270 BM1 | 7232 | 30 | 11 |
| 3130 | 270 BM1 | 2860 | 31 | 11 |

| | | | | |
|---|---|---|---|---|
| 3140 | 2150 1c | 990 | 32 | 11 |
| 3430 | 2150 1c | 1280 | 33 | 11 |
| 805 | 2150 1c | -1345 | 33 | 12 |
| 744 | 2150 1c | -1406 | 33 | 13 |
| 1060 | 2150 1c | -1090 | 33 | 14 |
| 1990 | 2150 1c | -160 | 33 | 15 |
| 2840 | 2150 1c | 690 | 34 | 15 |
| 6330 | 2150 1c | 4180 | 35 | 15 |
| 1325 | 2150 1c | -825 | 35 | 16 |
| 5894 | 2150 1c | 3744 | 36 | 16 |
| 6992 | 2150 1c | 4842 | 37 | 16 |
| 7502 | 2150 1c | 5352 | 38 | 16 |
| 3130 | 2150 1c | 980 | 39 | 16 |
| | | | | |
| 3430 | 3140 | 290 | 40 | 16 |
| 805 | 3140 | -2335 | 40 | 17 |
| 744 | 3140 | -2396 | 40 | 18 |
| 1060 | 3140 | -2080 | 40 | 19 |
| 1990 | 3140 | -1150 | 40 | 20 |
| 2840 | 3140 | -300 | 40 | 21 |
| 6330 | 3140 | 3190 | 41 | 21 |
| 1325 | 3140 | -1815 | 41 | 22 |
| 5894 | 3140 | 2754 | 42 | 22 |
| 6992 | 3140 | 3852 | 43 | 22 |
| 7502 | 3140 | 4362 | 44 | 22 |
| 3130 | 3140 | -10 | 44 | 23 |
| | | | | |
| 805 | 3430 | -2625 | 44 | 24 |
| 744 | 3430 | -2686 | 44 | 25 |
| 1060 | 3430 | -2370 | 44 | 26 |
| 1990 | 3430 | -1440 | 44 | 27 |
| 2840 | 3430 | -590 | 44 | 28 |
| 6330 | 3430 | 2900 | 45 | 28 |
| 1325 | 3430 | -2105 | 45 | 29 |
| 5894 | 3430 | 2464 | 46 | 29 |
| 6992 | 3430 | 3562 | 47 | 29 |
| 7502 | 3430 | 4072 | 48 | 29 |
| 3130 | 3430 | -300 | 48 | 30 |
| | | | | |
| 744 | 805 | -61 | 48 | 31 |
| 1060 | 805 | 255 | 49 | 31 |
| 1990 | 805 | 1185 | 50 | 31 |
| 2840 | 805 | 2035 | 51 | 31 |
| 6330 | 805 | 5525 | 52 | 31 |
| 1325 | 805 | 520 | 53 | 31 |
| 5894 | 805 | 5089 | 54 | 31 |
| 6992 | 805 | 6187 | 55 | 31 |
| 7502 | 805 | 6697 | 56 | 31 |
| 3130 | 805 | 2325 | 57 | 31 |
| | | | | |
| 1060 | 744 | 316 | 58 | 31 |
| 1990 | 744 | 1246 | 59 | 31 |
| 2840 | 744 | 2096 | 60 | 31 |
| 6330 | 744 | 5586 | 61 | 31 |
| 1325 | 744 | 581 | 62 | 31 |
| 5894 | 744 | 5150 | 63 | 31 |

| | | | | |
|---|---|---|---|---|
| 6992 | 744 | 6248 | 64 | 31 |
| 7502 | 744 | 6758 | 65 | 31 |
| 3130 | 744 | 2386 | 66 | 31 |
| | | | | |
| 1990 | 1060 | 930 | 67 | 31 |
| 2840 | 1060 | 1780 | 68 | 31 |
| 6330 | 1060 | 5270 | 69 | 31 |
| 1325 | 1060 | 265 | 70 | 31 |
| 5894 | 1060 | 4834 | 71 | 31 |
| 6992 | 1060 | 5932 | 72 | 31 |
| 7502 | 1060 | 6442 | 73 | 31 |
| 3130 | 1060 | 2070 | 74 | 31 |
| | | | | |
| 2840 | 1990 | 850 | 75 | 31 |
| 6330 | 1990 | 4340 | 76 | 31 |
| 1325 | 1990 | -665 | 76 | 32 |
| 5894 | 1990 | 3904 | 77 | 32 |
| 6992 | 1990 | 5002 | 78 | 32 |
| 7502 | 1990 | 5512 | 79 | 32 |
| 3130 | 1990 | 1140 | 80 | 32 |
| | | | | |
| 6330 | 2840 | 3490 | 81 | 32 |
| 1325 | 2840 | -1515 | 81 | 33 |
| 5894 | 2840 | 3054 | 82 | 33 |
| 6992 | 2840 | 4152 | 83 | 33 |
| 7502 | 2840 | 4662 | 84 | 33 |
| 3130 | 2840 | 290 | 85 | 33 |
| | | | | |
| 1325 | 6330 | -5005 | 85 | 34 |
| 5894 | 6330 | -436 | 85 | 35 |
| 6992 | 6330 | 662 | 86 | 35 |
| 7502 | 6330 | 1172 | 87 | 35 |
| 3130 | 6330 | -3200 | 87 | 36 |
| | | | | |
| 5894 | 1325 | 4569 | 88 | 36 |
| 6992 | 1325 | 5667 | 89 | 36 |
| 7502 | 1325 | 6177 | 90 | 36 |
| 3130 | 1325 | 1805 | 91 | 36 |
| | | | | |
| 6992 | 5894 | 1098 | 92 | 36 |
| 7502 | 5894 | 1608 | 93 | 36 |
| 3130 | 5894 | -2764 | 93 | 37 |
| | | | | |
| 7502 | 6992 | 510 | 94 | 37 |
| 3130 | 6992 | -3862 | 94 | 38 |
| | | | | |
| 3130 | 7502 | -4372 | 94 | 39 |

S Statistic = 94 - 39 = 55

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 5/1/2019 | 3 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |

| | |
|---|---|
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

---

A = 0
B = 66
C = 0
D = 6
E = 0
F = 6
a = 10608
b = 36720
c = 544
Group Variance = 585.667
Z-Score = 2.23135
Comparison Level at 95% confidence level = -1.65463 (downward trend)
2.23135 >= -1.65463 indicating no evidence of a downward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RWK-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 21300 | 21100 1c | Same Date | 0 | 0 |
| 25100 1c | 21100 1c | 4000 | 1 | 0 |
| 21600 | 21100 1c | 500 | 2 | 0 |
| 30300 | 21100 1c | 9200 | 3 | 0 |
| 21400 | 21100 1c | 300 | 4 | 0 |
| 36800 | 21100 1c | 15700 | 5 | 0 |
| 26500 | 21100 1c | 5400 | 6 | 0 |
| 34600 | 21100 1c | 13500 | 7 | 0 |
| 23700 | 21100 1c | 2600 | 8 | 0 |
| 19600 | 21100 1c | -1500 | 8 | 1 |
| 16940 | 21100 1c | -4160 | 8 | 2 |
| 15630 | 21100 1c | -5470 | 8 | 3 |
| 22520 | 21100 1c | 1420 | 9 | 3 |
| 38260 | 21100 1c | 17160 | 10 | 3 |
| 35070 | 21100 1c | 13970 | 11 | 3 |
| | | | | |
| 25100 1c | 21300 | 3800 | 12 | 3 |
| 21600 | 21300 | 300 | 13 | 3 |
| 30300 | 21300 | 9000 | 14 | 3 |
| 21400 | 21300 | 100 | 15 | 3 |
| 36800 | 21300 | 15500 | 16 | 3 |
| 26500 | 21300 | 5200 | 17 | 3 |
| 34600 | 21300 | 13300 | 18 | 3 |
| 23700 | 21300 | 2400 | 19 | 3 |
| 19600 | 21300 | -1700 | 19 | 4 |
| 16940 | 21300 | -4360 | 19 | 5 |
| 15630 | 21300 | -5670 | 19 | 6 |
| 22520 | 21300 | 1220 | 20 | 6 |
| 38260 | 21300 | 16960 | 21 | 6 |
| 35070 | 21300 | 13770 | 22 | 6 |
| | | | | |
| 21600 | 25100 1c | -3500 | 22 | 7 |
| 30300 | 25100 1c | 5200 | 23 | 7 |
| 21400 | 25100 1c | -3700 | 23 | 8 |
| 36800 | 25100 1c | 11700 | 24 | 8 |
| 26500 | 25100 1c | 1400 | 25 | 8 |
| 34600 | 25100 1c | 9500 | 26 | 8 |
| 23700 | 25100 1c | -1400 | 26 | 9 |
| 19600 | 25100 1c | -5500 | 26 | 10 |
| 16940 | 25100 1c | -8160 | 26 | 11 |
| 15630 | 25100 1c | -9470 | 26 | 12 |
| 22520 | 25100 1c | -2580 | 26 | 13 |
| 38260 | 25100 1c | 13160 | 27 | 13 |
| 35070 | 25100 1c | 9970 | 28 | 13 |
| | | | | |
| 30300 | 21600 | 8700 | 29 | 13 |
| 21400 | 21600 | -200 | 29 | 14 |

| | | | | |
|---|---|---|---|---|
| 36800 | 21600 | 15200 | 30 | 14 |
| 26500 | 21600 | 4900 | 31 | 14 |
| 34600 | 21600 | 13000 | 32 | 14 |
| 23700 | 21600 | 2100 | 33 | 14 |
| 19600 | 21600 | -2000 | 33 | 15 |
| 16940 | 21600 | -4660 | 33 | 16 |
| 15630 | 21600 | -5970 | 33 | 17 |
| 22520 | 21600 | 920 | 34 | 17 |
| 38260 | 21600 | 16660 | 35 | 17 |
| 35070 | 21600 | 13470 | 36 | 17 |
| | | | | |
| 21400 | 30300 | -8900 | 36 | 18 |
| 36800 | 30300 | 6500 | 37 | 18 |
| 26500 | 30300 | -3800 | 37 | 19 |
| 34600 | 30300 | 4300 | 38 | 19 |
| 23700 | 30300 | -6600 | 38 | 20 |
| 19600 | 30300 | -10700 | 38 | 21 |
| 16940 | 30300 | -13360 | 38 | 22 |
| 15630 | 30300 | -14670 | 38 | 23 |
| 22520 | 30300 | -7780 | 38 | 24 |
| 38260 | 30300 | 7960 | 39 | 24 |
| 35070 | 30300 | 4770 | 40 | 24 |
| | | | | |
| 36800 | 21400 | 15400 | 41 | 24 |
| 26500 | 21400 | 5100 | 42 | 24 |
| 34600 | 21400 | 13200 | 43 | 24 |
| 23700 | 21400 | 2300 | 44 | 24 |
| 19600 | 21400 | -1800 | 44 | 25 |
| 16940 | 21400 | -4460 | 44 | 26 |
| 15630 | 21400 | -5770 | 44 | 27 |
| 22520 | 21400 | 1120 | 45 | 27 |
| 38260 | 21400 | 16860 | 46 | 27 |
| 35070 | 21400 | 13670 | 47 | 27 |
| | | | | |
| 26500 | 36800 | -10300 | 47 | 28 |
| 34600 | 36800 | -2200 | 47 | 29 |
| 23700 | 36800 | -13100 | 47 | 30 |
| 19600 | 36800 | -17200 | 47 | 31 |
| 16940 | 36800 | -19860 | 47 | 32 |
| 15630 | 36800 | -21170 | 47 | 33 |
| 22520 | 36800 | -14280 | 47 | 34 |
| 38260 | 36800 | 1460 | 48 | 34 |
| 35070 | 36800 | -1730 | 48 | 35 |
| | | | | |
| 34600 | 26500 | 8100 | 49 | 35 |
| 23700 | 26500 | -2800 | 49 | 36 |
| 19600 | 26500 | -6900 | 49 | 37 |
| 16940 | 26500 | -9560 | 49 | 38 |
| 15630 | 26500 | -10870 | 49 | 39 |
| 22520 | 26500 | -3980 | 49 | 40 |
| 38260 | 26500 | 11760 | 50 | 40 |
| 35070 | 26500 | 8570 | 51 | 40 |
| | | | | |
| 23700 | 34600 | -10900 | 51 | 41 |
| 19600 | 34600 | -15000 | 51 | 42 |
| 16940 | 34600 | -17660 | 51 | 43 |
| 15630 | 34600 | -18970 | 51 | 44 |

| | | | | |
|---|---|---|---|---|
| 22520 | 34600 | -12080 | 51 | 45 |
| 38260 | 34600 | 3660 | 52 | 45 |
| 35070 | 34600 | 470 | 53 | 45 |
| | | | | |
| 19600 | 23700 | -4100 | 53 | 46 |
| 16940 | 23700 | -6760 | 53 | 47 |
| 15630 | 23700 | -8070 | 53 | 48 |
| 22520 | 23700 | -1180 | 53 | 49 |
| 38260 | 23700 | 14560 | 54 | 49 |
| 35070 | 23700 | 11370 | 55 | 49 |
| | | | | |
| 16940 | 19600 | -2660 | 55 | 50 |
| 15630 | 19600 | -3970 | 55 | 51 |
| 22520 | 19600 | 2920 | 56 | 51 |
| 38260 | 19600 | 18660 | 57 | 51 |
| 35070 | 19600 | 15470 | 58 | 51 |
| | | | | |
| 15630 | 16940 | -1310 | 58 | 52 |
| 22520 | 16940 | 5580 | 59 | 52 |
| 38260 | 16940 | 21320 | 60 | 52 |
| 35070 | 16940 | 18130 | 61 | 52 |
| | | | | |
| 22520 | 15630 | 6890 | 62 | 52 |
| 38260 | 15630 | 22630 | 63 | 52 |
| 35070 | 15630 | 19440 | 64 | 52 |
| | | | | |
| 38260 | 22520 | 15740 | 65 | 52 |
| 35070 | 22520 | 12550 | 66 | 52 |
| | | | | |
| 35070 | 38260 | -3190 | 66 | 53 |

S Statistic = 66 - 53 = 13

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 0
B = 18
C = 0

D = 0
E = 0
F = 2
a = 8880
b = 30240
c = 480
Group Variance = 492.333
Z-Score = 0.540819
Comparison Level at 95% confidence level = -1.65463 (downward trend)
0.540819 >= -1.65463 indicating no evidence of a downward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RWL-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 163000 | 169000 M6 | Same Date | 0 | 0 |
| 142000 1c | 169000 M6 | -27000 | 0 | 1 |
| 124000 | 169000 M6 | -45000 | 0 | 2 |
| 121000 | 169000 M6 | -48000 | 0 | 3 |
| 96300 | 169000 M6 | -72700 | 0 | 4 |
| 116000 2c | 169000 M6 | -53000 | 0 | 5 |
| 126000 | 169000 M6 | -43000 | 0 | 6 |
| 110000 | 169000 M6 | -59000 | 0 | 7 |
| 97000 | 169000 M6 | -72000 | 0 | 8 |
| 75200 | 169000 M6 | -93800 | 0 | 9 |
| 79440 | 169000 M6 | -89560 | 0 | 10 |
| 76850 | 169000 M6 | -92150 | 0 | 11 |
| 88270 | 169000 M6 | -80730 | 0 | 12 |
| 47080 | 169000 M6 | -121920 | 0 | 13 |
| 101000 | 169000 M6 | -68000 | 0 | 14 |
| | | | | |
| 142000 1c | 163000 | -21000 | 0 | 15 |
| 124000 | 163000 | -39000 | 0 | 16 |
| 121000 | 163000 | -42000 | 0 | 17 |
| 96300 | 163000 | -66700 | 0 | 18 |
| 116000 2c | 163000 | -47000 | 0 | 19 |
| 126000 | 163000 | -37000 | 0 | 20 |
| 110000 | 163000 | -53000 | 0 | 21 |
| 97000 | 163000 | -66000 | 0 | 22 |
| 75200 | 163000 | -87800 | 0 | 23 |
| 79440 | 163000 | -83560 | 0 | 24 |
| 76850 | 163000 | -86150 | 0 | 25 |
| 88270 | 163000 | -74730 | 0 | 26 |
| 47080 | 163000 | -115920 | 0 | 27 |
| 101000 | 163000 | -62000 | 0 | 28 |
| | | | | |
| 124000 | 142000 1c | -18000 | 0 | 29 |
| 121000 | 142000 1c | -21000 | 0 | 30 |
| 96300 | 142000 1c | -45700 | 0 | 31 |
| 116000 2c | 142000 1c | -26000 | 0 | 32 |
| 126000 | 142000 1c | -16000 | 0 | 33 |
| 110000 | 142000 1c | -32000 | 0 | 34 |
| 97000 | 142000 1c | -45000 | 0 | 35 |
| 75200 | 142000 1c | -66800 | 0 | 36 |
| 79440 | 142000 1c | -62560 | 0 | 37 |
| 76850 | 142000 1c | -65150 | 0 | 38 |
| 88270 | 142000 1c | -53730 | 0 | 39 |
| 47080 | 142000 1c | -94920 | 0 | 40 |
| 101000 | 142000 1c | -41000 | 0 | 41 |
| | | | | |
| 121000 | 124000 | -3000 | 0 | 42 |
| 96300 | 124000 | -27700 | 0 | 43 |

| | | | | |
|---|---|---|---|---|
| 116000 2c | 124000 | -8000 | 0 | 44 |
| 126000 | 124000 | 2000 | 1 | 44 |
| 110000 | 124000 | -14000 | 1 | 45 |
| 97000 | 124000 | -27000 | 1 | 46 |
| 75200 | 124000 | -48800 | 1 | 47 |
| 79440 | 124000 | -44560 | 1 | 48 |
| 76850 | 124000 | -47150 | 1 | 49 |
| 88270 | 124000 | -35730 | 1 | 50 |
| 47080 | 124000 | -76920 | 1 | 51 |
| 101000 | 124000 | -23000 | 1 | 52 |
| | | | | |
| 96300 | 121000 | -24700 | 1 | 53 |
| 116000 2c | 121000 | -5000 | 1 | 54 |
| 126000 | 121000 | 5000 | 2 | 54 |
| 110000 | 121000 | -11000 | 2 | 55 |
| 97000 | 121000 | -24000 | 2 | 56 |
| 75200 | 121000 | -45800 | 2 | 57 |
| 79440 | 121000 | -41560 | 2 | 58 |
| 76850 | 121000 | -44150 | 2 | 59 |
| 88270 | 121000 | -32730 | 2 | 60 |
| 47080 | 121000 | -73920 | 2 | 61 |
| 101000 | 121000 | -20000 | 2 | 62 |
| | | | | |
| 116000 2c | 96300 | 19700 | 3 | 62 |
| 126000 | 96300 | 29700 | 4 | 62 |
| 110000 | 96300 | 13700 | 5 | 62 |
| 97000 | 96300 | 700 | 6 | 62 |
| 75200 | 96300 | -21100 | 6 | 63 |
| 79440 | 96300 | -16860 | 6 | 64 |
| 76850 | 96300 | -19450 | 6 | 65 |
| 88270 | 96300 | -8030 | 6 | 66 |
| 47080 | 96300 | -49220 | 6 | 67 |
| 101000 | 96300 | 4700 | 7 | 67 |
| | | | | |
| 126000 | 116000 2c | 10000 | 8 | 67 |
| 110000 | 116000 2c | -6000 | 8 | 68 |
| 97000 | 116000 2c | -19000 | 8 | 69 |
| 75200 | 116000 2c | -40800 | 8 | 70 |
| 79440 | 116000 2c | -36560 | 8 | 71 |
| 76850 | 116000 2c | -39150 | 8 | 72 |
| 88270 | 116000 2c | -27730 | 8 | 73 |
| 47080 | 116000 2c | -68920 | 8 | 74 |
| 101000 | 116000 2c | -15000 | 8 | 75 |
| | | | | |
| 110000 | 126000 | -16000 | 8 | 76 |
| 97000 | 126000 | -29000 | 8 | 77 |
| 75200 | 126000 | -50800 | 8 | 78 |
| 79440 | 126000 | -46560 | 8 | 79 |
| 76850 | 126000 | -49150 | 8 | 80 |
| 88270 | 126000 | -37730 | 8 | 81 |
| 47080 | 126000 | -78920 | 8 | 82 |
| 101000 | 126000 | -25000 | 8 | 83 |
| | | | | |
| 97000 | 110000 | -13000 | 8 | 84 |
| 75200 | 110000 | -34800 | 8 | 85 |
| 79440 | 110000 | -30560 | 8 | 86 |
| 76850 | 110000 | -33150 | 8 | 87 |

| | | | | |
|---|---|---|---|---|
| 88270 | 110000 | -21730 | 8 | 88 |
| 47080 | 110000 | -62920 | 8 | 89 |
| 101000 | 110000 | -9000 | 8 | 90 |
| | | | | |
| 75200 | 97000 | -21800 | 8 | 91 |
| 79440 | 97000 | -17560 | 8 | 92 |
| 76850 | 97000 | -20150 | 8 | 93 |
| 88270 | 97000 | -8730 | 8 | 94 |
| 47080 | 97000 | -49920 | 8 | 95 |
| 101000 | 97000 | 4000 | 9 | 95 |
| | | | | |
| 79440 | 75200 | 4240 | 10 | 95 |
| 76850 | 75200 | 1650 | 11 | 95 |
| 88270 | 75200 | 13070 | 12 | 95 |
| 47080 | 75200 | -28120 | 12 | 96 |
| 101000 | 75200 | 25800 | 13 | 96 |
| | | | | |
| 76850 | 79440 | -2590 | 13 | 97 |
| 88270 | 79440 | 8830 | 14 | 97 |
| 47080 | 79440 | -32360 | 14 | 98 |
| 101000 | 79440 | 21560 | 15 | 98 |
| | | | | |
| 88270 | 76850 | 11420 | 16 | 98 |
| 47080 | 76850 | -29770 | 16 | 99 |
| 101000 | 76850 | 24150 | 17 | 99 |
| | | | | |
| 47080 | 88270 | -41190 | 17 | 100 |
| 101000 | 88270 | 12730 | 18 | 100 |
| | | | | |
| 101000 | 47080 | 53920 | 19 | 100 |

S Statistic = 19 - 100 = -81

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 0
B = 18
C = 0

D = 0
E = 0
F = 2
a = 8880
b = 30240
c = 480
Group Variance = 492.333
Z-Score = -3.60546
Comparison Level at 95% confidence level = -1.65463 (downward trend)
**-3.60546 < -1.65463 indicating a downward trend**

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RWM-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 165000 | 162000 | Same Date | 0 | 0 |
| 159000 | 162000 | -3000 | 0 | 1 |
| 152000 M61c | 162000 | -10000 | 0 | 2 |
| 139000 | 162000 | -23000 | 0 | 3 |
| 128000 | 162000 | -34000 | 0 | 4 |
| 138000 2c | 162000 | -24000 | 0 | 5 |
| 125000 | 162000 | -37000 | 0 | 6 |
| 150000 | 162000 | -12000 | 0 | 7 |
| 94900 | 162000 | -67100 | 0 | 8 |
| 98340 | 162000 | -63660 | 0 | 9 |
| 84760 | 162000 | -77240 | 0 | 10 |
| | | | | |
| 159000 | 165000 | -6000 | 0 | 11 |
| 152000 M61c | 165000 | -13000 | 0 | 12 |
| 139000 | 165000 | -26000 | 0 | 13 |
| 128000 | 165000 | -37000 | 0 | 14 |
| 138000 2c | 165000 | -27000 | 0 | 15 |
| 125000 | 165000 | -40000 | 0 | 16 |
| 150000 | 165000 | -15000 | 0 | 17 |
| 94900 | 165000 | -70100 | 0 | 18 |
| 98340 | 165000 | -66660 | 0 | 19 |
| 84760 | 165000 | -80240 | 0 | 20 |
| | | | | |
| 152000 M61c | 159000 | -7000 | 0 | 21 |
| 139000 | 159000 | -20000 | 0 | 22 |
| 128000 | 159000 | -31000 | 0 | 23 |
| 138000 2c | 159000 | -21000 | 0 | 24 |
| 125000 | 159000 | -34000 | 0 | 25 |
| 150000 | 159000 | -9000 | 0 | 26 |
| 94900 | 159000 | -64100 | 0 | 27 |
| 98340 | 159000 | -60660 | 0 | 28 |
| 84760 | 159000 | -74240 | 0 | 29 |
| | | | | |
| 139000 | 152000 M61c | -13000 | 0 | 30 |
| 128000 | 152000 M61c | -24000 | 0 | 31 |
| 138000 2c | 152000 M61c | -14000 | 0 | 32 |
| 125000 | 152000 M61c | -27000 | 0 | 33 |
| 150000 | 152000 M61c | -2000 | 0 | 34 |
| 94900 | 152000 M61c | -57100 | 0 | 35 |
| 98340 | 152000 M61c | -53660 | 0 | 36 |
| 84760 | 152000 M61c | -67240 | 0 | 37 |
| | | | | |
| 128000 | 139000 | -11000 | 0 | 38 |
| 138000 2c | 139000 | -1000 | 0 | 39 |
| 125000 | 139000 | -14000 | 0 | 40 |
| 150000 | 139000 | 11000 | 1 | 40 |
| 94900 | 139000 | -44100 | 1 | 41 |

| | | | | |
|---|---|---|---|---|
| 98340 | 139000 | -40660 | 1 | 42 |
| 84760 | 139000 | -54240 | 1 | 43 |
| | | | | |
| 138000 2c | 128000 | 10000 | 2 | 43 |
| 125000 | 128000 | -3000 | 2 | 44 |
| 150000 | 128000 | 22000 | 3 | 44 |
| 94900 | 128000 | -33100 | 3 | 45 |
| 98340 | 128000 | -29660 | 3 | 46 |
| 84760 | 128000 | -43240 | 3 | 47 |
| | | | | |
| 125000 | 138000 2c | -13000 | 3 | 48 |
| 150000 | 138000 2c | 12000 | 4 | 48 |
| 94900 | 138000 2c | -43100 | 4 | 49 |
| 98340 | 138000 2c | -39660 | 4 | 50 |
| 84760 | 138000 2c | -53240 | 4 | 51 |
| | | | | |
| 150000 | 125000 | 25000 | 5 | 51 |
| 94900 | 125000 | -30100 | 5 | 52 |
| 98340 | 125000 | -26660 | 5 | 53 |
| 84760 | 125000 | -40240 | 5 | 54 |
| | | | | |
| 94900 | 150000 | -55100 | 5 | 55 |
| 98340 | 150000 | -51660 | 5 | 56 |
| 84760 | 150000 | -65240 | 5 | 57 |
| | | | | |
| 98340 | 94900 | 3440 | 6 | 57 |
| 84760 | 94900 | -10140 | 6 | 58 |
| | | | | |
| 84760 | 98340 | -13580 | 6 | 59 |

S Statistic = 6 - 59 = -53

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 3/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 0
B = 18
C = 0
D = 0
E = 0
F = 2
a = 3828
b = 11880

c = 264
Group Variance = 211.667
Z-Score = -3.57419
Comparison Level at 95% confidence level = -1.65463 (downward trend)
**-3.57419 < -1.65463 indicating a downward trend**

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RWO-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 249000 M62c3c | 243000 M61c4c | Same Date | 0 | 0 |
| 214000 1c | 243000 M61c4c | -29000 | 0 | 1 |
| 204000 | 243000 M61c4c | -39000 | 0 | 2 |
| 202000 | 243000 M61c4c | -41000 | 0 | 3 |
| 223000 | 243000 M61c4c | -20000 | 0 | 4 |
| 204000 3c | 243000 M61c4c | -39000 | 0 | 5 |
| 155000 | 243000 M61c4c | -88000 | 0 | 6 |
| 208000 | 243000 M61c4c | -35000 | 0 | 7 |
| ND<100 U | 243000 M61c4c | -242900 | 0 | 8 |
| 1380 | 243000 M61c4c | -241620 | 0 | 9 |
| 114000 | 243000 M61c4c | -129000 | 0 | 10 |
| 180000 | 243000 M61c4c | -63000 | 0 | 11 |
| 149200 | 243000 M61c4c | -93800 | 0 | 12 |
| 182300 | 243000 M61c4c | -60700 | 0 | 13 |
| 147600 | 243000 M61c4c | -95400 | 0 | 14 |
| 318800 | 243000 M61c4c | 75800 | 1 | 14 |
| | | | | |
| 214000 1c | 249000 M62c3c | -35000 | 1 | 15 |
| 204000 | 249000 M62c3c | -45000 | 1 | 16 |
| 202000 | 249000 M62c3c | -47000 | 1 | 17 |
| 223000 | 249000 M62c3c | -26000 | 1 | 18 |
| 204000 3c | 249000 M62c3c | -45000 | 1 | 19 |
| 155000 | 249000 M62c3c | -94000 | 1 | 20 |
| 208000 | 249000 M62c3c | -41000 | 1 | 21 |
| ND<100 U | 249000 M62c3c | -248900 | 1 | 22 |
| 1380 | 249000 M62c3c | -247620 | 1 | 23 |
| 114000 | 249000 M62c3c | -135000 | 1 | 24 |
| 180000 | 249000 M62c3c | -69000 | 1 | 25 |
| 149200 | 249000 M62c3c | -99800 | 1 | 26 |
| 182300 | 249000 M62c3c | -66700 | 1 | 27 |
| 147600 | 249000 M62c3c | -101400 | 1 | 28 |
| 318800 | 249000 M62c3c | 69800 | 2 | 28 |
| | | | | |
| 204000 | 214000 1c | -10000 | 2 | 29 |
| 202000 | 214000 1c | -12000 | 2 | 30 |
| 223000 | 214000 1c | 9000 | 3 | 30 |
| 204000 3c | 214000 1c | -10000 | 3 | 31 |
| 155000 | 214000 1c | -59000 | 3 | 32 |
| 208000 | 214000 1c | -6000 | 3 | 33 |
| ND<100 U | 214000 1c | -213900 | 3 | 34 |
| 1380 | 214000 1c | -212620 | 3 | 35 |
| 114000 | 214000 1c | -100000 | 3 | 36 |
| 180000 | 214000 1c | -34000 | 3 | 37 |
| 149200 | 214000 1c | -64800 | 3 | 38 |
| 182300 | 214000 1c | -31700 | 3 | 39 |
| 147600 | 214000 1c | -66400 | 3 | 40 |
| 318800 | 214000 1c | 104800 | 4 | 40 |

| | | | | |
|---|---|---|---|---|
| 202000 | 204000 | -2000 | 4 | 41 |
| 223000 | 204000 | 19000 | 5 | 41 |
| 204000 3c | 204000 | 0 | 5 | 41 |
| 155000 | 204000 | -49000 | 5 | 42 |
| 208000 | 204000 | 4000 | 6 | 42 |
| ND<100 U | 204000 | -203900 | 6 | 43 |
| 1380 | 204000 | -202620 | 6 | 44 |
| 114000 | 204000 | -90000 | 6 | 45 |
| 180000 | 204000 | -24000 | 6 | 46 |
| 149200 | 204000 | -54800 | 6 | 47 |
| 182300 | 204000 | -21700 | 6 | 48 |
| 147600 | 204000 | -56400 | 6 | 49 |
| 318800 | 204000 | 114800 | 7 | 49 |
| | | | | |
| 223000 | 202000 | 21000 | 8 | 49 |
| 204000 3c | 202000 | 2000 | 9 | 49 |
| 155000 | 202000 | -47000 | 9 | 50 |
| 208000 | 202000 | 6000 | 10 | 50 |
| ND<100 U | 202000 | -201900 | 10 | 51 |
| 1380 | 202000 | -200620 | 10 | 52 |
| 114000 | 202000 | -88000 | 10 | 53 |
| 180000 | 202000 | -22000 | 10 | 54 |
| 149200 | 202000 | -52800 | 10 | 55 |
| 182300 | 202000 | -19700 | 10 | 56 |
| 147600 | 202000 | -54400 | 10 | 57 |
| 318800 | 202000 | 116800 | 11 | 57 |
| | | | | |
| 204000 3c | 223000 | -19000 | 11 | 58 |
| 155000 | 223000 | -68000 | 11 | 59 |
| 208000 | 223000 | -15000 | 11 | 60 |
| ND<100 U | 223000 | -222900 | 11 | 61 |
| 1380 | 223000 | -221620 | 11 | 62 |
| 114000 | 223000 | -109000 | 11 | 63 |
| 180000 | 223000 | -43000 | 11 | 64 |
| 149200 | 223000 | -73800 | 11 | 65 |
| 182300 | 223000 | -40700 | 11 | 66 |
| 147600 | 223000 | -75400 | 11 | 67 |
| 318800 | 223000 | 95800 | 12 | 67 |
| | | | | |
| 155000 | 204000 3c | -49000 | 12 | 68 |
| 208000 | 204000 3c | 4000 | 13 | 68 |
| ND<100 U | 204000 3c | -203900 | 13 | 69 |
| 1380 | 204000 3c | -202620 | 13 | 70 |
| 114000 | 204000 3c | -90000 | 13 | 71 |
| 180000 | 204000 3c | -24000 | 13 | 72 |
| 149200 | 204000 3c | -54800 | 13 | 73 |
| 182300 | 204000 3c | -21700 | 13 | 74 |
| 147600 | 204000 3c | -56400 | 13 | 75 |
| 318800 | 204000 3c | 114800 | 14 | 75 |
| | | | | |
| 208000 | 155000 | 53000 | 15 | 75 |
| ND<100 U | 155000 | -154900 | 15 | 76 |
| 1380 | 155000 | -153620 | 15 | 77 |
| 114000 | 155000 | -41000 | 15 | 78 |
| 180000 | 155000 | 25000 | 16 | 78 |
| 149200 | 155000 | -5800 | 16 | 79 |

| | | | | |
|---|---|---|---|---|
| 182300 | 155000 | 27300 | 17 | 79 |
| 147600 | 155000 | -7400 | 17 | 80 |
| 318800 | 155000 | 163800 | 18 | 80 |
| | | | | |
| ND<100 U | 208000 | -207900 | 18 | 81 |
| 1380 | 208000 | -206620 | 18 | 82 |
| 114000 | 208000 | -94000 | 18 | 83 |
| 180000 | 208000 | -28000 | 18 | 84 |
| 149200 | 208000 | -58800 | 18 | 85 |
| 182300 | 208000 | -25700 | 18 | 86 |
| 147600 | 208000 | -60400 | 18 | 87 |
| 318800 | 208000 | 110800 | 19 | 87 |
| | | | | |
| 1380 | ND<100 U | 1280 | 20 | 87 |
| 114000 | ND<100 U | 113900 | 21 | 87 |
| 180000 | ND<100 U | 179900 | 22 | 87 |
| 149200 | ND<100 U | 149100 | 23 | 87 |
| 182300 | ND<100 U | 182200 | 24 | 87 |
| 147600 | ND<100 U | 147500 | 25 | 87 |
| 318800 | ND<100 U | 318700 | 26 | 87 |
| | | | | |
| 114000 | 1380 | 112620 | 27 | 87 |
| 180000 | 1380 | 178620 | 28 | 87 |
| 149200 | 1380 | 147820 | 29 | 87 |
| 182300 | 1380 | 180920 | 30 | 87 |
| 147600 | 1380 | 146220 | 31 | 87 |
| 318800 | 1380 | 317420 | 32 | 87 |
| | | | | |
| 180000 | 114000 | 66000 | 33 | 87 |
| 149200 | 114000 | 35200 | 34 | 87 |
| 182300 | 114000 | 68300 | 35 | 87 |
| 147600 | 114000 | 33600 | 36 | 87 |
| 318800 | 114000 | 204800 | 37 | 87 |
| | | | | |
| 149200 | 180000 | -30800 | 37 | 88 |
| 182300 | 180000 | 2300 | 38 | 88 |
| 147600 | 180000 | -32400 | 38 | 89 |
| 318800 | 180000 | 138800 | 39 | 89 |
| | | | | |
| 182300 | 149200 | 33100 | 40 | 89 |
| 147600 | 149200 | -1600 | 40 | 90 |
| 318800 | 149200 | 169600 | 41 | 90 |
| | | | | |
| 147600 | 182300 | -34700 | 41 | 91 |
| 318800 | 182300 | 136500 | 42 | 91 |
| | | | | |
| 318800 | 147600 | 171200 | 43 | 91 |

S Statistic = 43 - 91 = -48

| Tied Group | Value | Members |
|---|---|---|
| 1 | 204000 | 2 |

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |

| | |
|---|---|
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 11/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

---

A = 18
B = 18
C = 0
D = 0
E = 2
F = 2
a = 10608
b = 36720
c = 544
Group Variance = 587.341
Z-Score = -1.93933
Comparison Level at 95% confidence level = -1.65463 (downward trend)
**-1.93933 < -1.65463 indicating a downward trend**

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RWP-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 3.21e+006 | 2.97e+006 | Same Date | 0 | 0 |
| 3.57e+006 1c | 2.97e+006 | 600000 | 1 | 0 |
| 3.88e+006 | 2.97e+006 | 910000 | 2 | 0 |
| 3.86e+006 | 2.97e+006 | 890000 | 3 | 0 |
| 3.16e+006 | 2.97e+006 | 190000 | 4 | 0 |
| 3.81e+006 | 2.97e+006 | 840000 | 5 | 0 |
| 3.52e+006 MH | 2.97e+006 | 550000 | 6 | 0 |
| 3.99e+006 | 2.97e+006 | 1.02e+006 | 7 | 0 |
| 526 | 2.97e+006 | -2.96947e+006 | 7 | 1 |
| 2.53e+006 | 2.97e+006 | -440000 | 7 | 2 |
| 2.709e+006 | 2.97e+006 | -261000 | 7 | 3 |
| 72.01 | 2.97e+006 | -2.96993e+006 | 7 | 4 |
| 3.118e+006 | 2.97e+006 | 148000 | 8 | 4 |
| 2.706e+006 | 2.97e+006 | -264000 | 8 | 5 |
| 3.227e+006 | 2.97e+006 | 257000 | 9 | 5 |
| | | | | |
| 3.57e+006 1c | 3.21e+006 | 360000 | 10 | 5 |
| 3.88e+006 | 3.21e+006 | 670000 | 11 | 5 |
| 3.86e+006 | 3.21e+006 | 650000 | 12 | 5 |
| 3.16e+006 | 3.21e+006 | -50000 | 12 | 6 |
| 3.81e+006 | 3.21e+006 | 600000 | 13 | 6 |
| 3.52e+006 MH | 3.21e+006 | 310000 | 14 | 6 |
| 3.99e+006 | 3.21e+006 | 780000 | 15 | 6 |
| 526 | 3.21e+006 | -3.20947e+006 | 15 | 7 |
| 2.53e+006 | 3.21e+006 | -680000 | 15 | 8 |
| 2.709e+006 | 3.21e+006 | -501000 | 15 | 9 |
| 72.01 | 3.21e+006 | -3.20993e+006 | 15 | 10 |
| 3.118e+006 | 3.21e+006 | -92000 | 15 | 11 |
| 2.706e+006 | 3.21e+006 | -504000 | 15 | 12 |
| 3.227e+006 | 3.21e+006 | 17000 | 16 | 12 |
| | | | | |
| 3.88e+006 | 3.57e+006 1c | 310000 | 17 | 12 |
| 3.86e+006 | 3.57e+006 1c | 290000 | 18 | 12 |
| 3.16e+006 | 3.57e+006 1c | -410000 | 18 | 13 |
| 3.81e+006 | 3.57e+006 1c | 240000 | 19 | 13 |
| 3.52e+006 MH | 3.57e+006 1c | -50000 | 19 | 14 |
| 3.99e+006 | 3.57e+006 1c | 420000 | 20 | 14 |
| 526 | 3.57e+006 1c | -3.56947e+006 | 20 | 15 |
| 2.53e+006 | 3.57e+006 1c | -1.04e+006 | 20 | 16 |
| 2.709e+006 | 3.57e+006 1c | -861000 | 20 | 17 |
| 72.01 | 3.57e+006 1c | -3.56993e+006 | 20 | 18 |
| 3.118e+006 | 3.57e+006 1c | -452000 | 20 | 19 |
| 2.706e+006 | 3.57e+006 1c | -864000 | 20 | 20 |
| 3.227e+006 | 3.57e+006 1c | -343000 | 20 | 21 |
| | | | | |
| 3.86e+006 | 3.88e+006 | -20000 | 20 | 22 |
| 3.16e+006 | 3.88e+006 | -720000 | 20 | 23 |

| | | | | |
|---|---|---|---|---|
| 3.81e+006 | 3.88e+006 | -70000 | 20 | 24 |
| 3.52e+006 MH | 3.88e+006 | -360000 | 20 | 25 |
| 3.99e+006 | 3.88e+006 | 110000 | 21 | 25 |
| 526 | 3.88e+006 | -3.87947e+006 | 21 | 26 |
| 2.53e+006 | 3.88e+006 | -1.35e+006 | 21 | 27 |
| 2.709e+006 | 3.88e+006 | -1.171e+006 | 21 | 28 |
| 72.01 | 3.88e+006 | -3.87993e+006 | 21 | 29 |
| 3.118e+006 | 3.88e+006 | -762000 | 21 | 30 |
| 2.706e+006 | 3.88e+006 | -1.174e+006 | 21 | 31 |
| 3.227e+006 | 3.88e+006 | -653000 | 21 | 32 |
| | | | | |
| 3.16e+006 | 3.86e+006 | -700000 | 21 | 33 |
| 3.81e+006 | 3.86e+006 | -50000 | 21 | 34 |
| 3.52e+006 MH | 3.86e+006 | -340000 | 21 | 35 |
| 3.99e+006 | 3.86e+006 | 130000 | 22 | 35 |
| 526 | 3.86e+006 | -3.85947e+006 | 22 | 36 |
| 2.53e+006 | 3.86e+006 | -1.33e+006 | 22 | 37 |
| 2.709e+006 | 3.86e+006 | -1.151e+006 | 22 | 38 |
| 72.01 | 3.86e+006 | -3.85993e+006 | 22 | 39 |
| 3.118e+006 | 3.86e+006 | -742000 | 22 | 40 |
| 2.706e+006 | 3.86e+006 | -1.154e+006 | 22 | 41 |
| 3.227e+006 | 3.86e+006 | -633000 | 22 | 42 |
| | | | | |
| 3.81e+006 | 3.16e+006 | 650000 | 23 | 42 |
| 3.52e+006 MH | 3.16e+006 | 360000 | 24 | 42 |
| 3.99e+006 | 3.16e+006 | 830000 | 25 | 42 |
| 526 | 3.16e+006 | -3.15947e+006 | 25 | 43 |
| 2.53e+006 | 3.16e+006 | -630000 | 25 | 44 |
| 2.709e+006 | 3.16e+006 | -451000 | 25 | 45 |
| 72.01 | 3.16e+006 | -3.15993e+006 | 25 | 46 |
| 3.118e+006 | 3.16e+006 | -42000 | 25 | 47 |
| 2.706e+006 | 3.16e+006 | -454000 | 25 | 48 |
| 3.227e+006 | 3.16e+006 | 67000 | 26 | 48 |
| | | | | |
| 3.52e+006 MH | 3.81e+006 | -290000 | 26 | 49 |
| 3.99e+006 | 3.81e+006 | 180000 | 27 | 49 |
| 526 | 3.81e+006 | -3.80947e+006 | 27 | 50 |
| 2.53e+006 | 3.81e+006 | -1.28e+006 | 27 | 51 |
| 2.709e+006 | 3.81e+006 | -1.101e+006 | 27 | 52 |
| 72.01 | 3.81e+006 | -3.80993e+006 | 27 | 53 |
| 3.118e+006 | 3.81e+006 | -692000 | 27 | 54 |
| 2.706e+006 | 3.81e+006 | -1.104e+006 | 27 | 55 |
| 3.227e+006 | 3.81e+006 | -583000 | 27 | 56 |
| | | | | |
| 3.99e+006 | 3.52e+006 MH | 470000 | 28 | 56 |
| 526 | 3.52e+006 MH | -3.51947e+006 | 28 | 57 |
| 2.53e+006 | 3.52e+006 MH | -990000 | 28 | 58 |
| 2.709e+006 | 3.52e+006 MH | -811000 | 28 | 59 |
| 72.01 | 3.52e+006 MH | -3.51993e+006 | 28 | 60 |
| 3.118e+006 | 3.52e+006 MH | -402000 | 28 | 61 |
| 2.706e+006 | 3.52e+006 MH | -814000 | 28 | 62 |
| 3.227e+006 | 3.52e+006 MH | -293000 | 28 | 63 |
| | | | | |
| 526 | 3.99e+006 | -3.98947e+006 | 28 | 64 |
| 2.53e+006 | 3.99e+006 | -1.46e+006 | 28 | 65 |
| 2.709e+006 | 3.99e+006 | -1.281e+006 | 28 | 66 |
| 72.01 | 3.99e+006 | -3.98993e+006 | 28 | 67 |

| | | | | |
|---|---|---|---|---|
| 3.118e+006 | 3.99e+006 | -872000 | 28 | 68 |
| 2.706e+006 | 3.99e+006 | -1.284e+006 | 28 | 69 |
| 3.227e+006 | 3.99e+006 | -763000 | 28 | 70 |
| | | | | |
| 2.53e+006 | 526 | 2.52947e+006 | 29 | 70 |
| 2.709e+006 | 526 | 2.70847e+006 | 30 | 70 |
| 72.01 | 526 | -453.99 | 30 | 71 |
| 3.118e+006 | 526 | 3.11747e+006 | 31 | 71 |
| 2.706e+006 | 526 | 2.70547e+006 | 32 | 71 |
| 3.227e+006 | 526 | 3.22647e+006 | 33 | 71 |
| | | | | |
| 2.709e+006 | 2.53e+006 | 179000 | 34 | 71 |
| 72.01 | 2.53e+006 | -2.52993e+006 | 34 | 72 |
| 3.118e+006 | 2.53e+006 | 588000 | 35 | 72 |
| 2.706e+006 | 2.53e+006 | 176000 | 36 | 72 |
| 3.227e+006 | 2.53e+006 | 697000 | 37 | 72 |
| | | | | |
| 72.01 | 2.709e+006 | -2.70893e+006 | 37 | 73 |
| 3.118e+006 | 2.709e+006 | 409000 | 38 | 73 |
| 2.706e+006 | 2.709e+006 | -3000 | 38 | 74 |
| 3.227e+006 | 2.709e+006 | 518000 | 39 | 74 |
| | | | | |
| 3.118e+006 | 72.01 | 3.11793e+006 | 40 | 74 |
| 2.706e+006 | 72.01 | 2.70593e+006 | 41 | 74 |
| 3.227e+006 | 72.01 | 3.22693e+006 | 42 | 74 |
| | | | | |
| 2.706e+006 | 3.118e+006 | -412000 | 42 | 75 |
| 3.227e+006 | 3.118e+006 | 109000 | 43 | 75 |
| | | | | |
| 3.227e+006 | 2.706e+006 | 521000 | 44 | 75 |

S Statistic = 44 - 75 = -31

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 11/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 0
B = 18
C = 0

D = 0
E = 0
F = 2
a = 8880
b = 30240
c = 480
Group Variance = 492.333
Z-Score = -1.35205
Comparison Level at 95% confidence level = -1.65463 (downward trend)
-1.35205 >= -1.65463 indicating no evidence of a downward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RWQ-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 339000 | 357000 | Same Date | 0 | 0 |
| 270000 1c | 357000 | -87000 | 0 | 1 |
| 258000 | 357000 | -99000 | 0 | 2 |
| 312000 | 357000 | -45000 | 0 | 3 |
| 255000 | 357000 | -102000 | 0 | 4 |
| 280000 3c | 357000 | -77000 | 0 | 5 |
| 257000 | 357000 | -100000 | 0 | 6 |
| 286000 | 357000 | -71000 | 0 | 7 |
| 256000 | 357000 | -101000 | 0 | 8 |
| 221000 | 357000 | -136000 | 0 | 9 |
| 216500 | 357000 | -140500 | 0 | 10 |
| 19.07 | 357000 | -356981 | 0 | 11 |
| 292800 | 357000 | -64200 | 0 | 12 |
| 316200 | 357000 | -40800 | 0 | 13 |
| 315500 | 357000 | -41500 | 0 | 14 |
| | | | | |
| 270000 1c | 339000 | -69000 | 0 | 15 |
| 258000 | 339000 | -81000 | 0 | 16 |
| 312000 | 339000 | -27000 | 0 | 17 |
| 255000 | 339000 | -84000 | 0 | 18 |
| 280000 3c | 339000 | -59000 | 0 | 19 |
| 257000 | 339000 | -82000 | 0 | 20 |
| 286000 | 339000 | -53000 | 0 | 21 |
| 256000 | 339000 | -83000 | 0 | 22 |
| 221000 | 339000 | -118000 | 0 | 23 |
| 216500 | 339000 | -122500 | 0 | 24 |
| 19.07 | 339000 | -338981 | 0 | 25 |
| 292800 | 339000 | -46200 | 0 | 26 |
| 316200 | 339000 | -22800 | 0 | 27 |
| 315500 | 339000 | -23500 | 0 | 28 |
| | | | | |
| 258000 | 270000 1c | -12000 | 0 | 29 |
| 312000 | 270000 1c | 42000 | 1 | 29 |
| 255000 | 270000 1c | -15000 | 1 | 30 |
| 280000 3c | 270000 1c | 10000 | 2 | 30 |
| 257000 | 270000 1c | -13000 | 2 | 31 |
| 286000 | 270000 1c | 16000 | 3 | 31 |
| 256000 | 270000 1c | -14000 | 3 | 32 |
| 221000 | 270000 1c | -49000 | 3 | 33 |
| 216500 | 270000 1c | -53500 | 3 | 34 |
| 19.07 | 270000 1c | -269981 | 3 | 35 |
| 292800 | 270000 1c | 22800 | 4 | 35 |
| 316200 | 270000 1c | 46200 | 5 | 35 |
| 315500 | 270000 1c | 45500 | 6 | 35 |
| | | | | |
| 312000 | 258000 | 54000 | 7 | 35 |
| 255000 | 258000 | -3000 | 7 | 36 |

| | | | | |
|---|---|---|---|---|
| 280000 3c | 258000 | 22000 | 8 | 36 |
| 257000 | 258000 | -1000 | 8 | 37 |
| 286000 | 258000 | 28000 | 9 | 37 |
| 256000 | 258000 | -2000 | 9 | 38 |
| 221000 | 258000 | -37000 | 9 | 39 |
| 216500 | 258000 | -41500 | 9 | 40 |
| 19.07 | 258000 | -257981 | 9 | 41 |
| 292800 | 258000 | 34800 | 10 | 41 |
| 316200 | 258000 | 58200 | 11 | 41 |
| 315500 | 258000 | 57500 | 12 | 41 |
| | | | | |
| 255000 | 312000 | -57000 | 12 | 42 |
| 280000 3c | 312000 | -32000 | 12 | 43 |
| 257000 | 312000 | -55000 | 12 | 44 |
| 286000 | 312000 | -26000 | 12 | 45 |
| 256000 | 312000 | -56000 | 12 | 46 |
| 221000 | 312000 | -91000 | 12 | 47 |
| 216500 | 312000 | -95500 | 12 | 48 |
| 19.07 | 312000 | -311981 | 12 | 49 |
| 292800 | 312000 | -19200 | 12 | 50 |
| 316200 | 312000 | 4200 | 13 | 50 |
| 315500 | 312000 | 3500 | 14 | 50 |
| | | | | |
| 280000 3c | 255000 | 25000 | 15 | 50 |
| 257000 | 255000 | 2000 | 16 | 50 |
| 286000 | 255000 | 31000 | 17 | 50 |
| 256000 | 255000 | 1000 | 18 | 50 |
| 221000 | 255000 | -34000 | 18 | 51 |
| 216500 | 255000 | -38500 | 18 | 52 |
| 19.07 | 255000 | -254981 | 18 | 53 |
| 292800 | 255000 | 37800 | 19 | 53 |
| 316200 | 255000 | 61200 | 20 | 53 |
| 315500 | 255000 | 60500 | 21 | 53 |
| | | | | |
| 257000 | 280000 3c | -23000 | 21 | 54 |
| 286000 | 280000 3c | 6000 | 22 | 54 |
| 256000 | 280000 3c | -24000 | 22 | 55 |
| 221000 | 280000 3c | -59000 | 22 | 56 |
| 216500 | 280000 3c | -63500 | 22 | 57 |
| 19.07 | 280000 3c | -279981 | 22 | 58 |
| 292800 | 280000 3c | 12800 | 23 | 58 |
| 316200 | 280000 3c | 36200 | 24 | 58 |
| 315500 | 280000 3c | 35500 | 25 | 58 |
| | | | | |
| 286000 | 257000 | 29000 | 26 | 58 |
| 256000 | 257000 | -1000 | 26 | 59 |
| 221000 | 257000 | -36000 | 26 | 60 |
| 216500 | 257000 | -40500 | 26 | 61 |
| 19.07 | 257000 | -256981 | 26 | 62 |
| 292800 | 257000 | 35800 | 27 | 62 |
| 316200 | 257000 | 59200 | 28 | 62 |
| 315500 | 257000 | 58500 | 29 | 62 |
| | | | | |
| 256000 | 286000 | -30000 | 29 | 63 |
| 221000 | 286000 | -65000 | 29 | 64 |
| 216500 | 286000 | -69500 | 29 | 65 |
| 19.07 | 286000 | -285981 | 29 | 66 |

| | | | | |
|---|---|---|---|---|
| 292800 | 286000 | 6800 | 30 | 66 |
| 316200 | 286000 | 30200 | 31 | 66 |
| 315500 | 286000 | 29500 | 32 | 66 |
| | | | | |
| 221000 | 256000 | -35000 | 32 | 67 |
| 216500 | 256000 | -39500 | 32 | 68 |
| 19.07 | 256000 | -255981 | 32 | 69 |
| 292800 | 256000 | 36800 | 33 | 69 |
| 316200 | 256000 | 60200 | 34 | 69 |
| 315500 | 256000 | 59500 | 35 | 69 |
| | | | | |
| 216500 | 221000 | -4500 | 35 | 70 |
| 19.07 | 221000 | -220981 | 35 | 71 |
| 292800 | 221000 | 71800 | 36 | 71 |
| 316200 | 221000 | 95200 | 37 | 71 |
| 315500 | 221000 | 94500 | 38 | 71 |
| | | | | |
| 19.07 | 216500 | -216481 | 38 | 72 |
| 292800 | 216500 | 76300 | 39 | 72 |
| 316200 | 216500 | 99700 | 40 | 72 |
| 315500 | 216500 | 99000 | 41 | 72 |
| | | | | |
| 292800 | 19.07 | 292781 | 42 | 72 |
| 316200 | 19.07 | 316181 | 43 | 72 |
| 315500 | 19.07 | 315481 | 44 | 72 |
| | | | | |
| 316200 | 292800 | 23400 | 45 | 72 |
| 315500 | 292800 | 22700 | 46 | 72 |
| | | | | |
| 315500 | 316200 | -700 | 46 | 73 |

S Statistic = 46 - 73 = -27

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 0
B = 18
C = 0

D = 0
E = 0
F = 2
a = 8880
b = 30240
c = 480
Group Variance = 492.333
Z-Score = -1.17177
Comparison Level at 95% confidence level = -1.65463 (downward trend)
-1.17177 >= -1.65463 indicating no evidence of a downward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RWR-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 2.66e+006 1c4c | 2.56e+006 2c | Same Date | 0 | 0 |
| 3.62e+006 1c | 2.56e+006 2c | 1.06e+006 | 1 | 0 |
| 4.05e+006 | 2.56e+006 2c | 1.49e+006 | 2 | 0 |
| 814000 | 2.56e+006 2c | -1.746e+006 | 2 | 1 |
| 2.53e+006 | 2.56e+006 2c | -30000 | 2 | 2 |
| 1.83e+006 | 2.56e+006 2c | -730000 | 2 | 3 |
| 996000 1c | 2.56e+006 2c | -1.564e+006 | 2 | 4 |
| 1.4e+006 | 2.56e+006 2c | -1.16e+006 | 2 | 5 |
| 48000 | 2.56e+006 2c | -2.512e+006 | 2 | 6 |
| 599000 | 2.56e+006 2c | -1.961e+006 | 2 | 7 |
| 912000 | 2.56e+006 2c | -1.648e+006 | 2 | 8 |
| 2.677e+006 | 2.56e+006 2c | 117000 | 3 | 8 |
| 2.476e+006 | 2.56e+006 2c | -84000 | 3 | 9 |
| 2.73e+006 | 2.56e+006 2c | 170000 | 4 | 9 |
| 4.833e+006 | 2.56e+006 2c | 2.273e+006 | 5 | 9 |
| | | | | |
| 3.62e+006 1c | 2.66e+006 1c4c | 960000 | 6 | 9 |
| 4.05e+006 | 2.66e+006 1c4c | 1.39e+006 | 7 | 9 |
| 814000 | 2.66e+006 1c4c | -1.846e+006 | 7 | 10 |
| 2.53e+006 | 2.66e+006 1c4c | -130000 | 7 | 11 |
| 1.83e+006 | 2.66e+006 1c4c | -830000 | 7 | 12 |
| 996000 1c | 2.66e+006 1c4c | -1.664e+006 | 7 | 13 |
| 1.4e+006 | 2.66e+006 1c4c | -1.26e+006 | 7 | 14 |
| 48000 | 2.66e+006 1c4c | -2.612e+006 | 7 | 15 |
| 599000 | 2.66e+006 1c4c | -2.061e+006 | 7 | 16 |
| 912000 | 2.66e+006 1c4c | -1.748e+006 | 7 | 17 |
| 2.677e+006 | 2.66e+006 1c4c | 17000 | 8 | 17 |
| 2.476e+006 | 2.66e+006 1c4c | -184000 | 8 | 18 |
| 2.73e+006 | 2.66e+006 1c4c | 70000 | 9 | 18 |
| 4.833e+006 | 2.66e+006 1c4c | 2.173e+006 | 10 | 18 |
| | | | | |
| 4.05e+006 | 3.62e+006 1c | 430000 | 11 | 18 |
| 814000 | 3.62e+006 1c | -2.806e+006 | 11 | 19 |
| 2.53e+006 | 3.62e+006 1c | -1.09e+006 | 11 | 20 |
| 1.83e+006 | 3.62e+006 1c | -1.79e+006 | 11 | 21 |
| 996000 1c | 3.62e+006 1c | -2.624e+006 | 11 | 22 |
| 1.4e+006 | 3.62e+006 1c | -2.22e+006 | 11 | 23 |
| 48000 | 3.62e+006 1c | -3.572e+006 | 11 | 24 |
| 599000 | 3.62e+006 1c | -3.021e+006 | 11 | 25 |
| 912000 | 3.62e+006 1c | -2.708e+006 | 11 | 26 |
| 2.677e+006 | 3.62e+006 1c | -943000 | 11 | 27 |
| 2.476e+006 | 3.62e+006 1c | -1.144e+006 | 11 | 28 |
| 2.73e+006 | 3.62e+006 1c | -890000 | 11 | 29 |
| 4.833e+006 | 3.62e+006 1c | 1.213e+006 | 12 | 29 |
| | | | | |
| 814000 | 4.05e+006 | -3.236e+006 | 12 | 30 |
| 2.53e+006 | 4.05e+006 | -1.52e+006 | 12 | 31 |

| | | | | |
|---|---|---|---|---|
| 1.83e+006 | 4.05e+006 | -2.22e+006 | 12 | 32 |
| 996000 1c | 4.05e+006 | -3.054e+006 | 12 | 33 |
| 1.4e+006 | 4.05e+006 | -2.65e+006 | 12 | 34 |
| 48000 | 4.05e+006 | -4.002e+006 | 12 | 35 |
| 599000 | 4.05e+006 | -3.451e+006 | 12 | 36 |
| 912000 | 4.05e+006 | -3.138e+006 | 12 | 37 |
| 2.677e+006 | 4.05e+006 | -1.373e+006 | 12 | 38 |
| 2.476e+006 | 4.05e+006 | -1.574e+006 | 12 | 39 |
| 2.73e+006 | 4.05e+006 | -1.32e+006 | 12 | 40 |
| 4.833e+006 | 4.05e+006 | 783000 | 13 | 40 |
| | | | | |
| 2.53e+006 | 814000 | 1.716e+006 | 14 | 40 |
| 1.83e+006 | 814000 | 1.016e+006 | 15 | 40 |
| 996000 1c | 814000 | 182000 | 16 | 40 |
| 1.4e+006 | 814000 | 586000 | 17 | 40 |
| 48000 | 814000 | -766000 | 17 | 41 |
| 599000 | 814000 | -215000 | 17 | 42 |
| 912000 | 814000 | 98000 | 18 | 42 |
| 2.677e+006 | 814000 | 1.863e+006 | 19 | 42 |
| 2.476e+006 | 814000 | 1.662e+006 | 20 | 42 |
| 2.73e+006 | 814000 | 1.916e+006 | 21 | 42 |
| 4.833e+006 | 814000 | 4.019e+006 | 22 | 42 |
| | | | | |
| 1.83e+006 | 2.53e+006 | -700000 | 22 | 43 |
| 996000 1c | 2.53e+006 | -1.534e+006 | 22 | 44 |
| 1.4e+006 | 2.53e+006 | -1.13e+006 | 22 | 45 |
| 48000 | 2.53e+006 | -2.482e+006 | 22 | 46 |
| 599000 | 2.53e+006 | -1.931e+006 | 22 | 47 |
| 912000 | 2.53e+006 | -1.618e+006 | 22 | 48 |
| 2.677e+006 | 2.53e+006 | 147000 | 23 | 48 |
| 2.476e+006 | 2.53e+006 | -54000 | 23 | 49 |
| 2.73e+006 | 2.53e+006 | 200000 | 24 | 49 |
| 4.833e+006 | 2.53e+006 | 2.303e+006 | 25 | 49 |
| | | | | |
| 996000 1c | 1.83e+006 | -834000 | 25 | 50 |
| 1.4e+006 | 1.83e+006 | -430000 | 25 | 51 |
| 48000 | 1.83e+006 | -1.782e+006 | 25 | 52 |
| 599000 | 1.83e+006 | -1.231e+006 | 25 | 53 |
| 912000 | 1.83e+006 | -918000 | 25 | 54 |
| 2.677e+006 | 1.83e+006 | 847000 | 26 | 54 |
| 2.476e+006 | 1.83e+006 | 646000 | 27 | 54 |
| 2.73e+006 | 1.83e+006 | 900000 | 28 | 54 |
| 4.833e+006 | 1.83e+006 | 3.003e+006 | 29 | 54 |
| | | | | |
| 1.4e+006 | 996000 1c | 404000 | 30 | 54 |
| 48000 | 996000 1c | -948000 | 30 | 55 |
| 599000 | 996000 1c | -397000 | 30 | 56 |
| 912000 | 996000 1c | -84000 | 30 | 57 |
| 2.677e+006 | 996000 1c | 1.681e+006 | 31 | 57 |
| 2.476e+006 | 996000 1c | 1.48e+006 | 32 | 57 |
| 2.73e+006 | 996000 1c | 1.734e+006 | 33 | 57 |
| 4.833e+006 | 996000 1c | 3.837e+006 | 34 | 57 |
| | | | | |
| 48000 | 1.4e+006 | -1.352e+006 | 34 | 58 |
| 599000 | 1.4e+006 | -801000 | 34 | 59 |
| 912000 | 1.4e+006 | -488000 | 34 | 60 |
| 2.677e+006 | 1.4e+006 | 1.277e+006 | 35 | 60 |

| | | | | |
|---|---|---|---|---|
| 2.476e+006 | 1.4e+006 | 1.076e+006 | 36 | 60 |
| 2.73e+006 | 1.4e+006 | 1.33e+006 | 37 | 60 |
| 4.833e+006 | 1.4e+006 | 3.433e+006 | 38 | 60 |
| | | | | |
| 599000 | 48000 | 551000 | 39 | 60 |
| 912000 | 48000 | 864000 | 40 | 60 |
| 2.677e+006 | 48000 | 2.629e+006 | 41 | 60 |
| 2.476e+006 | 48000 | 2.428e+006 | 42 | 60 |
| 2.73e+006 | 48000 | 2.682e+006 | 43 | 60 |
| 4.833e+006 | 48000 | 4.785e+006 | 44 | 60 |
| | | | | |
| 912000 | 599000 | 313000 | 45 | 60 |
| 2.677e+006 | 599000 | 2.078e+006 | 46 | 60 |
| 2.476e+006 | 599000 | 1.877e+006 | 47 | 60 |
| 2.73e+006 | 599000 | 2.131e+006 | 48 | 60 |
| 4.833e+006 | 599000 | 4.234e+006 | 49 | 60 |
| | | | | |
| 2.677e+006 | 912000 | 1.765e+006 | 50 | 60 |
| 2.476e+006 | 912000 | 1.564e+006 | 51 | 60 |
| 2.73e+006 | 912000 | 1.818e+006 | 52 | 60 |
| 4.833e+006 | 912000 | 3.921e+006 | 53 | 60 |
| | | | | |
| 2.476e+006 | 2.677e+006 | -201000 | 53 | 61 |
| 2.73e+006 | 2.677e+006 | 53000 | 54 | 61 |
| 4.833e+006 | 2.677e+006 | 2.156e+006 | 55 | 61 |
| | | | | |
| 2.73e+006 | 2.476e+006 | 254000 | 56 | 61 |
| 4.833e+006 | 2.476e+006 | 2.357e+006 | 57 | 61 |
| | | | | |
| 4.833e+006 | 2.73e+006 | 2.103e+006 | 58 | 61 |

S Statistic = 58 - 61 = -3

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 0
B = 18
C = 0

D = 0
E = 0
F = 2
a = 8880
b = 30240
c = 480
Group Variance = 492.333
Z-Score = -0.0901364
Comparison Level at 95% confidence level = -1.65463 (downward trend)
-0.0901364 >= -1.65463 indicating no evidence of a downward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RWS-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 843000 | 797000 | Same Date | 0 | 0 |
| 1.04e+006 1c | 797000 | 243000 | 1 | 0 |
| 946000 | 797000 | 149000 | 2 | 0 |
| 1.07e+006 | 797000 | 273000 | 3 | 0 |
| 74300 | 797000 | -722700 | 3 | 1 |
| 760000 | 797000 | -37000 | 3 | 2 |
| 919000 | 797000 | 122000 | 4 | 2 |
| 858000 | 797000 | 61000 | 5 | 2 |
| 649000 | 797000 | -148000 | 5 | 3 |
| 633000 | 797000 | -164000 | 5 | 4 |
| 228900 | 797000 | -568100 | 5 | 5 |
| 759700 | 797000 | -37300 | 5 | 6 |
| 773700 | 797000 | -23300 | 5 | 7 |
| 767800 | 797000 | -29200 | 5 | 8 |
| 742600 | 797000 | -54400 | 5 | 9 |
| | | | | |
| 1.04e+006 1c | 843000 | 197000 | 6 | 9 |
| 946000 | 843000 | 103000 | 7 | 9 |
| 1.07e+006 | 843000 | 227000 | 8 | 9 |
| 74300 | 843000 | -768700 | 8 | 10 |
| 760000 | 843000 | -83000 | 8 | 11 |
| 919000 | 843000 | 76000 | 9 | 11 |
| 858000 | 843000 | 15000 | 10 | 11 |
| 649000 | 843000 | -194000 | 10 | 12 |
| 633000 | 843000 | -210000 | 10 | 13 |
| 228900 | 843000 | -614100 | 10 | 14 |
| 759700 | 843000 | -83300 | 10 | 15 |
| 773700 | 843000 | -69300 | 10 | 16 |
| 767800 | 843000 | -75200 | 10 | 17 |
| 742600 | 843000 | -100400 | 10 | 18 |
| | | | | |
| 946000 | 1.04e+006 1c | -94000 | 10 | 19 |
| 1.07e+006 | 1.04e+006 1c | 30000 | 11 | 19 |
| 74300 | 1.04e+006 1c | -965700 | 11 | 20 |
| 760000 | 1.04e+006 1c | -280000 | 11 | 21 |
| 919000 | 1.04e+006 1c | -121000 | 11 | 22 |
| 858000 | 1.04e+006 1c | -182000 | 11 | 23 |
| 649000 | 1.04e+006 1c | -391000 | 11 | 24 |
| 633000 | 1.04e+006 1c | -407000 | 11 | 25 |
| 228900 | 1.04e+006 1c | -811100 | 11 | 26 |
| 759700 | 1.04e+006 1c | -280300 | 11 | 27 |
| 773700 | 1.04e+006 1c | -266300 | 11 | 28 |
| 767800 | 1.04e+006 1c | -272200 | 11 | 29 |
| 742600 | 1.04e+006 1c | -297400 | 11 | 30 |
| | | | | |
| 1.07e+006 | 946000 | 124000 | 12 | 30 |
| 74300 | 946000 | -871700 | 12 | 31 |

| | | | | |
|---|---|---|---|---|
| 760000 | 946000 | -186000 | 12 | 32 |
| 919000 | 946000 | -27000 | 12 | 33 |
| 858000 | 946000 | -88000 | 12 | 34 |
| 649000 | 946000 | -297000 | 12 | 35 |
| 633000 | 946000 | -313000 | 12 | 36 |
| 228900 | 946000 | -717100 | 12 | 37 |
| 759700 | 946000 | -186300 | 12 | 38 |
| 773700 | 946000 | -172300 | 12 | 39 |
| 767800 | 946000 | -178200 | 12 | 40 |
| 742600 | 946000 | -203400 | 12 | 41 |
| | | | | |
| 74300 | 1.07e+006 | -995700 | 12 | 42 |
| 760000 | 1.07e+006 | -310000 | 12 | 43 |
| 919000 | 1.07e+006 | -151000 | 12 | 44 |
| 858000 | 1.07e+006 | -212000 | 12 | 45 |
| 649000 | 1.07e+006 | -421000 | 12 | 46 |
| 633000 | 1.07e+006 | -437000 | 12 | 47 |
| 228900 | 1.07e+006 | -841100 | 12 | 48 |
| 759700 | 1.07e+006 | -310300 | 12 | 49 |
| 773700 | 1.07e+006 | -296300 | 12 | 50 |
| 767800 | 1.07e+006 | -302200 | 12 | 51 |
| 742600 | 1.07e+006 | -327400 | 12 | 52 |
| | | | | |
| 760000 | 74300 | 685700 | 13 | 52 |
| 919000 | 74300 | 844700 | 14 | 52 |
| 858000 | 74300 | 783700 | 15 | 52 |
| 649000 | 74300 | 574700 | 16 | 52 |
| 633000 | 74300 | 558700 | 17 | 52 |
| 228900 | 74300 | 154600 | 18 | 52 |
| 759700 | 74300 | 685400 | 19 | 52 |
| 773700 | 74300 | 699400 | 20 | 52 |
| 767800 | 74300 | 693500 | 21 | 52 |
| 742600 | 74300 | 668300 | 22 | 52 |
| | | | | |
| 919000 | 760000 | 159000 | 23 | 52 |
| 858000 | 760000 | 98000 | 24 | 52 |
| 649000 | 760000 | -111000 | 24 | 53 |
| 633000 | 760000 | -127000 | 24 | 54 |
| 228900 | 760000 | -531100 | 24 | 55 |
| 759700 | 760000 | -300 | 24 | 56 |
| 773700 | 760000 | 13700 | 25 | 56 |
| 767800 | 760000 | 7800 | 26 | 56 |
| 742600 | 760000 | -17400 | 26 | 57 |
| | | | | |
| 858000 | 919000 | -61000 | 26 | 58 |
| 649000 | 919000 | -270000 | 26 | 59 |
| 633000 | 919000 | -286000 | 26 | 60 |
| 228900 | 919000 | -690100 | 26 | 61 |
| 759700 | 919000 | -159300 | 26 | 62 |
| 773700 | 919000 | -145300 | 26 | 63 |
| 767800 | 919000 | -151200 | 26 | 64 |
| 742600 | 919000 | -176400 | 26 | 65 |
| | | | | |
| 649000 | 858000 | -209000 | 26 | 66 |
| 633000 | 858000 | -225000 | 26 | 67 |
| 228900 | 858000 | -629100 | 26 | 68 |
| 759700 | 858000 | -98300 | 26 | 69 |

| | | | | |
|---|---|---|---|---|
| 773700 | 858000 | -84300 | 26 | 70 |
| 767800 | 858000 | -90200 | 26 | 71 |
| 742600 | 858000 | -115400 | 26 | 72 |
| | | | | |
| 633000 | 649000 | -16000 | 26 | 73 |
| 228900 | 649000 | -420100 | 26 | 74 |
| 759700 | 649000 | 110700 | 27 | 74 |
| 773700 | 649000 | 124700 | 28 | 74 |
| 767800 | 649000 | 118800 | 29 | 74 |
| 742600 | 649000 | 93600 | 30 | 74 |
| | | | | |
| 228900 | 633000 | -404100 | 30 | 75 |
| 759700 | 633000 | 126700 | 31 | 75 |
| 773700 | 633000 | 140700 | 32 | 75 |
| 767800 | 633000 | 134800 | 33 | 75 |
| 742600 | 633000 | 109600 | 34 | 75 |
| | | | | |
| 759700 | 228900 | 530800 | 35 | 75 |
| 773700 | 228900 | 544800 | 36 | 75 |
| 767800 | 228900 | 538900 | 37 | 75 |
| 742600 | 228900 | 513700 | 38 | 75 |
| | | | | |
| 773700 | 759700 | 14000 | 39 | 75 |
| 767800 | 759700 | 8100 | 40 | 75 |
| 742600 | 759700 | -17100 | 40 | 76 |
| | | | | |
| 767800 | 773700 | -5900 | 40 | 77 |
| 742600 | 773700 | -31100 | 40 | 78 |
| | | | | |
| 742600 | 767800 | -25200 | 40 | 79 |

S Statistic = 40 - 79 = -39

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 0
B = 18
C = 0

D = 0
E = 0
F = 2
a = 8880
b = 30240
c = 480
Group Variance = 492.333
Z-Score = -1.71259
Comparison Level at 95% confidence level = -1.65463 (downward trend)
**-1.71259 < -1.65463 indicating a downward trend**

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RW01-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 0.51 J | 194 | -193.49 | 0 | 1 |
| 145 | 194 | -49 | 0 | 2 |
| ND<1.5 U | 194 | -192.5 | 0 | 3 |
| 37.5 | 194 | -156.5 | 0 | 4 |
| 2.4 J | 194 | -191.6 | 0 | 5 |
| 16.5 | 194 | -177.5 | 0 | 6 |
| 250 | 194 | 56 | 1 | 6 |
| ND<1.5 U | 194 | -192.5 | 1 | 7 |
| ND<1.5 U | 194 | -192.5 | 1 | 8 |
| 5.8 | 194 | -188.2 | 1 | 9 |
| 24.4 | 194 | -169.6 | 1 | 10 |
| 19.4 | 194 | -174.6 | 1 | 11 |
| 20.6 1c2c | 194 | -173.4 | 1 | 12 |
| 8.8 | 194 | -185.2 | 1 | 13 |
| 49.3 | 194 | -144.7 | 1 | 14 |
| 117 | 194 | -77 | 1 | 15 |
| ND<1.5 U | 194 | -192.5 | 1 | 16 |
| 162 | 194 | -32 | 1 | 17 |
| 277 | 194 | 83 | 2 | 17 |
| 322 | 194 | 128 | 3 | 17 |
| 565 M1 | 194 | 371 | 4 | 17 |
| 574.1 | 194 | 380.1 | 5 | 17 |
| 318.2 | 194 | 124.2 | 6 | 17 |
| | | | | |
| 145 | 0.51 J | 144.49 | 7 | 17 |
| ND<1.5 U | 0.51 J | 0.99 | 8 | 17 |
| 37.5 | 0.51 J | 36.99 | 9 | 17 |
| 2.4 J | 0.51 J | 1.89 | 10 | 17 |
| 16.5 | 0.51 J | 15.99 | 11 | 17 |
| 250 | 0.51 J | 249.49 | 12 | 17 |
| ND<1.5 U | 0.51 J | 0.99 | 13 | 17 |
| ND<1.5 U | 0.51 J | 0.99 | 14 | 17 |
| 5.8 | 0.51 J | 5.29 | 15 | 17 |
| 24.4 | 0.51 J | 23.89 | 16 | 17 |
| 19.4 | 0.51 J | 18.89 | 17 | 17 |
| 20.6 1c2c | 0.51 J | 20.09 | 18 | 17 |
| 8.8 | 0.51 J | 8.29 | 19 | 17 |
| 49.3 | 0.51 J | 48.79 | 20 | 17 |
| 117 | 0.51 J | 116.49 | 21 | 17 |
| ND<1.5 U | 0.51 J | 0.99 | 22 | 17 |
| 162 | 0.51 J | 161.49 | 23 | 17 |
| 277 | 0.51 J | 276.49 | 24 | 17 |
| 322 | 0.51 J | 321.49 | 25 | 17 |
| 565 M1 | 0.51 J | 564.49 | 26 | 17 |
| 574.1 | 0.51 J | 573.59 | 27 | 17 |
| 318.2 | 0.51 J | 317.69 | 28 | 17 |

| | | | | |
|---|---|---|---|---|
| ND<1.5 U | 145 | -143.5 | 28 | 18 |
| 37.5 | 145 | -107.5 | 28 | 19 |
| 2.4 J | 145 | -142.6 | 28 | 20 |
| 16.5 | 145 | -128.5 | 28 | 21 |
| 250 | 145 | 105 | 29 | 21 |
| ND<1.5 U | 145 | -143.5 | 29 | 22 |
| ND<1.5 U | 145 | -143.5 | 29 | 23 |
| 5.8 | 145 | -139.2 | 29 | 24 |
| 24.4 | 145 | -120.6 | 29 | 25 |
| 19.4 | 145 | -125.6 | 29 | 26 |
| 20.6 1c2c | 145 | -124.4 | 29 | 27 |
| 8.8 | 145 | -136.2 | 29 | 28 |
| 49.3 | 145 | -95.7 | 29 | 29 |
| 117 | 145 | -28 | 29 | 30 |
| ND<1.5 U | 145 | -143.5 | 29 | 31 |
| 162 | 145 | 17 | 30 | 31 |
| 277 | 145 | 132 | 31 | 31 |
| 322 | 145 | 177 | 32 | 31 |
| 565 M1 | 145 | 420 | 33 | 31 |
| 574.1 | 145 | 429.1 | 34 | 31 |
| 318.2 | 145 | 173.2 | 35 | 31 |
| | | | | |
| 37.5 | ND<1.5 U | 36 | 36 | 31 |
| 2.4 J | ND<1.5 U | 0.9 | 37 | 31 |
| 16.5 | ND<1.5 U | 15 | 38 | 31 |
| 250 | ND<1.5 U | 248.5 | 39 | 31 |
| ND<1.5 U | ND<1.5 U | 0 | 39 | 31 |
| ND<1.5 U | ND<1.5 U | 0 | 39 | 31 |
| 5.8 | ND<1.5 U | 4.3 | 40 | 31 |
| 24.4 | ND<1.5 U | 22.9 | 41 | 31 |
| 19.4 | ND<1.5 U | 17.9 | 42 | 31 |
| 20.6 1c2c | ND<1.5 U | 19.1 | 43 | 31 |
| 8.8 | ND<1.5 U | 7.3 | 44 | 31 |
| 49.3 | ND<1.5 U | 47.8 | 45 | 31 |
| 117 | ND<1.5 U | 115.5 | 46 | 31 |
| ND<1.5 U | ND<1.5 U | 0 | 46 | 31 |
| 162 | ND<1.5 U | 160.5 | 47 | 31 |
| 277 | ND<1.5 U | 275.5 | 48 | 31 |
| 322 | ND<1.5 U | 320.5 | 49 | 31 |
| 565 M1 | ND<1.5 U | 563.5 | 50 | 31 |
| 574.1 | ND<1.5 U | 572.6 | 51 | 31 |
| 318.2 | ND<1.5 U | 316.7 | 52 | 31 |
| | | | | |
| 2.4 J | 37.5 | -35.1 | 52 | 32 |
| 16.5 | 37.5 | -21 | 52 | 33 |
| 250 | 37.5 | 212.5 | 53 | 33 |
| ND<1.5 U | 37.5 | -36 | 53 | 34 |
| ND<1.5 U | 37.5 | -36 | 53 | 35 |
| 5.8 | 37.5 | -31.7 | 53 | 36 |
| 24.4 | 37.5 | -13.1 | 53 | 37 |
| 19.4 | 37.5 | -18.1 | 53 | 38 |
| 20.6 1c2c | 37.5 | -16.9 | 53 | 39 |
| 8.8 | 37.5 | -28.7 | 53 | 40 |
| 49.3 | 37.5 | 11.8 | 54 | 40 |
| 117 | 37.5 | 79.5 | 55 | 40 |
| ND<1.5 U | 37.5 | -36 | 55 | 41 |
| 162 | 37.5 | 124.5 | 56 | 41 |

| | | | | |
|---|---|---|---|---|
| 277 | 37.5 | 239.5 | 57 | 41 |
| 322 | 37.5 | 284.5 | 58 | 41 |
| 565 M1 | 37.5 | 527.5 | 59 | 41 |
| 574.1 | 37.5 | 536.6 | 60 | 41 |
| 318.2 | 37.5 | 280.7 | 61 | 41 |
| | | | | |
| 16.5 | 2.4 J | 14.1 | 62 | 41 |
| 250 | 2.4 J | 247.6 | 63 | 41 |
| ND<1.5 U | 2.4 J | -0.9 | 63 | 42 |
| ND<1.5 U | 2.4 J | -0.9 | 63 | 43 |
| 5.8 | 2.4 J | 3.4 | 64 | 43 |
| 24.4 | 2.4 J | 22 | 65 | 43 |
| 19.4 | 2.4 J | 17 | 66 | 43 |
| 20.6 1c2c | 2.4 J | 18.2 | 67 | 43 |
| 8.8 | 2.4 J | 6.4 | 68 | 43 |
| 49.3 | 2.4 J | 46.9 | 69 | 43 |
| 117 | 2.4 J | 114.6 | 70 | 43 |
| ND<1.5 U | 2.4 J | -0.9 | 70 | 44 |
| 162 | 2.4 J | 159.6 | 71 | 44 |
| 277 | 2.4 J | 274.6 | 72 | 44 |
| 322 | 2.4 J | 319.6 | 73 | 44 |
| 565 M1 | 2.4 J | 562.6 | 74 | 44 |
| 574.1 | 2.4 J | 571.7 | 75 | 44 |
| 318.2 | 2.4 J | 315.8 | 76 | 44 |
| | | | | |
| 250 | 16.5 | 233.5 | 77 | 44 |
| ND<1.5 U | 16.5 | -15 | 77 | 45 |
| ND<1.5 U | 16.5 | -15 | 77 | 46 |
| 5.8 | 16.5 | -10.7 | 77 | 47 |
| 24.4 | 16.5 | 7.9 | 78 | 47 |
| 19.4 | 16.5 | 2.9 | 79 | 47 |
| 20.6 1c2c | 16.5 | 4.1 | 80 | 47 |
| 8.8 | 16.5 | -7.7 | 80 | 48 |
| 49.3 | 16.5 | 32.8 | 81 | 48 |
| 117 | 16.5 | 100.5 | 82 | 48 |
| ND<1.5 U | 16.5 | -15 | 82 | 49 |
| 162 | 16.5 | 145.5 | 83 | 49 |
| 277 | 16.5 | 260.5 | 84 | 49 |
| 322 | 16.5 | 305.5 | 85 | 49 |
| 565 M1 | 16.5 | 548.5 | 86 | 49 |
| 574.1 | 16.5 | 557.6 | 87 | 49 |
| 318.2 | 16.5 | 301.7 | 88 | 49 |
| | | | | |
| ND<1.5 U | 250 | -248.5 | 88 | 50 |
| ND<1.5 U | 250 | -248.5 | 88 | 51 |
| 5.8 | 250 | -244.2 | 88 | 52 |
| 24.4 | 250 | -225.6 | 88 | 53 |
| 19.4 | 250 | -230.6 | 88 | 54 |
| 20.6 1c2c | 250 | -229.4 | 88 | 55 |
| 8.8 | 250 | -241.2 | 88 | 56 |
| 49.3 | 250 | -200.7 | 88 | 57 |
| 117 | 250 | -133 | 88 | 58 |
| ND<1.5 U | 250 | -248.5 | 88 | 59 |
| 162 | 250 | -88 | 88 | 60 |
| 277 | 250 | 27 | 89 | 60 |
| 322 | 250 | 72 | 90 | 60 |
| 565 M1 | 250 | 315 | 91 | 60 |

| | | | | |
|---|---|---|---|---|
| 574.1 | 250 | 324.1 | 92 | 60 |
| 318.2 | 250 | 68.2 | 93 | 60 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 93 | 60 |
| 5.8 | ND<1.5 U | 4.3 | 94 | 60 |
| 24.4 | ND<1.5 U | 22.9 | 95 | 60 |
| 19.4 | ND<1.5 U | 17.9 | 96 | 60 |
| 20.6 1c2c | ND<1.5 U | 19.1 | 97 | 60 |
| 8.8 | ND<1.5 U | 7.3 | 98 | 60 |
| 49.3 | ND<1.5 U | 47.8 | 99 | 60 |
| 117 | ND<1.5 U | 115.5 | 100 | 60 |
| ND<1.5 U | ND<1.5 U | 0 | 100 | 60 |
| 162 | ND<1.5 U | 160.5 | 101 | 60 |
| 277 | ND<1.5 U | 275.5 | 102 | 60 |
| 322 | ND<1.5 U | 320.5 | 103 | 60 |
| 565 M1 | ND<1.5 U | 563.5 | 104 | 60 |
| 574.1 | ND<1.5 U | 572.6 | 105 | 60 |
| 318.2 | ND<1.5 U | 316.7 | 106 | 60 |
| | | | | |
| 5.8 | ND<1.5 U | Same Date | 106 | 60 |
| 24.4 | ND<1.5 U | 22.9 | 107 | 60 |
| 19.4 | ND<1.5 U | 17.9 | 108 | 60 |
| 20.6 1c2c | ND<1.5 U | 19.1 | 109 | 60 |
| 8.8 | ND<1.5 U | 7.3 | 110 | 60 |
| 49.3 | ND<1.5 U | 47.8 | 111 | 60 |
| 117 | ND<1.5 U | 115.5 | 112 | 60 |
| ND<1.5 U | ND<1.5 U | 0 | 112 | 60 |
| 162 | ND<1.5 U | 160.5 | 113 | 60 |
| 277 | ND<1.5 U | 275.5 | 114 | 60 |
| 322 | ND<1.5 U | 320.5 | 115 | 60 |
| 565 M1 | ND<1.5 U | 563.5 | 116 | 60 |
| 574.1 | ND<1.5 U | 572.6 | 117 | 60 |
| 318.2 | ND<1.5 U | 316.7 | 118 | 60 |
| | | | | |
| 24.4 | 5.8 | 18.6 | 119 | 60 |
| 19.4 | 5.8 | 13.6 | 120 | 60 |
| 20.6 1c2c | 5.8 | 14.8 | 121 | 60 |
| 8.8 | 5.8 | 3 | 122 | 60 |
| 49.3 | 5.8 | 43.5 | 123 | 60 |
| 117 | 5.8 | 111.2 | 124 | 60 |
| ND<1.5 U | 5.8 | -4.3 | 124 | 61 |
| 162 | 5.8 | 156.2 | 125 | 61 |
| 277 | 5.8 | 271.2 | 126 | 61 |
| 322 | 5.8 | 316.2 | 127 | 61 |
| 565 M1 | 5.8 | 559.2 | 128 | 61 |
| 574.1 | 5.8 | 568.3 | 129 | 61 |
| 318.2 | 5.8 | 312.4 | 130 | 61 |
| | | | | |
| 19.4 | 24.4 | Same Date | 130 | 61 |
| 20.6 1c2c | 24.4 | -3.8 | 130 | 62 |
| 8.8 | 24.4 | -15.6 | 130 | 63 |
| 49.3 | 24.4 | 24.9 | 131 | 63 |
| 117 | 24.4 | 92.6 | 132 | 63 |
| ND<1.5 U | 24.4 | -22.9 | 132 | 64 |
| 162 | 24.4 | 137.6 | 133 | 64 |
| 277 | 24.4 | 252.6 | 134 | 64 |
| 322 | 24.4 | 297.6 | 135 | 64 |

| | | | | |
|---|---|---|---|---|
| 565 M1 | 24.4 | 540.6 | 136 | 64 |
| 574.1 | 24.4 | 549.7 | 137 | 64 |
| 318.2 | 24.4 | 293.8 | 138 | 64 |
| | | | | |
| 20.6 1c2c | 19.4 | 1.2 | 139 | 64 |
| 8.8 | 19.4 | -10.6 | 139 | 65 |
| 49.3 | 19.4 | 29.9 | 140 | 65 |
| 117 | 19.4 | 97.6 | 141 | 65 |
| ND<1.5 U | 19.4 | -17.9 | 141 | 66 |
| 162 | 19.4 | 142.6 | 142 | 66 |
| 277 | 19.4 | 257.6 | 143 | 66 |
| 322 | 19.4 | 302.6 | 144 | 66 |
| 565 M1 | 19.4 | 545.6 | 145 | 66 |
| 574.1 | 19.4 | 554.7 | 146 | 66 |
| 318.2 | 19.4 | 298.8 | 147 | 66 |
| | | | | |
| 8.8 | 20.6 1c2c | -11.8 | 147 | 67 |
| 49.3 | 20.6 1c2c | 28.7 | 148 | 67 |
| 117 | 20.6 1c2c | 96.4 | 149 | 67 |
| ND<1.5 U | 20.6 1c2c | -19.1 | 149 | 68 |
| 162 | 20.6 1c2c | 141.4 | 150 | 68 |
| 277 | 20.6 1c2c | 256.4 | 151 | 68 |
| 322 | 20.6 1c2c | 301.4 | 152 | 68 |
| 565 M1 | 20.6 1c2c | 544.4 | 153 | 68 |
| 574.1 | 20.6 1c2c | 553.5 | 154 | 68 |
| 318.2 | 20.6 1c2c | 297.6 | 155 | 68 |
| | | | | |
| 49.3 | 8.8 | 40.5 | 156 | 68 |
| 117 | 8.8 | 108.2 | 157 | 68 |
| ND<1.5 U | 8.8 | -7.3 | 157 | 69 |
| 162 | 8.8 | 153.2 | 158 | 69 |
| 277 | 8.8 | 268.2 | 159 | 69 |
| 322 | 8.8 | 313.2 | 160 | 69 |
| 565 M1 | 8.8 | 556.2 | 161 | 69 |
| 574.1 | 8.8 | 565.3 | 162 | 69 |
| 318.2 | 8.8 | 309.4 | 163 | 69 |
| | | | | |
| 117 | 49.3 | 67.7 | 164 | 69 |
| ND<1.5 U | 49.3 | -47.8 | 164 | 70 |
| 162 | 49.3 | 112.7 | 165 | 70 |
| 277 | 49.3 | 227.7 | 166 | 70 |
| 322 | 49.3 | 272.7 | 167 | 70 |
| 565 M1 | 49.3 | 515.7 | 168 | 70 |
| 574.1 | 49.3 | 524.8 | 169 | 70 |
| 318.2 | 49.3 | 268.9 | 170 | 70 |
| | | | | |
| ND<1.5 U | 117 | -115.5 | 170 | 71 |
| 162 | 117 | 45 | 171 | 71 |
| 277 | 117 | 160 | 172 | 71 |
| 322 | 117 | 205 | 173 | 71 |
| 565 M1 | 117 | 448 | 174 | 71 |
| 574.1 | 117 | 457.1 | 175 | 71 |
| 318.2 | 117 | 201.2 | 176 | 71 |
| | | | | |
| 162 | ND<1.5 U | 160.5 | 177 | 71 |
| 277 | ND<1.5 U | 275.5 | 178 | 71 |
| 322 | ND<1.5 U | 320.5 | 179 | 71 |

| | | | | |
|---|---|---|---|---|
| 565 M1 | ND<1.5 U | 563.5 | 180 | 71 |
| 574.1 | ND<1.5 U | 572.6 | 181 | 71 |
| 318.2 | ND<1.5 U | 316.7 | 182 | 71 |
| | | | | |
| 277 | 162 | 115 | 183 | 71 |
| 322 | 162 | 160 | 184 | 71 |
| 565 M1 | 162 | 403 | 185 | 71 |
| 574.1 | 162 | 412.1 | 186 | 71 |
| 318.2 | 162 | 156.2 | 187 | 71 |
| | | | | |
| 322 | 277 | 45 | 188 | 71 |
| 565 M1 | 277 | 288 | 189 | 71 |
| 574.1 | 277 | 297.1 | 190 | 71 |
| 318.2 | 277 | 41.2 | 191 | 71 |
| | | | | |
| 565 M1 | 322 | 243 | 192 | 71 |
| 574.1 | 322 | 252.1 | 193 | 71 |
| 318.2 | 322 | -3.8 | 193 | 72 |
| | | | | |
| 574.1 | 565 M1 | 9.1 | 194 | 72 |
| 318.2 | 565 M1 | -246.8 | 194 | 73 |
| | | | | |
| 318.2 | 574.1 | -255.9 | 194 | 74 |

S Statistic = 194 - 74 = 120

| Tied Group | Value | Members |
|---|---|---|
| 1 | 1.5 | 4 |

| Time Period | Observations |
|---|---|
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |

There are 2 time periods with multiple data

A = 156
B = 36

C = 24
D = 0
E = 12
F = 4
a = 29256
b = 109296
c = 1104
Group Variance = 1614.71
Z-Score = 2.96142
Comparison Level at 95% confidence level = 1.65463 (upward trend)
**2.96142 > 1.65463 indicating an upward trend**

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RW02-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 3 J | 511 | -508 | 0 | 1 |
| 2.4 J | 511 | -508.6 | 0 | 2 |
| ND<1.5 U | 511 | -509.5 | 0 | 3 |
| 2.3 J | 511 | -508.7 | 0 | 4 |
| 14.5 | 511 | -496.5 | 0 | 5 |
| 3 | 511 | -508 | 0 | 6 |
| 79.9 | 511 | -431.1 | 0 | 7 |
| 18 | 511 | -493 | 0 | 8 |
| 98.3 | 511 | -412.7 | 0 | 9 |
| 92.2 | 511 | -418.8 | 0 | 10 |
| 803 | 511 | 292 | 1 | 10 |
| 785 | 511 | 274 | 2 | 10 |
| 873 2c | 511 | 362 | 3 | 10 |
| 277 | 511 | -234 | 3 | 11 |
| 136 | 511 | -375 | 3 | 12 |
| 398 | 511 | -113 | 3 | 13 |
| 0.69 J | 511 | -510.31 | 3 | 14 |
| 208 | 511 | -303 | 3 | 15 |
| 0.58 J | 511 | -510.42 | 3 | 16 |
| ND<0.5 U | 511 | -510.5 | 3 | 17 |
| ND<1 U | 511 | -510 | 3 | 18 |
| 17.42 | 511 | -493.58 | 3 | 19 |
| 192.8 | 511 | -318.2 | 3 | 20 |
| | | | | |
| 2.4 J | 3 J | -0.6 | 3 | 21 |
| ND<1.5 U | 3 J | -1.5 | 3 | 22 |
| 2.3 J | 3 J | -0.7 | 3 | 23 |
| 14.5 | 3 J | 11.5 | 4 | 23 |
| 3 | 3 J | 0 | 4 | 23 |
| 79.9 | 3 J | 76.9 | 5 | 23 |
| 18 | 3 J | 15 | 6 | 23 |
| 98.3 | 3 J | 95.3 | 7 | 23 |
| 92.2 | 3 J | 89.2 | 8 | 23 |
| 803 | 3 J | 800 | 9 | 23 |
| 785 | 3 J | 782 | 10 | 23 |
| 873 2c | 3 J | 870 | 11 | 23 |
| 277 | 3 J | 274 | 12 | 23 |
| 136 | 3 J | 133 | 13 | 23 |
| 398 | 3 J | 395 | 14 | 23 |
| 0.69 J | 3 J | -2.31 | 14 | 24 |
| 208 | 3 J | 205 | 15 | 24 |
| 0.58 J | 3 J | -2.42 | 15 | 25 |
| ND<0.5 U | 3 J | -2.5 | 15 | 26 |
| ND<1 U | 3 J | -2 | 15 | 27 |
| 17.42 | 3 J | 14.42 | 16 | 27 |
| 192.8 | 3 J | 189.8 | 17 | 27 |

| | | | | |
|---|---|---|---|---|
| ND<1.5 U | 2.4 J | -0.9 | 17 | 28 |
| 2.3 J | 2.4 J | -0.1 | 17 | 29 |
| 14.5 | 2.4 J | 12.1 | 18 | 29 |
| 3 | 2.4 J | 0.6 | 19 | 29 |
| 79.9 | 2.4 J | 77.5 | 20 | 29 |
| 18 | 2.4 J | 15.6 | 21 | 29 |
| 98.3 | 2.4 J | 95.9 | 22 | 29 |
| 92.2 | 2.4 J | 89.8 | 23 | 29 |
| 803 | 2.4 J | 800.6 | 24 | 29 |
| 785 | 2.4 J | 782.6 | 25 | 29 |
| 873 2c | 2.4 J | 870.6 | 26 | 29 |
| 277 | 2.4 J | 274.6 | 27 | 29 |
| 136 | 2.4 J | 133.6 | 28 | 29 |
| 398 | 2.4 J | 395.6 | 29 | 29 |
| 0.69 J | 2.4 J | -1.71 | 29 | 30 |
| 208 | 2.4 J | 205.6 | 30 | 30 |
| 0.58 J | 2.4 J | -1.82 | 30 | 31 |
| ND<0.5 U | 2.4 J | -1.9 | 30 | 32 |
| ND<1 U | 2.4 J | -1.4 | 30 | 33 |
| 17.42 | 2.4 J | 15.02 | 31 | 33 |
| 192.8 | 2.4 J | 190.4 | 32 | 33 |
| | | | | |
| 2.3 J | ND<1.5 U | 0.8 | 33 | 33 |
| 14.5 | ND<1.5 U | 13 | 34 | 33 |
| 3 | ND<1.5 U | 1.5 | 35 | 33 |
| 79.9 | ND<1.5 U | 78.4 | 36 | 33 |
| 18 | ND<1.5 U | 16.5 | 37 | 33 |
| 98.3 | ND<1.5 U | 96.8 | 38 | 33 |
| 92.2 | ND<1.5 U | 90.7 | 39 | 33 |
| 803 | ND<1.5 U | 801.5 | 40 | 33 |
| 785 | ND<1.5 U | 783.5 | 41 | 33 |
| 873 2c | ND<1.5 U | 871.5 | 42 | 33 |
| 277 | ND<1.5 U | 275.5 | 43 | 33 |
| 136 | ND<1.5 U | 134.5 | 44 | 33 |
| 398 | ND<1.5 U | 396.5 | 45 | 33 |
| 0.69 J | ND<1.5 U | -0.81 | 45 | 34 |
| 208 | ND<1.5 U | 206.5 | 46 | 34 |
| 0.58 J | ND<1.5 U | -0.92 | 46 | 35 |
| ND<0.5 U | ND<1.5 U | -1 | 46 | 36 |
| ND<1 U | ND<1.5 U | -0.5 | 46 | 37 |
| 17.42 | ND<1.5 U | 15.92 | 47 | 37 |
| 192.8 | ND<1.5 U | 191.3 | 48 | 37 |
| | | | | |
| 14.5 | 2.3 J | 12.2 | 49 | 37 |
| 3 | 2.3 J | 0.7 | 50 | 37 |
| 79.9 | 2.3 J | 77.6 | 51 | 37 |
| 18 | 2.3 J | 15.7 | 52 | 37 |
| 98.3 | 2.3 J | 96 | 53 | 37 |
| 92.2 | 2.3 J | 89.9 | 54 | 37 |
| 803 | 2.3 J | 800.7 | 55 | 37 |
| 785 | 2.3 J | 782.7 | 56 | 37 |
| 873 2c | 2.3 J | 870.7 | 57 | 37 |
| 277 | 2.3 J | 274.7 | 58 | 37 |
| 136 | 2.3 J | 133.7 | 59 | 37 |
| 398 | 2.3 J | 395.7 | 60 | 37 |
| 0.69 J | 2.3 J | -1.61 | 60 | 38 |
| 208 | 2.3 J | 205.7 | 61 | 38 |

| | | | | |
|---|---|---|---|---|
| 0.58 J | 2.3 J | -1.72 | 61 | 39 |
| ND<0.5 U | 2.3 J | -1.8 | 61 | 40 |
| ND<1 U | 2.3 J | -1.3 | 61 | 41 |
| 17.42 | 2.3 J | 15.12 | 62 | 41 |
| 192.8 | 2.3 J | 190.5 | 63 | 41 |
| | | | | |
| 3 | 14.5 | -11.5 | 63 | 42 |
| 79.9 | 14.5 | 65.4 | 64 | 42 |
| 18 | 14.5 | 3.5 | 65 | 42 |
| 98.3 | 14.5 | 83.8 | 66 | 42 |
| 92.2 | 14.5 | 77.7 | 67 | 42 |
| 803 | 14.5 | 788.5 | 68 | 42 |
| 785 | 14.5 | 770.5 | 69 | 42 |
| 873 2c | 14.5 | 858.5 | 70 | 42 |
| 277 | 14.5 | 262.5 | 71 | 42 |
| 136 | 14.5 | 121.5 | 72 | 42 |
| 398 | 14.5 | 383.5 | 73 | 42 |
| 0.69 J | 14.5 | -13.81 | 73 | 43 |
| 208 | 14.5 | 193.5 | 74 | 43 |
| 0.58 J | 14.5 | -13.92 | 74 | 44 |
| ND<0.5 U | 14.5 | -14 | 74 | 45 |
| ND<1 U | 14.5 | -13.5 | 74 | 46 |
| 17.42 | 14.5 | 2.92 | 75 | 46 |
| 192.8 | 14.5 | 178.3 | 76 | 46 |
| | | | | |
| 79.9 | 3 | 76.9 | 77 | 46 |
| 18 | 3 | 15 | 78 | 46 |
| 98.3 | 3 | 95.3 | 79 | 46 |
| 92.2 | 3 | 89.2 | 80 | 46 |
| 803 | 3 | 800 | 81 | 46 |
| 785 | 3 | 782 | 82 | 46 |
| 873 2c | 3 | 870 | 83 | 46 |
| 277 | 3 | 274 | 84 | 46 |
| 136 | 3 | 133 | 85 | 46 |
| 398 | 3 | 395 | 86 | 46 |
| 0.69 J | 3 | -2.31 | 86 | 47 |
| 208 | 3 | 205 | 87 | 47 |
| 0.58 J | 3 | -2.42 | 87 | 48 |
| ND<0.5 U | 3 | -2.5 | 87 | 49 |
| ND<1 U | 3 | -2 | 87 | 50 |
| 17.42 | 3 | 14.42 | 88 | 50 |
| 192.8 | 3 | 189.8 | 89 | 50 |
| | | | | |
| 18 | 79.9 | -61.9 | 89 | 51 |
| 98.3 | 79.9 | 18.4 | 90 | 51 |
| 92.2 | 79.9 | 12.3 | 91 | 51 |
| 803 | 79.9 | 723.1 | 92 | 51 |
| 785 | 79.9 | 705.1 | 93 | 51 |
| 873 2c | 79.9 | 793.1 | 94 | 51 |
| 277 | 79.9 | 197.1 | 95 | 51 |
| 136 | 79.9 | 56.1 | 96 | 51 |
| 398 | 79.9 | 318.1 | 97 | 51 |
| 0.69 J | 79.9 | -79.21 | 97 | 52 |
| 208 | 79.9 | 128.1 | 98 | 52 |
| 0.58 J | 79.9 | -79.32 | 98 | 53 |
| ND<0.5 U | 79.9 | -79.4 | 98 | 54 |
| ND<1 U | 79.9 | -78.9 | 98 | 55 |

| | | | | |
|---|---|---|---|---|
| 17.42 | 79.9 | -62.48 | 98 | 56 |
| 192.8 | 79.9 | 112.9 | 99 | 56 |
| | | | | |
| 98.3 | 18 | 80.3 | 100 | 56 |
| 92.2 | 18 | 74.2 | 101 | 56 |
| 803 | 18 | 785 | 102 | 56 |
| 785 | 18 | 767 | 103 | 56 |
| 873 2c | 18 | 855 | 104 | 56 |
| 277 | 18 | 259 | 105 | 56 |
| 136 | 18 | 118 | 106 | 56 |
| 398 | 18 | 380 | 107 | 56 |
| 0.69 J | 18 | -17.31 | 107 | 57 |
| 208 | 18 | 190 | 108 | 57 |
| 0.58 J | 18 | -17.42 | 108 | 58 |
| ND<0.5 U | 18 | -17.5 | 108 | 59 |
| ND<1 U | 18 | -17 | 108 | 60 |
| 17.42 | 18 | -0.58 | 108 | 61 |
| 192.8 | 18 | 174.8 | 109 | 61 |
| | | | | |
| 92.2 | 98.3 | Same Date | 109 | 61 |
| 803 | 98.3 | 704.7 | 110 | 61 |
| 785 | 98.3 | 686.7 | 111 | 61 |
| 873 2c | 98.3 | 774.7 | 112 | 61 |
| 277 | 98.3 | 178.7 | 113 | 61 |
| 136 | 98.3 | 37.7 | 114 | 61 |
| 398 | 98.3 | 299.7 | 115 | 61 |
| 0.69 J | 98.3 | -97.61 | 115 | 62 |
| 208 | 98.3 | 109.7 | 116 | 62 |
| 0.58 J | 98.3 | -97.72 | 116 | 63 |
| ND<0.5 U | 98.3 | -97.8 | 116 | 64 |
| ND<1 U | 98.3 | -97.3 | 116 | 65 |
| 17.42 | 98.3 | -80.88 | 116 | 66 |
| 192.8 | 98.3 | 94.5 | 117 | 66 |
| | | | | |
| 803 | 92.2 | 710.8 | 118 | 66 |
| 785 | 92.2 | 692.8 | 119 | 66 |
| 873 2c | 92.2 | 780.8 | 120 | 66 |
| 277 | 92.2 | 184.8 | 121 | 66 |
| 136 | 92.2 | 43.8 | 122 | 66 |
| 398 | 92.2 | 305.8 | 123 | 66 |
| 0.69 J | 92.2 | -91.51 | 123 | 67 |
| 208 | 92.2 | 115.8 | 124 | 67 |
| 0.58 J | 92.2 | -91.62 | 124 | 68 |
| ND<0.5 U | 92.2 | -91.7 | 124 | 69 |
| ND<1 U | 92.2 | -91.2 | 124 | 70 |
| 17.42 | 92.2 | -74.78 | 124 | 71 |
| 192.8 | 92.2 | 100.6 | 125 | 71 |
| | | | | |
| 785 | 803 | Same Date | 125 | 71 |
| 873 2c | 803 | 70 | 126 | 71 |
| 277 | 803 | -526 | 126 | 72 |
| 136 | 803 | -667 | 126 | 73 |
| 398 | 803 | -405 | 126 | 74 |
| 0.69 J | 803 | -802.31 | 126 | 75 |
| 208 | 803 | -595 | 126 | 76 |
| 0.58 J | 803 | -802.42 | 126 | 77 |
| ND<0.5 U | 803 | -802.5 | 126 | 78 |

| | | | | |
|---|---|---|---|---|
| ND<1 U | 803 | -802 | 126 | 79 |
| 17.42 | 803 | -785.58 | 126 | 80 |
| 192.8 | 803 | -610.2 | 126 | 81 |
| | | | | |
| 873 2c | 785 | 88 | 127 | 81 |
| 277 | 785 | -508 | 127 | 82 |
| 136 | 785 | -649 | 127 | 83 |
| 398 | 785 | -387 | 127 | 84 |
| 0.69 J | 785 | -784.31 | 127 | 85 |
| 208 | 785 | -577 | 127 | 86 |
| 0.58 J | 785 | -784.42 | 127 | 87 |
| ND<0.5 U | 785 | -784.5 | 127 | 88 |
| ND<1 U | 785 | -784 | 127 | 89 |
| 17.42 | 785 | -767.58 | 127 | 90 |
| 192.8 | 785 | -592.2 | 127 | 91 |
| | | | | |
| 277 | 873 2c | -596 | 127 | 92 |
| 136 | 873 2c | -737 | 127 | 93 |
| 398 | 873 2c | -475 | 127 | 94 |
| 0.69 J | 873 2c | -872.31 | 127 | 95 |
| 208 | 873 2c | -665 | 127 | 96 |
| 0.58 J | 873 2c | -872.42 | 127 | 97 |
| ND<0.5 U | 873 2c | -872.5 | 127 | 98 |
| ND<1 U | 873 2c | -872 | 127 | 99 |
| 17.42 | 873 2c | -855.58 | 127 | 100 |
| 192.8 | 873 2c | -680.2 | 127 | 101 |
| | | | | |
| 136 | 277 | -141 | 127 | 102 |
| 398 | 277 | 121 | 128 | 102 |
| 0.69 J | 277 | -276.31 | 128 | 103 |
| 208 | 277 | -69 | 128 | 104 |
| 0.58 J | 277 | -276.42 | 128 | 105 |
| ND<0.5 U | 277 | -276.5 | 128 | 106 |
| ND<1 U | 277 | -276 | 128 | 107 |
| 17.42 | 277 | -259.58 | 128 | 108 |
| 192.8 | 277 | -84.2 | 128 | 109 |
| | | | | |
| 398 | 136 | 262 | 129 | 109 |
| 0.69 J | 136 | -135.31 | 129 | 110 |
| 208 | 136 | 72 | 130 | 110 |
| 0.58 J | 136 | -135.42 | 130 | 111 |
| ND<0.5 U | 136 | -135.5 | 130 | 112 |
| ND<1 U | 136 | -135 | 130 | 113 |
| 17.42 | 136 | -118.58 | 130 | 114 |
| 192.8 | 136 | 56.8 | 131 | 114 |
| | | | | |
| 0.69 J | 398 | -397.31 | 131 | 115 |
| 208 | 398 | -190 | 131 | 116 |
| 0.58 J | 398 | -397.42 | 131 | 117 |
| ND<0.5 U | 398 | -397.5 | 131 | 118 |
| ND<1 U | 398 | -397 | 131 | 119 |
| 17.42 | 398 | -380.58 | 131 | 120 |
| 192.8 | 398 | -205.2 | 131 | 121 |
| | | | | |
| 208 | 0.69 J | 207.31 | 132 | 121 |
| 0.58 J | 0.69 J | -0.11 | 132 | 122 |
| ND<0.5 U | 0.69 J | -0.19 | 132 | 123 |

| | | | | |
|---|---|---|---|---|
| ND<1 U | 0.69 J | 0.31 | 133 | 123 |
| 17.42 | 0.69 J | 16.73 | 134 | 123 |
| 192.8 | 0.69 J | 192.11 | 135 | 123 |
| | | | | |
| 0.58 J | 208 | -207.42 | 135 | 124 |
| ND<0.5 U | 208 | -207.5 | 135 | 125 |
| ND<1 U | 208 | -207 | 135 | 126 |
| 17.42 | 208 | -190.58 | 135 | 127 |
| 192.8 | 208 | -15.2 | 135 | 128 |
| | | | | |
| ND<0.5 U | 0.58 J | -0.08 | 135 | 129 |
| ND<1 U | 0.58 J | 0.42 | 136 | 129 |
| 17.42 | 0.58 J | 16.84 | 137 | 129 |
| 192.8 | 0.58 J | 192.22 | 138 | 129 |
| | | | | |
| ND<1 U | ND<0.5 U | 0.5 | 139 | 129 |
| 17.42 | ND<0.5 U | 16.92 | 140 | 129 |
| 192.8 | ND<0.5 U | 192.3 | 141 | 129 |
| | | | | |
| 17.42 | ND<1 U | 16.42 | 142 | 129 |
| 192.8 | ND<1 U | 191.8 | 143 | 129 |
| | | | | |
| 192.8 | 17.42 | 175.38 | 144 | 129 |

S Statistic = 144 - 129 = 15

| Tied Group | Value | Members |
|---|---|---|
| 1 | 3 | 2 |

| Time Period | Observations |
|---|---|
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |

There are 2 time periods with multiple data

A = 18
B = 36

C = 0
D = 0
E = 2
F = 4
a = 29256
b = 109296
c = 1104
Group Variance = 1622.34
Z-Score = 0.347582
Comparison Level at 95% confidence level = 1.65463 (upward trend)
0.347582 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RW03R-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 147.8 | 9.595 | 138.205 | 1 | 0 |
| 233.8 | 9.595 | 224.205 | 2 | 0 |
| ND<0.1 U | 9.595 | -9.495 | 2 | 1 |
| ND<5 U | 9.595 | -4.595 | 2 | 2 |
| | | | | |
| 233.8 | 147.8 | 86 | 3 | 2 |
| ND<0.1 U | 147.8 | -147.7 | 3 | 3 |
| ND<5 U | 147.8 | -142.8 | 3 | 4 |
| | | | | |
| ND<0.1 U | 233.8 | -233.7 | 3 | 5 |
| ND<5 U | 233.8 | -228.8 | 3 | 6 |
| | | | | |
| ND<5 U | ND<0.1 U | 4.9 | 4 | 6 |

S Statistic = 4 - 6 = -2

Comparing at 95% confidence level (upward trend)

Probability of obtaining S >= -2 is 0.408

S < 0 or 0.408 >= 0.05 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RW05-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 17.5 | 1.9 J | 15.6 | 1 | 0 |
| 19.3 | 1.9 J | 17.4 | 2 | 0 |
| 3.7 | 1.9 J | 1.8 | 3 | 0 |
| 4.2 | 1.9 J | 2.3 | 4 | 0 |
| 4.9 | 1.9 J | 3 | 5 | 0 |
| 2.7 J | 1.9 J | 0.8 | 6 | 0 |
| 2.2 J | 1.9 J | 0.3 | 7 | 0 |
| 2.6 J | 1.9 J | 0.7 | 8 | 0 |
| 1.3 J | 1.9 J | -0.6 | 8 | 1 |
| ND<1.5 U | 1.9 J | -0.4 | 8 | 2 |
| 1.7 J1c | 1.9 J | -0.2 | 8 | 3 |
| ND<1.5 U2c | 1.9 J | -0.4 | 8 | 4 |
| 1930 | 1.9 J | 1928.1 | 9 | 4 |
| | | | | |
| 19.3 | 17.5 | 1.8 | 10 | 4 |
| 3.7 | 17.5 | -13.8 | 10 | 5 |
| 4.2 | 17.5 | -13.3 | 10 | 6 |
| 4.9 | 17.5 | -12.6 | 10 | 7 |
| 2.7 J | 17.5 | -14.8 | 10 | 8 |
| 2.2 J | 17.5 | -15.3 | 10 | 9 |
| 2.6 J | 17.5 | -14.9 | 10 | 10 |
| 1.3 J | 17.5 | -16.2 | 10 | 11 |
| ND<1.5 U | 17.5 | -16 | 10 | 12 |
| 1.7 J1c | 17.5 | -15.8 | 10 | 13 |
| ND<1.5 U2c | 17.5 | -16 | 10 | 14 |
| 1930 | 17.5 | 1912.5 | 11 | 14 |
| | | | | |
| 3.7 | 19.3 | -15.6 | 11 | 15 |
| 4.2 | 19.3 | -15.1 | 11 | 16 |
| 4.9 | 19.3 | -14.4 | 11 | 17 |
| 2.7 J | 19.3 | -16.6 | 11 | 18 |
| 2.2 J | 19.3 | -17.1 | 11 | 19 |
| 2.6 J | 19.3 | -16.7 | 11 | 20 |
| 1.3 J | 19.3 | -18 | 11 | 21 |
| ND<1.5 U | 19.3 | -17.8 | 11 | 22 |
| 1.7 J1c | 19.3 | -17.6 | 11 | 23 |
| ND<1.5 U2c | 19.3 | -17.8 | 11 | 24 |
| 1930 | 19.3 | 1910.7 | 12 | 24 |
| | | | | |
| 4.2 | 3.7 | 0.5 | 13 | 24 |
| 4.9 | 3.7 | 1.2 | 14 | 24 |
| 2.7 J | 3.7 | -1 | 14 | 25 |
| 2.2 J | 3.7 | -1.5 | 14 | 26 |
| 2.6 J | 3.7 | -1.1 | 14 | 27 |
| 1.3 J | 3.7 | -2.4 | 14 | 28 |
| ND<1.5 U | 3.7 | -2.2 | 14 | 29 |
| 1.7 J1c | 3.7 | -2 | 14 | 30 |

| | | | | |
|---|---|---|---|---|
| ND<1.5 U2c | 3.7 | -2.2 | 14 | 31 |
| 1930 | 3.7 | 1926.3 | 15 | 31 |
| | | | | |
| 4.9 | 4.2 | 0.7 | 16 | 31 |
| 2.7 J | 4.2 | -1.5 | 16 | 32 |
| 2.2 J | 4.2 | -2 | 16 | 33 |
| 2.6 J | 4.2 | -1.6 | 16 | 34 |
| 1.3 J | 4.2 | -2.9 | 16 | 35 |
| ND<1.5 U | 4.2 | -2.7 | 16 | 36 |
| 1.7 J1c | 4.2 | -2.5 | 16 | 37 |
| ND<1.5 U2c | 4.2 | -2.7 | 16 | 38 |
| 1930 | 4.2 | 1925.8 | 17 | 38 |
| | | | | |
| 2.7 J | 4.9 | -2.2 | 17 | 39 |
| 2.2 J | 4.9 | -2.7 | 17 | 40 |
| 2.6 J | 4.9 | -2.3 | 17 | 41 |
| 1.3 J | 4.9 | -3.6 | 17 | 42 |
| ND<1.5 U | 4.9 | -3.4 | 17 | 43 |
| 1.7 J1c | 4.9 | -3.2 | 17 | 44 |
| ND<1.5 U2c | 4.9 | -3.4 | 17 | 45 |
| 1930 | 4.9 | 1925.1 | 18 | 45 |
| | | | | |
| 2.2 J | 2.7 J | -0.5 | 18 | 46 |
| 2.6 J | 2.7 J | -0.1 | 18 | 47 |
| 1.3 J | 2.7 J | -1.4 | 18 | 48 |
| ND<1.5 U | 2.7 J | -1.2 | 18 | 49 |
| 1.7 J1c | 2.7 J | -1 | 18 | 50 |
| ND<1.5 U2c | 2.7 J | -1.2 | 18 | 51 |
| 1930 | 2.7 J | 1927.3 | 19 | 51 |
| | | | | |
| 2.6 J | 2.2 J | 0.4 | 20 | 51 |
| 1.3 J | 2.2 J | -0.9 | 20 | 52 |
| ND<1.5 U | 2.2 J | -0.7 | 20 | 53 |
| 1.7 J1c | 2.2 J | -0.5 | 20 | 54 |
| ND<1.5 U2c | 2.2 J | -0.7 | 20 | 55 |
| 1930 | 2.2 J | 1927.8 | 21 | 55 |
| | | | | |
| 1.3 J | 2.6 J | -1.3 | 21 | 56 |
| ND<1.5 U | 2.6 J | -1.1 | 21 | 57 |
| 1.7 J1c | 2.6 J | -0.9 | 21 | 58 |
| ND<1.5 U2c | 2.6 J | -1.1 | 21 | 59 |
| 1930 | 2.6 J | 1927.4 | 22 | 59 |
| | | | | |
| ND<1.5 U | 1.3 J | 0.2 | 23 | 59 |
| 1.7 J1c | 1.3 J | 0.4 | 24 | 59 |
| ND<1.5 U2c | 1.3 J | 0.2 | 25 | 59 |
| 1930 | 1.3 J | 1928.7 | 26 | 59 |
| | | | | |
| 1.7 J1c | ND<1.5 U | 0.2 | 27 | 59 |
| ND<1.5 U2c | ND<1.5 U | 0 | 27 | 59 |
| 1930 | ND<1.5 U | 1928.5 | 28 | 59 |
| | | | | |
| ND<1.5 U2c | 1.7 J1c | Same Date | 28 | 59 |
| 1930 | 1.7 J1c | 1928.3 | 29 | 59 |
| | | | | |
| 1930 | ND<1.5 U2c | 1928.5 | 30 | 59 |

S Statistic = 30 - 59 = -29

| Tied Group | Value | Members |
|---|---|---|
| 1 | 1.5 | 2 |

| Time Period | Observations |
|---|---|
| 6/1/2017 | 1 |
| 7/1/2017 | 1 |
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 6/1/2020 | 1 |

There are 1 time periods with multiple data

A = 18
B = 18
C = 0
D = 0
E = 2
F = 2
a = 6006
b = 19656
c = 364
Group Variance = 331.678
Z-Score = -1.53745
Comparison Level at 95% confidence level = 1.65463 (upward trend)
-1.53745 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RW05R-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 2570 2c | 2590 1c3c | Same Date | 0 | 0 |
| 2820 2c | 2590 1c3c | 230 | 1 | 0 |
| 2700 | 2590 1c3c | 110 | 2 | 0 |
| 1960 | 2590 1c3c | -630 | 2 | 1 |
| 1650 | 2590 1c3c | -940 | 2 | 2 |
| 1790 | 2590 1c3c | -800 | 2 | 3 |
| 1570 | 2590 1c3c | -1020 | 2 | 4 |
| 1470 | 2590 1c3c | -1120 | 2 | 5 |
| 1660 | 2590 1c3c | -930 | 2 | 6 |
| 1243 | 2590 1c3c | -1347 | 2 | 7 |
| 1178 | 2590 1c3c | -1412 | 2 | 8 |
| 1451 | 2590 1c3c | -1139 | 2 | 9 |
| 1622 | 2590 1c3c | -968 | 2 | 10 |
| 1996 | 2590 1c3c | -594 | 2 | 11 |
| | | | | |
| 2820 2c | 2570 2c | 250 | 3 | 11 |
| 2700 | 2570 2c | 130 | 4 | 11 |
| 1960 | 2570 2c | -610 | 4 | 12 |
| 1650 | 2570 2c | -920 | 4 | 13 |
| 1790 | 2570 2c | -780 | 4 | 14 |
| 1570 | 2570 2c | -1000 | 4 | 15 |
| 1470 | 2570 2c | -1100 | 4 | 16 |
| 1660 | 2570 2c | -910 | 4 | 17 |
| 1243 | 2570 2c | -1327 | 4 | 18 |
| 1178 | 2570 2c | -1392 | 4 | 19 |
| 1451 | 2570 2c | -1119 | 4 | 20 |
| 1622 | 2570 2c | -948 | 4 | 21 |
| 1996 | 2570 2c | -574 | 4 | 22 |
| | | | | |
| 2700 | 2820 2c | -120 | 4 | 23 |
| 1960 | 2820 2c | -860 | 4 | 24 |
| 1650 | 2820 2c | -1170 | 4 | 25 |
| 1790 | 2820 2c | -1030 | 4 | 26 |
| 1570 | 2820 2c | -1250 | 4 | 27 |
| 1470 | 2820 2c | -1350 | 4 | 28 |
| 1660 | 2820 2c | -1160 | 4 | 29 |
| 1243 | 2820 2c | -1577 | 4 | 30 |
| 1178 | 2820 2c | -1642 | 4 | 31 |
| 1451 | 2820 2c | -1369 | 4 | 32 |
| 1622 | 2820 2c | -1198 | 4 | 33 |
| 1996 | 2820 2c | -824 | 4 | 34 |
| | | | | |
| 1960 | 2700 | -740 | 4 | 35 |
| 1650 | 2700 | -1050 | 4 | 36 |
| 1790 | 2700 | -910 | 4 | 37 |
| 1570 | 2700 | -1130 | 4 | 38 |
| 1470 | 2700 | -1230 | 4 | 39 |

| | | | | |
|---|---|---|---|---|
| 1660 | 2700 | -1040 | 4 | 40 |
| 1243 | 2700 | -1457 | 4 | 41 |
| 1178 | 2700 | -1522 | 4 | 42 |
| 1451 | 2700 | -1249 | 4 | 43 |
| 1622 | 2700 | -1078 | 4 | 44 |
| 1996 | 2700 | -704 | 4 | 45 |
| | | | | |
| 1650 | 1960 | -310 | 4 | 46 |
| 1790 | 1960 | -170 | 4 | 47 |
| 1570 | 1960 | -390 | 4 | 48 |
| 1470 | 1960 | -490 | 4 | 49 |
| 1660 | 1960 | -300 | 4 | 50 |
| 1243 | 1960 | -717 | 4 | 51 |
| 1178 | 1960 | -782 | 4 | 52 |
| 1451 | 1960 | -509 | 4 | 53 |
| 1622 | 1960 | -338 | 4 | 54 |
| 1996 | 1960 | 36 | 5 | 54 |
| | | | | |
| 1790 | 1650 | 140 | 6 | 54 |
| 1570 | 1650 | -80 | 6 | 55 |
| 1470 | 1650 | -180 | 6 | 56 |
| 1660 | 1650 | 10 | 7 | 56 |
| 1243 | 1650 | -407 | 7 | 57 |
| 1178 | 1650 | -472 | 7 | 58 |
| 1451 | 1650 | -199 | 7 | 59 |
| 1622 | 1650 | -28 | 7 | 60 |
| 1996 | 1650 | 346 | 8 | 60 |
| | | | | |
| 1570 | 1790 | -220 | 8 | 61 |
| 1470 | 1790 | -320 | 8 | 62 |
| 1660 | 1790 | -130 | 8 | 63 |
| 1243 | 1790 | -547 | 8 | 64 |
| 1178 | 1790 | -612 | 8 | 65 |
| 1451 | 1790 | -339 | 8 | 66 |
| 1622 | 1790 | -168 | 8 | 67 |
| 1996 | 1790 | 206 | 9 | 67 |
| | | | | |
| 1470 | 1570 | -100 | 9 | 68 |
| 1660 | 1570 | 90 | 10 | 68 |
| 1243 | 1570 | -327 | 10 | 69 |
| 1178 | 1570 | -392 | 10 | 70 |
| 1451 | 1570 | -119 | 10 | 71 |
| 1622 | 1570 | 52 | 11 | 71 |
| 1996 | 1570 | 426 | 12 | 71 |
| | | | | |
| 1660 | 1470 | 190 | 13 | 71 |
| 1243 | 1470 | -227 | 13 | 72 |
| 1178 | 1470 | -292 | 13 | 73 |
| 1451 | 1470 | -19 | 13 | 74 |
| 1622 | 1470 | 152 | 14 | 74 |
| 1996 | 1470 | 526 | 15 | 74 |
| | | | | |
| 1243 | 1660 | -417 | 15 | 75 |
| 1178 | 1660 | -482 | 15 | 76 |
| 1451 | 1660 | -209 | 15 | 77 |
| 1622 | 1660 | -38 | 15 | 78 |
| 1996 | 1660 | 336 | 16 | 78 |

| | | | | |
|---|---|---|---|---|
| 1178 | 1243 | -65 | 16 | 79 |
| 1451 | 1243 | 208 | 17 | 79 |
| 1622 | 1243 | 379 | 18 | 79 |
| 1996 | 1243 | 753 | 19 | 79 |
| | | | | |
| 1451 | 1178 | 273 | 20 | 79 |
| 1622 | 1178 | 444 | 21 | 79 |
| 1996 | 1178 | 818 | 22 | 79 |
| | | | | |
| 1622 | 1451 | 171 | 23 | 79 |
| 1996 | 1451 | 545 | 24 | 79 |
| | | | | |
| 1996 | 1622 | 374 | 25 | 79 |

S Statistic = 25 - 79 = -54

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 0
B = 18
C = 0
D = 0
E = 0
F = 2
a = 7350
b = 24570
c = 420
Group Variance = 407.333
Z-Score = -2.62604
Comparison Level at 95% confidence level = 1.65463 (upward trend)
-2.62604 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RW06-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 9.2 | 12.5 | -3.3 | 0 | 1 |
| 14 | 12.5 | 1.5 | 1 | 1 |
| 20.4 | 12.5 | 7.9 | 2 | 1 |
| 14.3 | 12.5 | 1.8 | 3 | 1 |
| 10.2 | 12.5 | -2.3 | 3 | 2 |
| 10.1 | 12.5 | -2.4 | 3 | 3 |
| 4.5 | 12.5 | -8 | 3 | 4 |
| 4.2 | 12.5 | -8.3 | 3 | 5 |
| 5.4 | 12.5 | -7.1 | 3 | 6 |
| 7.1 | 12.5 | -5.4 | 3 | 7 |
| 8.4 | 12.5 | -4.1 | 3 | 8 |
| 89.2 | 12.5 | 76.7 | 4 | 8 |
| ND<1.5 U | 12.5 | -11 | 4 | 9 |
| 629 | 12.5 | 616.5 | 5 | 9 |
| 934 1c | 12.5 | 921.5 | 6 | 9 |
| 876 2c | 12.5 | 863.5 | 7 | 9 |
| 885 | 12.5 | 872.5 | 8 | 9 |
| 903 | 12.5 | 890.5 | 9 | 9 |
| 793 | 12.5 | 780.5 | 10 | 9 |
| 673 | 12.5 | 660.5 | 11 | 9 |
| 690 | 12.5 | 677.5 | 12 | 9 |
| 582 | 12.5 | 569.5 | 13 | 9 |
| 530 | 12.5 | 517.5 | 14 | 9 |
| 0.66 J | 12.5 | -11.84 | 14 | 10 |
| 616 | 12.5 | 603.5 | 15 | 10 |
| 604 | 12.5 | 591.5 | 16 | 10 |
| 626 | 12.5 | 613.5 | 17 | 10 |
| 610.6 | 12.5 | 598.1 | 18 | 10 |
| 570.7 | 12.5 | 558.2 | 19 | 10 |
| | | | | |
| 14 | 9.2 | 4.8 | 20 | 10 |
| 20.4 | 9.2 | 11.2 | 21 | 10 |
| 14.3 | 9.2 | 5.1 | 22 | 10 |
| 10.2 | 9.2 | 1 | 23 | 10 |
| 10.1 | 9.2 | 0.9 | 24 | 10 |
| 4.5 | 9.2 | -4.7 | 24 | 11 |
| 4.2 | 9.2 | -5 | 24 | 12 |
| 5.4 | 9.2 | -3.8 | 24 | 13 |
| 7.1 | 9.2 | -2.1 | 24 | 14 |
| 8.4 | 9.2 | -0.8 | 24 | 15 |
| 89.2 | 9.2 | 80 | 25 | 15 |
| ND<1.5 U | 9.2 | -7.7 | 25 | 16 |
| 629 | 9.2 | 619.8 | 26 | 16 |
| 934 1c | 9.2 | 924.8 | 27 | 16 |
| 876 2c | 9.2 | 866.8 | 28 | 16 |
| 885 | 9.2 | 875.8 | 29 | 16 |
| 903 | 9.2 | 893.8 | 30 | 16 |

| | | | | |
|---|---|---|---|---|
| 793 | 9.2 | 783.8 | 31 | 16 |
| 673 | 9.2 | 663.8 | 32 | 16 |
| 690 | 9.2 | 680.8 | 33 | 16 |
| 582 | 9.2 | 572.8 | 34 | 16 |
| 530 | 9.2 | 520.8 | 35 | 16 |
| 0.66 J | 9.2 | -8.54 | 35 | 17 |
| 616 | 9.2 | 606.8 | 36 | 17 |
| 604 | 9.2 | 594.8 | 37 | 17 |
| 626 | 9.2 | 616.8 | 38 | 17 |
| 610.6 | 9.2 | 601.4 | 39 | 17 |
| 570.7 | 9.2 | 561.5 | 40 | 17 |
| | | | | |
| 20.4 | 14 | 6.4 | 41 | 17 |
| 14.3 | 14 | 0.3 | 42 | 17 |
| 10.2 | 14 | -3.8 | 42 | 18 |
| 10.1 | 14 | -3.9 | 42 | 19 |
| 4.5 | 14 | -9.5 | 42 | 20 |
| 4.2 | 14 | -9.8 | 42 | 21 |
| 5.4 | 14 | -8.6 | 42 | 22 |
| 7.1 | 14 | -6.9 | 42 | 23 |
| 8.4 | 14 | -5.6 | 42 | 24 |
| 89.2 | 14 | 75.2 | 43 | 24 |
| ND<1.5 U | 14 | -12.5 | 43 | 25 |
| 629 | 14 | 615 | 44 | 25 |
| 934 1c | 14 | 920 | 45 | 25 |
| 876 2c | 14 | 862 | 46 | 25 |
| 885 | 14 | 871 | 47 | 25 |
| 903 | 14 | 889 | 48 | 25 |
| 793 | 14 | 779 | 49 | 25 |
| 673 | 14 | 659 | 50 | 25 |
| 690 | 14 | 676 | 51 | 25 |
| 582 | 14 | 568 | 52 | 25 |
| 530 | 14 | 516 | 53 | 25 |
| 0.66 J | 14 | -13.34 | 53 | 26 |
| 616 | 14 | 602 | 54 | 26 |
| 604 | 14 | 590 | 55 | 26 |
| 626 | 14 | 612 | 56 | 26 |
| 610.6 | 14 | 596.6 | 57 | 26 |
| 570.7 | 14 | 556.7 | 58 | 26 |
| | | | | |
| 14.3 | 20.4 | -6.1 | 58 | 27 |
| 10.2 | 20.4 | -10.2 | 58 | 28 |
| 10.1 | 20.4 | -10.3 | 58 | 29 |
| 4.5 | 20.4 | -15.9 | 58 | 30 |
| 4.2 | 20.4 | -16.2 | 58 | 31 |
| 5.4 | 20.4 | -15 | 58 | 32 |
| 7.1 | 20.4 | -13.3 | 58 | 33 |
| 8.4 | 20.4 | -12 | 58 | 34 |
| 89.2 | 20.4 | 68.8 | 59 | 34 |
| ND<1.5 U | 20.4 | -18.9 | 59 | 35 |
| 629 | 20.4 | 608.6 | 60 | 35 |
| 934 1c | 20.4 | 913.6 | 61 | 35 |
| 876 2c | 20.4 | 855.6 | 62 | 35 |
| 885 | 20.4 | 864.6 | 63 | 35 |
| 903 | 20.4 | 882.6 | 64 | 35 |
| 793 | 20.4 | 772.6 | 65 | 35 |
| 673 | 20.4 | 652.6 | 66 | 35 |

| | | | | |
|---|---|---|---|---|
| 690 | 20.4 | 669.6 | 67 | 35 |
| 582 | 20.4 | 561.6 | 68 | 35 |
| 530 | 20.4 | 509.6 | 69 | 35 |
| 0.66 J | 20.4 | -19.74 | 69 | 36 |
| 616 | 20.4 | 595.6 | 70 | 36 |
| 604 | 20.4 | 583.6 | 71 | 36 |
| 626 | 20.4 | 605.6 | 72 | 36 |
| 610.6 | 20.4 | 590.2 | 73 | 36 |
| 570.7 | 20.4 | 550.3 | 74 | 36 |
| | | | | |
| 10.2 | 14.3 | -4.1 | 74 | 37 |
| 10.1 | 14.3 | -4.2 | 74 | 38 |
| 4.5 | 14.3 | -9.8 | 74 | 39 |
| 4.2 | 14.3 | -10.1 | 74 | 40 |
| 5.4 | 14.3 | -8.9 | 74 | 41 |
| 7.1 | 14.3 | -7.2 | 74 | 42 |
| 8.4 | 14.3 | -5.9 | 74 | 43 |
| 89.2 | 14.3 | 74.9 | 75 | 43 |
| ND<1.5 U | 14.3 | -12.8 | 75 | 44 |
| 629 | 14.3 | 614.7 | 76 | 44 |
| 934 1c | 14.3 | 919.7 | 77 | 44 |
| 876 2c | 14.3 | 861.7 | 78 | 44 |
| 885 | 14.3 | 870.7 | 79 | 44 |
| 903 | 14.3 | 888.7 | 80 | 44 |
| 793 | 14.3 | 778.7 | 81 | 44 |
| 673 | 14.3 | 658.7 | 82 | 44 |
| 690 | 14.3 | 675.7 | 83 | 44 |
| 582 | 14.3 | 567.7 | 84 | 44 |
| 530 | 14.3 | 515.7 | 85 | 44 |
| 0.66 J | 14.3 | -13.64 | 85 | 45 |
| 616 | 14.3 | 601.7 | 86 | 45 |
| 604 | 14.3 | 589.7 | 87 | 45 |
| 626 | 14.3 | 611.7 | 88 | 45 |
| 610.6 | 14.3 | 596.3 | 89 | 45 |
| 570.7 | 14.3 | 556.4 | 90 | 45 |
| | | | | |
| 10.1 | 10.2 | -0.1 | 90 | 46 |
| 4.5 | 10.2 | -5.7 | 90 | 47 |
| 4.2 | 10.2 | -6 | 90 | 48 |
| 5.4 | 10.2 | -4.8 | 90 | 49 |
| 7.1 | 10.2 | -3.1 | 90 | 50 |
| 8.4 | 10.2 | -1.8 | 90 | 51 |
| 89.2 | 10.2 | 79 | 91 | 51 |
| ND<1.5 U | 10.2 | -8.7 | 91 | 52 |
| 629 | 10.2 | 618.8 | 92 | 52 |
| 934 1c | 10.2 | 923.8 | 93 | 52 |
| 876 2c | 10.2 | 865.8 | 94 | 52 |
| 885 | 10.2 | 874.8 | 95 | 52 |
| 903 | 10.2 | 892.8 | 96 | 52 |
| 793 | 10.2 | 782.8 | 97 | 52 |
| 673 | 10.2 | 662.8 | 98 | 52 |
| 690 | 10.2 | 679.8 | 99 | 52 |
| 582 | 10.2 | 571.8 | 100 | 52 |
| 530 | 10.2 | 519.8 | 101 | 52 |
| 0.66 J | 10.2 | -9.54 | 101 | 53 |
| 616 | 10.2 | 605.8 | 102 | 53 |
| 604 | 10.2 | 593.8 | 103 | 53 |

| | | | | |
|---|---|---|---|---|
| 626 | 10.2 | 615.8 | 104 | 53 |
| 610.6 | 10.2 | 600.4 | 105 | 53 |
| 570.7 | 10.2 | 560.5 | 106 | 53 |
| | | | | |
| 4.5 | 10.1 | -5.6 | 106 | 54 |
| 4.2 | 10.1 | -5.9 | 106 | 55 |
| 5.4 | 10.1 | -4.7 | 106 | 56 |
| 7.1 | 10.1 | -3 | 106 | 57 |
| 8.4 | 10.1 | -1.7 | 106 | 58 |
| 89.2 | 10.1 | 79.1 | 107 | 58 |
| ND<1.5 U | 10.1 | -8.6 | 107 | 59 |
| 629 | 10.1 | 618.9 | 108 | 59 |
| 934 1c | 10.1 | 923.9 | 109 | 59 |
| 876 2c | 10.1 | 865.9 | 110 | 59 |
| 885 | 10.1 | 874.9 | 111 | 59 |
| 903 | 10.1 | 892.9 | 112 | 59 |
| 793 | 10.1 | 782.9 | 113 | 59 |
| 673 | 10.1 | 662.9 | 114 | 59 |
| 690 | 10.1 | 679.9 | 115 | 59 |
| 582 | 10.1 | 571.9 | 116 | 59 |
| 530 | 10.1 | 519.9 | 117 | 59 |
| 0.66 J | 10.1 | -9.44 | 117 | 60 |
| 616 | 10.1 | 605.9 | 118 | 60 |
| 604 | 10.1 | 593.9 | 119 | 60 |
| 626 | 10.1 | 615.9 | 120 | 60 |
| 610.6 | 10.1 | 600.5 | 121 | 60 |
| 570.7 | 10.1 | 560.6 | 122 | 60 |
| | | | | |
| 4.2 | 4.5 | -0.3 | 122 | 61 |
| 5.4 | 4.5 | 0.9 | 123 | 61 |
| 7.1 | 4.5 | 2.6 | 124 | 61 |
| 8.4 | 4.5 | 3.9 | 125 | 61 |
| 89.2 | 4.5 | 84.7 | 126 | 61 |
| ND<1.5 U | 4.5 | -3 | 126 | 62 |
| 629 | 4.5 | 624.5 | 127 | 62 |
| 934 1c | 4.5 | 929.5 | 128 | 62 |
| 876 2c | 4.5 | 871.5 | 129 | 62 |
| 885 | 4.5 | 880.5 | 130 | 62 |
| 903 | 4.5 | 898.5 | 131 | 62 |
| 793 | 4.5 | 788.5 | 132 | 62 |
| 673 | 4.5 | 668.5 | 133 | 62 |
| 690 | 4.5 | 685.5 | 134 | 62 |
| 582 | 4.5 | 577.5 | 135 | 62 |
| 530 | 4.5 | 525.5 | 136 | 62 |
| 0.66 J | 4.5 | -3.84 | 136 | 63 |
| 616 | 4.5 | 611.5 | 137 | 63 |
| 604 | 4.5 | 599.5 | 138 | 63 |
| 626 | 4.5 | 621.5 | 139 | 63 |
| 610.6 | 4.5 | 606.1 | 140 | 63 |
| 570.7 | 4.5 | 566.2 | 141 | 63 |
| | | | | |
| 5.4 | 4.2 | 1.2 | 142 | 63 |
| 7.1 | 4.2 | 2.9 | 143 | 63 |
| 8.4 | 4.2 | 4.2 | 144 | 63 |
| 89.2 | 4.2 | 85 | 145 | 63 |
| ND<1.5 U | 4.2 | -2.7 | 145 | 64 |
| 629 | 4.2 | 624.8 | 146 | 64 |

| | | | | |
|---|---|---|---|---|
| 934 1c | 4.2 | 929.8 | 147 | 64 |
| 876 2c | 4.2 | 871.8 | 148 | 64 |
| 885 | 4.2 | 880.8 | 149 | 64 |
| 903 | 4.2 | 898.8 | 150 | 64 |
| 793 | 4.2 | 788.8 | 151 | 64 |
| 673 | 4.2 | 668.8 | 152 | 64 |
| 690 | 4.2 | 685.8 | 153 | 64 |
| 582 | 4.2 | 577.8 | 154 | 64 |
| 530 | 4.2 | 525.8 | 155 | 64 |
| 0.66 J | 4.2 | -3.54 | 155 | 65 |
| 616 | 4.2 | 611.8 | 156 | 65 |
| 604 | 4.2 | 599.8 | 157 | 65 |
| 626 | 4.2 | 621.8 | 158 | 65 |
| 610.6 | 4.2 | 606.4 | 159 | 65 |
| 570.7 | 4.2 | 566.5 | 160 | 65 |
| | | | | |
| 7.1 | 5.4 | 1.7 | 161 | 65 |
| 8.4 | 5.4 | 3 | 162 | 65 |
| 89.2 | 5.4 | 83.8 | 163 | 65 |
| ND<1.5 U | 5.4 | -3.9 | 163 | 66 |
| 629 | 5.4 | 623.6 | 164 | 66 |
| 934 1c | 5.4 | 928.6 | 165 | 66 |
| 876 2c | 5.4 | 870.6 | 166 | 66 |
| 885 | 5.4 | 879.6 | 167 | 66 |
| 903 | 5.4 | 897.6 | 168 | 66 |
| 793 | 5.4 | 787.6 | 169 | 66 |
| 673 | 5.4 | 667.6 | 170 | 66 |
| 690 | 5.4 | 684.6 | 171 | 66 |
| 582 | 5.4 | 576.6 | 172 | 66 |
| 530 | 5.4 | 524.6 | 173 | 66 |
| 0.66 J | 5.4 | -4.74 | 173 | 67 |
| 616 | 5.4 | 610.6 | 174 | 67 |
| 604 | 5.4 | 598.6 | 175 | 67 |
| 626 | 5.4 | 620.6 | 176 | 67 |
| 610.6 | 5.4 | 605.2 | 177 | 67 |
| 570.7 | 5.4 | 565.3 | 178 | 67 |
| | | | | |
| 8.4 | 7.1 | 1.3 | 179 | 67 |
| 89.2 | 7.1 | 82.1 | 180 | 67 |
| ND<1.5 U | 7.1 | -5.6 | 180 | 68 |
| 629 | 7.1 | 621.9 | 181 | 68 |
| 934 1c | 7.1 | 926.9 | 182 | 68 |
| 876 2c | 7.1 | 868.9 | 183 | 68 |
| 885 | 7.1 | 877.9 | 184 | 68 |
| 903 | 7.1 | 895.9 | 185 | 68 |
| 793 | 7.1 | 785.9 | 186 | 68 |
| 673 | 7.1 | 665.9 | 187 | 68 |
| 690 | 7.1 | 682.9 | 188 | 68 |
| 582 | 7.1 | 574.9 | 189 | 68 |
| 530 | 7.1 | 522.9 | 190 | 68 |
| 0.66 J | 7.1 | -6.44 | 190 | 69 |
| 616 | 7.1 | 608.9 | 191 | 69 |
| 604 | 7.1 | 596.9 | 192 | 69 |
| 626 | 7.1 | 618.9 | 193 | 69 |
| 610.6 | 7.1 | 603.5 | 194 | 69 |
| 570.7 | 7.1 | 563.6 | 195 | 69 |

| | | | | |
|---|---|---|---|---|
| 89.2 | 8.4 | 80.8 | 196 | 69 |
| ND<1.5 U | 8.4 | -6.9 | 196 | 70 |
| 629 | 8.4 | 620.6 | 197 | 70 |
| 934 1c | 8.4 | 925.6 | 198 | 70 |
| 876 2c | 8.4 | 867.6 | 199 | 70 |
| 885 | 8.4 | 876.6 | 200 | 70 |
| 903 | 8.4 | 894.6 | 201 | 70 |
| 793 | 8.4 | 784.6 | 202 | 70 |
| 673 | 8.4 | 664.6 | 203 | 70 |
| 690 | 8.4 | 681.6 | 204 | 70 |
| 582 | 8.4 | 573.6 | 205 | 70 |
| 530 | 8.4 | 521.6 | 206 | 70 |
| 0.66 J | 8.4 | -7.74 | 206 | 71 |
| 616 | 8.4 | 607.6 | 207 | 71 |
| 604 | 8.4 | 595.6 | 208 | 71 |
| 626 | 8.4 | 617.6 | 209 | 71 |
| 610.6 | 8.4 | 602.2 | 210 | 71 |
| 570.7 | 8.4 | 562.3 | 211 | 71 |
| | | | | |
| ND<1.5 U | 89.2 | -87.7 | 211 | 72 |
| 629 | 89.2 | 539.8 | 212 | 72 |
| 934 1c | 89.2 | 844.8 | 213 | 72 |
| 876 2c | 89.2 | 786.8 | 214 | 72 |
| 885 | 89.2 | 795.8 | 215 | 72 |
| 903 | 89.2 | 813.8 | 216 | 72 |
| 793 | 89.2 | 703.8 | 217 | 72 |
| 673 | 89.2 | 583.8 | 218 | 72 |
| 690 | 89.2 | 600.8 | 219 | 72 |
| 582 | 89.2 | 492.8 | 220 | 72 |
| 530 | 89.2 | 440.8 | 221 | 72 |
| 0.66 J | 89.2 | -88.54 | 221 | 73 |
| 616 | 89.2 | 526.8 | 222 | 73 |
| 604 | 89.2 | 514.8 | 223 | 73 |
| 626 | 89.2 | 536.8 | 224 | 73 |
| 610.6 | 89.2 | 521.4 | 225 | 73 |
| 570.7 | 89.2 | 481.5 | 226 | 73 |
| | | | | |
| 629 | ND<1.5 U | 627.5 | 227 | 73 |
| 934 1c | ND<1.5 U | 932.5 | 228 | 73 |
| 876 2c | ND<1.5 U | 874.5 | 229 | 73 |
| 885 | ND<1.5 U | 883.5 | 230 | 73 |
| 903 | ND<1.5 U | 901.5 | 231 | 73 |
| 793 | ND<1.5 U | 791.5 | 232 | 73 |
| 673 | ND<1.5 U | 671.5 | 233 | 73 |
| 690 | ND<1.5 U | 688.5 | 234 | 73 |
| 582 | ND<1.5 U | 580.5 | 235 | 73 |
| 530 | ND<1.5 U | 528.5 | 236 | 73 |
| 0.66 J | ND<1.5 U | -0.84 | 236 | 74 |
| 616 | ND<1.5 U | 614.5 | 237 | 74 |
| 604 | ND<1.5 U | 602.5 | 238 | 74 |
| 626 | ND<1.5 U | 624.5 | 239 | 74 |
| 610.6 | ND<1.5 U | 609.1 | 240 | 74 |
| 570.7 | ND<1.5 U | 569.2 | 241 | 74 |
| | | | | |
| 934 1c | 629 | 305 | 242 | 74 |
| 876 2c | 629 | 247 | 243 | 74 |
| 885 | 629 | 256 | 244 | 74 |

| | | | | |
|---|---|---|---|---|
| 903 | 629 | 274 | 245 | 74 |
| 793 | 629 | 164 | 246 | 74 |
| 673 | 629 | 44 | 247 | 74 |
| 690 | 629 | 61 | 248 | 74 |
| 582 | 629 | -47 | 248 | 75 |
| 530 | 629 | -99 | 248 | 76 |
| 0.66 J | 629 | -628.34 | 248 | 77 |
| 616 | 629 | -13 | 248 | 78 |
| 604 | 629 | -25 | 248 | 79 |
| 626 | 629 | -3 | 248 | 80 |
| 610.6 | 629 | -18.4 | 248 | 81 |
| 570.7 | 629 | -58.3 | 248 | 82 |
| | | | | |
| 876 2c | 934 1c | Same Date | 248 | 82 |
| 885 | 934 1c | -49 | 248 | 83 |
| 903 | 934 1c | -31 | 248 | 84 |
| 793 | 934 1c | -141 | 248 | 85 |
| 673 | 934 1c | -261 | 248 | 86 |
| 690 | 934 1c | -244 | 248 | 87 |
| 582 | 934 1c | -352 | 248 | 88 |
| 530 | 934 1c | -404 | 248 | 89 |
| 0.66 J | 934 1c | -933.34 | 248 | 90 |
| 616 | 934 1c | -318 | 248 | 91 |
| 604 | 934 1c | -330 | 248 | 92 |
| 626 | 934 1c | -308 | 248 | 93 |
| 610.6 | 934 1c | -323.4 | 248 | 94 |
| 570.7 | 934 1c | -363.3 | 248 | 95 |
| | | | | |
| 885 | 876 2c | 9 | 249 | 95 |
| 903 | 876 2c | 27 | 250 | 95 |
| 793 | 876 2c | -83 | 250 | 96 |
| 673 | 876 2c | -203 | 250 | 97 |
| 690 | 876 2c | -186 | 250 | 98 |
| 582 | 876 2c | -294 | 250 | 99 |
| 530 | 876 2c | -346 | 250 | 100 |
| 0.66 J | 876 2c | -875.34 | 250 | 101 |
| 616 | 876 2c | -260 | 250 | 102 |
| 604 | 876 2c | -272 | 250 | 103 |
| 626 | 876 2c | -250 | 250 | 104 |
| 610.6 | 876 2c | -265.4 | 250 | 105 |
| 570.7 | 876 2c | -305.3 | 250 | 106 |
| | | | | |
| 903 | 885 | Same Date | 250 | 106 |
| 793 | 885 | -92 | 250 | 107 |
| 673 | 885 | -212 | 250 | 108 |
| 690 | 885 | -195 | 250 | 109 |
| 582 | 885 | -303 | 250 | 110 |
| 530 | 885 | -355 | 250 | 111 |
| 0.66 J | 885 | -884.34 | 250 | 112 |
| 616 | 885 | -269 | 250 | 113 |
| 604 | 885 | -281 | 250 | 114 |
| 626 | 885 | -259 | 250 | 115 |
| 610.6 | 885 | -274.4 | 250 | 116 |
| 570.7 | 885 | -314.3 | 250 | 117 |
| | | | | |
| 793 | 903 | -110 | 250 | 118 |
| 673 | 903 | -230 | 250 | 119 |

| | | | | |
|---|---|---|---|---|
| 690 | 903 | -213 | 250 | 120 |
| 582 | 903 | -321 | 250 | 121 |
| 530 | 903 | -373 | 250 | 122 |
| 0.66 J | 903 | -902.34 | 250 | 123 |
| 616 | 903 | -287 | 250 | 124 |
| 604 | 903 | -299 | 250 | 125 |
| 626 | 903 | -277 | 250 | 126 |
| 610.6 | 903 | -292.4 | 250 | 127 |
| 570.7 | 903 | -332.3 | 250 | 128 |
| | | | | |
| 673 | 793 | -120 | 250 | 129 |
| 690 | 793 | -103 | 250 | 130 |
| 582 | 793 | -211 | 250 | 131 |
| 530 | 793 | -263 | 250 | 132 |
| 0.66 J | 793 | -792.34 | 250 | 133 |
| 616 | 793 | -177 | 250 | 134 |
| 604 | 793 | -189 | 250 | 135 |
| 626 | 793 | -167 | 250 | 136 |
| 610.6 | 793 | -182.4 | 250 | 137 |
| 570.7 | 793 | -222.3 | 250 | 138 |
| | | | | |
| 690 | 673 | 17 | 251 | 138 |
| 582 | 673 | -91 | 251 | 139 |
| 530 | 673 | -143 | 251 | 140 |
| 0.66 J | 673 | -672.34 | 251 | 141 |
| 616 | 673 | -57 | 251 | 142 |
| 604 | 673 | -69 | 251 | 143 |
| 626 | 673 | -47 | 251 | 144 |
| 610.6 | 673 | -62.4 | 251 | 145 |
| 570.7 | 673 | -102.3 | 251 | 146 |
| | | | | |
| 582 | 690 | -108 | 251 | 147 |
| 530 | 690 | -160 | 251 | 148 |
| 0.66 J | 690 | -689.34 | 251 | 149 |
| 616 | 690 | -74 | 251 | 150 |
| 604 | 690 | -86 | 251 | 151 |
| 626 | 690 | -64 | 251 | 152 |
| 610.6 | 690 | -79.4 | 251 | 153 |
| 570.7 | 690 | -119.3 | 251 | 154 |
| | | | | |
| 530 | 582 | -52 | 251 | 155 |
| 0.66 J | 582 | -581.34 | 251 | 156 |
| 616 | 582 | 34 | 252 | 156 |
| 604 | 582 | 22 | 253 | 156 |
| 626 | 582 | 44 | 254 | 156 |
| 610.6 | 582 | 28.6 | 255 | 156 |
| 570.7 | 582 | -11.3 | 255 | 157 |
| | | | | |
| 0.66 J | 530 | -529.34 | 255 | 158 |
| 616 | 530 | 86 | 256 | 158 |
| 604 | 530 | 74 | 257 | 158 |
| 626 | 530 | 96 | 258 | 158 |
| 610.6 | 530 | 80.6 | 259 | 158 |
| 570.7 | 530 | 40.7 | 260 | 158 |
| | | | | |
| 616 | 0.66 J | 615.34 | 261 | 158 |
| 604 | 0.66 J | 603.34 | 262 | 158 |

| | | | | |
|---|---|---|---|---|
| 626 | 0.66 J | 625.34 | 263 | 158 |
| 610.6 | 0.66 J | 609.94 | 264 | 158 |
| 570.7 | 0.66 J | 570.04 | 265 | 158 |
| | | | | |
| 604 | 616 | -12 | 265 | 159 |
| 626 | 616 | 10 | 266 | 159 |
| 610.6 | 616 | -5.4 | 266 | 160 |
| 570.7 | 616 | -45.3 | 266 | 161 |
| | | | | |
| 626 | 604 | 22 | 267 | 161 |
| 610.6 | 604 | 6.6 | 268 | 161 |
| 570.7 | 604 | -33.3 | 268 | 162 |
| | | | | |
| 610.6 | 626 | -15.4 | 268 | 163 |
| 570.7 | 626 | -55.3 | 268 | 164 |
| | | | | |
| 570.7 | 610.6 | -39.9 | 268 | 165 |

S Statistic = 268 - 165 = 103

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 2/1/2017 | 1 |
| 3/1/2017 | 1 |
| 4/1/2017 | 1 |
| 5/1/2017 | 1 |
| 6/1/2017 | 1 |
| 7/1/2017 | 1 |
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |

There are 2 time periods with multiple data

A = 0
B = 36
C = 0

D = 0
E = 0
F = 4
a = 56550
b = 219240
c = 1740
Group Variance = 3139.67
Z-Score = 1.82036
Comparison Level at 95% confidence level = 1.65463 (upward trend)
**1.82036 > 1.65463 indicating an upward trend**

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RW07-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 4.6 | 1.2 J | 3.4 | 1 | 0 |
| ND<1.5 U | 1.2 J | 0.3 | 2 | 0 |
| 1.1 J | 1.2 J | -0.1 | 2 | 1 |
| 0.91 J | 1.2 J | -0.29 | 2 | 2 |
| 1.2 J | 1.2 J | 0 | 2 | 2 |
| 1 J | 1.2 J | -0.2 | 2 | 3 |
| 11 | 1.2 J | 9.8 | 3 | 3 |
| ND<1.5 U | 1.2 J | 0.3 | 4 | 3 |
| 5.1 | 1.2 J | 3.9 | 5 | 3 |
| 1.7 J | 1.2 J | 0.5 | 6 | 3 |
| ND<1.5 U | 1.2 J | 0.3 | 7 | 3 |
| 1.3 J | 1.2 J | 0.1 | 8 | 3 |
| 52.9 | 1.2 J | 51.7 | 9 | 3 |
| 28.7 | 1.2 J | 27.5 | 10 | 3 |
| 32.3 | 1.2 J | 31.1 | 11 | 3 |
| 29.5 | 1.2 J | 28.3 | 12 | 3 |
| 445 | 1.2 J | 443.8 | 13 | 3 |
| 453 | 1.2 J | 451.8 | 14 | 3 |
| 48.7 | 1.2 J | 47.5 | 15 | 3 |
| 38.1 | 1.2 J | 36.9 | 16 | 3 |
| 36 | 1.2 J | 34.8 | 17 | 3 |
| 1.7 J | 1.2 J | 0.5 | 18 | 3 |
| 49.1 | 1.2 J | 47.9 | 19 | 3 |
| 107 | 1.2 J | 105.8 | 20 | 3 |
| 42.71 | 1.2 J | 41.51 | 21 | 3 |
| 0.7383 | 1.2 J | -0.4617 | 21 | 4 |
| 26.94 | 1.2 J | 25.74 | 22 | 4 |
| 1.523 | 1.2 J | 0.323 | 23 | 4 |
| 8.475 | 1.2 J | 7.275 | 24 | 4 |
| | | | | |
| ND<1.5 U | 4.6 | -3.1 | 24 | 5 |
| 1.1 J | 4.6 | -3.5 | 24 | 6 |
| 0.91 J | 4.6 | -3.69 | 24 | 7 |
| 1.2 J | 4.6 | -3.4 | 24 | 8 |
| 1 J | 4.6 | -3.6 | 24 | 9 |
| 11 | 4.6 | 6.4 | 25 | 9 |
| ND<1.5 U | 4.6 | -3.1 | 25 | 10 |
| 5.1 | 4.6 | 0.5 | 26 | 10 |
| 1.7 J | 4.6 | -2.9 | 26 | 11 |
| ND<1.5 U | 4.6 | -3.1 | 26 | 12 |
| 1.3 J | 4.6 | -3.3 | 26 | 13 |
| 52.9 | 4.6 | 48.3 | 27 | 13 |
| 28.7 | 4.6 | 24.1 | 28 | 13 |
| 32.3 | 4.6 | 27.7 | 29 | 13 |
| 29.5 | 4.6 | 24.9 | 30 | 13 |
| 445 | 4.6 | 440.4 | 31 | 13 |
| 453 | 4.6 | 448.4 | 32 | 13 |

| | | | | |
|---|---|---|---|---|
| 48.7 | 4.6 | 44.1 | 33 | 13 |
| 38.1 | 4.6 | 33.5 | 34 | 13 |
| 36 | 4.6 | 31.4 | 35 | 13 |
| 1.7 J | 4.6 | -2.9 | 35 | 14 |
| 49.1 | 4.6 | 44.5 | 36 | 14 |
| 107 | 4.6 | 102.4 | 37 | 14 |
| 42.71 | 4.6 | 38.11 | 38 | 14 |
| 0.7383 | 4.6 | -3.8617 | 38 | 15 |
| 26.94 | 4.6 | 22.34 | 39 | 15 |
| 1.523 | 4.6 | -3.077 | 39 | 16 |
| 8.475 | 4.6 | 3.875 | 40 | 16 |
| | | | | |
| 1.1 J | ND<1.5 U | -0.4 | 40 | 17 |
| 0.91 J | ND<1.5 U | -0.59 | 40 | 18 |
| 1.2 J | ND<1.5 U | -0.3 | 40 | 19 |
| 1 J | ND<1.5 U | -0.5 | 40 | 20 |
| 11 | ND<1.5 U | 9.5 | 41 | 20 |
| ND<1.5 U | ND<1.5 U | 0 | 41 | 20 |
| 5.1 | ND<1.5 U | 3.6 | 42 | 20 |
| 1.7 J | ND<1.5 U | 0.2 | 43 | 20 |
| ND<1.5 U | ND<1.5 U | 0 | 43 | 20 |
| 1.3 J | ND<1.5 U | -0.2 | 43 | 21 |
| 52.9 | ND<1.5 U | 51.4 | 44 | 21 |
| 28.7 | ND<1.5 U | 27.2 | 45 | 21 |
| 32.3 | ND<1.5 U | 30.8 | 46 | 21 |
| 29.5 | ND<1.5 U | 28 | 47 | 21 |
| 445 | ND<1.5 U | 443.5 | 48 | 21 |
| 453 | ND<1.5 U | 451.5 | 49 | 21 |
| 48.7 | ND<1.5 U | 47.2 | 50 | 21 |
| 38.1 | ND<1.5 U | 36.6 | 51 | 21 |
| 36 | ND<1.5 U | 34.5 | 52 | 21 |
| 1.7 J | ND<1.5 U | 0.2 | 53 | 21 |
| 49.1 | ND<1.5 U | 47.6 | 54 | 21 |
| 107 | ND<1.5 U | 105.5 | 55 | 21 |
| 42.71 | ND<1.5 U | 41.21 | 56 | 21 |
| 0.7383 | ND<1.5 U | -0.7617 | 56 | 22 |
| 26.94 | ND<1.5 U | 25.44 | 57 | 22 |
| 1.523 | ND<1.5 U | 0.023 | 58 | 22 |
| 8.475 | ND<1.5 U | 6.975 | 59 | 22 |
| | | | | |
| 0.91 J | 1.1 J | -0.19 | 59 | 23 |
| 1.2 J | 1.1 J | 0.1 | 60 | 23 |
| 1 J | 1.1 J | -0.1 | 60 | 24 |
| 11 | 1.1 J | 9.9 | 61 | 24 |
| ND<1.5 U | 1.1 J | 0.4 | 62 | 24 |
| 5.1 | 1.1 J | 4 | 63 | 24 |
| 1.7 J | 1.1 J | 0.6 | 64 | 24 |
| ND<1.5 U | 1.1 J | 0.4 | 65 | 24 |
| 1.3 J | 1.1 J | 0.2 | 66 | 24 |
| 52.9 | 1.1 J | 51.8 | 67 | 24 |
| 28.7 | 1.1 J | 27.6 | 68 | 24 |
| 32.3 | 1.1 J | 31.2 | 69 | 24 |
| 29.5 | 1.1 J | 28.4 | 70 | 24 |
| 445 | 1.1 J | 443.9 | 71 | 24 |
| 453 | 1.1 J | 451.9 | 72 | 24 |
| 48.7 | 1.1 J | 47.6 | 73 | 24 |
| 38.1 | 1.1 J | 37 | 74 | 24 |

| | | | | |
|---|---|---|---|---|
| 36 | 1.1 J | 34.9 | 75 | 24 |
| 1.7 J | 1.1 J | 0.6 | 76 | 24 |
| 49.1 | 1.1 J | 48 | 77 | 24 |
| 107 | 1.1 J | 105.9 | 78 | 24 |
| 42.71 | 1.1 J | 41.61 | 79 | 24 |
| 0.7383 | 1.1 J | -0.3617 | 79 | 25 |
| 26.94 | 1.1 J | 25.84 | 80 | 25 |
| 1.523 | 1.1 J | 0.423 | 81 | 25 |
| 8.475 | 1.1 J | 7.375 | 82 | 25 |
| | | | | |
| 1.2 J | 0.91 J | 0.29 | 83 | 25 |
| 1 J | 0.91 J | 0.09 | 84 | 25 |
| 11 | 0.91 J | 10.09 | 85 | 25 |
| ND<1.5 U | 0.91 J | 0.59 | 86 | 25 |
| 5.1 | 0.91 J | 4.19 | 87 | 25 |
| 1.7 J | 0.91 J | 0.79 | 88 | 25 |
| ND<1.5 U | 0.91 J | 0.59 | 89 | 25 |
| 1.3 J | 0.91 J | 0.39 | 90 | 25 |
| 52.9 | 0.91 J | 51.99 | 91 | 25 |
| 28.7 | 0.91 J | 27.79 | 92 | 25 |
| 32.3 | 0.91 J | 31.39 | 93 | 25 |
| 29.5 | 0.91 J | 28.59 | 94 | 25 |
| 445 | 0.91 J | 444.09 | 95 | 25 |
| 453 | 0.91 J | 452.09 | 96 | 25 |
| 48.7 | 0.91 J | 47.79 | 97 | 25 |
| 38.1 | 0.91 J | 37.19 | 98 | 25 |
| 36 | 0.91 J | 35.09 | 99 | 25 |
| 1.7 J | 0.91 J | 0.79 | 100 | 25 |
| 49.1 | 0.91 J | 48.19 | 101 | 25 |
| 107 | 0.91 J | 106.09 | 102 | 25 |
| 42.71 | 0.91 J | 41.8 | 103 | 25 |
| 0.7383 | 0.91 J | -0.1717 | 103 | 26 |
| 26.94 | 0.91 J | 26.03 | 104 | 26 |
| 1.523 | 0.91 J | 0.613 | 105 | 26 |
| 8.475 | 0.91 J | 7.565 | 106 | 26 |
| | | | | |
| 1 J | 1.2 J | -0.2 | 106 | 27 |
| 11 | 1.2 J | 9.8 | 107 | 27 |
| ND<1.5 U | 1.2 J | 0.3 | 108 | 27 |
| 5.1 | 1.2 J | 3.9 | 109 | 27 |
| 1.7 J | 1.2 J | 0.5 | 110 | 27 |
| ND<1.5 U | 1.2 J | 0.3 | 111 | 27 |
| 1.3 J | 1.2 J | 0.1 | 112 | 27 |
| 52.9 | 1.2 J | 51.7 | 113 | 27 |
| 28.7 | 1.2 J | 27.5 | 114 | 27 |
| 32.3 | 1.2 J | 31.1 | 115 | 27 |
| 29.5 | 1.2 J | 28.3 | 116 | 27 |
| 445 | 1.2 J | 443.8 | 117 | 27 |
| 453 | 1.2 J | 451.8 | 118 | 27 |
| 48.7 | 1.2 J | 47.5 | 119 | 27 |
| 38.1 | 1.2 J | 36.9 | 120 | 27 |
| 36 | 1.2 J | 34.8 | 121 | 27 |
| 1.7 J | 1.2 J | 0.5 | 122 | 27 |
| 49.1 | 1.2 J | 47.9 | 123 | 27 |
| 107 | 1.2 J | 105.8 | 124 | 27 |
| 42.71 | 1.2 J | 41.51 | 125 | 27 |
| 0.7383 | 1.2 J | -0.4617 | 125 | 28 |

| | | | | |
|---|---|---|---|---|
| 26.94 | 1.2 J | 25.74 | 126 | 28 |
| 1.523 | 1.2 J | 0.323 | 127 | 28 |
| 8.475 | 1.2 J | 7.275 | 128 | 28 |
| | | | | |
| 11 | 1 J | 10 | 129 | 28 |
| ND<1.5 U | 1 J | 0.5 | 130 | 28 |
| 5.1 | 1 J | 4.1 | 131 | 28 |
| 1.7 J | 1 J | 0.7 | 132 | 28 |
| ND<1.5 U | 1 J | 0.5 | 133 | 28 |
| 1.3 J | 1 J | 0.3 | 134 | 28 |
| 52.9 | 1 J | 51.9 | 135 | 28 |
| 28.7 | 1 J | 27.7 | 136 | 28 |
| 32.3 | 1 J | 31.3 | 137 | 28 |
| 29.5 | 1 J | 28.5 | 138 | 28 |
| 445 | 1 J | 444 | 139 | 28 |
| 453 | 1 J | 452 | 140 | 28 |
| 48.7 | 1 J | 47.7 | 141 | 28 |
| 38.1 | 1 J | 37.1 | 142 | 28 |
| 36 | 1 J | 35 | 143 | 28 |
| 1.7 J | 1 J | 0.7 | 144 | 28 |
| 49.1 | 1 J | 48.1 | 145 | 28 |
| 107 | 1 J | 106 | 146 | 28 |
| 42.71 | 1 J | 41.71 | 147 | 28 |
| 0.7383 | 1 J | -0.2617 | 147 | 29 |
| 26.94 | 1 J | 25.94 | 148 | 29 |
| 1.523 | 1 J | 0.523 | 149 | 29 |
| 8.475 | 1 J | 7.475 | 150 | 29 |
| | | | | |
| ND<1.5 U | 11 | -9.5 | 150 | 30 |
| 5.1 | 11 | -5.9 | 150 | 31 |
| 1.7 J | 11 | -9.3 | 150 | 32 |
| ND<1.5 U | 11 | -9.5 | 150 | 33 |
| 1.3 J | 11 | -9.7 | 150 | 34 |
| 52.9 | 11 | 41.9 | 151 | 34 |
| 28.7 | 11 | 17.7 | 152 | 34 |
| 32.3 | 11 | 21.3 | 153 | 34 |
| 29.5 | 11 | 18.5 | 154 | 34 |
| 445 | 11 | 434 | 155 | 34 |
| 453 | 11 | 442 | 156 | 34 |
| 48.7 | 11 | 37.7 | 157 | 34 |
| 38.1 | 11 | 27.1 | 158 | 34 |
| 36 | 11 | 25 | 159 | 34 |
| 1.7 J | 11 | -9.3 | 159 | 35 |
| 49.1 | 11 | 38.1 | 160 | 35 |
| 107 | 11 | 96 | 161 | 35 |
| 42.71 | 11 | 31.71 | 162 | 35 |
| 0.7383 | 11 | -10.2617 | 162 | 36 |
| 26.94 | 11 | 15.94 | 163 | 36 |
| 1.523 | 11 | -9.477 | 163 | 37 |
| 8.475 | 11 | -2.525 | 163 | 38 |
| | | | | |
| 5.1 | ND<1.5 U | 3.6 | 164 | 38 |
| 1.7 J | ND<1.5 U | 0.2 | 165 | 38 |
| ND<1.5 U | ND<1.5 U | 0 | 165 | 38 |
| 1.3 J | ND<1.5 U | -0.2 | 165 | 39 |
| 52.9 | ND<1.5 U | 51.4 | 166 | 39 |
| 28.7 | ND<1.5 U | 27.2 | 167 | 39 |

| | | | | |
|---|---|---|---|---|
| 32.3 | ND<1.5 U | 30.8 | 168 | 39 |
| 29.5 | ND<1.5 U | 28 | 169 | 39 |
| 445 | ND<1.5 U | 443.5 | 170 | 39 |
| 453 | ND<1.5 U | 451.5 | 171 | 39 |
| 48.7 | ND<1.5 U | 47.2 | 172 | 39 |
| 38.1 | ND<1.5 U | 36.6 | 173 | 39 |
| 36 | ND<1.5 U | 34.5 | 174 | 39 |
| 1.7 J | ND<1.5 U | 0.2 | 175 | 39 |
| 49.1 | ND<1.5 U | 47.6 | 176 | 39 |
| 107 | ND<1.5 U | 105.5 | 177 | 39 |
| 42.71 | ND<1.5 U | 41.21 | 178 | 39 |
| 0.7383 | ND<1.5 U | -0.7617 | 178 | 40 |
| 26.94 | ND<1.5 U | 25.44 | 179 | 40 |
| 1.523 | ND<1.5 U | 0.023 | 180 | 40 |
| 8.475 | ND<1.5 U | 6.975 | 181 | 40 |
| | | | | |
| 1.7 J | 5.1 | -3.4 | 181 | 41 |
| ND<1.5 U | 5.1 | -3.6 | 181 | 42 |
| 1.3 J | 5.1 | -3.8 | 181 | 43 |
| 52.9 | 5.1 | 47.8 | 182 | 43 |
| 28.7 | 5.1 | 23.6 | 183 | 43 |
| 32.3 | 5.1 | 27.2 | 184 | 43 |
| 29.5 | 5.1 | 24.4 | 185 | 43 |
| 445 | 5.1 | 439.9 | 186 | 43 |
| 453 | 5.1 | 447.9 | 187 | 43 |
| 48.7 | 5.1 | 43.6 | 188 | 43 |
| 38.1 | 5.1 | 33 | 189 | 43 |
| 36 | 5.1 | 30.9 | 190 | 43 |
| 1.7 J | 5.1 | -3.4 | 190 | 44 |
| 49.1 | 5.1 | 44 | 191 | 44 |
| 107 | 5.1 | 101.9 | 192 | 44 |
| 42.71 | 5.1 | 37.61 | 193 | 44 |
| 0.7383 | 5.1 | -4.3617 | 193 | 45 |
| 26.94 | 5.1 | 21.84 | 194 | 45 |
| 1.523 | 5.1 | -3.577 | 194 | 46 |
| 8.475 | 5.1 | 3.375 | 195 | 46 |
| | | | | |
| ND<1.5 U | 1.7 J | -0.2 | 195 | 47 |
| 1.3 J | 1.7 J | -0.4 | 195 | 48 |
| 52.9 | 1.7 J | 51.2 | 196 | 48 |
| 28.7 | 1.7 J | 27 | 197 | 48 |
| 32.3 | 1.7 J | 30.6 | 198 | 48 |
| 29.5 | 1.7 J | 27.8 | 199 | 48 |
| 445 | 1.7 J | 443.3 | 200 | 48 |
| 453 | 1.7 J | 451.3 | 201 | 48 |
| 48.7 | 1.7 J | 47 | 202 | 48 |
| 38.1 | 1.7 J | 36.4 | 203 | 48 |
| 36 | 1.7 J | 34.3 | 204 | 48 |
| 1.7 J | 1.7 J | 0 | 204 | 48 |
| 49.1 | 1.7 J | 47.4 | 205 | 48 |
| 107 | 1.7 J | 105.3 | 206 | 48 |
| 42.71 | 1.7 J | 41.01 | 207 | 48 |
| 0.7383 | 1.7 J | -0.9617 | 207 | 49 |
| 26.94 | 1.7 J | 25.24 | 208 | 49 |
| 1.523 | 1.7 J | -0.177 | 208 | 50 |
| 8.475 | 1.7 J | 6.775 | 209 | 50 |

| | | | | |
|---|---|---|---|---|
| 1.3 J | ND<1.5 U | -0.2 | 209 | 51 |
| 52.9 | ND<1.5 U | 51.4 | 210 | 51 |
| 28.7 | ND<1.5 U | 27.2 | 211 | 51 |
| 32.3 | ND<1.5 U | 30.8 | 212 | 51 |
| 29.5 | ND<1.5 U | 28 | 213 | 51 |
| 445 | ND<1.5 U | 443.5 | 214 | 51 |
| 453 | ND<1.5 U | 451.5 | 215 | 51 |
| 48.7 | ND<1.5 U | 47.2 | 216 | 51 |
| 38.1 | ND<1.5 U | 36.6 | 217 | 51 |
| 36 | ND<1.5 U | 34.5 | 218 | 51 |
| 1.7 J | ND<1.5 U | 0.2 | 219 | 51 |
| 49.1 | ND<1.5 U | 47.6 | 220 | 51 |
| 107 | ND<1.5 U | 105.5 | 221 | 51 |
| 42.71 | ND<1.5 U | 41.21 | 222 | 51 |
| 0.7383 | ND<1.5 U | -0.7617 | 222 | 52 |
| 26.94 | ND<1.5 U | 25.44 | 223 | 52 |
| 1.523 | ND<1.5 U | 0.023 | 224 | 52 |
| 8.475 | ND<1.5 U | 6.975 | 225 | 52 |
| | | | | |
| 52.9 | 1.3 J | 51.6 | 226 | 52 |
| 28.7 | 1.3 J | 27.4 | 227 | 52 |
| 32.3 | 1.3 J | 31 | 228 | 52 |
| 29.5 | 1.3 J | 28.2 | 229 | 52 |
| 445 | 1.3 J | 443.7 | 230 | 52 |
| 453 | 1.3 J | 451.7 | 231 | 52 |
| 48.7 | 1.3 J | 47.4 | 232 | 52 |
| 38.1 | 1.3 J | 36.8 | 233 | 52 |
| 36 | 1.3 J | 34.7 | 234 | 52 |
| 1.7 J | 1.3 J | 0.4 | 235 | 52 |
| 49.1 | 1.3 J | 47.8 | 236 | 52 |
| 107 | 1.3 J | 105.7 | 237 | 52 |
| 42.71 | 1.3 J | 41.41 | 238 | 52 |
| 0.7383 | 1.3 J | -0.5617 | 238 | 53 |
| 26.94 | 1.3 J | 25.64 | 239 | 53 |
| 1.523 | 1.3 J | 0.223 | 240 | 53 |
| 8.475 | 1.3 J | 7.175 | 241 | 53 |
| | | | | |
| 28.7 | 52.9 | -24.2 | 241 | 54 |
| 32.3 | 52.9 | -20.6 | 241 | 55 |
| 29.5 | 52.9 | -23.4 | 241 | 56 |
| 445 | 52.9 | 392.1 | 242 | 56 |
| 453 | 52.9 | 400.1 | 243 | 56 |
| 48.7 | 52.9 | -4.2 | 243 | 57 |
| 38.1 | 52.9 | -14.8 | 243 | 58 |
| 36 | 52.9 | -16.9 | 243 | 59 |
| 1.7 J | 52.9 | -51.2 | 243 | 60 |
| 49.1 | 52.9 | -3.8 | 243 | 61 |
| 107 | 52.9 | 54.1 | 244 | 61 |
| 42.71 | 52.9 | -10.19 | 244 | 62 |
| 0.7383 | 52.9 | -52.1617 | 244 | 63 |
| 26.94 | 52.9 | -25.96 | 244 | 64 |
| 1.523 | 52.9 | -51.377 | 244 | 65 |
| 8.475 | 52.9 | -44.425 | 244 | 66 |
| | | | | |
| 32.3 | 28.7 | 3.6 | 245 | 66 |
| 29.5 | 28.7 | 0.8 | 246 | 66 |
| 445 | 28.7 | 416.3 | 247 | 66 |

| | | | | |
|---|---|---|---|---|
| 453 | 28.7 | 424.3 | 248 | 66 |
| 48.7 | 28.7 | 20 | 249 | 66 |
| 38.1 | 28.7 | 9.4 | 250 | 66 |
| 36 | 28.7 | 7.3 | 251 | 66 |
| 1.7 J | 28.7 | -27 | 251 | 67 |
| 49.1 | 28.7 | 20.4 | 252 | 67 |
| 107 | 28.7 | 78.3 | 253 | 67 |
| 42.71 | 28.7 | 14.01 | 254 | 67 |
| 0.7383 | 28.7 | -27.9617 | 254 | 68 |
| 26.94 | 28.7 | -1.76 | 254 | 69 |
| 1.523 | 28.7 | -27.177 | 254 | 70 |
| 8.475 | 28.7 | -20.225 | 254 | 71 |
| | | | | |
| 29.5 | 32.3 | Same Date | 254 | 71 |
| 445 | 32.3 | 412.7 | 255 | 71 |
| 453 | 32.3 | 420.7 | 256 | 71 |
| 48.7 | 32.3 | 16.4 | 257 | 71 |
| 38.1 | 32.3 | 5.8 | 258 | 71 |
| 36 | 32.3 | 3.7 | 259 | 71 |
| 1.7 J | 32.3 | -30.6 | 259 | 72 |
| 49.1 | 32.3 | 16.8 | 260 | 72 |
| 107 | 32.3 | 74.7 | 261 | 72 |
| 42.71 | 32.3 | 10.41 | 262 | 72 |
| 0.7383 | 32.3 | -31.5617 | 262 | 73 |
| 26.94 | 32.3 | -5.36 | 262 | 74 |
| 1.523 | 32.3 | -30.777 | 262 | 75 |
| 8.475 | 32.3 | -23.825 | 262 | 76 |
| | | | | |
| 445 | 29.5 | 415.5 | 263 | 76 |
| 453 | 29.5 | 423.5 | 264 | 76 |
| 48.7 | 29.5 | 19.2 | 265 | 76 |
| 38.1 | 29.5 | 8.6 | 266 | 76 |
| 36 | 29.5 | 6.5 | 267 | 76 |
| 1.7 J | 29.5 | -27.8 | 267 | 77 |
| 49.1 | 29.5 | 19.6 | 268 | 77 |
| 107 | 29.5 | 77.5 | 269 | 77 |
| 42.71 | 29.5 | 13.21 | 270 | 77 |
| 0.7383 | 29.5 | -28.7617 | 270 | 78 |
| 26.94 | 29.5 | -2.56 | 270 | 79 |
| 1.523 | 29.5 | -27.977 | 270 | 80 |
| 8.475 | 29.5 | -21.025 | 270 | 81 |
| | | | | |
| 453 | 445 | Same Date | 270 | 81 |
| 48.7 | 445 | -396.3 | 270 | 82 |
| 38.1 | 445 | -406.9 | 270 | 83 |
| 36 | 445 | -409 | 270 | 84 |
| 1.7 J | 445 | -443.3 | 270 | 85 |
| 49.1 | 445 | -395.9 | 270 | 86 |
| 107 | 445 | -338 | 270 | 87 |
| 42.71 | 445 | -402.29 | 270 | 88 |
| 0.7383 | 445 | -444.262 | 270 | 89 |
| 26.94 | 445 | -418.06 | 270 | 90 |
| 1.523 | 445 | -443.477 | 270 | 91 |
| 8.475 | 445 | -436.525 | 270 | 92 |
| | | | | |
| 48.7 | 453 | -404.3 | 270 | 93 |
| 38.1 | 453 | -414.9 | 270 | 94 |

| | | | | |
|---|---|---|---|---|
| 36 | 453 | -417 | 270 | 95 |
| 1.7 J | 453 | -451.3 | 270 | 96 |
| 49.1 | 453 | -403.9 | 270 | 97 |
| 107 | 453 | -346 | 270 | 98 |
| 42.71 | 453 | -410.29 | 270 | 99 |
| 0.7383 | 453 | -452.262 | 270 | 100 |
| 26.94 | 453 | -426.06 | 270 | 101 |
| 1.523 | 453 | -451.477 | 270 | 102 |
| 8.475 | 453 | -444.525 | 270 | 103 |
| | | | | |
| 38.1 | 48.7 | -10.6 | 270 | 104 |
| 36 | 48.7 | -12.7 | 270 | 105 |
| 1.7 J | 48.7 | -47 | 270 | 106 |
| 49.1 | 48.7 | 0.4 | 271 | 106 |
| 107 | 48.7 | 58.3 | 272 | 106 |
| 42.71 | 48.7 | -5.99 | 272 | 107 |
| 0.7383 | 48.7 | -47.9617 | 272 | 108 |
| 26.94 | 48.7 | -21.76 | 272 | 109 |
| 1.523 | 48.7 | -47.177 | 272 | 110 |
| 8.475 | 48.7 | -40.225 | 272 | 111 |
| | | | | |
| 36 | 38.1 | -2.1 | 272 | 112 |
| 1.7 J | 38.1 | -36.4 | 272 | 113 |
| 49.1 | 38.1 | 11 | 273 | 113 |
| 107 | 38.1 | 68.9 | 274 | 113 |
| 42.71 | 38.1 | 4.61 | 275 | 113 |
| 0.7383 | 38.1 | -37.3617 | 275 | 114 |
| 26.94 | 38.1 | -11.16 | 275 | 115 |
| 1.523 | 38.1 | -36.577 | 275 | 116 |
| 8.475 | 38.1 | -29.625 | 275 | 117 |
| | | | | |
| 1.7 J | 36 | -34.3 | 275 | 118 |
| 49.1 | 36 | 13.1 | 276 | 118 |
| 107 | 36 | 71 | 277 | 118 |
| 42.71 | 36 | 6.71 | 278 | 118 |
| 0.7383 | 36 | -35.2617 | 278 | 119 |
| 26.94 | 36 | -9.06 | 278 | 120 |
| 1.523 | 36 | -34.477 | 278 | 121 |
| 8.475 | 36 | -27.525 | 278 | 122 |
| | | | | |
| 49.1 | 1.7 J | 47.4 | 279 | 122 |
| 107 | 1.7 J | 105.3 | 280 | 122 |
| 42.71 | 1.7 J | 41.01 | 281 | 122 |
| 0.7383 | 1.7 J | -0.9617 | 281 | 123 |
| 26.94 | 1.7 J | 25.24 | 282 | 123 |
| 1.523 | 1.7 J | -0.177 | 282 | 124 |
| 8.475 | 1.7 J | 6.775 | 283 | 124 |
| | | | | |
| 107 | 49.1 | 57.9 | 284 | 124 |
| 42.71 | 49.1 | -6.39 | 284 | 125 |
| 0.7383 | 49.1 | -48.3617 | 284 | 126 |
| 26.94 | 49.1 | -22.16 | 284 | 127 |
| 1.523 | 49.1 | -47.577 | 284 | 128 |
| 8.475 | 49.1 | -40.625 | 284 | 129 |
| | | | | |
| 42.71 | 107 | -64.29 | 284 | 130 |
| 0.7383 | 107 | -106.262 | 284 | 131 |

| | | | | |
|---|---|---|---|---|
| 26.94 | 107 | -80.06 | 284 | 132 |
| 1.523 | 107 | -105.477 | 284 | 133 |
| 8.475 | 107 | -98.525 | 284 | 134 |
| | | | | |
| 0.7383 | 42.71 | -41.9717 | 284 | 135 |
| 26.94 | 42.71 | -15.77 | 284 | 136 |
| 1.523 | 42.71 | -41.187 | 284 | 137 |
| 8.475 | 42.71 | -34.235 | 284 | 138 |
| | | | | |
| 26.94 | 0.7383 | 26.2017 | 285 | 138 |
| 1.523 | 0.7383 | 0.7847 | 286 | 138 |
| 8.475 | 0.7383 | 7.7367 | 287 | 138 |
| | | | | |
| 1.523 | 26.94 | -25.417 | 287 | 139 |
| 8.475 | 26.94 | -18.465 | 287 | 140 |
| | | | | |
| 8.475 | 1.523 | 6.952 | 288 | 140 |

S Statistic = 288 - 140 = 148

| Tied Group | Value | Members |
|---|---|---|
| 1 | 1.2 | 2 |
| 2 | 1.5 | 3 |
| 3 | 1.7 | 2 |

| Time Period | Observations |
|---|---|
| 2/1/2017 | 1 |
| 3/1/2017 | 1 |
| 4/1/2017 | 1 |
| 5/1/2017 | 1 |
| 6/1/2017 | 1 |
| 7/1/2017 | 1 |
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 2 time periods with multiple data

A = 102
B = 36
C = 6
D = 0
E = 10
F = 4
a = 56550
b = 219240
c = 1740
Group Variance = 3134.02
Z-Score = 2.62583
Comparison Level at 95% confidence level = 1.65463 (upward trend)
**2.62583 > 1.65463 indicating an upward trend**

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RW08-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 0.39 J | 0.49 J | -0.1 | 0 | 1 |
| ND<1.5 U | 0.49 J | 1.01 | 1 | 1 |
| 1.5 J | 0.49 J | 1.01 | 2 | 1 |
| 0.48 J | 0.49 J | -0.01 | 2 | 2 |
| 1.3 J | 0.49 J | 0.81 | 3 | 2 |
| 0.86 J | 0.49 J | 0.37 | 4 | 2 |
| 0.77 J | 0.49 J | 0.28 | 5 | 2 |
| ND<1.5 U | 0.49 J | 1.01 | 6 | 2 |
| 0.88 J | 0.49 J | 0.39 | 7 | 2 |
| 1.8 J | 0.49 J | 1.31 | 8 | 2 |
| ND<1.5 U | 0.49 J | 1.01 | 9 | 2 |
| 6.2 | 0.49 J | 5.71 | 10 | 2 |
| 14.1 | 0.49 J | 13.61 | 11 | 2 |
| 0.92 J1c | 0.49 J | 0.43 | 12 | 2 |
| 0.34 J1c | 0.49 J | -0.15 | 12 | 3 |
| ND<1.5 U2c | 0.49 J | 1.01 | 13 | 3 |
| ND<1.5 U | 0.49 J | 1.01 | 14 | 3 |
| ND<1.5 U | 0.49 J | 1.01 | 15 | 3 |
| ND<1.5 U | 0.49 J | 1.01 | 16 | 3 |
| 0.59 J | 0.49 J | 0.1 | 17 | 3 |
| ND<1.5 U | 0.49 J | 1.01 | 18 | 3 |
| 0.47 J | 0.49 J | -0.02 | 18 | 4 |
| 0.39 J | 0.49 J | -0.1 | 18 | 5 |
| 0.56 J | 0.49 J | 0.07 | 19 | 5 |
| 0.38 J | 0.49 J | -0.11 | 19 | 6 |
| ND<100 U | 0.49 J | 99.51 | 20 | 6 |
| ND<0.1 U | 0.49 J | -0.39 | 20 | 7 |
| 12 | 0.49 J | 11.51 | 21 | 7 |
| | | | | |
| ND<1.5 U | 0.39 J | 1.11 | 22 | 7 |
| 1.5 J | 0.39 J | 1.11 | 23 | 7 |
| 0.48 J | 0.39 J | 0.09 | 24 | 7 |
| 1.3 J | 0.39 J | 0.91 | 25 | 7 |
| 0.86 J | 0.39 J | 0.47 | 26 | 7 |
| 0.77 J | 0.39 J | 0.38 | 27 | 7 |
| ND<1.5 U | 0.39 J | 1.11 | 28 | 7 |
| 0.88 J | 0.39 J | 0.49 | 29 | 7 |
| 1.8 J | 0.39 J | 1.41 | 30 | 7 |
| ND<1.5 U | 0.39 J | 1.11 | 31 | 7 |
| 6.2 | 0.39 J | 5.81 | 32 | 7 |
| 14.1 | 0.39 J | 13.71 | 33 | 7 |
| 0.92 J1c | 0.39 J | 0.53 | 34 | 7 |
| 0.34 J1c | 0.39 J | -0.05 | 34 | 8 |
| ND<1.5 U2c | 0.39 J | 1.11 | 35 | 8 |
| ND<1.5 U | 0.39 J | 1.11 | 36 | 8 |
| ND<1.5 U | 0.39 J | 1.11 | 37 | 8 |
| ND<1.5 U | 0.39 J | 1.11 | 38 | 8 |

| | | | | |
|---|---|---|---|---|
| 0.59 J | 0.39 J | 0.2 | 39 | 8 |
| ND<1.5 U | 0.39 J | 1.11 | 40 | 8 |
| 0.47 J | 0.39 J | 0.08 | 41 | 8 |
| 0.39 J | 0.39 J | 0 | 41 | 8 |
| 0.56 J | 0.39 J | 0.17 | 42 | 8 |
| 0.38 J | 0.39 J | -0.01 | 42 | 9 |
| ND<100 U | 0.39 J | 99.61 | 43 | 9 |
| ND<0.1 U | 0.39 J | -0.29 | 43 | 10 |
| 12 | 0.39 J | 11.61 | 44 | 10 |
| | | | | |
| 1.5 J | ND<1.5 U | 0 | 44 | 10 |
| 0.48 J | ND<1.5 U | -1.02 | 44 | 11 |
| 1.3 J | ND<1.5 U | -0.2 | 44 | 12 |
| 0.86 J | ND<1.5 U | -0.64 | 44 | 13 |
| 0.77 J | ND<1.5 U | -0.73 | 44 | 14 |
| ND<1.5 U | ND<1.5 U | 0 | 44 | 14 |
| 0.88 J | ND<1.5 U | -0.62 | 44 | 15 |
| 1.8 J | ND<1.5 U | 0.3 | 45 | 15 |
| ND<1.5 U | ND<1.5 U | 0 | 45 | 15 |
| 6.2 | ND<1.5 U | 4.7 | 46 | 15 |
| 14.1 | ND<1.5 U | 12.6 | 47 | 15 |
| 0.92 J1c | ND<1.5 U | -0.58 | 47 | 16 |
| 0.34 J1c | ND<1.5 U | -1.16 | 47 | 17 |
| ND<1.5 U2c | ND<1.5 U | 0 | 47 | 17 |
| ND<1.5 U | ND<1.5 U | 0 | 47 | 17 |
| ND<1.5 U | ND<1.5 U | 0 | 47 | 17 |
| ND<1.5 U | ND<1.5 U | 0 | 47 | 17 |
| 0.59 J | ND<1.5 U | -0.91 | 47 | 18 |
| ND<1.5 U | ND<1.5 U | 0 | 47 | 18 |
| 0.47 J | ND<1.5 U | -1.03 | 47 | 19 |
| 0.39 J | ND<1.5 U | -1.11 | 47 | 20 |
| 0.56 J | ND<1.5 U | -0.94 | 47 | 21 |
| 0.38 J | ND<1.5 U | -1.12 | 47 | 22 |
| ND<100 U | ND<1.5 U | 98.5 | 48 | 22 |
| ND<0.1 U | ND<1.5 U | -1.4 | 48 | 23 |
| 12 | ND<1.5 U | 10.5 | 49 | 23 |
| | | | | |
| 0.48 J | 1.5 J | -1.02 | 49 | 24 |
| 1.3 J | 1.5 J | -0.2 | 49 | 25 |
| 0.86 J | 1.5 J | -0.64 | 49 | 26 |
| 0.77 J | 1.5 J | -0.73 | 49 | 27 |
| ND<1.5 U | 1.5 J | 0 | 49 | 27 |
| 0.88 J | 1.5 J | -0.62 | 49 | 28 |
| 1.8 J | 1.5 J | 0.3 | 50 | 28 |
| ND<1.5 U | 1.5 J | 0 | 50 | 28 |
| 6.2 | 1.5 J | 4.7 | 51 | 28 |
| 14.1 | 1.5 J | 12.6 | 52 | 28 |
| 0.92 J1c | 1.5 J | -0.58 | 52 | 29 |
| 0.34 J1c | 1.5 J | -1.16 | 52 | 30 |
| ND<1.5 U2c | 1.5 J | 0 | 52 | 30 |
| ND<1.5 U | 1.5 J | 0 | 52 | 30 |
| ND<1.5 U | 1.5 J | 0 | 52 | 30 |
| ND<1.5 U | 1.5 J | 0 | 52 | 30 |
| 0.59 J | 1.5 J | -0.91 | 52 | 31 |
| ND<1.5 U | 1.5 J | 0 | 52 | 31 |
| 0.47 J | 1.5 J | -1.03 | 52 | 32 |
| 0.39 J | 1.5 J | -1.11 | 52 | 33 |

| | | | | |
|---|---|---|---|---|
| 0.56 J | 1.5 J | -0.94 | 52 | 34 |
| 0.38 J | 1.5 J | -1.12 | 52 | 35 |
| ND<100 U | 1.5 J | 98.5 | 53 | 35 |
| ND<0.1 U | 1.5 J | -1.4 | 53 | 36 |
| 12 | 1.5 J | 10.5 | 54 | 36 |
| | | | | |
| 1.3 J | 0.48 J | 0.82 | 55 | 36 |
| 0.86 J | 0.48 J | 0.38 | 56 | 36 |
| 0.77 J | 0.48 J | 0.29 | 57 | 36 |
| ND<1.5 U | 0.48 J | 1.02 | 58 | 36 |
| 0.88 J | 0.48 J | 0.4 | 59 | 36 |
| 1.8 J | 0.48 J | 1.32 | 60 | 36 |
| ND<1.5 U | 0.48 J | 1.02 | 61 | 36 |
| 6.2 | 0.48 J | 5.72 | 62 | 36 |
| 14.1 | 0.48 J | 13.62 | 63 | 36 |
| 0.92 J1c | 0.48 J | 0.44 | 64 | 36 |
| 0.34 J1c | 0.48 J | -0.14 | 64 | 37 |
| ND<1.5 U2c | 0.48 J | 1.02 | 65 | 37 |
| ND<1.5 U | 0.48 J | 1.02 | 66 | 37 |
| ND<1.5 U | 0.48 J | 1.02 | 67 | 37 |
| ND<1.5 U | 0.48 J | 1.02 | 68 | 37 |
| 0.59 J | 0.48 J | 0.11 | 69 | 37 |
| ND<1.5 U | 0.48 J | 1.02 | 70 | 37 |
| 0.47 J | 0.48 J | -0.01 | 70 | 38 |
| 0.39 J | 0.48 J | -0.09 | 70 | 39 |
| 0.56 J | 0.48 J | 0.08 | 71 | 39 |
| 0.38 J | 0.48 J | -0.1 | 71 | 40 |
| ND<100 U | 0.48 J | 99.52 | 72 | 40 |
| ND<0.1 U | 0.48 J | -0.38 | 72 | 41 |
| 12 | 0.48 J | 11.52 | 73 | 41 |
| | | | | |
| 0.86 J | 1.3 J | -0.44 | 73 | 42 |
| 0.77 J | 1.3 J | -0.53 | 73 | 43 |
| ND<1.5 U | 1.3 J | 0.2 | 74 | 43 |
| 0.88 J | 1.3 J | -0.42 | 74 | 44 |
| 1.8 J | 1.3 J | 0.5 | 75 | 44 |
| ND<1.5 U | 1.3 J | 0.2 | 76 | 44 |
| 6.2 | 1.3 J | 4.9 | 77 | 44 |
| 14.1 | 1.3 J | 12.8 | 78 | 44 |
| 0.92 J1c | 1.3 J | -0.38 | 78 | 45 |
| 0.34 J1c | 1.3 J | -0.96 | 78 | 46 |
| ND<1.5 U2c | 1.3 J | 0.2 | 79 | 46 |
| ND<1.5 U | 1.3 J | 0.2 | 80 | 46 |
| ND<1.5 U | 1.3 J | 0.2 | 81 | 46 |
| ND<1.5 U | 1.3 J | 0.2 | 82 | 46 |
| 0.59 J | 1.3 J | -0.71 | 82 | 47 |
| ND<1.5 U | 1.3 J | 0.2 | 83 | 47 |
| 0.47 J | 1.3 J | -0.83 | 83 | 48 |
| 0.39 J | 1.3 J | -0.91 | 83 | 49 |
| 0.56 J | 1.3 J | -0.74 | 83 | 50 |
| 0.38 J | 1.3 J | -0.92 | 83 | 51 |
| ND<100 U | 1.3 J | 98.7 | 84 | 51 |
| ND<0.1 U | 1.3 J | -1.2 | 84 | 52 |
| 12 | 1.3 J | 10.7 | 85 | 52 |
| | | | | |
| 0.77 J | 0.86 J | -0.09 | 85 | 53 |
| ND<1.5 U | 0.86 J | 0.64 | 86 | 53 |

| | | | | |
|---|---|---|---|---|
| 0.88 J | 0.86 J | 0.02 | 87 | 53 |
| 1.8 J | 0.86 J | 0.94 | 88 | 53 |
| ND<1.5 U | 0.86 J | 0.64 | 89 | 53 |
| 6.2 | 0.86 J | 5.34 | 90 | 53 |
| 14.1 | 0.86 J | 13.24 | 91 | 53 |
| 0.92 J1c | 0.86 J | 0.06 | 92 | 53 |
| 0.34 J1c | 0.86 J | -0.52 | 92 | 54 |
| ND<1.5 U2c | 0.86 J | 0.64 | 93 | 54 |
| ND<1.5 U | 0.86 J | 0.64 | 94 | 54 |
| ND<1.5 U | 0.86 J | 0.64 | 95 | 54 |
| ND<1.5 U | 0.86 J | 0.64 | 96 | 54 |
| 0.59 J | 0.86 J | -0.27 | 96 | 55 |
| ND<1.5 U | 0.86 J | 0.64 | 97 | 55 |
| 0.47 J | 0.86 J | -0.39 | 97 | 56 |
| 0.39 J | 0.86 J | -0.47 | 97 | 57 |
| 0.56 J | 0.86 J | -0.3 | 97 | 58 |
| 0.38 J | 0.86 J | -0.48 | 97 | 59 |
| ND<100 U | 0.86 J | 99.14 | 98 | 59 |
| ND<0.1 U | 0.86 J | -0.76 | 98 | 60 |
| 12 | 0.86 J | 11.14 | 99 | 60 |
| | | | | |
| ND<1.5 U | 0.77 J | 0.73 | 100 | 60 |
| 0.88 J | 0.77 J | 0.11 | 101 | 60 |
| 1.8 J | 0.77 J | 1.03 | 102 | 60 |
| ND<1.5 U | 0.77 J | 0.73 | 103 | 60 |
| 6.2 | 0.77 J | 5.43 | 104 | 60 |
| 14.1 | 0.77 J | 13.33 | 105 | 60 |
| 0.92 J1c | 0.77 J | 0.15 | 106 | 60 |
| 0.34 J1c | 0.77 J | -0.43 | 106 | 61 |
| ND<1.5 U2c | 0.77 J | 0.73 | 107 | 61 |
| ND<1.5 U | 0.77 J | 0.73 | 108 | 61 |
| ND<1.5 U | 0.77 J | 0.73 | 109 | 61 |
| ND<1.5 U | 0.77 J | 0.73 | 110 | 61 |
| 0.59 J | 0.77 J | -0.18 | 110 | 62 |
| ND<1.5 U | 0.77 J | 0.73 | 111 | 62 |
| 0.47 J | 0.77 J | -0.3 | 111 | 63 |
| 0.39 J | 0.77 J | -0.38 | 111 | 64 |
| 0.56 J | 0.77 J | -0.21 | 111 | 65 |
| 0.38 J | 0.77 J | -0.39 | 111 | 66 |
| ND<100 U | 0.77 J | 99.23 | 112 | 66 |
| ND<0.1 U | 0.77 J | -0.67 | 112 | 67 |
| 12 | 0.77 J | 11.23 | 113 | 67 |
| | | | | |
| 0.88 J | ND<1.5 U | -0.62 | 113 | 68 |
| 1.8 J | ND<1.5 U | 0.3 | 114 | 68 |
| ND<1.5 U | ND<1.5 U | 0 | 114 | 68 |
| 6.2 | ND<1.5 U | 4.7 | 115 | 68 |
| 14.1 | ND<1.5 U | 12.6 | 116 | 68 |
| 0.92 J1c | ND<1.5 U | -0.58 | 116 | 69 |
| 0.34 J1c | ND<1.5 U | -1.16 | 116 | 70 |
| ND<1.5 U2c | ND<1.5 U | 0 | 116 | 70 |
| ND<1.5 U | ND<1.5 U | 0 | 116 | 70 |
| ND<1.5 U | ND<1.5 U | 0 | 116 | 70 |
| ND<1.5 U | ND<1.5 U | 0 | 116 | 70 |
| 0.59 J | ND<1.5 U | -0.91 | 116 | 71 |
| ND<1.5 U | ND<1.5 U | 0 | 116 | 71 |
| 0.47 J | ND<1.5 U | -1.03 | 116 | 72 |

| | | | | |
|---|---|---|---|---|
| 0.39 J | ND<1.5 U | -1.11 | 116 | 73 |
| 0.56 J | ND<1.5 U | -0.94 | 116 | 74 |
| 0.38 J | ND<1.5 U | -1.12 | 116 | 75 |
| ND<100 U | ND<1.5 U | 98.5 | 117 | 75 |
| ND<0.1 U | ND<1.5 U | -1.4 | 117 | 76 |
| 12 | ND<1.5 U | 10.5 | 118 | 76 |
| | | | | |
| 1.8 J | 0.88 J | 0.92 | 119 | 76 |
| ND<1.5 U | 0.88 J | 0.62 | 120 | 76 |
| 6.2 | 0.88 J | 5.32 | 121 | 76 |
| 14.1 | 0.88 J | 13.22 | 122 | 76 |
| 0.92 J1c | 0.88 J | 0.04 | 123 | 76 |
| 0.34 J1c | 0.88 J | -0.54 | 123 | 77 |
| ND<1.5 U2c | 0.88 J | 0.62 | 124 | 77 |
| ND<1.5 U | 0.88 J | 0.62 | 125 | 77 |
| ND<1.5 U | 0.88 J | 0.62 | 126 | 77 |
| ND<1.5 U | 0.88 J | 0.62 | 127 | 77 |
| 0.59 J | 0.88 J | -0.29 | 127 | 78 |
| ND<1.5 U | 0.88 J | 0.62 | 128 | 78 |
| 0.47 J | 0.88 J | -0.41 | 128 | 79 |
| 0.39 J | 0.88 J | -0.49 | 128 | 80 |
| 0.56 J | 0.88 J | -0.32 | 128 | 81 |
| 0.38 J | 0.88 J | -0.5 | 128 | 82 |
| ND<100 U | 0.88 J | 99.12 | 129 | 82 |
| ND<0.1 U | 0.88 J | -0.78 | 129 | 83 |
| 12 | 0.88 J | 11.12 | 130 | 83 |
| | | | | |
| ND<1.5 U | 1.8 J | -0.3 | 130 | 84 |
| 6.2 | 1.8 J | 4.4 | 131 | 84 |
| 14.1 | 1.8 J | 12.3 | 132 | 84 |
| 0.92 J1c | 1.8 J | -0.88 | 132 | 85 |
| 0.34 J1c | 1.8 J | -1.46 | 132 | 86 |
| ND<1.5 U2c | 1.8 J | -0.3 | 132 | 87 |
| ND<1.5 U | 1.8 J | -0.3 | 132 | 88 |
| ND<1.5 U | 1.8 J | -0.3 | 132 | 89 |
| ND<1.5 U | 1.8 J | -0.3 | 132 | 90 |
| 0.59 J | 1.8 J | -1.21 | 132 | 91 |
| ND<1.5 U | 1.8 J | -0.3 | 132 | 92 |
| 0.47 J | 1.8 J | -1.33 | 132 | 93 |
| 0.39 J | 1.8 J | -1.41 | 132 | 94 |
| 0.56 J | 1.8 J | -1.24 | 132 | 95 |
| 0.38 J | 1.8 J | -1.42 | 132 | 96 |
| ND<100 U | 1.8 J | 98.2 | 133 | 96 |
| ND<0.1 U | 1.8 J | -1.7 | 133 | 97 |
| 12 | 1.8 J | 10.2 | 134 | 97 |
| | | | | |
| 6.2 | ND<1.5 U | 4.7 | 135 | 97 |
| 14.1 | ND<1.5 U | 12.6 | 136 | 97 |
| 0.92 J1c | ND<1.5 U | -0.58 | 136 | 98 |
| 0.34 J1c | ND<1.5 U | -1.16 | 136 | 99 |
| ND<1.5 U2c | ND<1.5 U | 0 | 136 | 99 |
| ND<1.5 U | ND<1.5 U | 0 | 136 | 99 |
| ND<1.5 U | ND<1.5 U | 0 | 136 | 99 |
| ND<1.5 U | ND<1.5 U | 0 | 136 | 99 |
| 0.59 J | ND<1.5 U | -0.91 | 136 | 100 |
| ND<1.5 U | ND<1.5 U | 0 | 136 | 100 |
| 0.47 J | ND<1.5 U | -1.03 | 136 | 101 |

| | | | | |
|---|---|---|---|---|
| 0.39 J | ND<1.5 U | -1.11 | 136 | 102 |
| 0.56 J | ND<1.5 U | -0.94 | 136 | 103 |
| 0.38 J | ND<1.5 U | -1.12 | 136 | 104 |
| ND<100 U | ND<1.5 U | 98.5 | 137 | 104 |
| ND<0.1 U | ND<1.5 U | -1.4 | 137 | 105 |
| 12 | ND<1.5 U | 10.5 | 138 | 105 |
| | | | | |
| 14.1 | 6.2 | 7.9 | 139 | 105 |
| 0.92 J1c | 6.2 | -5.28 | 139 | 106 |
| 0.34 J1c | 6.2 | -5.86 | 139 | 107 |
| ND<1.5 U2c | 6.2 | -4.7 | 139 | 108 |
| ND<1.5 U | 6.2 | -4.7 | 139 | 109 |
| ND<1.5 U | 6.2 | -4.7 | 139 | 110 |
| ND<1.5 U | 6.2 | -4.7 | 139 | 111 |
| 0.59 J | 6.2 | -5.61 | 139 | 112 |
| ND<1.5 U | 6.2 | -4.7 | 139 | 113 |
| 0.47 J | 6.2 | -5.73 | 139 | 114 |
| 0.39 J | 6.2 | -5.81 | 139 | 115 |
| 0.56 J | 6.2 | -5.64 | 139 | 116 |
| 0.38 J | 6.2 | -5.82 | 139 | 117 |
| ND<100 U | 6.2 | 93.8 | 140 | 117 |
| ND<0.1 U | 6.2 | -6.1 | 140 | 118 |
| 12 | 6.2 | 5.8 | 141 | 118 |
| | | | | |
| 0.92 J1c | 14.1 | -13.18 | 141 | 119 |
| 0.34 J1c | 14.1 | -13.76 | 141 | 120 |
| ND<1.5 U2c | 14.1 | -12.6 | 141 | 121 |
| ND<1.5 U | 14.1 | -12.6 | 141 | 122 |
| ND<1.5 U | 14.1 | -12.6 | 141 | 123 |
| ND<1.5 U | 14.1 | -12.6 | 141 | 124 |
| 0.59 J | 14.1 | -13.51 | 141 | 125 |
| ND<1.5 U | 14.1 | -12.6 | 141 | 126 |
| 0.47 J | 14.1 | -13.63 | 141 | 127 |
| 0.39 J | 14.1 | -13.71 | 141 | 128 |
| 0.56 J | 14.1 | -13.54 | 141 | 129 |
| 0.38 J | 14.1 | -13.72 | 141 | 130 |
| ND<100 U | 14.1 | 85.9 | 142 | 130 |
| ND<0.1 U | 14.1 | -14 | 142 | 131 |
| 12 | 14.1 | -2.1 | 142 | 132 |
| | | | | |
| 0.34 J1c | 0.92 J1c | -0.58 | 142 | 133 |
| ND<1.5 U2c | 0.92 J1c | 0.58 | 143 | 133 |
| ND<1.5 U | 0.92 J1c | 0.58 | 144 | 133 |
| ND<1.5 U | 0.92 J1c | 0.58 | 145 | 133 |
| ND<1.5 U | 0.92 J1c | 0.58 | 146 | 133 |
| 0.59 J | 0.92 J1c | -0.33 | 146 | 134 |
| ND<1.5 U | 0.92 J1c | 0.58 | 147 | 134 |
| 0.47 J | 0.92 J1c | -0.45 | 147 | 135 |
| 0.39 J | 0.92 J1c | -0.53 | 147 | 136 |
| 0.56 J | 0.92 J1c | -0.36 | 147 | 137 |
| 0.38 J | 0.92 J1c | -0.54 | 147 | 138 |
| ND<100 U | 0.92 J1c | 99.08 | 148 | 138 |
| ND<0.1 U | 0.92 J1c | -0.82 | 148 | 139 |
| 12 | 0.92 J1c | 11.08 | 149 | 139 |
| | | | | |
| ND<1.5 U2c | 0.34 J1c | Same Date | 149 | 139 |
| ND<1.5 U | 0.34 J1c | 1.16 | 150 | 139 |

| | | | | |
|---|---|---|---|---|
| ND<1.5 U | 0.34 J1c | 1.16 | 151 | 139 |
| ND<1.5 U | 0.34 J1c | 1.16 | 152 | 139 |
| 0.59 J | 0.34 J1c | 0.25 | 153 | 139 |
| ND<1.5 U | 0.34 J1c | 1.16 | 154 | 139 |
| 0.47 J | 0.34 J1c | 0.13 | 155 | 139 |
| 0.39 J | 0.34 J1c | 0.05 | 156 | 139 |
| 0.56 J | 0.34 J1c | 0.22 | 157 | 139 |
| 0.38 J | 0.34 J1c | 0.04 | 158 | 139 |
| ND<100 U | 0.34 J1c | 99.66 | 159 | 139 |
| ND<0.1 U | 0.34 J1c | -0.24 | 159 | 140 |
| 12 | 0.34 J1c | 11.66 | 160 | 140 |
| | | | | |
| ND<1.5 U | ND<1.5 U2c | 0 | 160 | 140 |
| ND<1.5 U | ND<1.5 U2c | 0 | 160 | 140 |
| ND<1.5 U | ND<1.5 U2c | 0 | 160 | 140 |
| 0.59 J | ND<1.5 U2c | -0.91 | 160 | 141 |
| ND<1.5 U | ND<1.5 U2c | 0 | 160 | 141 |
| 0.47 J | ND<1.5 U2c | -1.03 | 160 | 142 |
| 0.39 J | ND<1.5 U2c | -1.11 | 160 | 143 |
| 0.56 J | ND<1.5 U2c | -0.94 | 160 | 144 |
| 0.38 J | ND<1.5 U2c | -1.12 | 160 | 145 |
| ND<100 U | ND<1.5 U2c | 98.5 | 161 | 145 |
| ND<0.1 U | ND<1.5 U2c | -1.4 | 161 | 146 |
| 12 | ND<1.5 U2c | 10.5 | 162 | 146 |
| | | | | |
| ND<1.5 U | ND<1.5 U | Same Date | 162 | 146 |
| ND<1.5 U | ND<1.5 U | 0 | 162 | 146 |
| 0.59 J | ND<1.5 U | -0.91 | 162 | 147 |
| ND<1.5 U | ND<1.5 U | 0 | 162 | 147 |
| 0.47 J | ND<1.5 U | -1.03 | 162 | 148 |
| 0.39 J | ND<1.5 U | -1.11 | 162 | 149 |
| 0.56 J | ND<1.5 U | -0.94 | 162 | 150 |
| 0.38 J | ND<1.5 U | -1.12 | 162 | 151 |
| ND<100 U | ND<1.5 U | 98.5 | 163 | 151 |
| ND<0.1 U | ND<1.5 U | -1.4 | 163 | 152 |
| 12 | ND<1.5 U | 10.5 | 164 | 152 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 164 | 152 |
| 0.59 J | ND<1.5 U | -0.91 | 164 | 153 |
| ND<1.5 U | ND<1.5 U | 0 | 164 | 153 |
| 0.47 J | ND<1.5 U | -1.03 | 164 | 154 |
| 0.39 J | ND<1.5 U | -1.11 | 164 | 155 |
| 0.56 J | ND<1.5 U | -0.94 | 164 | 156 |
| 0.38 J | ND<1.5 U | -1.12 | 164 | 157 |
| ND<100 U | ND<1.5 U | 98.5 | 165 | 157 |
| ND<0.1 U | ND<1.5 U | -1.4 | 165 | 158 |
| 12 | ND<1.5 U | 10.5 | 166 | 158 |
| | | | | |
| 0.59 J | ND<1.5 U | -0.91 | 166 | 159 |
| ND<1.5 U | ND<1.5 U | 0 | 166 | 159 |
| 0.47 J | ND<1.5 U | -1.03 | 166 | 160 |
| 0.39 J | ND<1.5 U | -1.11 | 166 | 161 |
| 0.56 J | ND<1.5 U | -0.94 | 166 | 162 |
| 0.38 J | ND<1.5 U | -1.12 | 166 | 163 |
| ND<100 U | ND<1.5 U | 98.5 | 167 | 163 |
| ND<0.1 U | ND<1.5 U | -1.4 | 167 | 164 |
| 12 | ND<1.5 U | 10.5 | 168 | 164 |

| | | | | |
|---|---|---|---|---|
| ND<1.5 U | 0.59 J | 0.91 | 169 | 164 |
| 0.47 J | 0.59 J | -0.12 | 169 | 165 |
| 0.39 J | 0.59 J | -0.2 | 169 | 166 |
| 0.56 J | 0.59 J | -0.03 | 169 | 167 |
| 0.38 J | 0.59 J | -0.21 | 169 | 168 |
| ND<100 U | 0.59 J | 99.41 | 170 | 168 |
| ND<0.1 U | 0.59 J | -0.49 | 170 | 169 |
| 12 | 0.59 J | 11.41 | 171 | 169 |
| | | | | |
| 0.47 J | ND<1.5 U | -1.03 | 171 | 170 |
| 0.39 J | ND<1.5 U | -1.11 | 171 | 171 |
| 0.56 J | ND<1.5 U | -0.94 | 171 | 172 |
| 0.38 J | ND<1.5 U | -1.12 | 171 | 173 |
| ND<100 U | ND<1.5 U | 98.5 | 172 | 173 |
| ND<0.1 U | ND<1.5 U | -1.4 | 172 | 174 |
| 12 | ND<1.5 U | 10.5 | 173 | 174 |
| | | | | |
| 0.39 J | 0.47 J | -0.08 | 173 | 175 |
| 0.56 J | 0.47 J | 0.09 | 174 | 175 |
| 0.38 J | 0.47 J | -0.09 | 174 | 176 |
| ND<100 U | 0.47 J | 99.53 | 175 | 176 |
| ND<0.1 U | 0.47 J | -0.37 | 175 | 177 |
| 12 | 0.47 J | 11.53 | 176 | 177 |
| | | | | |
| 0.56 J | 0.39 J | 0.17 | 177 | 177 |
| 0.38 J | 0.39 J | -0.01 | 177 | 178 |
| ND<100 U | 0.39 J | 99.61 | 178 | 178 |
| ND<0.1 U | 0.39 J | -0.29 | 178 | 179 |
| 12 | 0.39 J | 11.61 | 179 | 179 |
| | | | | |
| 0.38 J | 0.56 J | -0.18 | 179 | 180 |
| ND<100 U | 0.56 J | 99.44 | 180 | 180 |
| ND<0.1 U | 0.56 J | -0.46 | 180 | 181 |
| 12 | 0.56 J | 11.44 | 181 | 181 |
| | | | | |
| ND<100 U | 0.38 J | 99.62 | 182 | 181 |
| ND<0.1 U | 0.38 J | -0.28 | 182 | 182 |
| 12 | 0.38 J | 11.62 | 183 | 182 |
| | | | | |
| ND<0.1 U | ND<100 U | -99.9 | 183 | 183 |
| 12 | ND<100 U | -88 | 183 | 184 |
| | | | | |
| 12 | ND<0.1 U | 11.9 | 184 | 184 |

S Statistic = 184 - 184 = 0

| Tied Group | Value | Members |
|---|---|---|
| 1 | 0.39 | 2 |
| 2 | 1.5 | 9 |

| Time Period | Observations |
|---|---|
| 2/1/2017 | 1 |
| 3/1/2017 | 1 |
| 4/1/2017 | 1 |
| 5/1/2017 | 1 |

| | |
|---|---|
| 6/1/2017 | 1 |
| 7/1/2017 | 1 |
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 3/1/2022 | 1 |
| 3/1/2023 | 1 |
| 3/1/2024 | 1 |

There are 2 time periods with multiple data

---

A = 1674
B = 36
C = 504
D = 0
E = 74
F = 4
a = 51156
b = 197316
c = 1624
Group Variance = 2747.18
Z-Score = 0
Comparison Level at 95% confidence level = 1.65463 (upward trend)
0 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RW09-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 4 | 3.1 | 0.9 | 1 | 0 |
| 5 | 3.1 | 1.9 | 2 | 0 |
| 11.1 | 3.1 | 8 | 3 | 0 |
| 8.1 | 3.1 | 5 | 4 | 0 |
| 12.9 | 3.1 | 9.8 | 5 | 0 |
| 18.5 | 3.1 | 15.4 | 6 | 0 |
| 9.1 | 3.1 | 6 | 7 | 0 |
| 12 | 3.1 | 8.9 | 8 | 0 |
| 8.8 | 3.1 | 5.7 | 9 | 0 |
| 7.7 | 3.1 | 4.6 | 10 | 0 |
| 2.1 J | 3.1 | -1 | 10 | 1 |
| 1.8 J | 3.1 | -1.3 | 10 | 2 |
| ND<1.5 U | 3.1 | -1.6 | 10 | 3 |
| 3.7 | 3.1 | 0.6 | 11 | 3 |
| 2 J2c | 3.1 | -1.1 | 11 | 4 |
| 5.3 1c | 3.1 | 2.2 | 12 | 4 |
| 3.8 | 3.1 | 0.7 | 13 | 4 |
| 4.7 | 3.1 | 1.6 | 14 | 4 |
| 5.6 1c | 3.1 | 2.5 | 15 | 4 |
| 4.2 B | 3.1 | 1.1 | 16 | 4 |
| 10.6 | 3.1 | 7.5 | 17 | 4 |
| 16.5 1c | 3.1 | 13.4 | 18 | 4 |
| 10.7 | 3.1 | 7.6 | 19 | 4 |
| 10.3 | 3.1 | 7.2 | 20 | 4 |
| 16 | 3.1 | 12.9 | 21 | 4 |
| ND<1 U | 3.1 | -2.1 | 21 | 5 |
| 11.5 | 3.1 | 8.4 | 22 | 5 |
| 6.329 | 3.1 | 3.229 | 23 | 5 |
| | | | | |
| 5 | 4 | 1 | 24 | 5 |
| 11.1 | 4 | 7.1 | 25 | 5 |
| 8.1 | 4 | 4.1 | 26 | 5 |
| 12.9 | 4 | 8.9 | 27 | 5 |
| 18.5 | 4 | 14.5 | 28 | 5 |
| 9.1 | 4 | 5.1 | 29 | 5 |
| 12 | 4 | 8 | 30 | 5 |
| 8.8 | 4 | 4.8 | 31 | 5 |
| 7.7 | 4 | 3.7 | 32 | 5 |
| 2.1 J | 4 | -1.9 | 32 | 6 |
| 1.8 J | 4 | -2.2 | 32 | 7 |
| ND<1.5 U | 4 | -2.5 | 32 | 8 |
| 3.7 | 4 | -0.3 | 32 | 9 |
| 2 J2c | 4 | -2 | 32 | 10 |
| 5.3 1c | 4 | 1.3 | 33 | 10 |
| 3.8 | 4 | -0.2 | 33 | 11 |
| 4.7 | 4 | 0.7 | 34 | 11 |
| 5.6 1c | 4 | 1.6 | 35 | 11 |

| | | | | |
|---|---|---|---|---|
| 4.2 B | 4 | 0.2 | 36 | 11 |
| 10.6 | 4 | 6.6 | 37 | 11 |
| 16.5 1c | 4 | 12.5 | 38 | 11 |
| 10.7 | 4 | 6.7 | 39 | 11 |
| 10.3 | 4 | 6.3 | 40 | 11 |
| 16 | 4 | 12 | 41 | 11 |
| ND<1 U | 4 | -3 | 41 | 12 |
| 11.5 | 4 | 7.5 | 42 | 12 |
| 6.329 | 4 | 2.329 | 43 | 12 |
| | | | | |
| 11.1 | 5 | 6.1 | 44 | 12 |
| 8.1 | 5 | 3.1 | 45 | 12 |
| 12.9 | 5 | 7.9 | 46 | 12 |
| 18.5 | 5 | 13.5 | 47 | 12 |
| 9.1 | 5 | 4.1 | 48 | 12 |
| 12 | 5 | 7 | 49 | 12 |
| 8.8 | 5 | 3.8 | 50 | 12 |
| 7.7 | 5 | 2.7 | 51 | 12 |
| 2.1 J | 5 | -2.9 | 51 | 13 |
| 1.8 J | 5 | -3.2 | 51 | 14 |
| ND<1.5 U | 5 | -3.5 | 51 | 15 |
| 3.7 | 5 | -1.3 | 51 | 16 |
| 2 J2c | 5 | -3 | 51 | 17 |
| 5.3 1c | 5 | 0.3 | 52 | 17 |
| 3.8 | 5 | -1.2 | 52 | 18 |
| 4.7 | 5 | -0.3 | 52 | 19 |
| 5.6 1c | 5 | 0.6 | 53 | 19 |
| 4.2 B | 5 | -0.8 | 53 | 20 |
| 10.6 | 5 | 5.6 | 54 | 20 |
| 16.5 1c | 5 | 11.5 | 55 | 20 |
| 10.7 | 5 | 5.7 | 56 | 20 |
| 10.3 | 5 | 5.3 | 57 | 20 |
| 16 | 5 | 11 | 58 | 20 |
| ND<1 U | 5 | -4 | 58 | 21 |
| 11.5 | 5 | 6.5 | 59 | 21 |
| 6.329 | 5 | 1.329 | 60 | 21 |
| | | | | |
| 8.1 | 11.1 | -3 | 60 | 22 |
| 12.9 | 11.1 | 1.8 | 61 | 22 |
| 18.5 | 11.1 | 7.4 | 62 | 22 |
| 9.1 | 11.1 | -2 | 62 | 23 |
| 12 | 11.1 | 0.9 | 63 | 23 |
| 8.8 | 11.1 | -2.3 | 63 | 24 |
| 7.7 | 11.1 | -3.4 | 63 | 25 |
| 2.1 J | 11.1 | -9 | 63 | 26 |
| 1.8 J | 11.1 | -9.3 | 63 | 27 |
| ND<1.5 U | 11.1 | -9.6 | 63 | 28 |
| 3.7 | 11.1 | -7.4 | 63 | 29 |
| 2 J2c | 11.1 | -9.1 | 63 | 30 |
| 5.3 1c | 11.1 | -5.8 | 63 | 31 |
| 3.8 | 11.1 | -7.3 | 63 | 32 |
| 4.7 | 11.1 | -6.4 | 63 | 33 |
| 5.6 1c | 11.1 | -5.5 | 63 | 34 |
| 4.2 B | 11.1 | -6.9 | 63 | 35 |
| 10.6 | 11.1 | -0.5 | 63 | 36 |
| 16.5 1c | 11.1 | 5.4 | 64 | 36 |
| 10.7 | 11.1 | -0.4 | 64 | 37 |

| | | | | |
|---|---|---|---|---|
| 10.3 | 11.1 | -0.8 | 64 | 38 |
| 16 | 11.1 | 4.9 | 65 | 38 |
| ND<1 U | 11.1 | -10.1 | 65 | 39 |
| 11.5 | 11.1 | 0.4 | 66 | 39 |
| 6.329 | 11.1 | -4.771 | 66 | 40 |
| | | | | |
| 12.9 | 8.1 | 4.8 | 67 | 40 |
| 18.5 | 8.1 | 10.4 | 68 | 40 |
| 9.1 | 8.1 | 1 | 69 | 40 |
| 12 | 8.1 | 3.9 | 70 | 40 |
| 8.8 | 8.1 | 0.7 | 71 | 40 |
| 7.7 | 8.1 | -0.4 | 71 | 41 |
| 2.1 J | 8.1 | -6 | 71 | 42 |
| 1.8 J | 8.1 | -6.3 | 71 | 43 |
| ND<1.5 U | 8.1 | -6.6 | 71 | 44 |
| 3.7 | 8.1 | -4.4 | 71 | 45 |
| 2 J2c | 8.1 | -6.1 | 71 | 46 |
| 5.3 1c | 8.1 | -2.8 | 71 | 47 |
| 3.8 | 8.1 | -4.3 | 71 | 48 |
| 4.7 | 8.1 | -3.4 | 71 | 49 |
| 5.6 1c | 8.1 | -2.5 | 71 | 50 |
| 4.2 B | 8.1 | -3.9 | 71 | 51 |
| 10.6 | 8.1 | 2.5 | 72 | 51 |
| 16.5 1c | 8.1 | 8.4 | 73 | 51 |
| 10.7 | 8.1 | 2.6 | 74 | 51 |
| 10.3 | 8.1 | 2.2 | 75 | 51 |
| 16 | 8.1 | 7.9 | 76 | 51 |
| ND<1 U | 8.1 | -7.1 | 76 | 52 |
| 11.5 | 8.1 | 3.4 | 77 | 52 |
| 6.329 | 8.1 | -1.771 | 77 | 53 |
| | | | | |
| 18.5 | 12.9 | 5.6 | 78 | 53 |
| 9.1 | 12.9 | -3.8 | 78 | 54 |
| 12 | 12.9 | -0.9 | 78 | 55 |
| 8.8 | 12.9 | -4.1 | 78 | 56 |
| 7.7 | 12.9 | -5.2 | 78 | 57 |
| 2.1 J | 12.9 | -10.8 | 78 | 58 |
| 1.8 J | 12.9 | -11.1 | 78 | 59 |
| ND<1.5 U | 12.9 | -11.4 | 78 | 60 |
| 3.7 | 12.9 | -9.2 | 78 | 61 |
| 2 J2c | 12.9 | -10.9 | 78 | 62 |
| 5.3 1c | 12.9 | -7.6 | 78 | 63 |
| 3.8 | 12.9 | -9.1 | 78 | 64 |
| 4.7 | 12.9 | -8.2 | 78 | 65 |
| 5.6 1c | 12.9 | -7.3 | 78 | 66 |
| 4.2 B | 12.9 | -8.7 | 78 | 67 |
| 10.6 | 12.9 | -2.3 | 78 | 68 |
| 16.5 1c | 12.9 | 3.6 | 79 | 68 |
| 10.7 | 12.9 | -2.2 | 79 | 69 |
| 10.3 | 12.9 | -2.6 | 79 | 70 |
| 16 | 12.9 | 3.1 | 80 | 70 |
| ND<1 U | 12.9 | -11.9 | 80 | 71 |
| 11.5 | 12.9 | -1.4 | 80 | 72 |
| 6.329 | 12.9 | -6.571 | 80 | 73 |
| | | | | |
| 9.1 | 18.5 | -9.4 | 80 | 74 |
| 12 | 18.5 | -6.5 | 80 | 75 |

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|---|---|---|---|---|
| 8.8 | 18.5 | -9.7 | 80 | 76 |
| 7.7 | 18.5 | -10.8 | 80 | 77 |
| 2.1 J | 18.5 | -16.4 | 80 | 78 |
| 1.8 J | 18.5 | -16.7 | 80 | 79 |
| ND<1.5 U | 18.5 | -17 | 80 | 80 |
| 3.7 | 18.5 | -14.8 | 80 | 81 |
| 2 J2c | 18.5 | -16.5 | 80 | 82 |
| 5.3 1c | 18.5 | -13.2 | 80 | 83 |
| 3.8 | 18.5 | -14.7 | 80 | 84 |
| 4.7 | 18.5 | -13.8 | 80 | 85 |
| 5.6 1c | 18.5 | -12.9 | 80 | 86 |
| 4.2 B | 18.5 | -14.3 | 80 | 87 |
| 10.6 | 18.5 | -7.9 | 80 | 88 |
| 16.5 1c | 18.5 | -2 | 80 | 89 |
| 10.7 | 18.5 | -7.8 | 80 | 90 |
| 10.3 | 18.5 | -8.2 | 80 | 91 |
| 16 | 18.5 | -2.5 | 80 | 92 |
| ND<1 U | 18.5 | -17.5 | 80 | 93 |
| 11.5 | 18.5 | -7 | 80 | 94 |
| 6.329 | 18.5 | -12.171 | 80 | 95 |
| | | | | |
| 12 | 9.1 | 2.9 | 81 | 95 |
| 8.8 | 9.1 | -0.3 | 81 | 96 |
| 7.7 | 9.1 | -1.4 | 81 | 97 |
| 2.1 J | 9.1 | -7 | 81 | 98 |
| 1.8 J | 9.1 | -7.3 | 81 | 99 |
| ND<1.5 U | 9.1 | -7.6 | 81 | 100 |
| 3.7 | 9.1 | -5.4 | 81 | 101 |
| 2 J2c | 9.1 | -7.1 | 81 | 102 |
| 5.3 1c | 9.1 | -3.8 | 81 | 103 |
| 3.8 | 9.1 | -5.3 | 81 | 104 |
| 4.7 | 9.1 | -4.4 | 81 | 105 |
| 5.6 1c | 9.1 | -3.5 | 81 | 106 |
| 4.2 B | 9.1 | -4.9 | 81 | 107 |
| 10.6 | 9.1 | 1.5 | 82 | 107 |
| 16.5 1c | 9.1 | 7.4 | 83 | 107 |
| 10.7 | 9.1 | 1.6 | 84 | 107 |
| 10.3 | 9.1 | 1.2 | 85 | 107 |
| 16 | 9.1 | 6.9 | 86 | 107 |
| ND<1 U | 9.1 | -8.1 | 86 | 108 |
| 11.5 | 9.1 | 2.4 | 87 | 108 |
| 6.329 | 9.1 | -2.771 | 87 | 109 |
| | | | | |
| 8.8 | 12 | -3.2 | 87 | 110 |
| 7.7 | 12 | -4.3 | 87 | 111 |
| 2.1 J | 12 | -9.9 | 87 | 112 |
| 1.8 J | 12 | -10.2 | 87 | 113 |
| ND<1.5 U | 12 | -10.5 | 87 | 114 |
| 3.7 | 12 | -8.3 | 87 | 115 |
| 2 J2c | 12 | -10 | 87 | 116 |
| 5.3 1c | 12 | -6.7 | 87 | 117 |
| 3.8 | 12 | -8.2 | 87 | 118 |
| 4.7 | 12 | -7.3 | 87 | 119 |
| 5.6 1c | 12 | -6.4 | 87 | 120 |
| 4.2 B | 12 | -7.8 | 87 | 121 |
| 10.6 | 12 | -1.4 | 87 | 122 |
| 16.5 1c | 12 | 4.5 | 88 | 122 |

| | | | | |
|---|---|---|---|---|
| 10.7 | 12 | -1.3 | 88 | 123 |
| 10.3 | 12 | -1.7 | 88 | 124 |
| 16 | 12 | 4 | 89 | 124 |
| ND<1 U | 12 | -11 | 89 | 125 |
| 11.5 | 12 | -0.5 | 89 | 126 |
| 6.329 | 12 | -5.671 | 89 | 127 |
| | | | | |
| 7.7 | 8.8 | -1.1 | 89 | 128 |
| 2.1 J | 8.8 | -6.7 | 89 | 129 |
| 1.8 J | 8.8 | -7 | 89 | 130 |
| ND<1.5 U | 8.8 | -7.3 | 89 | 131 |
| 3.7 | 8.8 | -5.1 | 89 | 132 |
| 2 J2c | 8.8 | -6.8 | 89 | 133 |
| 5.3 1c | 8.8 | -3.5 | 89 | 134 |
| 3.8 | 8.8 | -5 | 89 | 135 |
| 4.7 | 8.8 | -4.1 | 89 | 136 |
| 5.6 1c | 8.8 | -3.2 | 89 | 137 |
| 4.2 B | 8.8 | -4.6 | 89 | 138 |
| 10.6 | 8.8 | 1.8 | 90 | 138 |
| 16.5 1c | 8.8 | 7.7 | 91 | 138 |
| 10.7 | 8.8 | 1.9 | 92 | 138 |
| 10.3 | 8.8 | 1.5 | 93 | 138 |
| 16 | 8.8 | 7.2 | 94 | 138 |
| ND<1 U | 8.8 | -7.8 | 94 | 139 |
| 11.5 | 8.8 | 2.7 | 95 | 139 |
| 6.329 | 8.8 | -2.471 | 95 | 140 |
| | | | | |
| 2.1 J | 7.7 | -5.6 | 95 | 141 |
| 1.8 J | 7.7 | -5.9 | 95 | 142 |
| ND<1.5 U | 7.7 | -6.2 | 95 | 143 |
| 3.7 | 7.7 | -4 | 95 | 144 |
| 2 J2c | 7.7 | -5.7 | 95 | 145 |
| 5.3 1c | 7.7 | -2.4 | 95 | 146 |
| 3.8 | 7.7 | -3.9 | 95 | 147 |
| 4.7 | 7.7 | -3 | 95 | 148 |
| 5.6 1c | 7.7 | -2.1 | 95 | 149 |
| 4.2 B | 7.7 | -3.5 | 95 | 150 |
| 10.6 | 7.7 | 2.9 | 96 | 150 |
| 16.5 1c | 7.7 | 8.8 | 97 | 150 |
| 10.7 | 7.7 | 3 | 98 | 150 |
| 10.3 | 7.7 | 2.6 | 99 | 150 |
| 16 | 7.7 | 8.3 | 100 | 150 |
| ND<1 U | 7.7 | -6.7 | 100 | 151 |
| 11.5 | 7.7 | 3.8 | 101 | 151 |
| 6.329 | 7.7 | -1.371 | 101 | 152 |
| | | | | |
| 1.8 J | 2.1 J | -0.3 | 101 | 153 |
| ND<1.5 U | 2.1 J | -0.6 | 101 | 154 |
| 3.7 | 2.1 J | 1.6 | 102 | 154 |
| 2 J2c | 2.1 J | -0.1 | 102 | 155 |
| 5.3 1c | 2.1 J | 3.2 | 103 | 155 |
| 3.8 | 2.1 J | 1.7 | 104 | 155 |
| 4.7 | 2.1 J | 2.6 | 105 | 155 |
| 5.6 1c | 2.1 J | 3.5 | 106 | 155 |
| 4.2 B | 2.1 J | 2.1 | 107 | 155 |
| 10.6 | 2.1 J | 8.5 | 108 | 155 |
| 16.5 1c | 2.1 J | 14.4 | 109 | 155 |

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|---|---|---|---|---|
| 10.7 | 2.1 J | 8.6 | 110 | 155 |
| 10.3 | 2.1 J | 8.2 | 111 | 155 |
| 16 | 2.1 J | 13.9 | 112 | 155 |
| ND<1 U | 2.1 J | -1.1 | 112 | 156 |
| 11.5 | 2.1 J | 9.4 | 113 | 156 |
| 6.329 | 2.1 J | 4.229 | 114 | 156 |
| | | | | |
| ND<1.5 U | 1.8 J | -0.3 | 114 | 157 |
| 3.7 | 1.8 J | 1.9 | 115 | 157 |
| 2 J2c | 1.8 J | 0.2 | 116 | 157 |
| 5.3 1c | 1.8 J | 3.5 | 117 | 157 |
| 3.8 | 1.8 J | 2 | 118 | 157 |
| 4.7 | 1.8 J | 2.9 | 119 | 157 |
| 5.6 1c | 1.8 J | 3.8 | 120 | 157 |
| 4.2 B | 1.8 J | 2.4 | 121 | 157 |
| 10.6 | 1.8 J | 8.8 | 122 | 157 |
| 16.5 1c | 1.8 J | 14.7 | 123 | 157 |
| 10.7 | 1.8 J | 8.9 | 124 | 157 |
| 10.3 | 1.8 J | 8.5 | 125 | 157 |
| 16 | 1.8 J | 14.2 | 126 | 157 |
| ND<1 U | 1.8 J | -0.8 | 126 | 158 |
| 11.5 | 1.8 J | 9.7 | 127 | 158 |
| 6.329 | 1.8 J | 4.529 | 128 | 158 |
| | | | | |
| 3.7 | ND<1.5 U | 2.2 | 129 | 158 |
| 2 J2c | ND<1.5 U | 0.5 | 130 | 158 |
| 5.3 1c | ND<1.5 U | 3.8 | 131 | 158 |
| 3.8 | ND<1.5 U | 2.3 | 132 | 158 |
| 4.7 | ND<1.5 U | 3.2 | 133 | 158 |
| 5.6 1c | ND<1.5 U | 4.1 | 134 | 158 |
| 4.2 B | ND<1.5 U | 2.7 | 135 | 158 |
| 10.6 | ND<1.5 U | 9.1 | 136 | 158 |
| 16.5 1c | ND<1.5 U | 15 | 137 | 158 |
| 10.7 | ND<1.5 U | 9.2 | 138 | 158 |
| 10.3 | ND<1.5 U | 8.8 | 139 | 158 |
| 16 | ND<1.5 U | 14.5 | 140 | 158 |
| ND<1 U | ND<1.5 U | -0.5 | 140 | 159 |
| 11.5 | ND<1.5 U | 10 | 141 | 159 |
| 6.329 | ND<1.5 U | 4.829 | 142 | 159 |
| | | | | |
| 2 J2c | 3.7 | -1.7 | 142 | 160 |
| 5.3 1c | 3.7 | 1.6 | 143 | 160 |
| 3.8 | 3.7 | 0.1 | 144 | 160 |
| 4.7 | 3.7 | 1 | 145 | 160 |
| 5.6 1c | 3.7 | 1.9 | 146 | 160 |
| 4.2 B | 3.7 | 0.5 | 147 | 160 |
| 10.6 | 3.7 | 6.9 | 148 | 160 |
| 16.5 1c | 3.7 | 12.8 | 149 | 160 |
| 10.7 | 3.7 | 7 | 150 | 160 |
| 10.3 | 3.7 | 6.6 | 151 | 160 |
| 16 | 3.7 | 12.3 | 152 | 160 |
| ND<1 U | 3.7 | -2.7 | 152 | 161 |
| 11.5 | 3.7 | 7.8 | 153 | 161 |
| 6.329 | 3.7 | 2.629 | 154 | 161 |
| | | | | |
| 5.3 1c | 2 J2c | Same Date | 154 | 161 |
| 3.8 | 2 J2c | 1.8 | 155 | 161 |

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|---|---|---|---|---|
| 4.7 | 2 J2c | 2.7 | 156 | 161 |
| 5.6 1c | 2 J2c | 3.6 | 157 | 161 |
| 4.2 B | 2 J2c | 2.2 | 158 | 161 |
| 10.6 | 2 J2c | 8.6 | 159 | 161 |
| 16.5 1c | 2 J2c | 14.5 | 160 | 161 |
| 10.7 | 2 J2c | 8.7 | 161 | 161 |
| 10.3 | 2 J2c | 8.3 | 162 | 161 |
| 16 | 2 J2c | 14 | 163 | 161 |
| ND<1 U | 2 J2c | -1 | 163 | 162 |
| 11.5 | 2 J2c | 9.5 | 164 | 162 |
| 6.329 | 2 J2c | 4.329 | 165 | 162 |
| | | | | |
| 3.8 | 5.3 1c | -1.5 | 165 | 163 |
| 4.7 | 5.3 1c | -0.6 | 165 | 164 |
| 5.6 1c | 5.3 1c | 0.3 | 166 | 164 |
| 4.2 B | 5.3 1c | -1.1 | 166 | 165 |
| 10.6 | 5.3 1c | 5.3 | 167 | 165 |
| 16.5 1c | 5.3 1c | 11.2 | 168 | 165 |
| 10.7 | 5.3 1c | 5.4 | 169 | 165 |
| 10.3 | 5.3 1c | 5 | 170 | 165 |
| 16 | 5.3 1c | 10.7 | 171 | 165 |
| ND<1 U | 5.3 1c | -4.3 | 171 | 166 |
| 11.5 | 5.3 1c | 6.2 | 172 | 166 |
| 6.329 | 5.3 1c | 1.029 | 173 | 166 |
| | | | | |
| 4.7 | 3.8 | Same Date | 173 | 166 |
| 5.6 1c | 3.8 | 1.8 | 174 | 166 |
| 4.2 B | 3.8 | 0.4 | 175 | 166 |
| 10.6 | 3.8 | 6.8 | 176 | 166 |
| 16.5 1c | 3.8 | 12.7 | 177 | 166 |
| 10.7 | 3.8 | 6.9 | 178 | 166 |
| 10.3 | 3.8 | 6.5 | 179 | 166 |
| 16 | 3.8 | 12.2 | 180 | 166 |
| ND<1 U | 3.8 | -2.8 | 180 | 167 |
| 11.5 | 3.8 | 7.7 | 181 | 167 |
| 6.329 | 3.8 | 2.529 | 182 | 167 |
| | | | | |
| 5.6 1c | 4.7 | 0.9 | 183 | 167 |
| 4.2 B | 4.7 | -0.5 | 183 | 168 |
| 10.6 | 4.7 | 5.9 | 184 | 168 |
| 16.5 1c | 4.7 | 11.8 | 185 | 168 |
| 10.7 | 4.7 | 6 | 186 | 168 |
| 10.3 | 4.7 | 5.6 | 187 | 168 |
| 16 | 4.7 | 11.3 | 188 | 168 |
| ND<1 U | 4.7 | -3.7 | 188 | 169 |
| 11.5 | 4.7 | 6.8 | 189 | 169 |
| 6.329 | 4.7 | 1.629 | 190 | 169 |
| | | | | |
| 4.2 B | 5.6 1c | -1.4 | 190 | 170 |
| 10.6 | 5.6 1c | 5 | 191 | 170 |
| 16.5 1c | 5.6 1c | 10.9 | 192 | 170 |
| 10.7 | 5.6 1c | 5.1 | 193 | 170 |
| 10.3 | 5.6 1c | 4.7 | 194 | 170 |
| 16 | 5.6 1c | 10.4 | 195 | 170 |
| ND<1 U | 5.6 1c | -4.6 | 195 | 171 |
| 11.5 | 5.6 1c | 5.9 | 196 | 171 |
| 6.329 | 5.6 1c | 0.729 | 197 | 171 |

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|---|---|---|---|---|
| 10.6 | 4.2 B | 6.4 | 198 | 171 |
| 16.5 1c | 4.2 B | 12.3 | 199 | 171 |
| 10.7 | 4.2 B | 6.5 | 200 | 171 |
| 10.3 | 4.2 B | 6.1 | 201 | 171 |
| 16 | 4.2 B | 11.8 | 202 | 171 |
| ND<1 U | 4.2 B | -3.2 | 202 | 172 |
| 11.5 | 4.2 B | 7.3 | 203 | 172 |
| 6.329 | 4.2 B | 2.129 | 204 | 172 |
| | | | | |
| 16.5 1c | 10.6 | 5.9 | 205 | 172 |
| 10.7 | 10.6 | 0.1 | 206 | 172 |
| 10.3 | 10.6 | -0.3 | 206 | 173 |
| 16 | 10.6 | 5.4 | 207 | 173 |
| ND<1 U | 10.6 | -9.6 | 207 | 174 |
| 11.5 | 10.6 | 0.9 | 208 | 174 |
| 6.329 | 10.6 | -4.271 | 208 | 175 |
| | | | | |
| 10.7 | 16.5 1c | -5.8 | 208 | 176 |
| 10.3 | 16.5 1c | -6.2 | 208 | 177 |
| 16 | 16.5 1c | -0.5 | 208 | 178 |
| ND<1 U | 16.5 1c | -15.5 | 208 | 179 |
| 11.5 | 16.5 1c | -5 | 208 | 180 |
| 6.329 | 16.5 1c | -10.171 | 208 | 181 |
| | | | | |
| 10.3 | 10.7 | -0.4 | 208 | 182 |
| 16 | 10.7 | 5.3 | 209 | 182 |
| ND<1 U | 10.7 | -9.7 | 209 | 183 |
| 11.5 | 10.7 | 0.8 | 210 | 183 |
| 6.329 | 10.7 | -4.371 | 210 | 184 |
| | | | | |
| 16 | 10.3 | 5.7 | 211 | 184 |
| ND<1 U | 10.3 | -9.3 | 211 | 185 |
| 11.5 | 10.3 | 1.2 | 212 | 185 |
| 6.329 | 10.3 | -3.971 | 212 | 186 |
| | | | | |
| ND<1 U | 16 | -15 | 212 | 187 |
| 11.5 | 16 | -4.5 | 212 | 188 |
| 6.329 | 16 | -9.671 | 212 | 189 |
| | | | | |
| 11.5 | ND<1 U | 10.5 | 213 | 189 |
| 6.329 | ND<1 U | 5.329 | 214 | 189 |
| | | | | |
| 6.329 | 11.5 | -5.171 | 214 | 190 |

S Statistic = 214 - 190 = 24

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 2/1/2017 | 1 |
| 3/1/2017 | 1 |
| 4/1/2017 | 1 |
| 5/1/2017 | 1 |
| 6/1/2017 | 1 |
| 7/1/2017 | 1 |

| | |
|---|---|
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 3/1/2022 | 1 |
| 3/1/2023 | 1 |
| 3/1/2024 | 1 |

There are 2 time periods with multiple data

---

A = 0
B = 36
C = 0
D = 0
E = 0
F = 4
a = 51156
b = 197316
c = 1624
Group Variance = 2840
Z-Score = 0.431587
Comparison Level at 95% confidence level = 1.65463 (upward trend)
0.431587 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RW10-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 446 | 455 | Same Date | 0 | 0 |
| ND<1.5 U | 455 | -453.5 | 0 | 1 |
| 198 | 455 | -257 | 0 | 2 |
| 2.5 J | 455 | -452.5 | 0 | 3 |
| 27.2 | 455 | -427.8 | 0 | 4 |
| 16.3 | 455 | -438.7 | 0 | 5 |
| ND<1.5 U | 455 | -453.5 | 0 | 6 |
| 17.7 | 455 | -437.3 | 0 | 7 |
| 24.6 | 455 | -430.4 | 0 | 8 |
| 63.7 | 455 | -391.3 | 0 | 9 |
| ND<1.5 U | 455 | -453.5 | 0 | 10 |
| ND<1.5 U | 455 | -453.5 | 0 | 11 |
| 44.4 | 455 | -410.6 | 0 | 12 |
| 44.7 | 455 | -410.3 | 0 | 13 |
| 10.8 | 455 | -444.2 | 0 | 14 |
| 0.38 J | 455 | -454.62 | 0 | 15 |
| 1.3 J | 455 | -453.7 | 0 | 16 |
| 3 B | 455 | -452 | 0 | 17 |
| 0.86 J | 455 | -454.14 | 0 | 18 |
| 8.4 1c | 455 | -446.6 | 0 | 19 |
| 13.9 | 455 | -441.1 | 0 | 20 |
| 0.67 J1c | 455 | -454.33 | 0 | 21 |
| 0.77 J1c | 455 | -454.23 | 0 | 22 |
| 0.55 J | 455 | -454.45 | 0 | 23 |
| 11.1 | 455 | -443.9 | 0 | 24 |
| 13.3 | 455 | -441.7 | 0 | 25 |
| 1.106 | 455 | -453.894 | 0 | 26 |
| 0.3548 | 455 | -454.645 | 0 | 27 |
| | | | | |
| ND<1.5 U | 446 | -444.5 | 0 | 28 |
| 198 | 446 | -248 | 0 | 29 |
| 2.5 J | 446 | -443.5 | 0 | 30 |
| 27.2 | 446 | -418.8 | 0 | 31 |
| 16.3 | 446 | -429.7 | 0 | 32 |
| ND<1.5 U | 446 | -444.5 | 0 | 33 |
| 17.7 | 446 | -428.3 | 0 | 34 |
| 24.6 | 446 | -421.4 | 0 | 35 |
| 63.7 | 446 | -382.3 | 0 | 36 |
| ND<1.5 U | 446 | -444.5 | 0 | 37 |
| ND<1.5 U | 446 | -444.5 | 0 | 38 |
| 44.4 | 446 | -401.6 | 0 | 39 |
| 44.7 | 446 | -401.3 | 0 | 40 |
| 10.8 | 446 | -435.2 | 0 | 41 |
| 0.38 J | 446 | -445.62 | 0 | 42 |
| 1.3 J | 446 | -444.7 | 0 | 43 |
| 3 B | 446 | -443 | 0 | 44 |
| 0.86 J | 446 | -445.14 | 0 | 45 |

| | | | | |
|---|---|---|---|---|
| 8.4 1c | 446 | -437.6 | 0 | 46 |
| 13.9 | 446 | -432.1 | 0 | 47 |
| 0.67 J1c | 446 | -445.33 | 0 | 48 |
| 0.77 J1c | 446 | -445.23 | 0 | 49 |
| 0.55 J | 446 | -445.45 | 0 | 50 |
| 11.1 | 446 | -434.9 | 0 | 51 |
| 13.3 | 446 | -432.7 | 0 | 52 |
| 1.106 | 446 | -444.894 | 0 | 53 |
| 0.3548 | 446 | -445.645 | 0 | 54 |
| | | | | |
| 198 | ND<1.5 U | 196.5 | 1 | 54 |
| 2.5 J | ND<1.5 U | 1 | 2 | 54 |
| 27.2 | ND<1.5 U | 25.7 | 3 | 54 |
| 16.3 | ND<1.5 U | 14.8 | 4 | 54 |
| ND<1.5 U | ND<1.5 U | 0 | 4 | 54 |
| 17.7 | ND<1.5 U | 16.2 | 5 | 54 |
| 24.6 | ND<1.5 U | 23.1 | 6 | 54 |
| 63.7 | ND<1.5 U | 62.2 | 7 | 54 |
| ND<1.5 U | ND<1.5 U | 0 | 7 | 54 |
| ND<1.5 U | ND<1.5 U | 0 | 7 | 54 |
| 44.4 | ND<1.5 U | 42.9 | 8 | 54 |
| 44.7 | ND<1.5 U | 43.2 | 9 | 54 |
| 10.8 | ND<1.5 U | 9.3 | 10 | 54 |
| 0.38 J | ND<1.5 U | -1.12 | 10 | 55 |
| 1.3 J | ND<1.5 U | -0.2 | 10 | 56 |
| 3 B | ND<1.5 U | 1.5 | 11 | 56 |
| 0.86 J | ND<1.5 U | -0.64 | 11 | 57 |
| 8.4 1c | ND<1.5 U | 6.9 | 12 | 57 |
| 13.9 | ND<1.5 U | 12.4 | 13 | 57 |
| 0.67 J1c | ND<1.5 U | -0.83 | 13 | 58 |
| 0.77 J1c | ND<1.5 U | -0.73 | 13 | 59 |
| 0.55 J | ND<1.5 U | -0.95 | 13 | 60 |
| 11.1 | ND<1.5 U | 9.6 | 14 | 60 |
| 13.3 | ND<1.5 U | 11.8 | 15 | 60 |
| 1.106 | ND<1.5 U | -0.394 | 15 | 61 |
| 0.3548 | ND<1.5 U | -1.1452 | 15 | 62 |
| | | | | |
| 2.5 J | 198 | -195.5 | 15 | 63 |
| 27.2 | 198 | -170.8 | 15 | 64 |
| 16.3 | 198 | -181.7 | 15 | 65 |
| ND<1.5 U | 198 | -196.5 | 15 | 66 |
| 17.7 | 198 | -180.3 | 15 | 67 |
| 24.6 | 198 | -173.4 | 15 | 68 |
| 63.7 | 198 | -134.3 | 15 | 69 |
| ND<1.5 U | 198 | -196.5 | 15 | 70 |
| ND<1.5 U | 198 | -196.5 | 15 | 71 |
| 44.4 | 198 | -153.6 | 15 | 72 |
| 44.7 | 198 | -153.3 | 15 | 73 |
| 10.8 | 198 | -187.2 | 15 | 74 |
| 0.38 J | 198 | -197.62 | 15 | 75 |
| 1.3 J | 198 | -196.7 | 15 | 76 |
| 3 B | 198 | -195 | 15 | 77 |
| 0.86 J | 198 | -197.14 | 15 | 78 |
| 8.4 1c | 198 | -189.6 | 15 | 79 |
| 13.9 | 198 | -184.1 | 15 | 80 |
| 0.67 J1c | 198 | -197.33 | 15 | 81 |
| 0.77 J1c | 198 | -197.23 | 15 | 82 |

| | | | | |
|---|---|---|---|---|
| 0.55 J | 198 | -197.45 | 15 | 83 |
| 11.1 | 198 | -186.9 | 15 | 84 |
| 13.3 | 198 | -184.7 | 15 | 85 |
| 1.106 | 198 | -196.894 | 15 | 86 |
| 0.3548 | 198 | -197.645 | 15 | 87 |
| | | | | |
| 27.2 | 2.5 J | 24.7 | 16 | 87 |
| 16.3 | 2.5 J | 13.8 | 17 | 87 |
| ND<1.5 U | 2.5 J | -1 | 17 | 88 |
| 17.7 | 2.5 J | 15.2 | 18 | 88 |
| 24.6 | 2.5 J | 22.1 | 19 | 88 |
| 63.7 | 2.5 J | 61.2 | 20 | 88 |
| ND<1.5 U | 2.5 J | -1 | 20 | 89 |
| ND<1.5 U | 2.5 J | -1 | 20 | 90 |
| 44.4 | 2.5 J | 41.9 | 21 | 90 |
| 44.7 | 2.5 J | 42.2 | 22 | 90 |
| 10.8 | 2.5 J | 8.3 | 23 | 90 |
| 0.38 J | 2.5 J | -2.12 | 23 | 91 |
| 1.3 J | 2.5 J | -1.2 | 23 | 92 |
| 3 B | 2.5 J | 0.5 | 24 | 92 |
| 0.86 J | 2.5 J | -1.64 | 24 | 93 |
| 8.4 1c | 2.5 J | 5.9 | 25 | 93 |
| 13.9 | 2.5 J | 11.4 | 26 | 93 |
| 0.67 J1c | 2.5 J | -1.83 | 26 | 94 |
| 0.77 J1c | 2.5 J | -1.73 | 26 | 95 |
| 0.55 J | 2.5 J | -1.95 | 26 | 96 |
| 11.1 | 2.5 J | 8.6 | 27 | 96 |
| 13.3 | 2.5 J | 10.8 | 28 | 96 |
| 1.106 | 2.5 J | -1.394 | 28 | 97 |
| 0.3548 | 2.5 J | -2.1452 | 28 | 98 |
| | | | | |
| 16.3 | 27.2 | -10.9 | 28 | 99 |
| ND<1.5 U | 27.2 | -25.7 | 28 | 100 |
| 17.7 | 27.2 | -9.5 | 28 | 101 |
| 24.6 | 27.2 | -2.6 | 28 | 102 |
| 63.7 | 27.2 | 36.5 | 29 | 102 |
| ND<1.5 U | 27.2 | -25.7 | 29 | 103 |
| ND<1.5 U | 27.2 | -25.7 | 29 | 104 |
| 44.4 | 27.2 | 17.2 | 30 | 104 |
| 44.7 | 27.2 | 17.5 | 31 | 104 |
| 10.8 | 27.2 | -16.4 | 31 | 105 |
| 0.38 J | 27.2 | -26.82 | 31 | 106 |
| 1.3 J | 27.2 | -25.9 | 31 | 107 |
| 3 B | 27.2 | -24.2 | 31 | 108 |
| 0.86 J | 27.2 | -26.34 | 31 | 109 |
| 8.4 1c | 27.2 | -18.8 | 31 | 110 |
| 13.9 | 27.2 | -13.3 | 31 | 111 |
| 0.67 J1c | 27.2 | -26.53 | 31 | 112 |
| 0.77 J1c | 27.2 | -26.43 | 31 | 113 |
| 0.55 J | 27.2 | -26.65 | 31 | 114 |
| 11.1 | 27.2 | -16.1 | 31 | 115 |
| 13.3 | 27.2 | -13.9 | 31 | 116 |
| 1.106 | 27.2 | -26.094 | 31 | 117 |
| 0.3548 | 27.2 | -26.8452 | 31 | 118 |
| | | | | |
| ND<1.5 U | 16.3 | -14.8 | 31 | 119 |
| 17.7 | 16.3 | 1.4 | 32 | 119 |

| | | | | |
|---|---|---|---|---|
| 24.6 | 16.3 | 8.3 | 33 | 119 |
| 63.7 | 16.3 | 47.4 | 34 | 119 |
| ND<1.5 U | 16.3 | -14.8 | 34 | 120 |
| ND<1.5 U | 16.3 | -14.8 | 34 | 121 |
| 44.4 | 16.3 | 28.1 | 35 | 121 |
| 44.7 | 16.3 | 28.4 | 36 | 121 |
| 10.8 | 16.3 | -5.5 | 36 | 122 |
| 0.38 J | 16.3 | -15.92 | 36 | 123 |
| 1.3 J | 16.3 | -15 | 36 | 124 |
| 3 B | 16.3 | -13.3 | 36 | 125 |
| 0.86 J | 16.3 | -15.44 | 36 | 126 |
| 8.4 1c | 16.3 | -7.9 | 36 | 127 |
| 13.9 | 16.3 | -2.4 | 36 | 128 |
| 0.67 J1c | 16.3 | -15.63 | 36 | 129 |
| 0.77 J1c | 16.3 | -15.53 | 36 | 130 |
| 0.55 J | 16.3 | -15.75 | 36 | 131 |
| 11.1 | 16.3 | -5.2 | 36 | 132 |
| 13.3 | 16.3 | -3 | 36 | 133 |
| 1.106 | 16.3 | -15.194 | 36 | 134 |
| 0.3548 | 16.3 | -15.9452 | 36 | 135 |
| | | | | |
| 17.7 | ND<1.5 U | 16.2 | 37 | 135 |
| 24.6 | ND<1.5 U | 23.1 | 38 | 135 |
| 63.7 | ND<1.5 U | 62.2 | 39 | 135 |
| ND<1.5 U | ND<1.5 U | 0 | 39 | 135 |
| ND<1.5 U | ND<1.5 U | 0 | 39 | 135 |
| 44.4 | ND<1.5 U | 42.9 | 40 | 135 |
| 44.7 | ND<1.5 U | 43.2 | 41 | 135 |
| 10.8 | ND<1.5 U | 9.3 | 42 | 135 |
| 0.38 J | ND<1.5 U | -1.12 | 42 | 136 |
| 1.3 J | ND<1.5 U | -0.2 | 42 | 137 |
| 3 B | ND<1.5 U | 1.5 | 43 | 137 |
| 0.86 J | ND<1.5 U | -0.64 | 43 | 138 |
| 8.4 1c | ND<1.5 U | 6.9 | 44 | 138 |
| 13.9 | ND<1.5 U | 12.4 | 45 | 138 |
| 0.67 J1c | ND<1.5 U | -0.83 | 45 | 139 |
| 0.77 J1c | ND<1.5 U | -0.73 | 45 | 140 |
| 0.55 J | ND<1.5 U | -0.95 | 45 | 141 |
| 11.1 | ND<1.5 U | 9.6 | 46 | 141 |
| 13.3 | ND<1.5 U | 11.8 | 47 | 141 |
| 1.106 | ND<1.5 U | -0.394 | 47 | 142 |
| 0.3548 | ND<1.5 U | -1.1452 | 47 | 143 |
| | | | | |
| 24.6 | 17.7 | 6.9 | 48 | 143 |
| 63.7 | 17.7 | 46 | 49 | 143 |
| ND<1.5 U | 17.7 | -16.2 | 49 | 144 |
| ND<1.5 U | 17.7 | -16.2 | 49 | 145 |
| 44.4 | 17.7 | 26.7 | 50 | 145 |
| 44.7 | 17.7 | 27 | 51 | 145 |
| 10.8 | 17.7 | -6.9 | 51 | 146 |
| 0.38 J | 17.7 | -17.32 | 51 | 147 |
| 1.3 J | 17.7 | -16.4 | 51 | 148 |
| 3 B | 17.7 | -14.7 | 51 | 149 |
| 0.86 J | 17.7 | -16.84 | 51 | 150 |
| 8.4 1c | 17.7 | -9.3 | 51 | 151 |
| 13.9 | 17.7 | -3.8 | 51 | 152 |
| 0.67 J1c | 17.7 | -17.03 | 51 | 153 |

| | | | | |
|---|---|---|---|---|
| 0.77 J1c | 17.7 | -16.93 | 51 | 154 |
| 0.55 J | 17.7 | -17.15 | 51 | 155 |
| 11.1 | 17.7 | -6.6 | 51 | 156 |
| 13.3 | 17.7 | -4.4 | 51 | 157 |
| 1.106 | 17.7 | -16.594 | 51 | 158 |
| 0.3548 | 17.7 | -17.3452 | 51 | 159 |
| | | | | |
| 63.7 | 24.6 | 39.1 | 52 | 159 |
| ND<1.5 U | 24.6 | -23.1 | 52 | 160 |
| ND<1.5 U | 24.6 | -23.1 | 52 | 161 |
| 44.4 | 24.6 | 19.8 | 53 | 161 |
| 44.7 | 24.6 | 20.1 | 54 | 161 |
| 10.8 | 24.6 | -13.8 | 54 | 162 |
| 0.38 J | 24.6 | -24.22 | 54 | 163 |
| 1.3 J | 24.6 | -23.3 | 54 | 164 |
| 3 B | 24.6 | -21.6 | 54 | 165 |
| 0.86 J | 24.6 | -23.74 | 54 | 166 |
| 8.4 1c | 24.6 | -16.2 | 54 | 167 |
| 13.9 | 24.6 | -10.7 | 54 | 168 |
| 0.67 J1c | 24.6 | -23.93 | 54 | 169 |
| 0.77 J1c | 24.6 | -23.83 | 54 | 170 |
| 0.55 J | 24.6 | -24.05 | 54 | 171 |
| 11.1 | 24.6 | -13.5 | 54 | 172 |
| 13.3 | 24.6 | -11.3 | 54 | 173 |
| 1.106 | 24.6 | -23.494 | 54 | 174 |
| 0.3548 | 24.6 | -24.2452 | 54 | 175 |
| | | | | |
| ND<1.5 U | 63.7 | -62.2 | 54 | 176 |
| ND<1.5 U | 63.7 | -62.2 | 54 | 177 |
| 44.4 | 63.7 | -19.3 | 54 | 178 |
| 44.7 | 63.7 | -19 | 54 | 179 |
| 10.8 | 63.7 | -52.9 | 54 | 180 |
| 0.38 J | 63.7 | -63.32 | 54 | 181 |
| 1.3 J | 63.7 | -62.4 | 54 | 182 |
| 3 B | 63.7 | -60.7 | 54 | 183 |
| 0.86 J | 63.7 | -62.84 | 54 | 184 |
| 8.4 1c | 63.7 | -55.3 | 54 | 185 |
| 13.9 | 63.7 | -49.8 | 54 | 186 |
| 0.67 J1c | 63.7 | -63.03 | 54 | 187 |
| 0.77 J1c | 63.7 | -62.93 | 54 | 188 |
| 0.55 J | 63.7 | -63.15 | 54 | 189 |
| 11.1 | 63.7 | -52.6 | 54 | 190 |
| 13.3 | 63.7 | -50.4 | 54 | 191 |
| 1.106 | 63.7 | -62.594 | 54 | 192 |
| 0.3548 | 63.7 | -63.3452 | 54 | 193 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 54 | 193 |
| 44.4 | ND<1.5 U | 42.9 | 55 | 193 |
| 44.7 | ND<1.5 U | 43.2 | 56 | 193 |
| 10.8 | ND<1.5 U | 9.3 | 57 | 193 |
| 0.38 J | ND<1.5 U | -1.12 | 57 | 194 |
| 1.3 J | ND<1.5 U | -0.2 | 57 | 195 |
| 3 B | ND<1.5 U | 1.5 | 58 | 195 |
| 0.86 J | ND<1.5 U | -0.64 | 58 | 196 |
| 8.4 1c | ND<1.5 U | 6.9 | 59 | 196 |
| 13.9 | ND<1.5 U | 12.4 | 60 | 196 |
| 0.67 J1c | ND<1.5 U | -0.83 | 60 | 197 |

| | | | | |
|---|---|---|---|---|
| 0.77 J1c | ND<1.5 U | -0.73 | 60 | 198 |
| 0.55 J | ND<1.5 U | -0.95 | 60 | 199 |
| 11.1 | ND<1.5 U | 9.6 | 61 | 199 |
| 13.3 | ND<1.5 U | 11.8 | 62 | 199 |
| 1.106 | ND<1.5 U | -0.394 | 62 | 200 |
| 0.3548 | ND<1.5 U | -1.1452 | 62 | 201 |
| | | | | |
| 44.4 | ND<1.5 U | 42.9 | 63 | 201 |
| 44.7 | ND<1.5 U | 43.2 | 64 | 201 |
| 10.8 | ND<1.5 U | 9.3 | 65 | 201 |
| 0.38 J | ND<1.5 U | -1.12 | 65 | 202 |
| 1.3 J | ND<1.5 U | -0.2 | 65 | 203 |
| 3 B | ND<1.5 U | 1.5 | 66 | 203 |
| 0.86 J | ND<1.5 U | -0.64 | 66 | 204 |
| 8.4 1c | ND<1.5 U | 6.9 | 67 | 204 |
| 13.9 | ND<1.5 U | 12.4 | 68 | 204 |
| 0.67 J1c | ND<1.5 U | -0.83 | 68 | 205 |
| 0.77 J1c | ND<1.5 U | -0.73 | 68 | 206 |
| 0.55 J | ND<1.5 U | -0.95 | 68 | 207 |
| 11.1 | ND<1.5 U | 9.6 | 69 | 207 |
| 13.3 | ND<1.5 U | 11.8 | 70 | 207 |
| 1.106 | ND<1.5 U | -0.394 | 70 | 208 |
| 0.3548 | ND<1.5 U | -1.1452 | 70 | 209 |
| | | | | |
| 44.7 | 44.4 | 0.3 | 71 | 209 |
| 10.8 | 44.4 | -33.6 | 71 | 210 |
| 0.38 J | 44.4 | -44.02 | 71 | 211 |
| 1.3 J | 44.4 | -43.1 | 71 | 212 |
| 3 B | 44.4 | -41.4 | 71 | 213 |
| 0.86 J | 44.4 | -43.54 | 71 | 214 |
| 8.4 1c | 44.4 | -36 | 71 | 215 |
| 13.9 | 44.4 | -30.5 | 71 | 216 |
| 0.67 J1c | 44.4 | -43.73 | 71 | 217 |
| 0.77 J1c | 44.4 | -43.63 | 71 | 218 |
| 0.55 J | 44.4 | -43.85 | 71 | 219 |
| 11.1 | 44.4 | -33.3 | 71 | 220 |
| 13.3 | 44.4 | -31.1 | 71 | 221 |
| 1.106 | 44.4 | -43.294 | 71 | 222 |
| 0.3548 | 44.4 | -44.0452 | 71 | 223 |
| | | | | |
| 10.8 | 44.7 | -33.9 | 71 | 224 |
| 0.38 J | 44.7 | -44.32 | 71 | 225 |
| 1.3 J | 44.7 | -43.4 | 71 | 226 |
| 3 B | 44.7 | -41.7 | 71 | 227 |
| 0.86 J | 44.7 | -43.84 | 71 | 228 |
| 8.4 1c | 44.7 | -36.3 | 71 | 229 |
| 13.9 | 44.7 | -30.8 | 71 | 230 |
| 0.67 J1c | 44.7 | -44.03 | 71 | 231 |
| 0.77 J1c | 44.7 | -43.93 | 71 | 232 |
| 0.55 J | 44.7 | -44.15 | 71 | 233 |
| 11.1 | 44.7 | -33.6 | 71 | 234 |
| 13.3 | 44.7 | -31.4 | 71 | 235 |
| 1.106 | 44.7 | -43.594 | 71 | 236 |
| 0.3548 | 44.7 | -44.3452 | 71 | 237 |
| | | | | |
| 0.38 J | 10.8 | -10.42 | 71 | 238 |
| 1.3 J | 10.8 | -9.5 | 71 | 239 |

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|---|---|---|---|---|
| 3 B | 10.8 | -7.8 | 71 | 240 |
| 0.86 J | 10.8 | -9.94 | 71 | 241 |
| 8.4 1c | 10.8 | -2.4 | 71 | 242 |
| 13.9 | 10.8 | 3.1 | 72 | 242 |
| 0.67 J1c | 10.8 | -10.13 | 72 | 243 |
| 0.77 J1c | 10.8 | -10.03 | 72 | 244 |
| 0.55 J | 10.8 | -10.25 | 72 | 245 |
| 11.1 | 10.8 | 0.3 | 73 | 245 |
| 13.3 | 10.8 | 2.5 | 74 | 245 |
| 1.106 | 10.8 | -9.694 | 74 | 246 |
| 0.3548 | 10.8 | -10.4452 | 74 | 247 |
| | | | | |
| 1.3 J | 0.38 J | Same Date | 74 | 247 |
| 3 B | 0.38 J | 2.62 | 75 | 247 |
| 0.86 J | 0.38 J | 0.48 | 76 | 247 |
| 8.4 1c | 0.38 J | 8.02 | 77 | 247 |
| 13.9 | 0.38 J | 13.52 | 78 | 247 |
| 0.67 J1c | 0.38 J | 0.29 | 79 | 247 |
| 0.77 J1c | 0.38 J | 0.39 | 80 | 247 |
| 0.55 J | 0.38 J | 0.17 | 81 | 247 |
| 11.1 | 0.38 J | 10.72 | 82 | 247 |
| 13.3 | 0.38 J | 12.92 | 83 | 247 |
| 1.106 | 0.38 J | 0.726 | 84 | 247 |
| 0.3548 | 0.38 J | -0.0252 | 84 | 248 |
| | | | | |
| 3 B | 1.3 J | 1.7 | 85 | 248 |
| 0.86 J | 1.3 J | -0.44 | 85 | 249 |
| 8.4 1c | 1.3 J | 7.1 | 86 | 249 |
| 13.9 | 1.3 J | 12.6 | 87 | 249 |
| 0.67 J1c | 1.3 J | -0.63 | 87 | 250 |
| 0.77 J1c | 1.3 J | -0.53 | 87 | 251 |
| 0.55 J | 1.3 J | -0.75 | 87 | 252 |
| 11.1 | 1.3 J | 9.8 | 88 | 252 |
| 13.3 | 1.3 J | 12 | 89 | 252 |
| 1.106 | 1.3 J | -0.194 | 89 | 253 |
| 0.3548 | 1.3 J | -0.9452 | 89 | 254 |
| | | | | |
| 0.86 J | 3 B | Same Date | 89 | 254 |
| 8.4 1c | 3 B | 5.4 | 90 | 254 |
| 13.9 | 3 B | 10.9 | 91 | 254 |
| 0.67 J1c | 3 B | -2.33 | 91 | 255 |
| 0.77 J1c | 3 B | -2.23 | 91 | 256 |
| 0.55 J | 3 B | -2.45 | 91 | 257 |
| 11.1 | 3 B | 8.1 | 92 | 257 |
| 13.3 | 3 B | 10.3 | 93 | 257 |
| 1.106 | 3 B | -1.894 | 93 | 258 |
| 0.3548 | 3 B | -2.6452 | 93 | 259 |
| | | | | |
| 8.4 1c | 0.86 J | 7.54 | 94 | 259 |
| 13.9 | 0.86 J | 13.04 | 95 | 259 |
| 0.67 J1c | 0.86 J | -0.19 | 95 | 260 |
| 0.77 J1c | 0.86 J | -0.09 | 95 | 261 |
| 0.55 J | 0.86 J | -0.31 | 95 | 262 |
| 11.1 | 0.86 J | 10.24 | 96 | 262 |
| 13.3 | 0.86 J | 12.44 | 97 | 262 |
| 1.106 | 0.86 J | 0.246 | 98 | 262 |
| 0.3548 | 0.86 J | -0.5052 | 98 | 263 |

| | | | | |
|---|---|---|---|---|
| 13.9 | 8.4 1c | 5.5 | 99 | 263 |
| 0.67 J1c | 8.4 1c | -7.73 | 99 | 264 |
| 0.77 J1c | 8.4 1c | -7.63 | 99 | 265 |
| 0.55 J | 8.4 1c | -7.85 | 99 | 266 |
| 11.1 | 8.4 1c | 2.7 | 100 | 266 |
| 13.3 | 8.4 1c | 4.9 | 101 | 266 |
| 1.106 | 8.4 1c | -7.294 | 101 | 267 |
| 0.3548 | 8.4 1c | -8.0452 | 101 | 268 |
| | | | | |
| 0.67 J1c | 13.9 | -13.23 | 101 | 269 |
| 0.77 J1c | 13.9 | -13.13 | 101 | 270 |
| 0.55 J | 13.9 | -13.35 | 101 | 271 |
| 11.1 | 13.9 | -2.8 | 101 | 272 |
| 13.3 | 13.9 | -0.6 | 101 | 273 |
| 1.106 | 13.9 | -12.794 | 101 | 274 |
| 0.3548 | 13.9 | -13.5452 | 101 | 275 |
| | | | | |
| 0.77 J1c | 0.67 J1c | 0.1 | 102 | 275 |
| 0.55 J | 0.67 J1c | -0.12 | 102 | 276 |
| 11.1 | 0.67 J1c | 10.43 | 103 | 276 |
| 13.3 | 0.67 J1c | 12.63 | 104 | 276 |
| 1.106 | 0.67 J1c | 0.436 | 105 | 276 |
| 0.3548 | 0.67 J1c | -0.3152 | 105 | 277 |
| | | | | |
| 0.55 J | 0.77 J1c | -0.22 | 105 | 278 |
| 11.1 | 0.77 J1c | 10.33 | 106 | 278 |
| 13.3 | 0.77 J1c | 12.53 | 107 | 278 |
| 1.106 | 0.77 J1c | 0.336 | 108 | 278 |
| 0.3548 | 0.77 J1c | -0.4152 | 108 | 279 |
| | | | | |
| 11.1 | 0.55 J | 10.55 | 109 | 279 |
| 13.3 | 0.55 J | 12.75 | 110 | 279 |
| 1.106 | 0.55 J | 0.556 | 111 | 279 |
| 0.3548 | 0.55 J | -0.1952 | 111 | 280 |
| | | | | |
| 13.3 | 11.1 | 2.2 | 112 | 280 |
| 1.106 | 11.1 | -9.994 | 112 | 281 |
| 0.3548 | 11.1 | -10.7452 | 112 | 282 |
| | | | | |
| 1.106 | 13.3 | -12.194 | 112 | 283 |
| 0.3548 | 13.3 | -12.9452 | 112 | 284 |
| | | | | |
| 0.3548 | 1.106 | -0.7512 | 112 | 285 |

S Statistic = 112 - 285 = -173

| Tied Group | Value | Members |
|---|---|---|
| 1 | 1.5 | 4 |

| Time Period | Observations |
|---|---|
| 2/1/2017 | 2 |
| 3/1/2017 | 1 |
| 4/1/2017 | 1 |
| 5/1/2017 | 1 |
| 6/1/2017 | 1 |

| | |
|---|---|
| 7/1/2017 | 1 |
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 3/1/2022 | 1 |
| 3/1/2023 | 1 |
| 3/1/2024 | 1 |

There are 3 time periods with multiple data

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A = 156
B = 54
C = 24
D = 0
E = 12
F = 6
a = 51156
b = 197316
c = 1624
Group Variance = 2830.38
Z-Score = -3.233
Comparison Level at 95% confidence level = 1.65463 (upward trend)
-3.233 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RW11-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 1490 | 1690 | -200 | 0 | 1 |
| 1800 | 1690 | 110 | 1 | 1 |
| 2600 | 1690 | 910 | 2 | 1 |
| 218 | 1690 | -1472 | 2 | 2 |
| 518 | 1690 | -1172 | 2 | 3 |
| 163 | 1690 | -1527 | 2 | 4 |
| 274 | 1690 | -1416 | 2 | 5 |
| 125 | 1690 | -1565 | 2 | 6 |
| 1460 | 1690 | -230 | 2 | 7 |
| 1380 | 1690 | -310 | 2 | 8 |
| 1400 | 1690 | -290 | 2 | 9 |
| 1660 | 1690 | -30 | 2 | 10 |
| 4.7 | 1690 | -1685.3 | 2 | 11 |
| 133 | 1690 | -1557 | 2 | 12 |
| 98.9 2c | 1690 | -1591.1 | 2 | 13 |
| 885 1c | 1690 | -805 | 2 | 14 |
| 598 | 1690 | -1092 | 2 | 15 |
| 586 | 1690 | -1104 | 2 | 16 |
| 517 | 1690 | -1173 | 2 | 17 |
| 476 | 1690 | -1214 | 2 | 18 |
| 365 | 1690 | -1325 | 2 | 19 |
| 75.1 | 1690 | -1614.9 | 2 | 20 |
| 179 | 1690 | -1511 | 2 | 21 |
| 175 | 1690 | -1515 | 2 | 22 |
| 194 | 1690 | -1496 | 2 | 23 |
| 202.8 | 1690 | -1487.2 | 2 | 24 |
| 1.448 | 1690 | -1688.55 | 2 | 25 |
| | | | | |
| 1800 | 1490 | 310 | 3 | 25 |
| 2600 | 1490 | 1110 | 4 | 25 |
| 218 | 1490 | -1272 | 4 | 26 |
| 518 | 1490 | -972 | 4 | 27 |
| 163 | 1490 | -1327 | 4 | 28 |
| 274 | 1490 | -1216 | 4 | 29 |
| 125 | 1490 | -1365 | 4 | 30 |
| 1460 | 1490 | -30 | 4 | 31 |
| 1380 | 1490 | -110 | 4 | 32 |
| 1400 | 1490 | -90 | 4 | 33 |
| 1660 | 1490 | 170 | 5 | 33 |
| 4.7 | 1490 | -1485.3 | 5 | 34 |
| 133 | 1490 | -1357 | 5 | 35 |
| 98.9 2c | 1490 | -1391.1 | 5 | 36 |
| 885 1c | 1490 | -605 | 5 | 37 |
| 598 | 1490 | -892 | 5 | 38 |
| 586 | 1490 | -904 | 5 | 39 |
| 517 | 1490 | -973 | 5 | 40 |
| 476 | 1490 | -1014 | 5 | 41 |

| | | | | |
|---|---|---|---|---|
| 365 | 1490 | -1125 | 5 | 42 |
| 75.1 | 1490 | -1414.9 | 5 | 43 |
| 179 | 1490 | -1311 | 5 | 44 |
| 175 | 1490 | -1315 | 5 | 45 |
| 194 | 1490 | -1296 | 5 | 46 |
| 202.8 | 1490 | -1287.2 | 5 | 47 |
| 1.448 | 1490 | -1488.55 | 5 | 48 |
| | | | | |
| 2600 | 1800 | 800 | 6 | 48 |
| 218 | 1800 | -1582 | 6 | 49 |
| 518 | 1800 | -1282 | 6 | 50 |
| 163 | 1800 | -1637 | 6 | 51 |
| 274 | 1800 | -1526 | 6 | 52 |
| 125 | 1800 | -1675 | 6 | 53 |
| 1460 | 1800 | -340 | 6 | 54 |
| 1380 | 1800 | -420 | 6 | 55 |
| 1400 | 1800 | -400 | 6 | 56 |
| 1660 | 1800 | -140 | 6 | 57 |
| 4.7 | 1800 | -1795.3 | 6 | 58 |
| 133 | 1800 | -1667 | 6 | 59 |
| 98.9 2c | 1800 | -1701.1 | 6 | 60 |
| 885 1c | 1800 | -915 | 6 | 61 |
| 598 | 1800 | -1202 | 6 | 62 |
| 586 | 1800 | -1214 | 6 | 63 |
| 517 | 1800 | -1283 | 6 | 64 |
| 476 | 1800 | -1324 | 6 | 65 |
| 365 | 1800 | -1435 | 6 | 66 |
| 75.1 | 1800 | -1724.9 | 6 | 67 |
| 179 | 1800 | -1621 | 6 | 68 |
| 175 | 1800 | -1625 | 6 | 69 |
| 194 | 1800 | -1606 | 6 | 70 |
| 202.8 | 1800 | -1597.2 | 6 | 71 |
| 1.448 | 1800 | -1798.55 | 6 | 72 |
| | | | | |
| 218 | 2600 | -2382 | 6 | 73 |
| 518 | 2600 | -2082 | 6 | 74 |
| 163 | 2600 | -2437 | 6 | 75 |
| 274 | 2600 | -2326 | 6 | 76 |
| 125 | 2600 | -2475 | 6 | 77 |
| 1460 | 2600 | -1140 | 6 | 78 |
| 1380 | 2600 | -1220 | 6 | 79 |
| 1400 | 2600 | -1200 | 6 | 80 |
| 1660 | 2600 | -940 | 6 | 81 |
| 4.7 | 2600 | -2595.3 | 6 | 82 |
| 133 | 2600 | -2467 | 6 | 83 |
| 98.9 2c | 2600 | -2501.1 | 6 | 84 |
| 885 1c | 2600 | -1715 | 6 | 85 |
| 598 | 2600 | -2002 | 6 | 86 |
| 586 | 2600 | -2014 | 6 | 87 |
| 517 | 2600 | -2083 | 6 | 88 |
| 476 | 2600 | -2124 | 6 | 89 |
| 365 | 2600 | -2235 | 6 | 90 |
| 75.1 | 2600 | -2524.9 | 6 | 91 |
| 179 | 2600 | -2421 | 6 | 92 |
| 175 | 2600 | -2425 | 6 | 93 |
| 194 | 2600 | -2406 | 6 | 94 |
| 202.8 | 2600 | -2397.2 | 6 | 95 |

| | | | | |
|---|---|---|---|---|
| 1.448 | 2600 | -2598.55 | 6 | 96 |
| | | | | |
| 518 | 218 | 300 | 7 | 96 |
| 163 | 218 | -55 | 7 | 97 |
| 274 | 218 | 56 | 8 | 97 |
| 125 | 218 | -93 | 8 | 98 |
| 1460 | 218 | 1242 | 9 | 98 |
| 1380 | 218 | 1162 | 10 | 98 |
| 1400 | 218 | 1182 | 11 | 98 |
| 1660 | 218 | 1442 | 12 | 98 |
| 4.7 | 218 | -213.3 | 12 | 99 |
| 133 | 218 | -85 | 12 | 100 |
| 98.9 2c | 218 | -119.1 | 12 | 101 |
| 885 1c | 218 | 667 | 13 | 101 |
| 598 | 218 | 380 | 14 | 101 |
| 586 | 218 | 368 | 15 | 101 |
| 517 | 218 | 299 | 16 | 101 |
| 476 | 218 | 258 | 17 | 101 |
| 365 | 218 | 147 | 18 | 101 |
| 75.1 | 218 | -142.9 | 18 | 102 |
| 179 | 218 | -39 | 18 | 103 |
| 175 | 218 | -43 | 18 | 104 |
| 194 | 218 | -24 | 18 | 105 |
| 202.8 | 218 | -15.2 | 18 | 106 |
| 1.448 | 218 | -216.552 | 18 | 107 |
| | | | | |
| 163 | 518 | -355 | 18 | 108 |
| 274 | 518 | -244 | 18 | 109 |
| 125 | 518 | -393 | 18 | 110 |
| 1460 | 518 | 942 | 19 | 110 |
| 1380 | 518 | 862 | 20 | 110 |
| 1400 | 518 | 882 | 21 | 110 |
| 1660 | 518 | 1142 | 22 | 110 |
| 4.7 | 518 | -513.3 | 22 | 111 |
| 133 | 518 | -385 | 22 | 112 |
| 98.9 2c | 518 | -419.1 | 22 | 113 |
| 885 1c | 518 | 367 | 23 | 113 |
| 598 | 518 | 80 | 24 | 113 |
| 586 | 518 | 68 | 25 | 113 |
| 517 | 518 | -1 | 25 | 114 |
| 476 | 518 | -42 | 25 | 115 |
| 365 | 518 | -153 | 25 | 116 |
| 75.1 | 518 | -442.9 | 25 | 117 |
| 179 | 518 | -339 | 25 | 118 |
| 175 | 518 | -343 | 25 | 119 |
| 194 | 518 | -324 | 25 | 120 |
| 202.8 | 518 | -315.2 | 25 | 121 |
| 1.448 | 518 | -516.552 | 25 | 122 |
| | | | | |
| 274 | 163 | 111 | 26 | 122 |
| 125 | 163 | -38 | 26 | 123 |
| 1460 | 163 | 1297 | 27 | 123 |
| 1380 | 163 | 1217 | 28 | 123 |
| 1400 | 163 | 1237 | 29 | 123 |
| 1660 | 163 | 1497 | 30 | 123 |
| 4.7 | 163 | -158.3 | 30 | 124 |
| 133 | 163 | -30 | 30 | 125 |

| | | | | |
|---|---|---|---|---|
| 98.9 2c | 163 | -64.1 | 30 | 126 |
| 885 1c | 163 | 722 | 31 | 126 |
| 598 | 163 | 435 | 32 | 126 |
| 586 | 163 | 423 | 33 | 126 |
| 517 | 163 | 354 | 34 | 126 |
| 476 | 163 | 313 | 35 | 126 |
| 365 | 163 | 202 | 36 | 126 |
| 75.1 | 163 | -87.9 | 36 | 127 |
| 179 | 163 | 16 | 37 | 127 |
| 175 | 163 | 12 | 38 | 127 |
| 194 | 163 | 31 | 39 | 127 |
| 202.8 | 163 | 39.8 | 40 | 127 |
| 1.448 | 163 | -161.552 | 40 | 128 |
| | | | | |
| 125 | 274 | -149 | 40 | 129 |
| 1460 | 274 | 1186 | 41 | 129 |
| 1380 | 274 | 1106 | 42 | 129 |
| 1400 | 274 | 1126 | 43 | 129 |
| 1660 | 274 | 1386 | 44 | 129 |
| 4.7 | 274 | -269.3 | 44 | 130 |
| 133 | 274 | -141 | 44 | 131 |
| 98.9 2c | 274 | -175.1 | 44 | 132 |
| 885 1c | 274 | 611 | 45 | 132 |
| 598 | 274 | 324 | 46 | 132 |
| 586 | 274 | 312 | 47 | 132 |
| 517 | 274 | 243 | 48 | 132 |
| 476 | 274 | 202 | 49 | 132 |
| 365 | 274 | 91 | 50 | 132 |
| 75.1 | 274 | -198.9 | 50 | 133 |
| 179 | 274 | -95 | 50 | 134 |
| 175 | 274 | -99 | 50 | 135 |
| 194 | 274 | -80 | 50 | 136 |
| 202.8 | 274 | -71.2 | 50 | 137 |
| 1.448 | 274 | -272.552 | 50 | 138 |
| | | | | |
| 1460 | 125 | 1335 | 51 | 138 |
| 1380 | 125 | 1255 | 52 | 138 |
| 1400 | 125 | 1275 | 53 | 138 |
| 1660 | 125 | 1535 | 54 | 138 |
| 4.7 | 125 | -120.3 | 54 | 139 |
| 133 | 125 | 8 | 55 | 139 |
| 98.9 2c | 125 | -26.1 | 55 | 140 |
| 885 1c | 125 | 760 | 56 | 140 |
| 598 | 125 | 473 | 57 | 140 |
| 586 | 125 | 461 | 58 | 140 |
| 517 | 125 | 392 | 59 | 140 |
| 476 | 125 | 351 | 60 | 140 |
| 365 | 125 | 240 | 61 | 140 |
| 75.1 | 125 | -49.9 | 61 | 141 |
| 179 | 125 | 54 | 62 | 141 |
| 175 | 125 | 50 | 63 | 141 |
| 194 | 125 | 69 | 64 | 141 |
| 202.8 | 125 | 77.8 | 65 | 141 |
| 1.448 | 125 | -123.552 | 65 | 142 |
| | | | | |
| 1380 | 1460 | -80 | 65 | 143 |
| 1400 | 1460 | -60 | 65 | 144 |

| | | | | |
|---|---|---|---|---|
| 1660 | 1460 | 200 | 66 | 144 |
| 4.7 | 1460 | -1455.3 | 66 | 145 |
| 133 | 1460 | -1327 | 66 | 146 |
| 98.9 2c | 1460 | -1361.1 | 66 | 147 |
| 885 1c | 1460 | -575 | 66 | 148 |
| 598 | 1460 | -862 | 66 | 149 |
| 586 | 1460 | -874 | 66 | 150 |
| 517 | 1460 | -943 | 66 | 151 |
| 476 | 1460 | -984 | 66 | 152 |
| 365 | 1460 | -1095 | 66 | 153 |
| 75.1 | 1460 | -1384.9 | 66 | 154 |
| 179 | 1460 | -1281 | 66 | 155 |
| 175 | 1460 | -1285 | 66 | 156 |
| 194 | 1460 | -1266 | 66 | 157 |
| 202.8 | 1460 | -1257.2 | 66 | 158 |
| 1.448 | 1460 | -1458.55 | 66 | 159 |
| | | | | |
| 1400 | 1380 | 20 | 67 | 159 |
| 1660 | 1380 | 280 | 68 | 159 |
| 4.7 | 1380 | -1375.3 | 68 | 160 |
| 133 | 1380 | -1247 | 68 | 161 |
| 98.9 2c | 1380 | -1281.1 | 68 | 162 |
| 885 1c | 1380 | -495 | 68 | 163 |
| 598 | 1380 | -782 | 68 | 164 |
| 586 | 1380 | -794 | 68 | 165 |
| 517 | 1380 | -863 | 68 | 166 |
| 476 | 1380 | -904 | 68 | 167 |
| 365 | 1380 | -1015 | 68 | 168 |
| 75.1 | 1380 | -1304.9 | 68 | 169 |
| 179 | 1380 | -1201 | 68 | 170 |
| 175 | 1380 | -1205 | 68 | 171 |
| 194 | 1380 | -1186 | 68 | 172 |
| 202.8 | 1380 | -1177.2 | 68 | 173 |
| 1.448 | 1380 | -1378.55 | 68 | 174 |
| | | | | |
| 1660 | 1400 | 260 | 69 | 174 |
| 4.7 | 1400 | -1395.3 | 69 | 175 |
| 133 | 1400 | -1267 | 69 | 176 |
| 98.9 2c | 1400 | -1301.1 | 69 | 177 |
| 885 1c | 1400 | -515 | 69 | 178 |
| 598 | 1400 | -802 | 69 | 179 |
| 586 | 1400 | -814 | 69 | 180 |
| 517 | 1400 | -883 | 69 | 181 |
| 476 | 1400 | -924 | 69 | 182 |
| 365 | 1400 | -1035 | 69 | 183 |
| 75.1 | 1400 | -1324.9 | 69 | 184 |
| 179 | 1400 | -1221 | 69 | 185 |
| 175 | 1400 | -1225 | 69 | 186 |
| 194 | 1400 | -1206 | 69 | 187 |
| 202.8 | 1400 | -1197.2 | 69 | 188 |
| 1.448 | 1400 | -1398.55 | 69 | 189 |
| | | | | |
| 4.7 | 1660 | -1655.3 | 69 | 190 |
| 133 | 1660 | -1527 | 69 | 191 |
| 98.9 2c | 1660 | -1561.1 | 69 | 192 |
| 885 1c | 1660 | -775 | 69 | 193 |
| 598 | 1660 | -1062 | 69 | 194 |

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|---|---|---|---|---|
| 586 | 1660 | -1074 | 69 | 195 |
| 517 | 1660 | -1143 | 69 | 196 |
| 476 | 1660 | -1184 | 69 | 197 |
| 365 | 1660 | -1295 | 69 | 198 |
| 75.1 | 1660 | -1584.9 | 69 | 199 |
| 179 | 1660 | -1481 | 69 | 200 |
| 175 | 1660 | -1485 | 69 | 201 |
| 194 | 1660 | -1466 | 69 | 202 |
| 202.8 | 1660 | -1457.2 | 69 | 203 |
| 1.448 | 1660 | -1658.55 | 69 | 204 |
| | | | | |
| 133 | 4.7 | 128.3 | 70 | 204 |
| 98.9 2c | 4.7 | 94.2 | 71 | 204 |
| 885 1c | 4.7 | 880.3 | 72 | 204 |
| 598 | 4.7 | 593.3 | 73 | 204 |
| 586 | 4.7 | 581.3 | 74 | 204 |
| 517 | 4.7 | 512.3 | 75 | 204 |
| 476 | 4.7 | 471.3 | 76 | 204 |
| 365 | 4.7 | 360.3 | 77 | 204 |
| 75.1 | 4.7 | 70.4 | 78 | 204 |
| 179 | 4.7 | 174.3 | 79 | 204 |
| 175 | 4.7 | 170.3 | 80 | 204 |
| 194 | 4.7 | 189.3 | 81 | 204 |
| 202.8 | 4.7 | 198.1 | 82 | 204 |
| 1.448 | 4.7 | -3.252 | 82 | 205 |
| | | | | |
| 98.9 2c | 133 | -34.1 | 82 | 206 |
| 885 1c | 133 | 752 | 83 | 206 |
| 598 | 133 | 465 | 84 | 206 |
| 586 | 133 | 453 | 85 | 206 |
| 517 | 133 | 384 | 86 | 206 |
| 476 | 133 | 343 | 87 | 206 |
| 365 | 133 | 232 | 88 | 206 |
| 75.1 | 133 | -57.9 | 88 | 207 |
| 179 | 133 | 46 | 89 | 207 |
| 175 | 133 | 42 | 90 | 207 |
| 194 | 133 | 61 | 91 | 207 |
| 202.8 | 133 | 69.8 | 92 | 207 |
| 1.448 | 133 | -131.552 | 92 | 208 |
| | | | | |
| 885 1c | 98.9 2c | Same Date | 92 | 208 |
| 598 | 98.9 2c | 499.1 | 93 | 208 |
| 586 | 98.9 2c | 487.1 | 94 | 208 |
| 517 | 98.9 2c | 418.1 | 95 | 208 |
| 476 | 98.9 2c | 377.1 | 96 | 208 |
| 365 | 98.9 2c | 266.1 | 97 | 208 |
| 75.1 | 98.9 2c | -23.8 | 97 | 209 |
| 179 | 98.9 2c | 80.1 | 98 | 209 |
| 175 | 98.9 2c | 76.1 | 99 | 209 |
| 194 | 98.9 2c | 95.1 | 100 | 209 |
| 202.8 | 98.9 2c | 103.9 | 101 | 209 |
| 1.448 | 98.9 2c | -97.452 | 101 | 210 |
| | | | | |
| 598 | 885 1c | -287 | 101 | 211 |
| 586 | 885 1c | -299 | 101 | 212 |
| 517 | 885 1c | -368 | 101 | 213 |
| 476 | 885 1c | -409 | 101 | 214 |

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|---|---|---|---|---|
| 365 | 885 1c | -520 | 101 | 215 |
| 75.1 | 885 1c | -809.9 | 101 | 216 |
| 179 | 885 1c | -706 | 101 | 217 |
| 175 | 885 1c | -710 | 101 | 218 |
| 194 | 885 1c | -691 | 101 | 219 |
| 202.8 | 885 1c | -682.2 | 101 | 220 |
| 1.448 | 885 1c | -883.552 | 101 | 221 |
| | | | | |
| 586 | 598 | Same Date | 101 | 221 |
| 517 | 598 | -81 | 101 | 222 |
| 476 | 598 | -122 | 101 | 223 |
| 365 | 598 | -233 | 101 | 224 |
| 75.1 | 598 | -522.9 | 101 | 225 |
| 179 | 598 | -419 | 101 | 226 |
| 175 | 598 | -423 | 101 | 227 |
| 194 | 598 | -404 | 101 | 228 |
| 202.8 | 598 | -395.2 | 101 | 229 |
| 1.448 | 598 | -596.552 | 101 | 230 |
| | | | | |
| 517 | 586 | -69 | 101 | 231 |
| 476 | 586 | -110 | 101 | 232 |
| 365 | 586 | -221 | 101 | 233 |
| 75.1 | 586 | -510.9 | 101 | 234 |
| 179 | 586 | -407 | 101 | 235 |
| 175 | 586 | -411 | 101 | 236 |
| 194 | 586 | -392 | 101 | 237 |
| 202.8 | 586 | -383.2 | 101 | 238 |
| 1.448 | 586 | -584.552 | 101 | 239 |
| | | | | |
| 476 | 517 | -41 | 101 | 240 |
| 365 | 517 | -152 | 101 | 241 |
| 75.1 | 517 | -441.9 | 101 | 242 |
| 179 | 517 | -338 | 101 | 243 |
| 175 | 517 | -342 | 101 | 244 |
| 194 | 517 | -323 | 101 | 245 |
| 202.8 | 517 | -314.2 | 101 | 246 |
| 1.448 | 517 | -515.552 | 101 | 247 |
| | | | | |
| 365 | 476 | -111 | 101 | 248 |
| 75.1 | 476 | -400.9 | 101 | 249 |
| 179 | 476 | -297 | 101 | 250 |
| 175 | 476 | -301 | 101 | 251 |
| 194 | 476 | -282 | 101 | 252 |
| 202.8 | 476 | -273.2 | 101 | 253 |
| 1.448 | 476 | -474.552 | 101 | 254 |
| | | | | |
| 75.1 | 365 | -289.9 | 101 | 255 |
| 179 | 365 | -186 | 101 | 256 |
| 175 | 365 | -190 | 101 | 257 |
| 194 | 365 | -171 | 101 | 258 |
| 202.8 | 365 | -162.2 | 101 | 259 |
| 1.448 | 365 | -363.552 | 101 | 260 |
| | | | | |
| 179 | 75.1 | 103.9 | 102 | 260 |
| 175 | 75.1 | 99.9 | 103 | 260 |
| 194 | 75.1 | 118.9 | 104 | 260 |
| 202.8 | 75.1 | 127.7 | 105 | 260 |

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|---|---|---|---|---|
| 1.448 | 75.1 | -73.652 | 105 | 261 |
| | | | | |
| 175 | 179 | -4 | 105 | 262 |
| 194 | 179 | 15 | 106 | 262 |
| 202.8 | 179 | 23.8 | 107 | 262 |
| 1.448 | 179 | -177.552 | 107 | 263 |
| | | | | |
| 194 | 175 | 19 | 108 | 263 |
| 202.8 | 175 | 27.8 | 109 | 263 |
| 1.448 | 175 | -173.552 | 109 | 264 |
| | | | | |
| 202.8 | 194 | 8.8 | 110 | 264 |
| 1.448 | 194 | -192.552 | 110 | 265 |
| | | | | |
| 1.448 | 202.8 | -201.352 | 110 | 266 |

S Statistic = 110 - 266 = -156

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 2/1/2017 | 1 |
| 3/1/2017 | 1 |
| 4/1/2017 | 1 |
| 5/1/2017 | 1 |
| 6/1/2017 | 1 |
| 7/1/2017 | 1 |
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 3/1/2022 | 1 |
| 3/1/2023 | 1 |
| 3/1/2024 | 1 |

There are 2 time periods with multiple data

A = 0
B = 36
C = 0
D = 0
E = 0
F = 4
a = 46116

b = 176904
c = 1512
Group Variance = 2560
Z-Score = -3.06346
Comparison Level at 95% confidence level = 1.65463 (upward trend)
-3.06346 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RW12-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 3530 | 4740 | -1210 | 0 | 1 |
| 2730 | 4740 | -2010 | 0 | 2 |
| 3820 | 4740 | -920 | 0 | 3 |
| 2260 | 4740 | -2480 | 0 | 4 |
| 2730 | 4740 | -2010 | 0 | 5 |
| 2220 | 4740 | -2520 | 0 | 6 |
| 1820 | 4740 | -2920 | 0 | 7 |
| 1510 | 4740 | -3230 | 0 | 8 |
| 1380 | 4740 | -3360 | 0 | 9 |
| 1450 | 4740 | -3290 | 0 | 10 |
| 1270 | 4740 | -3470 | 0 | 11 |
| 121 | 4740 | -4619 | 0 | 12 |
| 134 | 4740 | -4606 | 0 | 13 |
| 86.3 | 4740 | -4653.7 | 0 | 14 |
| 768 | 4740 | -3972 | 0 | 15 |
| 755 | 4740 | -3985 | 0 | 16 |
| 1520 | 4740 | -3220 | 0 | 17 |
| 1500 | 4740 | -3240 | 0 | 18 |
| 1780 | 4740 | -2960 | 0 | 19 |
| 420 | 4740 | -4320 | 0 | 20 |
| 716 | 4740 | -4024 | 0 | 21 |
| 1080 | 4740 | -3660 | 0 | 22 |
| 1396 | 4740 | -3344 | 0 | 23 |
| 315 | 4740 | -4425 | 0 | 24 |
| 1100 | 4740 | -3640 | 0 | 25 |
| 289 | 4740 | -4451 | 0 | 26 |
| 1128 | 4740 | -3612 | 0 | 27 |
| | | | | |
| 2730 | 3530 | -800 | 0 | 28 |
| 3820 | 3530 | 290 | 1 | 28 |
| 2260 | 3530 | -1270 | 1 | 29 |
| 2730 | 3530 | -800 | 1 | 30 |
| 2220 | 3530 | -1310 | 1 | 31 |
| 1820 | 3530 | -1710 | 1 | 32 |
| 1510 | 3530 | -2020 | 1 | 33 |
| 1380 | 3530 | -2150 | 1 | 34 |
| 1450 | 3530 | -2080 | 1 | 35 |
| 1270 | 3530 | -2260 | 1 | 36 |
| 121 | 3530 | -3409 | 1 | 37 |
| 134 | 3530 | -3396 | 1 | 38 |
| 86.3 | 3530 | -3443.7 | 1 | 39 |
| 768 | 3530 | -2762 | 1 | 40 |
| 755 | 3530 | -2775 | 1 | 41 |
| 1520 | 3530 | -2010 | 1 | 42 |
| 1500 | 3530 | -2030 | 1 | 43 |
| 1780 | 3530 | -1750 | 1 | 44 |
| 420 | 3530 | -3110 | 1 | 45 |

| | | | | |
|---|---|---|---|---|
| 716 | 3530 | -2814 | 1 | 46 |
| 1080 | 3530 | -2450 | 1 | 47 |
| 1396 | 3530 | -2134 | 1 | 48 |
| 315 | 3530 | -3215 | 1 | 49 |
| 1100 | 3530 | -2430 | 1 | 50 |
| 289 | 3530 | -3241 | 1 | 51 |
| 1128 | 3530 | -2402 | 1 | 52 |
| | | | | |
| 3820 | 2730 | 1090 | 2 | 52 |
| 2260 | 2730 | -470 | 2 | 53 |
| 2730 | 2730 | 0 | 2 | 53 |
| 2220 | 2730 | -510 | 2 | 54 |
| 1820 | 2730 | -910 | 2 | 55 |
| 1510 | 2730 | -1220 | 2 | 56 |
| 1380 | 2730 | -1350 | 2 | 57 |
| 1450 | 2730 | -1280 | 2 | 58 |
| 1270 | 2730 | -1460 | 2 | 59 |
| 121 | 2730 | -2609 | 2 | 60 |
| 134 | 2730 | -2596 | 2 | 61 |
| 86.3 | 2730 | -2643.7 | 2 | 62 |
| 768 | 2730 | -1962 | 2 | 63 |
| 755 | 2730 | -1975 | 2 | 64 |
| 1520 | 2730 | -1210 | 2 | 65 |
| 1500 | 2730 | -1230 | 2 | 66 |
| 1780 | 2730 | -950 | 2 | 67 |
| 420 | 2730 | -2310 | 2 | 68 |
| 716 | 2730 | -2014 | 2 | 69 |
| 1080 | 2730 | -1650 | 2 | 70 |
| 1396 | 2730 | -1334 | 2 | 71 |
| 315 | 2730 | -2415 | 2 | 72 |
| 1100 | 2730 | -1630 | 2 | 73 |
| 289 | 2730 | -2441 | 2 | 74 |
| 1128 | 2730 | -1602 | 2 | 75 |
| | | | | |
| 2260 | 3820 | -1560 | 2 | 76 |
| 2730 | 3820 | -1090 | 2 | 77 |
| 2220 | 3820 | -1600 | 2 | 78 |
| 1820 | 3820 | -2000 | 2 | 79 |
| 1510 | 3820 | -2310 | 2 | 80 |
| 1380 | 3820 | -2440 | 2 | 81 |
| 1450 | 3820 | -2370 | 2 | 82 |
| 1270 | 3820 | -2550 | 2 | 83 |
| 121 | 3820 | -3699 | 2 | 84 |
| 134 | 3820 | -3686 | 2 | 85 |
| 86.3 | 3820 | -3733.7 | 2 | 86 |
| 768 | 3820 | -3052 | 2 | 87 |
| 755 | 3820 | -3065 | 2 | 88 |
| 1520 | 3820 | -2300 | 2 | 89 |
| 1500 | 3820 | -2320 | 2 | 90 |
| 1780 | 3820 | -2040 | 2 | 91 |
| 420 | 3820 | -3400 | 2 | 92 |
| 716 | 3820 | -3104 | 2 | 93 |
| 1080 | 3820 | -2740 | 2 | 94 |
| 1396 | 3820 | -2424 | 2 | 95 |
| 315 | 3820 | -3505 | 2 | 96 |
| 1100 | 3820 | -2720 | 2 | 97 |
| 289 | 3820 | -3531 | 2 | 98 |

| | | | | |
|---|---|---|---|---|
| 1128 | 3820 | -2692 | 2 | 99 |
| | | | | |
| 2730 | 2260 | 470 | 3 | 99 |
| 2220 | 2260 | -40 | 3 | 100 |
| 1820 | 2260 | -440 | 3 | 101 |
| 1510 | 2260 | -750 | 3 | 102 |
| 1380 | 2260 | -880 | 3 | 103 |
| 1450 | 2260 | -810 | 3 | 104 |
| 1270 | 2260 | -990 | 3 | 105 |
| 121 | 2260 | -2139 | 3 | 106 |
| 134 | 2260 | -2126 | 3 | 107 |
| 86.3 | 2260 | -2173.7 | 3 | 108 |
| 768 | 2260 | -1492 | 3 | 109 |
| 755 | 2260 | -1505 | 3 | 110 |
| 1520 | 2260 | -740 | 3 | 111 |
| 1500 | 2260 | -760 | 3 | 112 |
| 1780 | 2260 | -480 | 3 | 113 |
| 420 | 2260 | -1840 | 3 | 114 |
| 716 | 2260 | -1544 | 3 | 115 |
| 1080 | 2260 | -1180 | 3 | 116 |
| 1396 | 2260 | -864 | 3 | 117 |
| 315 | 2260 | -1945 | 3 | 118 |
| 1100 | 2260 | -1160 | 3 | 119 |
| 289 | 2260 | -1971 | 3 | 120 |
| 1128 | 2260 | -1132 | 3 | 121 |
| | | | | |
| 2220 | 2730 | -510 | 3 | 122 |
| 1820 | 2730 | -910 | 3 | 123 |
| 1510 | 2730 | -1220 | 3 | 124 |
| 1380 | 2730 | -1350 | 3 | 125 |
| 1450 | 2730 | -1280 | 3 | 126 |
| 1270 | 2730 | -1460 | 3 | 127 |
| 121 | 2730 | -2609 | 3 | 128 |
| 134 | 2730 | -2596 | 3 | 129 |
| 86.3 | 2730 | -2643.7 | 3 | 130 |
| 768 | 2730 | -1962 | 3 | 131 |
| 755 | 2730 | -1975 | 3 | 132 |
| 1520 | 2730 | -1210 | 3 | 133 |
| 1500 | 2730 | -1230 | 3 | 134 |
| 1780 | 2730 | -950 | 3 | 135 |
| 420 | 2730 | -2310 | 3 | 136 |
| 716 | 2730 | -2014 | 3 | 137 |
| 1080 | 2730 | -1650 | 3 | 138 |
| 1396 | 2730 | -1334 | 3 | 139 |
| 315 | 2730 | -2415 | 3 | 140 |
| 1100 | 2730 | -1630 | 3 | 141 |
| 289 | 2730 | -2441 | 3 | 142 |
| 1128 | 2730 | -1602 | 3 | 143 |
| | | | | |
| 1820 | 2220 | -400 | 3 | 144 |
| 1510 | 2220 | -710 | 3 | 145 |
| 1380 | 2220 | -840 | 3 | 146 |
| 1450 | 2220 | -770 | 3 | 147 |
| 1270 | 2220 | -950 | 3 | 148 |
| 121 | 2220 | -2099 | 3 | 149 |
| 134 | 2220 | -2086 | 3 | 150 |
| 86.3 | 2220 | -2133.7 | 3 | 151 |

| | | | | |
|---|---|---|---|---|
| 768 | 2220 | -1452 | 3 | 152 |
| 755 | 2220 | -1465 | 3 | 153 |
| 1520 | 2220 | -700 | 3 | 154 |
| 1500 | 2220 | -720 | 3 | 155 |
| 1780 | 2220 | -440 | 3 | 156 |
| 420 | 2220 | -1800 | 3 | 157 |
| 716 | 2220 | -1504 | 3 | 158 |
| 1080 | 2220 | -1140 | 3 | 159 |
| 1396 | 2220 | -824 | 3 | 160 |
| 315 | 2220 | -1905 | 3 | 161 |
| 1100 | 2220 | -1120 | 3 | 162 |
| 289 | 2220 | -1931 | 3 | 163 |
| 1128 | 2220 | -1092 | 3 | 164 |
| | | | | |
| 1510 | 1820 | -310 | 3 | 165 |
| 1380 | 1820 | -440 | 3 | 166 |
| 1450 | 1820 | -370 | 3 | 167 |
| 1270 | 1820 | -550 | 3 | 168 |
| 121 | 1820 | -1699 | 3 | 169 |
| 134 | 1820 | -1686 | 3 | 170 |
| 86.3 | 1820 | -1733.7 | 3 | 171 |
| 768 | 1820 | -1052 | 3 | 172 |
| 755 | 1820 | -1065 | 3 | 173 |
| 1520 | 1820 | -300 | 3 | 174 |
| 1500 | 1820 | -320 | 3 | 175 |
| 1780 | 1820 | -40 | 3 | 176 |
| 420 | 1820 | -1400 | 3 | 177 |
| 716 | 1820 | -1104 | 3 | 178 |
| 1080 | 1820 | -740 | 3 | 179 |
| 1396 | 1820 | -424 | 3 | 180 |
| 315 | 1820 | -1505 | 3 | 181 |
| 1100 | 1820 | -720 | 3 | 182 |
| 289 | 1820 | -1531 | 3 | 183 |
| 1128 | 1820 | -692 | 3 | 184 |
| | | | | |
| 1380 | 1510 | -130 | 3 | 185 |
| 1450 | 1510 | -60 | 3 | 186 |
| 1270 | 1510 | -240 | 3 | 187 |
| 121 | 1510 | -1389 | 3 | 188 |
| 134 | 1510 | -1376 | 3 | 189 |
| 86.3 | 1510 | -1423.7 | 3 | 190 |
| 768 | 1510 | -742 | 3 | 191 |
| 755 | 1510 | -755 | 3 | 192 |
| 1520 | 1510 | 10 | 4 | 192 |
| 1500 | 1510 | -10 | 4 | 193 |
| 1780 | 1510 | 270 | 5 | 193 |
| 420 | 1510 | -1090 | 5 | 194 |
| 716 | 1510 | -794 | 5 | 195 |
| 1080 | 1510 | -430 | 5 | 196 |
| 1396 | 1510 | -114 | 5 | 197 |
| 315 | 1510 | -1195 | 5 | 198 |
| 1100 | 1510 | -410 | 5 | 199 |
| 289 | 1510 | -1221 | 5 | 200 |
| 1128 | 1510 | -382 | 5 | 201 |
| | | | | |
| 1450 | 1380 | 70 | 6 | 201 |
| 1270 | 1380 | -110 | 6 | 202 |

| | | | | |
|---|---|---|---|---|
| 121 | 1380 | -1259 | 6 | 203 |
| 134 | 1380 | -1246 | 6 | 204 |
| 86.3 | 1380 | -1293.7 | 6 | 205 |
| 768 | 1380 | -612 | 6 | 206 |
| 755 | 1380 | -625 | 6 | 207 |
| 1520 | 1380 | 140 | 7 | 207 |
| 1500 | 1380 | 120 | 8 | 207 |
| 1780 | 1380 | 400 | 9 | 207 |
| 420 | 1380 | -960 | 9 | 208 |
| 716 | 1380 | -664 | 9 | 209 |
| 1080 | 1380 | -300 | 9 | 210 |
| 1396 | 1380 | 16 | 10 | 210 |
| 315 | 1380 | -1065 | 10 | 211 |
| 1100 | 1380 | -280 | 10 | 212 |
| 289 | 1380 | -1091 | 10 | 213 |
| 1128 | 1380 | -252 | 10 | 214 |
| | | | | |
| 1270 | 1450 | -180 | 10 | 215 |
| 121 | 1450 | -1329 | 10 | 216 |
| 134 | 1450 | -1316 | 10 | 217 |
| 86.3 | 1450 | -1363.7 | 10 | 218 |
| 768 | 1450 | -682 | 10 | 219 |
| 755 | 1450 | -695 | 10 | 220 |
| 1520 | 1450 | 70 | 11 | 220 |
| 1500 | 1450 | 50 | 12 | 220 |
| 1780 | 1450 | 330 | 13 | 220 |
| 420 | 1450 | -1030 | 13 | 221 |
| 716 | 1450 | -734 | 13 | 222 |
| 1080 | 1450 | -370 | 13 | 223 |
| 1396 | 1450 | -54 | 13 | 224 |
| 315 | 1450 | -1135 | 13 | 225 |
| 1100 | 1450 | -350 | 13 | 226 |
| 289 | 1450 | -1161 | 13 | 227 |
| 1128 | 1450 | -322 | 13 | 228 |
| | | | | |
| 121 | 1270 | -1149 | 13 | 229 |
| 134 | 1270 | -1136 | 13 | 230 |
| 86.3 | 1270 | -1183.7 | 13 | 231 |
| 768 | 1270 | -502 | 13 | 232 |
| 755 | 1270 | -515 | 13 | 233 |
| 1520 | 1270 | 250 | 14 | 233 |
| 1500 | 1270 | 230 | 15 | 233 |
| 1780 | 1270 | 510 | 16 | 233 |
| 420 | 1270 | -850 | 16 | 234 |
| 716 | 1270 | -554 | 16 | 235 |
| 1080 | 1270 | -190 | 16 | 236 |
| 1396 | 1270 | 126 | 17 | 236 |
| 315 | 1270 | -955 | 17 | 237 |
| 1100 | 1270 | -170 | 17 | 238 |
| 289 | 1270 | -981 | 17 | 239 |
| 1128 | 1270 | -142 | 17 | 240 |
| | | | | |
| 134 | 121 | 13 | 18 | 240 |
| 86.3 | 121 | -34.7 | 18 | 241 |
| 768 | 121 | 647 | 19 | 241 |
| 755 | 121 | 634 | 20 | 241 |
| 1520 | 121 | 1399 | 21 | 241 |

| | | | | |
|---|---|---|---|---|
| 1500 | 121 | 1379 | 22 | 241 |
| 1780 | 121 | 1659 | 23 | 241 |
| 420 | 121 | 299 | 24 | 241 |
| 716 | 121 | 595 | 25 | 241 |
| 1080 | 121 | 959 | 26 | 241 |
| 1396 | 121 | 1275 | 27 | 241 |
| 315 | 121 | 194 | 28 | 241 |
| 1100 | 121 | 979 | 29 | 241 |
| 289 | 121 | 168 | 30 | 241 |
| 1128 | 121 | 1007 | 31 | 241 |
| | | | | |
| 86.3 | 134 | -47.7 | 31 | 242 |
| 768 | 134 | 634 | 32 | 242 |
| 755 | 134 | 621 | 33 | 242 |
| 1520 | 134 | 1386 | 34 | 242 |
| 1500 | 134 | 1366 | 35 | 242 |
| 1780 | 134 | 1646 | 36 | 242 |
| 420 | 134 | 286 | 37 | 242 |
| 716 | 134 | 582 | 38 | 242 |
| 1080 | 134 | 946 | 39 | 242 |
| 1396 | 134 | 1262 | 40 | 242 |
| 315 | 134 | 181 | 41 | 242 |
| 1100 | 134 | 966 | 42 | 242 |
| 289 | 134 | 155 | 43 | 242 |
| 1128 | 134 | 994 | 44 | 242 |
| | | | | |
| 768 | 86.3 | 681.7 | 45 | 242 |
| 755 | 86.3 | 668.7 | 46 | 242 |
| 1520 | 86.3 | 1433.7 | 47 | 242 |
| 1500 | 86.3 | 1413.7 | 48 | 242 |
| 1780 | 86.3 | 1693.7 | 49 | 242 |
| 420 | 86.3 | 333.7 | 50 | 242 |
| 716 | 86.3 | 629.7 | 51 | 242 |
| 1080 | 86.3 | 993.7 | 52 | 242 |
| 1396 | 86.3 | 1309.7 | 53 | 242 |
| 315 | 86.3 | 228.7 | 54 | 242 |
| 1100 | 86.3 | 1013.7 | 55 | 242 |
| 289 | 86.3 | 202.7 | 56 | 242 |
| 1128 | 86.3 | 1041.7 | 57 | 242 |
| | | | | |
| 755 | 768 | Same Date | 57 | 242 |
| 1520 | 768 | 752 | 58 | 242 |
| 1500 | 768 | 732 | 59 | 242 |
| 1780 | 768 | 1012 | 60 | 242 |
| 420 | 768 | -348 | 60 | 243 |
| 716 | 768 | -52 | 60 | 244 |
| 1080 | 768 | 312 | 61 | 244 |
| 1396 | 768 | 628 | 62 | 244 |
| 315 | 768 | -453 | 62 | 245 |
| 1100 | 768 | 332 | 63 | 245 |
| 289 | 768 | -479 | 63 | 246 |
| 1128 | 768 | 360 | 64 | 246 |
| | | | | |
| 1520 | 755 | 765 | 65 | 246 |
| 1500 | 755 | 745 | 66 | 246 |
| 1780 | 755 | 1025 | 67 | 246 |
| 420 | 755 | -335 | 67 | 247 |

| | | | | |
|---|---|---|---|---|
| 716 | 755 | -39 | 67 | 248 |
| 1080 | 755 | 325 | 68 | 248 |
| 1396 | 755 | 641 | 69 | 248 |
| 315 | 755 | -440 | 69 | 249 |
| 1100 | 755 | 345 | 70 | 249 |
| 289 | 755 | -466 | 70 | 250 |
| 1128 | 755 | 373 | 71 | 250 |
| | | | | |
| 1500 | 1520 | Same Date | 71 | 250 |
| 1780 | 1520 | 260 | 72 | 250 |
| 420 | 1520 | -1100 | 72 | 251 |
| 716 | 1520 | -804 | 72 | 252 |
| 1080 | 1520 | -440 | 72 | 253 |
| 1396 | 1520 | -124 | 72 | 254 |
| 315 | 1520 | -1205 | 72 | 255 |
| 1100 | 1520 | -420 | 72 | 256 |
| 289 | 1520 | -1231 | 72 | 257 |
| 1128 | 1520 | -392 | 72 | 258 |
| | | | | |
| 1780 | 1500 | 280 | 73 | 258 |
| 420 | 1500 | -1080 | 73 | 259 |
| 716 | 1500 | -784 | 73 | 260 |
| 1080 | 1500 | -420 | 73 | 261 |
| 1396 | 1500 | -104 | 73 | 262 |
| 315 | 1500 | -1185 | 73 | 263 |
| 1100 | 1500 | -400 | 73 | 264 |
| 289 | 1500 | -1211 | 73 | 265 |
| 1128 | 1500 | -372 | 73 | 266 |
| | | | | |
| 420 | 1780 | -1360 | 73 | 267 |
| 716 | 1780 | -1064 | 73 | 268 |
| 1080 | 1780 | -700 | 73 | 269 |
| 1396 | 1780 | -384 | 73 | 270 |
| 315 | 1780 | -1465 | 73 | 271 |
| 1100 | 1780 | -680 | 73 | 272 |
| 289 | 1780 | -1491 | 73 | 273 |
| 1128 | 1780 | -652 | 73 | 274 |
| | | | | |
| 716 | 420 | 296 | 74 | 274 |
| 1080 | 420 | 660 | 75 | 274 |
| 1396 | 420 | 976 | 76 | 274 |
| 315 | 420 | -105 | 76 | 275 |
| 1100 | 420 | 680 | 77 | 275 |
| 289 | 420 | -131 | 77 | 276 |
| 1128 | 420 | 708 | 78 | 276 |
| | | | | |
| 1080 | 716 | 364 | 79 | 276 |
| 1396 | 716 | 680 | 80 | 276 |
| 315 | 716 | -401 | 80 | 277 |
| 1100 | 716 | 384 | 81 | 277 |
| 289 | 716 | -427 | 81 | 278 |
| 1128 | 716 | 412 | 82 | 278 |
| | | | | |
| 1396 | 1080 | 316 | 83 | 278 |
| 315 | 1080 | -765 | 83 | 279 |
| 1100 | 1080 | 20 | 84 | 279 |
| 289 | 1080 | -791 | 84 | 280 |

| | | | | |
|---|---|---|---|---|
| 1128 | 1080 | 48 | 85 | 280 |
| | | | | |
| 315 | 1396 | -1081 | 85 | 281 |
| 1100 | 1396 | -296 | 85 | 282 |
| 289 | 1396 | -1107 | 85 | 283 |
| 1128 | 1396 | -268 | 85 | 284 |
| | | | | |
| 1100 | 315 | 785 | 86 | 284 |
| 289 | 315 | -26 | 86 | 285 |
| 1128 | 315 | 813 | 87 | 285 |
| | | | | |
| 289 | 1100 | -811 | 87 | 286 |
| 1128 | 1100 | 28 | 88 | 286 |
| | | | | |
| 1128 | 289 | 839 | 89 | 286 |

S Statistic = 89 - 286 = -197

| Tied Group | Value | Members |
|---|---|---|
| 1 | 2730 | 2 |

| Time Period | Observations |
|---|---|
| 2/1/2017 | 1 |
| 3/1/2017 | 1 |
| 4/1/2017 | 1 |
| 5/1/2017 | 1 |
| 6/1/2017 | 1 |
| 7/1/2017 | 1 |
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 6/1/2020 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 2 time periods with multiple data

A = 18
B = 36
C = 0
D = 0
E = 2
F = 4

a = 46116
b = 176904
c = 1512
Group Variance = 2559.01
Z-Score = -3.87454
Comparison Level at 95% confidence level = 1.65463 (upward trend)
-3.87454 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RW13-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 66 | 31800 | -31734 | 0 | 1 |
| 28700 | 31800 | -3100 | 0 | 2 |
| 24500 | 31800 | -7300 | 0 | 3 |
| 44.2 | 31800 | -31755.8 | 0 | 4 |
| 1240 | 31800 | -30560 | 0 | 5 |
| 19400 | 31800 | -12400 | 0 | 6 |
| 21000 | 31800 | -10800 | 0 | 7 |
| 12.6 | 31800 | -31787.4 | 0 | 8 |
| 29200 | 31800 | -2600 | 0 | 9 |
| 26900 | 31800 | -4900 | 0 | 10 |
| 94.7 | 31800 | -31705.3 | 0 | 11 |
| 51.1 | 31800 | -31748.9 | 0 | 12 |
| 12.8 1c | 31800 | -31787.2 | 0 | 13 |
| 22500 | 31800 | -9300 | 0 | 14 |
| 24700 | 31800 | -7100 | 0 | 15 |
| 15.4 | 31800 | -31784.6 | 0 | 16 |
| 23900 ML | 31800 | -7900 | 0 | 17 |
| 6.1 | 31800 | -31793.9 | 0 | 18 |
| 26400 | 31800 | -5400 | 0 | 19 |
| 23700 | 31800 | -8100 | 0 | 20 |
| 35700 | 31800 | 3900 | 1 | 20 |
| 38540 | 31800 | 6740 | 2 | 20 |
| | | | | |
| 28700 | 66 | 28634 | 3 | 20 |
| 24500 | 66 | 24434 | 4 | 20 |
| 44.2 | 66 | -21.8 | 4 | 21 |
| 1240 | 66 | 1174 | 5 | 21 |
| 19400 | 66 | 19334 | 6 | 21 |
| 21000 | 66 | 20934 | 7 | 21 |
| 12.6 | 66 | -53.4 | 7 | 22 |
| 29200 | 66 | 29134 | 8 | 22 |
| 26900 | 66 | 26834 | 9 | 22 |
| 94.7 | 66 | 28.7 | 10 | 22 |
| 51.1 | 66 | -14.9 | 10 | 23 |
| 12.8 1c | 66 | -53.2 | 10 | 24 |
| 22500 | 66 | 22434 | 11 | 24 |
| 24700 | 66 | 24634 | 12 | 24 |
| 15.4 | 66 | -50.6 | 12 | 25 |
| 23900 ML | 66 | 23834 | 13 | 25 |
| 6.1 | 66 | -59.9 | 13 | 26 |
| 26400 | 66 | 26334 | 14 | 26 |
| 23700 | 66 | 23634 | 15 | 26 |
| 35700 | 66 | 35634 | 16 | 26 |
| 38540 | 66 | 38474 | 17 | 26 |
| | | | | |
| 24500 | 28700 | -4200 | 17 | 27 |
| 44.2 | 28700 | -28655.8 | 17 | 28 |

| | | | | |
|---|---|---|---|---|
| 1240 | 28700 | -27460 | 17 | 29 |
| 19400 | 28700 | -9300 | 17 | 30 |
| 21000 | 28700 | -7700 | 17 | 31 |
| 12.6 | 28700 | -28687.4 | 17 | 32 |
| 29200 | 28700 | 500 | 18 | 32 |
| 26900 | 28700 | -1800 | 18 | 33 |
| 94.7 | 28700 | -28605.3 | 18 | 34 |
| 51.1 | 28700 | -28648.9 | 18 | 35 |
| 12.8 1c | 28700 | -28687.2 | 18 | 36 |
| 22500 | 28700 | -6200 | 18 | 37 |
| 24700 | 28700 | -4000 | 18 | 38 |
| 15.4 | 28700 | -28684.6 | 18 | 39 |
| 23900 ML | 28700 | -4800 | 18 | 40 |
| 6.1 | 28700 | -28693.9 | 18 | 41 |
| 26400 | 28700 | -2300 | 18 | 42 |
| 23700 | 28700 | -5000 | 18 | 43 |
| 35700 | 28700 | 7000 | 19 | 43 |
| 38540 | 28700 | 9840 | 20 | 43 |
| | | | | |
| 44.2 | 24500 | -24455.8 | 20 | 44 |
| 1240 | 24500 | -23260 | 20 | 45 |
| 19400 | 24500 | -5100 | 20 | 46 |
| 21000 | 24500 | -3500 | 20 | 47 |
| 12.6 | 24500 | -24487.4 | 20 | 48 |
| 29200 | 24500 | 4700 | 21 | 48 |
| 26900 | 24500 | 2400 | 22 | 48 |
| 94.7 | 24500 | -24405.3 | 22 | 49 |
| 51.1 | 24500 | -24448.9 | 22 | 50 |
| 12.8 1c | 24500 | -24487.2 | 22 | 51 |
| 22500 | 24500 | -2000 | 22 | 52 |
| 24700 | 24500 | 200 | 23 | 52 |
| 15.4 | 24500 | -24484.6 | 23 | 53 |
| 23900 ML | 24500 | -600 | 23 | 54 |
| 6.1 | 24500 | -24493.9 | 23 | 55 |
| 26400 | 24500 | 1900 | 24 | 55 |
| 23700 | 24500 | -800 | 24 | 56 |
| 35700 | 24500 | 11200 | 25 | 56 |
| 38540 | 24500 | 14040 | 26 | 56 |
| | | | | |
| 1240 | 44.2 | 1195.8 | 27 | 56 |
| 19400 | 44.2 | 19355.8 | 28 | 56 |
| 21000 | 44.2 | 20955.8 | 29 | 56 |
| 12.6 | 44.2 | -31.6 | 29 | 57 |
| 29200 | 44.2 | 29155.8 | 30 | 57 |
| 26900 | 44.2 | 26855.8 | 31 | 57 |
| 94.7 | 44.2 | 50.5 | 32 | 57 |
| 51.1 | 44.2 | 6.9 | 33 | 57 |
| 12.8 1c | 44.2 | -31.4 | 33 | 58 |
| 22500 | 44.2 | 22455.8 | 34 | 58 |
| 24700 | 44.2 | 24655.8 | 35 | 58 |
| 15.4 | 44.2 | -28.8 | 35 | 59 |
| 23900 ML | 44.2 | 23855.8 | 36 | 59 |
| 6.1 | 44.2 | -38.1 | 36 | 60 |
| 26400 | 44.2 | 26355.8 | 37 | 60 |
| 23700 | 44.2 | 23655.8 | 38 | 60 |
| 35700 | 44.2 | 35655.8 | 39 | 60 |
| 38540 | 44.2 | 38495.8 | 40 | 60 |

| | | | | |
|---|---|---|---|---|
| 19400 | 1240 | 18160 | 41 | 60 |
| 21000 | 1240 | 19760 | 42 | 60 |
| 12.6 | 1240 | -1227.4 | 42 | 61 |
| 29200 | 1240 | 27960 | 43 | 61 |
| 26900 | 1240 | 25660 | 44 | 61 |
| 94.7 | 1240 | -1145.3 | 44 | 62 |
| 51.1 | 1240 | -1188.9 | 44 | 63 |
| 12.8 1c | 1240 | -1227.2 | 44 | 64 |
| 22500 | 1240 | 21260 | 45 | 64 |
| 24700 | 1240 | 23460 | 46 | 64 |
| 15.4 | 1240 | -1224.6 | 46 | 65 |
| 23900 ML | 1240 | 22660 | 47 | 65 |
| 6.1 | 1240 | -1233.9 | 47 | 66 |
| 26400 | 1240 | 25160 | 48 | 66 |
| 23700 | 1240 | 22460 | 49 | 66 |
| 35700 | 1240 | 34460 | 50 | 66 |
| 38540 | 1240 | 37300 | 51 | 66 |
| | | | | |
| 21000 | 19400 | 1600 | 52 | 66 |
| 12.6 | 19400 | -19387.4 | 52 | 67 |
| 29200 | 19400 | 9800 | 53 | 67 |
| 26900 | 19400 | 7500 | 54 | 67 |
| 94.7 | 19400 | -19305.3 | 54 | 68 |
| 51.1 | 19400 | -19348.9 | 54 | 69 |
| 12.8 1c | 19400 | -19387.2 | 54 | 70 |
| 22500 | 19400 | 3100 | 55 | 70 |
| 24700 | 19400 | 5300 | 56 | 70 |
| 15.4 | 19400 | -19384.6 | 56 | 71 |
| 23900 ML | 19400 | 4500 | 57 | 71 |
| 6.1 | 19400 | -19393.9 | 57 | 72 |
| 26400 | 19400 | 7000 | 58 | 72 |
| 23700 | 19400 | 4300 | 59 | 72 |
| 35700 | 19400 | 16300 | 60 | 72 |
| 38540 | 19400 | 19140 | 61 | 72 |
| | | | | |
| 12.6 | 21000 | -20987.4 | 61 | 73 |
| 29200 | 21000 | 8200 | 62 | 73 |
| 26900 | 21000 | 5900 | 63 | 73 |
| 94.7 | 21000 | -20905.3 | 63 | 74 |
| 51.1 | 21000 | -20948.9 | 63 | 75 |
| 12.8 1c | 21000 | -20987.2 | 63 | 76 |
| 22500 | 21000 | 1500 | 64 | 76 |
| 24700 | 21000 | 3700 | 65 | 76 |
| 15.4 | 21000 | -20984.6 | 65 | 77 |
| 23900 ML | 21000 | 2900 | 66 | 77 |
| 6.1 | 21000 | -20993.9 | 66 | 78 |
| 26400 | 21000 | 5400 | 67 | 78 |
| 23700 | 21000 | 2700 | 68 | 78 |
| 35700 | 21000 | 14700 | 69 | 78 |
| 38540 | 21000 | 17540 | 70 | 78 |
| | | | | |
| 29200 | 12.6 | 29187.4 | 71 | 78 |
| 26900 | 12.6 | 26887.4 | 72 | 78 |
| 94.7 | 12.6 | 82.1 | 73 | 78 |
| 51.1 | 12.6 | 38.5 | 74 | 78 |
| 12.8 1c | 12.6 | 0.2 | 75 | 78 |

| | | | | |
|---|---|---|---|---|
| 22500 | 12.6 | 22487.4 | 76 | 78 |
| 24700 | 12.6 | 24687.4 | 77 | 78 |
| 15.4 | 12.6 | 2.8 | 78 | 78 |
| 23900 ML | 12.6 | 23887.4 | 79 | 78 |
| 6.1 | 12.6 | -6.5 | 79 | 79 |
| 26400 | 12.6 | 26387.4 | 80 | 79 |
| 23700 | 12.6 | 23687.4 | 81 | 79 |
| 35700 | 12.6 | 35687.4 | 82 | 79 |
| 38540 | 12.6 | 38527.4 | 83 | 79 |
| | | | | |
| 26900 | 29200 | Same Date | 83 | 79 |
| 94.7 | 29200 | -29105.3 | 83 | 80 |
| 51.1 | 29200 | -29148.9 | 83 | 81 |
| 12.8 1c | 29200 | -29187.2 | 83 | 82 |
| 22500 | 29200 | -6700 | 83 | 83 |
| 24700 | 29200 | -4500 | 83 | 84 |
| 15.4 | 29200 | -29184.6 | 83 | 85 |
| 23900 ML | 29200 | -5300 | 83 | 86 |
| 6.1 | 29200 | -29193.9 | 83 | 87 |
| 26400 | 29200 | -2800 | 83 | 88 |
| 23700 | 29200 | -5500 | 83 | 89 |
| 35700 | 29200 | 6500 | 84 | 89 |
| 38540 | 29200 | 9340 | 85 | 89 |
| | | | | |
| 94.7 | 26900 | -26805.3 | 85 | 90 |
| 51.1 | 26900 | -26848.9 | 85 | 91 |
| 12.8 1c | 26900 | -26887.2 | 85 | 92 |
| 22500 | 26900 | -4400 | 85 | 93 |
| 24700 | 26900 | -2200 | 85 | 94 |
| 15.4 | 26900 | -26884.6 | 85 | 95 |
| 23900 ML | 26900 | -3000 | 85 | 96 |
| 6.1 | 26900 | -26893.9 | 85 | 97 |
| 26400 | 26900 | -500 | 85 | 98 |
| 23700 | 26900 | -3200 | 85 | 99 |
| 35700 | 26900 | 8800 | 86 | 99 |
| 38540 | 26900 | 11640 | 87 | 99 |
| | | | | |
| 51.1 | 94.7 | Same Date | 87 | 99 |
| 12.8 1c | 94.7 | -81.9 | 87 | 100 |
| 22500 | 94.7 | 22405.3 | 88 | 100 |
| 24700 | 94.7 | 24605.3 | 89 | 100 |
| 15.4 | 94.7 | -79.3 | 89 | 101 |
| 23900 ML | 94.7 | 23805.3 | 90 | 101 |
| 6.1 | 94.7 | -88.6 | 90 | 102 |
| 26400 | 94.7 | 26305.3 | 91 | 102 |
| 23700 | 94.7 | 23605.3 | 92 | 102 |
| 35700 | 94.7 | 35605.3 | 93 | 102 |
| 38540 | 94.7 | 38445.3 | 94 | 102 |
| | | | | |
| 12.8 1c | 51.1 | -38.3 | 94 | 103 |
| 22500 | 51.1 | 22448.9 | 95 | 103 |
| 24700 | 51.1 | 24648.9 | 96 | 103 |
| 15.4 | 51.1 | -35.7 | 96 | 104 |
| 23900 ML | 51.1 | 23848.9 | 97 | 104 |
| 6.1 | 51.1 | -45 | 97 | 105 |
| 26400 | 51.1 | 26348.9 | 98 | 105 |
| 23700 | 51.1 | 23648.9 | 99 | 105 |

| | | | | |
|---|---|---|---|---|
| 35700 | 51.1 | 35648.9 | 100 | 105 |
| 38540 | 51.1 | 38488.9 | 101 | 105 |
| | | | | |
| 22500 | 12.8 1c | 22487.2 | 102 | 105 |
| 24700 | 12.8 1c | 24687.2 | 103 | 105 |
| 15.4 | 12.8 1c | 2.6 | 104 | 105 |
| 23900 ML | 12.8 1c | 23887.2 | 105 | 105 |
| 6.1 | 12.8 1c | -6.7 | 105 | 106 |
| 26400 | 12.8 1c | 26387.2 | 106 | 106 |
| 23700 | 12.8 1c | 23687.2 | 107 | 106 |
| 35700 | 12.8 1c | 35687.2 | 108 | 106 |
| 38540 | 12.8 1c | 38527.2 | 109 | 106 |
| | | | | |
| 24700 | 22500 | 2200 | 110 | 106 |
| 15.4 | 22500 | -22484.6 | 110 | 107 |
| 23900 ML | 22500 | 1400 | 111 | 107 |
| 6.1 | 22500 | -22493.9 | 111 | 108 |
| 26400 | 22500 | 3900 | 112 | 108 |
| 23700 | 22500 | 1200 | 113 | 108 |
| 35700 | 22500 | 13200 | 114 | 108 |
| 38540 | 22500 | 16040 | 115 | 108 |
| | | | | |
| 15.4 | 24700 | -24684.6 | 115 | 109 |
| 23900 ML | 24700 | -800 | 115 | 110 |
| 6.1 | 24700 | -24693.9 | 115 | 111 |
| 26400 | 24700 | 1700 | 116 | 111 |
| 23700 | 24700 | -1000 | 116 | 112 |
| 35700 | 24700 | 11000 | 117 | 112 |
| 38540 | 24700 | 13840 | 118 | 112 |
| | | | | |
| 23900 ML | 15.4 | 23884.6 | 119 | 112 |
| 6.1 | 15.4 | -9.3 | 119 | 113 |
| 26400 | 15.4 | 26384.6 | 120 | 113 |
| 23700 | 15.4 | 23684.6 | 121 | 113 |
| 35700 | 15.4 | 35684.6 | 122 | 113 |
| 38540 | 15.4 | 38524.6 | 123 | 113 |
| | | | | |
| 6.1 | 23900 ML | -23893.9 | 123 | 114 |
| 26400 | 23900 ML | 2500 | 124 | 114 |
| 23700 | 23900 ML | -200 | 124 | 115 |
| 35700 | 23900 ML | 11800 | 125 | 115 |
| 38540 | 23900 ML | 14640 | 126 | 115 |
| | | | | |
| 26400 | 6.1 | 26393.9 | 127 | 115 |
| 23700 | 6.1 | 23693.9 | 128 | 115 |
| 35700 | 6.1 | 35693.9 | 129 | 115 |
| 38540 | 6.1 | 38533.9 | 130 | 115 |
| | | | | |
| 23700 | 26400 | -2700 | 130 | 116 |
| 35700 | 26400 | 9300 | 131 | 116 |
| 38540 | 26400 | 12140 | 132 | 116 |
| | | | | |
| 35700 | 23700 | 12000 | 133 | 116 |
| 38540 | 23700 | 14840 | 134 | 116 |
| | | | | |
| 38540 | 35700 | 2840 | 135 | 116 |

S Statistic = 135 - 116 = 19

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 3/1/2022 | 1 |
| 3/1/2023 | 1 |
| 3/1/2024 | 1 |

There are 2 time periods with multiple data

A = 0
B = 36
C = 0
D = 0
E = 0
F = 4
a = 25806
b = 95634
c = 1012
Group Variance = 1431.67
Z-Score = 0.47572
Comparison Level at 95% confidence level = 1.65463 (upward trend)
0.47572 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RW15-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| ND<1.5 U | 10.1 | -8.6 | 0 | 1 |
| ND<1.5 U | 10.1 | -8.6 | 0 | 2 |
| ND<1.5 U | 10.1 | -8.6 | 0 | 3 |
| 0.97 J | 10.1 | -9.13 | 0 | 4 |
| 1.6 J | 10.1 | -8.5 | 0 | 5 |
| ND<1.5 U | 10.1 | -8.6 | 0 | 6 |
| 15.3 | 10.1 | 5.2 | 1 | 6 |
| ND<1.5 U | 10.1 | -8.6 | 1 | 7 |
| 402 | 10.1 | 391.9 | 2 | 7 |
| 396 | 10.1 | 385.9 | 3 | 7 |
| 64.9 | 10.1 | 54.8 | 4 | 7 |
| 64.2 | 10.1 | 54.1 | 5 | 7 |
| 589 | 10.1 | 578.9 | 6 | 7 |
| 605 1c | 10.1 | 594.9 | 7 | 7 |
| 0.5 J | 10.1 | -9.6 | 7 | 8 |
| ND<1.5 U | 10.1 | -8.6 | 7 | 9 |
| 8 | 10.1 | -2.1 | 7 | 10 |
| 0.91 J | 10.1 | -9.19 | 7 | 11 |
| 43.6 | 10.1 | 33.5 | 8 | 11 |
| 169 | 10.1 | 158.9 | 9 | 11 |
| 407.8 | 10.1 | 397.7 | 10 | 11 |
| 4.679 | 10.1 | -5.421 | 10 | 12 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 10 | 12 |
| ND<1.5 U | ND<1.5 U | 0 | 10 | 12 |
| 0.97 J | ND<1.5 U | -0.53 | 10 | 13 |
| 1.6 J | ND<1.5 U | 0.1 | 11 | 13 |
| ND<1.5 U | ND<1.5 U | 0 | 11 | 13 |
| 15.3 | ND<1.5 U | 13.8 | 12 | 13 |
| ND<1.5 U | ND<1.5 U | 0 | 12 | 13 |
| 402 | ND<1.5 U | 400.5 | 13 | 13 |
| 396 | ND<1.5 U | 394.5 | 14 | 13 |
| 64.9 | ND<1.5 U | 63.4 | 15 | 13 |
| 64.2 | ND<1.5 U | 62.7 | 16 | 13 |
| 589 | ND<1.5 U | 587.5 | 17 | 13 |
| 605 1c | ND<1.5 U | 603.5 | 18 | 13 |
| 0.5 J | ND<1.5 U | -1 | 18 | 14 |
| ND<1.5 U | ND<1.5 U | 0 | 18 | 14 |
| 8 | ND<1.5 U | 6.5 | 19 | 14 |
| 0.91 J | ND<1.5 U | -0.59 | 19 | 15 |
| 43.6 | ND<1.5 U | 42.1 | 20 | 15 |
| 169 | ND<1.5 U | 167.5 | 21 | 15 |
| 407.8 | ND<1.5 U | 406.3 | 22 | 15 |
| 4.679 | ND<1.5 U | 3.179 | 23 | 15 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 23 | 15 |
| 0.97 J | ND<1.5 U | -0.53 | 23 | 16 |

| | | | | |
|---|---|---|---|---|
| 1.6 J | ND<1.5 U | 0.1 | 24 | 16 |
| ND<1.5 U | ND<1.5 U | 0 | 24 | 16 |
| 15.3 | ND<1.5 U | 13.8 | 25 | 16 |
| ND<1.5 U | ND<1.5 U | 0 | 25 | 16 |
| 402 | ND<1.5 U | 400.5 | 26 | 16 |
| 396 | ND<1.5 U | 394.5 | 27 | 16 |
| 64.9 | ND<1.5 U | 63.4 | 28 | 16 |
| 64.2 | ND<1.5 U | 62.7 | 29 | 16 |
| 589 | ND<1.5 U | 587.5 | 30 | 16 |
| 605 1c | ND<1.5 U | 603.5 | 31 | 16 |
| 0.5 J | ND<1.5 U | -1 | 31 | 17 |
| ND<1.5 U | ND<1.5 U | 0 | 31 | 17 |
| 8 | ND<1.5 U | 6.5 | 32 | 17 |
| 0.91 J | ND<1.5 U | -0.59 | 32 | 18 |
| 43.6 | ND<1.5 U | 42.1 | 33 | 18 |
| 169 | ND<1.5 U | 167.5 | 34 | 18 |
| 407.8 | ND<1.5 U | 406.3 | 35 | 18 |
| 4.679 | ND<1.5 U | 3.179 | 36 | 18 |
| | | | | |
| 0.97 J | ND<1.5 U | -0.53 | 36 | 19 |
| 1.6 J | ND<1.5 U | 0.1 | 37 | 19 |
| ND<1.5 U | ND<1.5 U | 0 | 37 | 19 |
| 15.3 | ND<1.5 U | 13.8 | 38 | 19 |
| ND<1.5 U | ND<1.5 U | 0 | 38 | 19 |
| 402 | ND<1.5 U | 400.5 | 39 | 19 |
| 396 | ND<1.5 U | 394.5 | 40 | 19 |
| 64.9 | ND<1.5 U | 63.4 | 41 | 19 |
| 64.2 | ND<1.5 U | 62.7 | 42 | 19 |
| 589 | ND<1.5 U | 587.5 | 43 | 19 |
| 605 1c | ND<1.5 U | 603.5 | 44 | 19 |
| 0.5 J | ND<1.5 U | -1 | 44 | 20 |
| ND<1.5 U | ND<1.5 U | 0 | 44 | 20 |
| 8 | ND<1.5 U | 6.5 | 45 | 20 |
| 0.91 J | ND<1.5 U | -0.59 | 45 | 21 |
| 43.6 | ND<1.5 U | 42.1 | 46 | 21 |
| 169 | ND<1.5 U | 167.5 | 47 | 21 |
| 407.8 | ND<1.5 U | 406.3 | 48 | 21 |
| 4.679 | ND<1.5 U | 3.179 | 49 | 21 |
| | | | | |
| 1.6 J | 0.97 J | 0.63 | 50 | 21 |
| ND<1.5 U | 0.97 J | 0.53 | 51 | 21 |
| 15.3 | 0.97 J | 14.33 | 52 | 21 |
| ND<1.5 U | 0.97 J | 0.53 | 53 | 21 |
| 402 | 0.97 J | 401.03 | 54 | 21 |
| 396 | 0.97 J | 395.03 | 55 | 21 |
| 64.9 | 0.97 J | 63.93 | 56 | 21 |
| 64.2 | 0.97 J | 63.23 | 57 | 21 |
| 589 | 0.97 J | 588.03 | 58 | 21 |
| 605 1c | 0.97 J | 604.03 | 59 | 21 |
| 0.5 J | 0.97 J | -0.47 | 59 | 22 |
| ND<1.5 U | 0.97 J | 0.53 | 60 | 22 |
| 8 | 0.97 J | 7.03 | 61 | 22 |
| 0.91 J | 0.97 J | -0.06 | 61 | 23 |
| 43.6 | 0.97 J | 42.63 | 62 | 23 |
| 169 | 0.97 J | 168.03 | 63 | 23 |
| 407.8 | 0.97 J | 406.83 | 64 | 23 |
| 4.679 | 0.97 J | 3.709 | 65 | 23 |

| | | | | |
|---|---|---|---|---|
| ND<1.5 U | 1.6 J | -0.1 | 65 | 24 |
| 15.3 | 1.6 J | 13.7 | 66 | 24 |
| ND<1.5 U | 1.6 J | -0.1 | 66 | 25 |
| 402 | 1.6 J | 400.4 | 67 | 25 |
| 396 | 1.6 J | 394.4 | 68 | 25 |
| 64.9 | 1.6 J | 63.3 | 69 | 25 |
| 64.2 | 1.6 J | 62.6 | 70 | 25 |
| 589 | 1.6 J | 587.4 | 71 | 25 |
| 605 1c | 1.6 J | 603.4 | 72 | 25 |
| 0.5 J | 1.6 J | -1.1 | 72 | 26 |
| ND<1.5 U | 1.6 J | -0.1 | 72 | 27 |
| 8 | 1.6 J | 6.4 | 73 | 27 |
| 0.91 J | 1.6 J | -0.69 | 73 | 28 |
| 43.6 | 1.6 J | 42 | 74 | 28 |
| 169 | 1.6 J | 167.4 | 75 | 28 |
| 407.8 | 1.6 J | 406.2 | 76 | 28 |
| 4.679 | 1.6 J | 3.079 | 77 | 28 |
| | | | | |
| 15.3 | ND<1.5 U | 13.8 | 78 | 28 |
| ND<1.5 U | ND<1.5 U | 0 | 78 | 28 |
| 402 | ND<1.5 U | 400.5 | 79 | 28 |
| 396 | ND<1.5 U | 394.5 | 80 | 28 |
| 64.9 | ND<1.5 U | 63.4 | 81 | 28 |
| 64.2 | ND<1.5 U | 62.7 | 82 | 28 |
| 589 | ND<1.5 U | 587.5 | 83 | 28 |
| 605 1c | ND<1.5 U | 603.5 | 84 | 28 |
| 0.5 J | ND<1.5 U | -1 | 84 | 29 |
| ND<1.5 U | ND<1.5 U | 0 | 84 | 29 |
| 8 | ND<1.5 U | 6.5 | 85 | 29 |
| 0.91 J | ND<1.5 U | -0.59 | 85 | 30 |
| 43.6 | ND<1.5 U | 42.1 | 86 | 30 |
| 169 | ND<1.5 U | 167.5 | 87 | 30 |
| 407.8 | ND<1.5 U | 406.3 | 88 | 30 |
| 4.679 | ND<1.5 U | 3.179 | 89 | 30 |
| | | | | |
| ND<1.5 U | 15.3 | -13.8 | 89 | 31 |
| 402 | 15.3 | 386.7 | 90 | 31 |
| 396 | 15.3 | 380.7 | 91 | 31 |
| 64.9 | 15.3 | 49.6 | 92 | 31 |
| 64.2 | 15.3 | 48.9 | 93 | 31 |
| 589 | 15.3 | 573.7 | 94 | 31 |
| 605 1c | 15.3 | 589.7 | 95 | 31 |
| 0.5 J | 15.3 | -14.8 | 95 | 32 |
| ND<1.5 U | 15.3 | -13.8 | 95 | 33 |
| 8 | 15.3 | -7.3 | 95 | 34 |
| 0.91 J | 15.3 | -14.39 | 95 | 35 |
| 43.6 | 15.3 | 28.3 | 96 | 35 |
| 169 | 15.3 | 153.7 | 97 | 35 |
| 407.8 | 15.3 | 392.5 | 98 | 35 |
| 4.679 | 15.3 | -10.621 | 98 | 36 |
| | | | | |
| 402 | ND<1.5 U | 400.5 | 99 | 36 |
| 396 | ND<1.5 U | 394.5 | 100 | 36 |
| 64.9 | ND<1.5 U | 63.4 | 101 | 36 |
| 64.2 | ND<1.5 U | 62.7 | 102 | 36 |
| 589 | ND<1.5 U | 587.5 | 103 | 36 |

| | | | | |
|---|---|---|---|---|
| 605 1c | ND<1.5 U | 603.5 | 104 | 36 |
| 0.5 J | ND<1.5 U | -1 | 104 | 37 |
| ND<1.5 U | ND<1.5 U | 0 | 104 | 37 |
| 8 | ND<1.5 U | 6.5 | 105 | 37 |
| 0.91 J | ND<1.5 U | -0.59 | 105 | 38 |
| 43.6 | ND<1.5 U | 42.1 | 106 | 38 |
| 169 | ND<1.5 U | 167.5 | 107 | 38 |
| 407.8 | ND<1.5 U | 406.3 | 108 | 38 |
| 4.679 | ND<1.5 U | 3.179 | 109 | 38 |
| | | | | |
| 396 | 402 | Same Date | 109 | 38 |
| 64.9 | 402 | -337.1 | 109 | 39 |
| 64.2 | 402 | -337.8 | 109 | 40 |
| 589 | 402 | 187 | 110 | 40 |
| 605 1c | 402 | 203 | 111 | 40 |
| 0.5 J | 402 | -401.5 | 111 | 41 |
| ND<1.5 U | 402 | -400.5 | 111 | 42 |
| 8 | 402 | -394 | 111 | 43 |
| 0.91 J | 402 | -401.09 | 111 | 44 |
| 43.6 | 402 | -358.4 | 111 | 45 |
| 169 | 402 | -233 | 111 | 46 |
| 407.8 | 402 | 5.8 | 112 | 46 |
| 4.679 | 402 | -397.321 | 112 | 47 |
| | | | | |
| 64.9 | 396 | -331.1 | 112 | 48 |
| 64.2 | 396 | -331.8 | 112 | 49 |
| 589 | 396 | 193 | 113 | 49 |
| 605 1c | 396 | 209 | 114 | 49 |
| 0.5 J | 396 | -395.5 | 114 | 50 |
| ND<1.5 U | 396 | -394.5 | 114 | 51 |
| 8 | 396 | -388 | 114 | 52 |
| 0.91 J | 396 | -395.09 | 114 | 53 |
| 43.6 | 396 | -352.4 | 114 | 54 |
| 169 | 396 | -227 | 114 | 55 |
| 407.8 | 396 | 11.8 | 115 | 55 |
| 4.679 | 396 | -391.321 | 115 | 56 |
| | | | | |
| 64.2 | 64.9 | Same Date | 115 | 56 |
| 589 | 64.9 | 524.1 | 116 | 56 |
| 605 1c | 64.9 | 540.1 | 117 | 56 |
| 0.5 J | 64.9 | -64.4 | 117 | 57 |
| ND<1.5 U | 64.9 | -63.4 | 117 | 58 |
| 8 | 64.9 | -56.9 | 117 | 59 |
| 0.91 J | 64.9 | -63.99 | 117 | 60 |
| 43.6 | 64.9 | -21.3 | 117 | 61 |
| 169 | 64.9 | 104.1 | 118 | 61 |
| 407.8 | 64.9 | 342.9 | 119 | 61 |
| 4.679 | 64.9 | -60.221 | 119 | 62 |
| | | | | |
| 589 | 64.2 | 524.8 | 120 | 62 |
| 605 1c | 64.2 | 540.8 | 121 | 62 |
| 0.5 J | 64.2 | -63.7 | 121 | 63 |
| ND<1.5 U | 64.2 | -62.7 | 121 | 64 |
| 8 | 64.2 | -56.2 | 121 | 65 |
| 0.91 J | 64.2 | -63.29 | 121 | 66 |
| 43.6 | 64.2 | -20.6 | 121 | 67 |
| 169 | 64.2 | 104.8 | 122 | 67 |

| | | | | |
|---|---|---|---|---|
| 407.8 | 64.2 | 343.6 | 123 | 67 |
| 4.679 | 64.2 | -59.521 | 123 | 68 |
| | | | | |
| 605 1c | 589 | 16 | 124 | 68 |
| 0.5 J | 589 | -588.5 | 124 | 69 |
| ND<1.5 U | 589 | -587.5 | 124 | 70 |
| 8 | 589 | -581 | 124 | 71 |
| 0.91 J | 589 | -588.09 | 124 | 72 |
| 43.6 | 589 | -545.4 | 124 | 73 |
| 169 | 589 | -420 | 124 | 74 |
| 407.8 | 589 | -181.2 | 124 | 75 |
| 4.679 | 589 | -584.321 | 124 | 76 |
| | | | | |
| 0.5 J | 605 1c | -604.5 | 124 | 77 |
| ND<1.5 U | 605 1c | -603.5 | 124 | 78 |
| 8 | 605 1c | -597 | 124 | 79 |
| 0.91 J | 605 1c | -604.09 | 124 | 80 |
| 43.6 | 605 1c | -561.4 | 124 | 81 |
| 169 | 605 1c | -436 | 124 | 82 |
| 407.8 | 605 1c | -197.2 | 124 | 83 |
| 4.679 | 605 1c | -600.321 | 124 | 84 |
| | | | | |
| ND<1.5 U | 0.5 J | 1 | 125 | 84 |
| 8 | 0.5 J | 7.5 | 126 | 84 |
| 0.91 J | 0.5 J | 0.41 | 127 | 84 |
| 43.6 | 0.5 J | 43.1 | 128 | 84 |
| 169 | 0.5 J | 168.5 | 129 | 84 |
| 407.8 | 0.5 J | 407.3 | 130 | 84 |
| 4.679 | 0.5 J | 4.179 | 131 | 84 |
| | | | | |
| 8 | ND<1.5 U | 6.5 | 132 | 84 |
| 0.91 J | ND<1.5 U | -0.59 | 132 | 85 |
| 43.6 | ND<1.5 U | 42.1 | 133 | 85 |
| 169 | ND<1.5 U | 167.5 | 134 | 85 |
| 407.8 | ND<1.5 U | 406.3 | 135 | 85 |
| 4.679 | ND<1.5 U | 3.179 | 136 | 85 |
| | | | | |
| 0.91 J | 8 | -7.09 | 136 | 86 |
| 43.6 | 8 | 35.6 | 137 | 86 |
| 169 | 8 | 161 | 138 | 86 |
| 407.8 | 8 | 399.8 | 139 | 86 |
| 4.679 | 8 | -3.321 | 139 | 87 |
| | | | | |
| 43.6 | 0.91 J | 42.69 | 140 | 87 |
| 169 | 0.91 J | 168.09 | 141 | 87 |
| 407.8 | 0.91 J | 406.89 | 142 | 87 |
| 4.679 | 0.91 J | 3.769 | 143 | 87 |
| | | | | |
| 169 | 43.6 | 125.4 | 144 | 87 |
| 407.8 | 43.6 | 364.2 | 145 | 87 |
| 4.679 | 43.6 | -38.921 | 145 | 88 |
| | | | | |
| 407.8 | 169 | 238.8 | 146 | 88 |
| 4.679 | 169 | -164.321 | 146 | 89 |
| | | | | |
| 4.679 | 407.8 | -403.121 | 146 | 90 |

S Statistic = 146 - 90 = 56

| Tied Group | Value | Members |
|---|---|---|
| 1 | 1.5 | 6 |

| Time Period | Observations |
|---|---|
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 3/1/2022 | 1 |
| 3/1/2023 | 1 |
| 3/1/2024 | 1 |

There are 2 time periods with multiple data

A = 510
B = 36
C = 120
D = 0
E = 30
F = 4
a = 25806
b = 95634
c = 1012
Group Variance = 1403.45
Z-Score = 1.46813
Comparison Level at 95% confidence level = 1.65463 (upward trend)
1.46813 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RW16-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 28.6 | 12.1 | 16.5 | 1 | 0 |
| 194 | 12.1 | 181.9 | 2 | 0 |
| 73.9 | 12.1 | 61.8 | 3 | 0 |
| 1.7 J | 12.1 | -10.4 | 3 | 1 |
| ND<1.5 U | 12.1 | -10.6 | 3 | 2 |
| ND<1.5 U | 12.1 | -10.6 | 3 | 3 |
| 1.9 J | 12.1 | -10.2 | 3 | 4 |
| 1.2 J | 12.1 | -10.9 | 3 | 5 |
| 1.1 J | 12.1 | -11 | 3 | 6 |
| ND<1.5 U | 12.1 | -10.6 | 3 | 7 |
| ND<1.5 U | 12.1 | -10.6 | 3 | 8 |
| ND<1.5 U | 12.1 | -10.6 | 3 | 9 |
| ND<1.5 U | 12.1 | -10.6 | 3 | 10 |
| ND<1.5 U | 12.1 | -10.6 | 3 | 11 |
| ND<1.5 U | 12.1 | -10.6 | 3 | 12 |
| ND<1.5 U | 12.1 | -10.6 | 3 | 13 |
| ND<1.5 U | 12.1 | -10.6 | 3 | 14 |
| 0.36 J | 12.1 | -11.74 | 3 | 15 |
| ND<1.5 U | 12.1 | -10.6 | 3 | 16 |
| ND<1.5 U | 12.1 | -10.6 | 3 | 17 |
| ND<1.5 U | 12.1 | -10.6 | 3 | 18 |
| 0.42 J | 12.1 | -11.68 | 3 | 19 |
| ND<1 U | 12.1 | -11.1 | 3 | 20 |
| ND<0.1 U | 12.1 | -12 | 3 | 21 |
| ND<0.1 U | 12.1 | -12 | 3 | 22 |
| | | | | |
| 194 | 28.6 | 165.4 | 4 | 22 |
| 73.9 | 28.6 | 45.3 | 5 | 22 |
| 1.7 J | 28.6 | -26.9 | 5 | 23 |
| ND<1.5 U | 28.6 | -27.1 | 5 | 24 |
| ND<1.5 U | 28.6 | -27.1 | 5 | 25 |
| 1.9 J | 28.6 | -26.7 | 5 | 26 |
| 1.2 J | 28.6 | -27.4 | 5 | 27 |
| 1.1 J | 28.6 | -27.5 | 5 | 28 |
| ND<1.5 U | 28.6 | -27.1 | 5 | 29 |
| ND<1.5 U | 28.6 | -27.1 | 5 | 30 |
| ND<1.5 U | 28.6 | -27.1 | 5 | 31 |
| ND<1.5 U | 28.6 | -27.1 | 5 | 32 |
| ND<1.5 U | 28.6 | -27.1 | 5 | 33 |
| ND<1.5 U | 28.6 | -27.1 | 5 | 34 |
| ND<1.5 U | 28.6 | -27.1 | 5 | 35 |
| ND<1.5 U | 28.6 | -27.1 | 5 | 36 |
| 0.36 J | 28.6 | -28.24 | 5 | 37 |
| ND<1.5 U | 28.6 | -27.1 | 5 | 38 |
| ND<1.5 U | 28.6 | -27.1 | 5 | 39 |
| ND<1.5 U | 28.6 | -27.1 | 5 | 40 |
| 0.42 J | 28.6 | -28.18 | 5 | 41 |

| | | | | |
|---|---|---|---|---|
| ND<1 U | 28.6 | -27.6 | 5 | 42 |
| ND<0.1 U | 28.6 | -28.5 | 5 | 43 |
| ND<0.1 U | 28.6 | -28.5 | 5 | 44 |
| | | | | |
| 73.9 | 194 | -120.1 | 5 | 45 |
| 1.7 J | 194 | -192.3 | 5 | 46 |
| ND<1.5 U | 194 | -192.5 | 5 | 47 |
| ND<1.5 U | 194 | -192.5 | 5 | 48 |
| 1.9 J | 194 | -192.1 | 5 | 49 |
| 1.2 J | 194 | -192.8 | 5 | 50 |
| 1.1 J | 194 | -192.9 | 5 | 51 |
| ND<1.5 U | 194 | -192.5 | 5 | 52 |
| ND<1.5 U | 194 | -192.5 | 5 | 53 |
| ND<1.5 U | 194 | -192.5 | 5 | 54 |
| ND<1.5 U | 194 | -192.5 | 5 | 55 |
| ND<1.5 U | 194 | -192.5 | 5 | 56 |
| ND<1.5 U | 194 | -192.5 | 5 | 57 |
| ND<1.5 U | 194 | -192.5 | 5 | 58 |
| ND<1.5 U | 194 | -192.5 | 5 | 59 |
| 0.36 J | 194 | -193.64 | 5 | 60 |
| ND<1.5 U | 194 | -192.5 | 5 | 61 |
| ND<1.5 U | 194 | -192.5 | 5 | 62 |
| ND<1.5 U | 194 | -192.5 | 5 | 63 |
| 0.42 J | 194 | -193.58 | 5 | 64 |
| ND<1 U | 194 | -193 | 5 | 65 |
| ND<0.1 U | 194 | -193.9 | 5 | 66 |
| ND<0.1 U | 194 | -193.9 | 5 | 67 |
| | | | | |
| 1.7 J | 73.9 | -72.2 | 5 | 68 |
| ND<1.5 U | 73.9 | -72.4 | 5 | 69 |
| ND<1.5 U | 73.9 | -72.4 | 5 | 70 |
| 1.9 J | 73.9 | -72 | 5 | 71 |
| 1.2 J | 73.9 | -72.7 | 5 | 72 |
| 1.1 J | 73.9 | -72.8 | 5 | 73 |
| ND<1.5 U | 73.9 | -72.4 | 5 | 74 |
| ND<1.5 U | 73.9 | -72.4 | 5 | 75 |
| ND<1.5 U | 73.9 | -72.4 | 5 | 76 |
| ND<1.5 U | 73.9 | -72.4 | 5 | 77 |
| ND<1.5 U | 73.9 | -72.4 | 5 | 78 |
| ND<1.5 U | 73.9 | -72.4 | 5 | 79 |
| ND<1.5 U | 73.9 | -72.4 | 5 | 80 |
| ND<1.5 U | 73.9 | -72.4 | 5 | 81 |
| 0.36 J | 73.9 | -73.54 | 5 | 82 |
| ND<1.5 U | 73.9 | -72.4 | 5 | 83 |
| ND<1.5 U | 73.9 | -72.4 | 5 | 84 |
| ND<1.5 U | 73.9 | -72.4 | 5 | 85 |
| 0.42 J | 73.9 | -73.48 | 5 | 86 |
| ND<1 U | 73.9 | -72.9 | 5 | 87 |
| ND<0.1 U | 73.9 | -73.8 | 5 | 88 |
| ND<0.1 U | 73.9 | -73.8 | 5 | 89 |
| | | | | |
| ND<1.5 U | 1.7 J | -0.2 | 5 | 90 |
| ND<1.5 U | 1.7 J | -0.2 | 5 | 91 |
| 1.9 J | 1.7 J | 0.2 | 6 | 91 |
| 1.2 J | 1.7 J | -0.5 | 6 | 92 |
| 1.1 J | 1.7 J | -0.6 | 6 | 93 |
| ND<1.5 U | 1.7 J | -0.2 | 6 | 94 |

| | | | | |
|---|---|---|---|---|
| ND<1.5 U | 1.7 J | -0.2 | 6 | 95 |
| ND<1.5 U | 1.7 J | -0.2 | 6 | 96 |
| ND<1.5 U | 1.7 J | -0.2 | 6 | 97 |
| ND<1.5 U | 1.7 J | -0.2 | 6 | 98 |
| ND<1.5 U | 1.7 J | -0.2 | 6 | 99 |
| ND<1.5 U | 1.7 J | -0.2 | 6 | 100 |
| ND<1.5 U | 1.7 J | -0.2 | 6 | 101 |
| 0.36 J | 1.7 J | -1.34 | 6 | 102 |
| ND<1.5 U | 1.7 J | -0.2 | 6 | 103 |
| ND<1.5 U | 1.7 J | -0.2 | 6 | 104 |
| ND<1.5 U | 1.7 J | -0.2 | 6 | 105 |
| 0.42 J | 1.7 J | -1.28 | 6 | 106 |
| ND<1 U | 1.7 J | -0.7 | 6 | 107 |
| ND<0.1 U | 1.7 J | -1.6 | 6 | 108 |
| ND<0.1 U | 1.7 J | -1.6 | 6 | 109 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 6 | 109 |
| 1.9 J | ND<1.5 U | 0.4 | 7 | 109 |
| 1.2 J | ND<1.5 U | -0.3 | 7 | 110 |
| 1.1 J | ND<1.5 U | -0.4 | 7 | 111 |
| ND<1.5 U | ND<1.5 U | 0 | 7 | 111 |
| ND<1.5 U | ND<1.5 U | 0 | 7 | 111 |
| ND<1.5 U | ND<1.5 U | 0 | 7 | 111 |
| ND<1.5 U | ND<1.5 U | 0 | 7 | 111 |
| ND<1.5 U | ND<1.5 U | 0 | 7 | 111 |
| ND<1.5 U | ND<1.5 U | 0 | 7 | 111 |
| ND<1.5 U | ND<1.5 U | 0 | 7 | 111 |
| ND<1.5 U | ND<1.5 U | 0 | 7 | 111 |
| 0.36 J | ND<1.5 U | -1.14 | 7 | 112 |
| ND<1.5 U | ND<1.5 U | 0 | 7 | 112 |
| ND<1.5 U | ND<1.5 U | 0 | 7 | 112 |
| ND<1.5 U | ND<1.5 U | 0 | 7 | 112 |
| 0.42 J | ND<1.5 U | -1.08 | 7 | 113 |
| ND<1 U | ND<1.5 U | -0.5 | 7 | 114 |
| ND<0.1 U | ND<1.5 U | -1.4 | 7 | 115 |
| ND<0.1 U | ND<1.5 U | -1.4 | 7 | 116 |
| | | | | |
| 1.9 J | ND<1.5 U | 0.4 | 8 | 116 |
| 1.2 J | ND<1.5 U | -0.3 | 8 | 117 |
| 1.1 J | ND<1.5 U | -0.4 | 8 | 118 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 118 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 118 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 118 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 118 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 118 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 118 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 118 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 118 |
| 0.36 J | ND<1.5 U | -1.14 | 8 | 119 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 119 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 119 |
| ND<1.5 U | ND<1.5 U | 0 | 8 | 119 |
| 0.42 J | ND<1.5 U | -1.08 | 8 | 120 |
| ND<1 U | ND<1.5 U | -0.5 | 8 | 121 |
| ND<0.1 U | ND<1.5 U | -1.4 | 8 | 122 |
| ND<0.1 U | ND<1.5 U | -1.4 | 8 | 123 |

| | | | | |
|---|---|---|---|---|
| 1.2 J | 1.9 J | -0.7 | 8 | 124 |
| 1.1 J | 1.9 J | -0.8 | 8 | 125 |
| ND<1.5 U | 1.9 J | -0.4 | 8 | 126 |
| ND<1.5 U | 1.9 J | -0.4 | 8 | 127 |
| ND<1.5 U | 1.9 J | -0.4 | 8 | 128 |
| ND<1.5 U | 1.9 J | -0.4 | 8 | 129 |
| ND<1.5 U | 1.9 J | -0.4 | 8 | 130 |
| ND<1.5 U | 1.9 J | -0.4 | 8 | 131 |
| ND<1.5 U | 1.9 J | -0.4 | 8 | 132 |
| ND<1.5 U | 1.9 J | -0.4 | 8 | 133 |
| 0.36 J | 1.9 J | -1.54 | 8 | 134 |
| ND<1.5 U | 1.9 J | -0.4 | 8 | 135 |
| ND<1.5 U | 1.9 J | -0.4 | 8 | 136 |
| ND<1.5 U | 1.9 J | -0.4 | 8 | 137 |
| 0.42 J | 1.9 J | -1.48 | 8 | 138 |
| ND<1 U | 1.9 J | -0.9 | 8 | 139 |
| ND<0.1 U | 1.9 J | -1.8 | 8 | 140 |
| ND<0.1 U | 1.9 J | -1.8 | 8 | 141 |
| | | | | |
| 1.1 J | 1.2 J | -0.1 | 8 | 142 |
| ND<1.5 U | 1.2 J | 0.3 | 9 | 142 |
| ND<1.5 U | 1.2 J | 0.3 | 10 | 142 |
| ND<1.5 U | 1.2 J | 0.3 | 11 | 142 |
| ND<1.5 U | 1.2 J | 0.3 | 12 | 142 |
| ND<1.5 U | 1.2 J | 0.3 | 13 | 142 |
| ND<1.5 U | 1.2 J | 0.3 | 14 | 142 |
| ND<1.5 U | 1.2 J | 0.3 | 15 | 142 |
| ND<1.5 U | 1.2 J | 0.3 | 16 | 142 |
| 0.36 J | 1.2 J | -0.84 | 16 | 143 |
| ND<1.5 U | 1.2 J | 0.3 | 17 | 143 |
| ND<1.5 U | 1.2 J | 0.3 | 18 | 143 |
| ND<1.5 U | 1.2 J | 0.3 | 19 | 143 |
| 0.42 J | 1.2 J | -0.78 | 19 | 144 |
| ND<1 U | 1.2 J | -0.2 | 19 | 145 |
| ND<0.1 U | 1.2 J | -1.1 | 19 | 146 |
| ND<0.1 U | 1.2 J | -1.1 | 19 | 147 |
| | | | | |
| ND<1.5 U | 1.1 J | 0.4 | 20 | 147 |
| ND<1.5 U | 1.1 J | 0.4 | 21 | 147 |
| ND<1.5 U | 1.1 J | 0.4 | 22 | 147 |
| ND<1.5 U | 1.1 J | 0.4 | 23 | 147 |
| ND<1.5 U | 1.1 J | 0.4 | 24 | 147 |
| ND<1.5 U | 1.1 J | 0.4 | 25 | 147 |
| ND<1.5 U | 1.1 J | 0.4 | 26 | 147 |
| ND<1.5 U | 1.1 J | 0.4 | 27 | 147 |
| 0.36 J | 1.1 J | -0.74 | 27 | 148 |
| ND<1.5 U | 1.1 J | 0.4 | 28 | 148 |
| ND<1.5 U | 1.1 J | 0.4 | 29 | 148 |
| ND<1.5 U | 1.1 J | 0.4 | 30 | 148 |
| 0.42 J | 1.1 J | -0.68 | 30 | 149 |
| ND<1 U | 1.1 J | -0.1 | 30 | 150 |
| ND<0.1 U | 1.1 J | -1 | 30 | 151 |
| ND<0.1 U | 1.1 J | -1 | 30 | 152 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 30 | 152 |
| ND<1.5 U | ND<1.5 U | 0 | 30 | 152 |
| ND<1.5 U | ND<1.5 U | 0 | 30 | 152 |

| | | | | |
|---|---|---|---|---|
| ND<1.5 U | ND<1.5 U | 0 | 30 | 152 |
| ND<1.5 U | ND<1.5 U | 0 | 30 | 152 |
| ND<1.5 U | ND<1.5 U | 0 | 30 | 152 |
| ND<1.5 U | ND<1.5 U | 0 | 30 | 152 |
| 0.36 J | ND<1.5 U | -1.14 | 30 | 153 |
| ND<1.5 U | ND<1.5 U | 0 | 30 | 153 |
| ND<1.5 U | ND<1.5 U | 0 | 30 | 153 |
| ND<1.5 U | ND<1.5 U | 0 | 30 | 153 |
| 0.42 J | ND<1.5 U | -1.08 | 30 | 154 |
| ND<1 U | ND<1.5 U | -0.5 | 30 | 155 |
| ND<0.1 U | ND<1.5 U | -1.4 | 30 | 156 |
| ND<0.1 U | ND<1.5 U | -1.4 | 30 | 157 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 30 | 157 |
| ND<1.5 U | ND<1.5 U | 0 | 30 | 157 |
| ND<1.5 U | ND<1.5 U | 0 | 30 | 157 |
| ND<1.5 U | ND<1.5 U | 0 | 30 | 157 |
| ND<1.5 U | ND<1.5 U | 0 | 30 | 157 |
| ND<1.5 U | ND<1.5 U | 0 | 30 | 157 |
| 0.36 J | ND<1.5 U | -1.14 | 30 | 158 |
| ND<1.5 U | ND<1.5 U | 0 | 30 | 158 |
| ND<1.5 U | ND<1.5 U | 0 | 30 | 158 |
| ND<1.5 U | ND<1.5 U | 0 | 30 | 158 |
| 0.42 J | ND<1.5 U | -1.08 | 30 | 159 |
| ND<1 U | ND<1.5 U | -0.5 | 30 | 160 |
| ND<0.1 U | ND<1.5 U | -1.4 | 30 | 161 |
| ND<0.1 U | ND<1.5 U | -1.4 | 30 | 162 |
| | | | | |
| ND<1.5 U | ND<1.5 U | Same Date | 30 | 162 |
| ND<1.5 U | ND<1.5 U | 0 | 30 | 162 |
| ND<1.5 U | ND<1.5 U | 0 | 30 | 162 |
| ND<1.5 U | ND<1.5 U | 0 | 30 | 162 |
| ND<1.5 U | ND<1.5 U | 0 | 30 | 162 |
| 0.36 J | ND<1.5 U | -1.14 | 30 | 163 |
| ND<1.5 U | ND<1.5 U | 0 | 30 | 163 |
| ND<1.5 U | ND<1.5 U | 0 | 30 | 163 |
| ND<1.5 U | ND<1.5 U | 0 | 30 | 163 |
| 0.42 J | ND<1.5 U | -1.08 | 30 | 164 |
| ND<1 U | ND<1.5 U | -0.5 | 30 | 165 |
| ND<0.1 U | ND<1.5 U | -1.4 | 30 | 166 |
| ND<0.1 U | ND<1.5 U | -1.4 | 30 | 167 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 30 | 167 |
| ND<1.5 U | ND<1.5 U | 0 | 30 | 167 |
| ND<1.5 U | ND<1.5 U | 0 | 30 | 167 |
| ND<1.5 U | ND<1.5 U | 0 | 30 | 167 |
| 0.36 J | ND<1.5 U | -1.14 | 30 | 168 |
| ND<1.5 U | ND<1.5 U | 0 | 30 | 168 |
| ND<1.5 U | ND<1.5 U | 0 | 30 | 168 |
| ND<1.5 U | ND<1.5 U | 0 | 30 | 168 |
| 0.42 J | ND<1.5 U | -1.08 | 30 | 169 |
| ND<1 U | ND<1.5 U | -0.5 | 30 | 170 |
| ND<0.1 U | ND<1.5 U | -1.4 | 30 | 171 |
| ND<0.1 U | ND<1.5 U | -1.4 | 30 | 172 |
| | | | | |
| ND<1.5 U | ND<1.5 U | Same Date | 30 | 172 |
| ND<1.5 U | ND<1.5 U | 0 | 30 | 172 |

| | | | | |
|---|---|---|---|---|
| ND<1.5 U | ND<1.5 U | 0 | 30 | 172 |
| 0.36 J | ND<1.5 U | -1.14 | 30 | 173 |
| ND<1.5 U | ND<1.5 U | 0 | 30 | 173 |
| ND<1.5 U | ND<1.5 U | 0 | 30 | 173 |
| ND<1.5 U | ND<1.5 U | 0 | 30 | 173 |
| 0.42 J | ND<1.5 U | -1.08 | 30 | 174 |
| ND<1 U | ND<1.5 U | -0.5 | 30 | 175 |
| ND<0.1 U | ND<1.5 U | -1.4 | 30 | 176 |
| ND<0.1 U | ND<1.5 U | -1.4 | 30 | 177 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 30 | 177 |
| ND<1.5 U | ND<1.5 U | 0 | 30 | 177 |
| 0.36 J | ND<1.5 U | -1.14 | 30 | 178 |
| ND<1.5 U | ND<1.5 U | 0 | 30 | 178 |
| ND<1.5 U | ND<1.5 U | 0 | 30 | 178 |
| ND<1.5 U | ND<1.5 U | 0 | 30 | 178 |
| 0.42 J | ND<1.5 U | -1.08 | 30 | 179 |
| ND<1 U | ND<1.5 U | -0.5 | 30 | 180 |
| ND<0.1 U | ND<1.5 U | -1.4 | 30 | 181 |
| ND<0.1 U | ND<1.5 U | -1.4 | 30 | 182 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 30 | 182 |
| 0.36 J | ND<1.5 U | -1.14 | 30 | 183 |
| ND<1.5 U | ND<1.5 U | 0 | 30 | 183 |
| ND<1.5 U | ND<1.5 U | 0 | 30 | 183 |
| ND<1.5 U | ND<1.5 U | 0 | 30 | 183 |
| 0.42 J | ND<1.5 U | -1.08 | 30 | 184 |
| ND<1 U | ND<1.5 U | -0.5 | 30 | 185 |
| ND<0.1 U | ND<1.5 U | -1.4 | 30 | 186 |
| ND<0.1 U | ND<1.5 U | -1.4 | 30 | 187 |
| | | | | |
| 0.36 J | ND<1.5 U | -1.14 | 30 | 188 |
| ND<1.5 U | ND<1.5 U | 0 | 30 | 188 |
| ND<1.5 U | ND<1.5 U | 0 | 30 | 188 |
| ND<1.5 U | ND<1.5 U | 0 | 30 | 188 |
| 0.42 J | ND<1.5 U | -1.08 | 30 | 189 |
| ND<1 U | ND<1.5 U | -0.5 | 30 | 190 |
| ND<0.1 U | ND<1.5 U | -1.4 | 30 | 191 |
| ND<0.1 U | ND<1.5 U | -1.4 | 30 | 192 |
| | | | | |
| ND<1.5 U | 0.36 J | 1.14 | 31 | 192 |
| ND<1.5 U | 0.36 J | 1.14 | 32 | 192 |
| ND<1.5 U | 0.36 J | 1.14 | 33 | 192 |
| 0.42 J | 0.36 J | 0.06 | 34 | 192 |
| ND<1 U | 0.36 J | 0.64 | 35 | 192 |
| ND<0.1 U | 0.36 J | -0.26 | 35 | 193 |
| ND<0.1 U | 0.36 J | -0.26 | 35 | 194 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 35 | 194 |
| ND<1.5 U | ND<1.5 U | 0 | 35 | 194 |
| 0.42 J | ND<1.5 U | -1.08 | 35 | 195 |
| ND<1 U | ND<1.5 U | -0.5 | 35 | 196 |
| ND<0.1 U | ND<1.5 U | -1.4 | 35 | 197 |
| ND<0.1 U | ND<1.5 U | -1.4 | 35 | 198 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 35 | 198 |
| 0.42 J | ND<1.5 U | -1.08 | 35 | 199 |

| | | | | |
|---|---|---|---|---|
| ND<1 U | ND<1.5 U | -0.5 | 35 | 200 |
| ND<0.1 U | ND<1.5 U | -1.4 | 35 | 201 |
| ND<0.1 U | ND<1.5 U | -1.4 | 35 | 202 |
| | | | | |
| 0.42 J | ND<1.5 U | -1.08 | 35 | 203 |
| ND<1 U | ND<1.5 U | -0.5 | 35 | 204 |
| ND<0.1 U | ND<1.5 U | -1.4 | 35 | 205 |
| ND<0.1 U | ND<1.5 U | -1.4 | 35 | 206 |
| | | | | |
| ND<1 U | 0.42 J | 0.58 | 36 | 206 |
| ND<0.1 U | 0.42 J | -0.32 | 36 | 207 |
| ND<0.1 U | 0.42 J | -0.32 | 36 | 208 |
| | | | | |
| ND<0.1 U | ND<1 U | -0.9 | 36 | 209 |
| ND<0.1 U | ND<1 U | -0.9 | 36 | 210 |
| | | | | |
| ND<0.1 U | ND<0.1 U | 0 | 36 | 210 |

S Statistic = 36 - 210 = -174

| Tied Group | Value | Members |
|---|---|---|
| 1 | 1.5 | 13 |
| 2 | 0.1 | 2 |

| Time Period | Observations |
|---|---|
| 2/1/2017 | 1 |
| 3/1/2017 | 1 |
| 4/1/2017 | 1 |
| 5/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 3/1/2022 | 1 |
| 3/1/2023 | 1 |
| 3/1/2024 | 1 |

There are 2 time periods with multiple data

A = 4854
B = 36
C = 1716
D = 0
E = 158

F = 4
a = 37050
b = 140400
c = 1300
Group Variance = 1787.15
Z-Score = -4.09228
Comparison Level at 95% confidence level = 1.65463 (upward trend)
-4.09228 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RW18-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 63.8 | 70.3 | -6.5 | 0 | 1 |
| 119 | 70.3 | 48.7 | 1 | 1 |
| 92 | 70.3 | 21.7 | 2 | 1 |
| 65.1 | 70.3 | -5.2 | 2 | 2 |
| 61.7 | 70.3 | -8.6 | 2 | 3 |
| 74.4 | 70.3 | 4.1 | 3 | 3 |
| 72.2 | 70.3 | 1.9 | 4 | 3 |
| 43.7 | 70.3 | -26.6 | 4 | 4 |
| 66.6 | 70.3 | -3.7 | 4 | 5 |
| 51.5 | 70.3 | -18.8 | 4 | 6 |
| 63.5 | 70.3 | -6.8 | 4 | 7 |
| 55.8 | 70.3 | -14.5 | 4 | 8 |
| 35.1 | 70.3 | -35.2 | 4 | 9 |
| 14.5 | 70.3 | -55.8 | 4 | 10 |
| 82.9 | 70.3 | 12.6 | 5 | 10 |
| 80.3 | 70.3 | 10 | 6 | 10 |
| 38 | 70.3 | -32.3 | 6 | 11 |
| 38 | 70.3 | -32.3 | 6 | 12 |
| 50.4 | 70.3 | -19.9 | 6 | 13 |
| 87.6 | 70.3 | 17.3 | 7 | 13 |
| 36.8 | 70.3 | -33.5 | 7 | 14 |
| 16 | 70.3 | -54.3 | 7 | 15 |
| 43.1 | 70.3 | -27.2 | 7 | 16 |
| 42.1 | 70.3 | -28.2 | 7 | 17 |
| ND<1.5 U | 70.3 | -68.8 | 7 | 18 |
| 31.7 | 70.3 | -38.6 | 7 | 19 |
| 12.46 | 70.3 | -57.84 | 7 | 20 |
| 7.655 | 70.3 | -62.645 | 7 | 21 |
| | | | | |
| 119 | 63.8 | 55.2 | 8 | 21 |
| 92 | 63.8 | 28.2 | 9 | 21 |
| 65.1 | 63.8 | 1.3 | 10 | 21 |
| 61.7 | 63.8 | -2.1 | 10 | 22 |
| 74.4 | 63.8 | 10.6 | 11 | 22 |
| 72.2 | 63.8 | 8.4 | 12 | 22 |
| 43.7 | 63.8 | -20.1 | 12 | 23 |
| 66.6 | 63.8 | 2.8 | 13 | 23 |
| 51.5 | 63.8 | -12.3 | 13 | 24 |
| 63.5 | 63.8 | -0.3 | 13 | 25 |
| 55.8 | 63.8 | -8 | 13 | 26 |
| 35.1 | 63.8 | -28.7 | 13 | 27 |
| 14.5 | 63.8 | -49.3 | 13 | 28 |
| 82.9 | 63.8 | 19.1 | 14 | 28 |
| 80.3 | 63.8 | 16.5 | 15 | 28 |
| 38 | 63.8 | -25.8 | 15 | 29 |
| 38 | 63.8 | -25.8 | 15 | 30 |
| 50.4 | 63.8 | -13.4 | 15 | 31 |

| | | | | |
|---|---|---|---|---|
| 87.6 | 63.8 | 23.8 | 16 | 31 |
| 36.8 | 63.8 | -27 | 16 | 32 |
| 16 | 63.8 | -47.8 | 16 | 33 |
| 43.1 | 63.8 | -20.7 | 16 | 34 |
| 42.1 | 63.8 | -21.7 | 16 | 35 |
| ND<1.5 U | 63.8 | -62.3 | 16 | 36 |
| 31.7 | 63.8 | -32.1 | 16 | 37 |
| 12.46 | 63.8 | -51.34 | 16 | 38 |
| 7.655 | 63.8 | -56.145 | 16 | 39 |
| | | | | |
| 92 | 119 | -27 | 16 | 40 |
| 65.1 | 119 | -53.9 | 16 | 41 |
| 61.7 | 119 | -57.3 | 16 | 42 |
| 74.4 | 119 | -44.6 | 16 | 43 |
| 72.2 | 119 | -46.8 | 16 | 44 |
| 43.7 | 119 | -75.3 | 16 | 45 |
| 66.6 | 119 | -52.4 | 16 | 46 |
| 51.5 | 119 | -67.5 | 16 | 47 |
| 63.5 | 119 | -55.5 | 16 | 48 |
| 55.8 | 119 | -63.2 | 16 | 49 |
| 35.1 | 119 | -83.9 | 16 | 50 |
| 14.5 | 119 | -104.5 | 16 | 51 |
| 82.9 | 119 | -36.1 | 16 | 52 |
| 80.3 | 119 | -38.7 | 16 | 53 |
| 38 | 119 | -81 | 16 | 54 |
| 38 | 119 | -81 | 16 | 55 |
| 50.4 | 119 | -68.6 | 16 | 56 |
| 87.6 | 119 | -31.4 | 16 | 57 |
| 36.8 | 119 | -82.2 | 16 | 58 |
| 16 | 119 | -103 | 16 | 59 |
| 43.1 | 119 | -75.9 | 16 | 60 |
| 42.1 | 119 | -76.9 | 16 | 61 |
| ND<1.5 U | 119 | -117.5 | 16 | 62 |
| 31.7 | 119 | -87.3 | 16 | 63 |
| 12.46 | 119 | -106.54 | 16 | 64 |
| 7.655 | 119 | -111.345 | 16 | 65 |
| | | | | |
| 65.1 | 92 | -26.9 | 16 | 66 |
| 61.7 | 92 | -30.3 | 16 | 67 |
| 74.4 | 92 | -17.6 | 16 | 68 |
| 72.2 | 92 | -19.8 | 16 | 69 |
| 43.7 | 92 | -48.3 | 16 | 70 |
| 66.6 | 92 | -25.4 | 16 | 71 |
| 51.5 | 92 | -40.5 | 16 | 72 |
| 63.5 | 92 | -28.5 | 16 | 73 |
| 55.8 | 92 | -36.2 | 16 | 74 |
| 35.1 | 92 | -56.9 | 16 | 75 |
| 14.5 | 92 | -77.5 | 16 | 76 |
| 82.9 | 92 | -9.1 | 16 | 77 |
| 80.3 | 92 | -11.7 | 16 | 78 |
| 38 | 92 | -54 | 16 | 79 |
| 38 | 92 | -54 | 16 | 80 |
| 50.4 | 92 | -41.6 | 16 | 81 |
| 87.6 | 92 | -4.4 | 16 | 82 |
| 36.8 | 92 | -55.2 | 16 | 83 |
| 16 | 92 | -76 | 16 | 84 |
| 43.1 | 92 | -48.9 | 16 | 85 |

| | | | | |
|---|---|---|---|---|
| 42.1 | 92 | -49.9 | 16 | 86 |
| ND<1.5 U | 92 | -90.5 | 16 | 87 |
| 31.7 | 92 | -60.3 | 16 | 88 |
| 12.46 | 92 | -79.54 | 16 | 89 |
| 7.655 | 92 | -84.345 | 16 | 90 |
| | | | | |
| 61.7 | 65.1 | -3.4 | 16 | 91 |
| 74.4 | 65.1 | 9.3 | 17 | 91 |
| 72.2 | 65.1 | 7.1 | 18 | 91 |
| 43.7 | 65.1 | -21.4 | 18 | 92 |
| 66.6 | 65.1 | 1.5 | 19 | 92 |
| 51.5 | 65.1 | -13.6 | 19 | 93 |
| 63.5 | 65.1 | -1.6 | 19 | 94 |
| 55.8 | 65.1 | -9.3 | 19 | 95 |
| 35.1 | 65.1 | -30 | 19 | 96 |
| 14.5 | 65.1 | -50.6 | 19 | 97 |
| 82.9 | 65.1 | 17.8 | 20 | 97 |
| 80.3 | 65.1 | 15.2 | 21 | 97 |
| 38 | 65.1 | -27.1 | 21 | 98 |
| 38 | 65.1 | -27.1 | 21 | 99 |
| 50.4 | 65.1 | -14.7 | 21 | 100 |
| 87.6 | 65.1 | 22.5 | 22 | 100 |
| 36.8 | 65.1 | -28.3 | 22 | 101 |
| 16 | 65.1 | -49.1 | 22 | 102 |
| 43.1 | 65.1 | -22 | 22 | 103 |
| 42.1 | 65.1 | -23 | 22 | 104 |
| ND<1.5 U | 65.1 | -63.6 | 22 | 105 |
| 31.7 | 65.1 | -33.4 | 22 | 106 |
| 12.46 | 65.1 | -52.64 | 22 | 107 |
| 7.655 | 65.1 | -57.445 | 22 | 108 |
| | | | | |
| 74.4 | 61.7 | 12.7 | 23 | 108 |
| 72.2 | 61.7 | 10.5 | 24 | 108 |
| 43.7 | 61.7 | -18 | 24 | 109 |
| 66.6 | 61.7 | 4.9 | 25 | 109 |
| 51.5 | 61.7 | -10.2 | 25 | 110 |
| 63.5 | 61.7 | 1.8 | 26 | 110 |
| 55.8 | 61.7 | -5.9 | 26 | 111 |
| 35.1 | 61.7 | -26.6 | 26 | 112 |
| 14.5 | 61.7 | -47.2 | 26 | 113 |
| 82.9 | 61.7 | 21.2 | 27 | 113 |
| 80.3 | 61.7 | 18.6 | 28 | 113 |
| 38 | 61.7 | -23.7 | 28 | 114 |
| 38 | 61.7 | -23.7 | 28 | 115 |
| 50.4 | 61.7 | -11.3 | 28 | 116 |
| 87.6 | 61.7 | 25.9 | 29 | 116 |
| 36.8 | 61.7 | -24.9 | 29 | 117 |
| 16 | 61.7 | -45.7 | 29 | 118 |
| 43.1 | 61.7 | -18.6 | 29 | 119 |
| 42.1 | 61.7 | -19.6 | 29 | 120 |
| ND<1.5 U | 61.7 | -60.2 | 29 | 121 |
| 31.7 | 61.7 | -30 | 29 | 122 |
| 12.46 | 61.7 | -49.24 | 29 | 123 |
| 7.655 | 61.7 | -54.045 | 29 | 124 |
| | | | | |
| 72.2 | 74.4 | -2.2 | 29 | 125 |
| 43.7 | 74.4 | -30.7 | 29 | 126 |

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|---|---|---|---|---|
| 66.6 | 74.4 | -7.8 | 29 | 127 |
| 51.5 | 74.4 | -22.9 | 29 | 128 |
| 63.5 | 74.4 | -10.9 | 29 | 129 |
| 55.8 | 74.4 | -18.6 | 29 | 130 |
| 35.1 | 74.4 | -39.3 | 29 | 131 |
| 14.5 | 74.4 | -59.9 | 29 | 132 |
| 82.9 | 74.4 | 8.5 | 30 | 132 |
| 80.3 | 74.4 | 5.9 | 31 | 132 |
| 38 | 74.4 | -36.4 | 31 | 133 |
| 38 | 74.4 | -36.4 | 31 | 134 |
| 50.4 | 74.4 | -24 | 31 | 135 |
| 87.6 | 74.4 | 13.2 | 32 | 135 |
| 36.8 | 74.4 | -37.6 | 32 | 136 |
| 16 | 74.4 | -58.4 | 32 | 137 |
| 43.1 | 74.4 | -31.3 | 32 | 138 |
| 42.1 | 74.4 | -32.3 | 32 | 139 |
| ND<1.5 U | 74.4 | -72.9 | 32 | 140 |
| 31.7 | 74.4 | -42.7 | 32 | 141 |
| 12.46 | 74.4 | -61.94 | 32 | 142 |
| 7.655 | 74.4 | -66.745 | 32 | 143 |
| | | | | |
| 43.7 | 72.2 | -28.5 | 32 | 144 |
| 66.6 | 72.2 | -5.6 | 32 | 145 |
| 51.5 | 72.2 | -20.7 | 32 | 146 |
| 63.5 | 72.2 | -8.7 | 32 | 147 |
| 55.8 | 72.2 | -16.4 | 32 | 148 |
| 35.1 | 72.2 | -37.1 | 32 | 149 |
| 14.5 | 72.2 | -57.7 | 32 | 150 |
| 82.9 | 72.2 | 10.7 | 33 | 150 |
| 80.3 | 72.2 | 8.1 | 34 | 150 |
| 38 | 72.2 | -34.2 | 34 | 151 |
| 38 | 72.2 | -34.2 | 34 | 152 |
| 50.4 | 72.2 | -21.8 | 34 | 153 |
| 87.6 | 72.2 | 15.4 | 35 | 153 |
| 36.8 | 72.2 | -35.4 | 35 | 154 |
| 16 | 72.2 | -56.2 | 35 | 155 |
| 43.1 | 72.2 | -29.1 | 35 | 156 |
| 42.1 | 72.2 | -30.1 | 35 | 157 |
| ND<1.5 U | 72.2 | -70.7 | 35 | 158 |
| 31.7 | 72.2 | -40.5 | 35 | 159 |
| 12.46 | 72.2 | -59.74 | 35 | 160 |
| 7.655 | 72.2 | -64.545 | 35 | 161 |
| | | | | |
| 66.6 | 43.7 | 22.9 | 36 | 161 |
| 51.5 | 43.7 | 7.8 | 37 | 161 |
| 63.5 | 43.7 | 19.8 | 38 | 161 |
| 55.8 | 43.7 | 12.1 | 39 | 161 |
| 35.1 | 43.7 | -8.6 | 39 | 162 |
| 14.5 | 43.7 | -29.2 | 39 | 163 |
| 82.9 | 43.7 | 39.2 | 40 | 163 |
| 80.3 | 43.7 | 36.6 | 41 | 163 |
| 38 | 43.7 | -5.7 | 41 | 164 |
| 38 | 43.7 | -5.7 | 41 | 165 |
| 50.4 | 43.7 | 6.7 | 42 | 165 |
| 87.6 | 43.7 | 43.9 | 43 | 165 |
| 36.8 | 43.7 | -6.9 | 43 | 166 |
| 16 | 43.7 | -27.7 | 43 | 167 |

| | | | | |
|---|---|---|---|---|
| 43.1 | 43.7 | -0.6 | 43 | 168 |
| 42.1 | 43.7 | -1.6 | 43 | 169 |
| ND<1.5 U | 43.7 | -42.2 | 43 | 170 |
| 31.7 | 43.7 | -12 | 43 | 171 |
| 12.46 | 43.7 | -31.24 | 43 | 172 |
| 7.655 | 43.7 | -36.045 | 43 | 173 |
| | | | | |
| 51.5 | 66.6 | -15.1 | 43 | 174 |
| 63.5 | 66.6 | -3.1 | 43 | 175 |
| 55.8 | 66.6 | -10.8 | 43 | 176 |
| 35.1 | 66.6 | -31.5 | 43 | 177 |
| 14.5 | 66.6 | -52.1 | 43 | 178 |
| 82.9 | 66.6 | 16.3 | 44 | 178 |
| 80.3 | 66.6 | 13.7 | 45 | 178 |
| 38 | 66.6 | -28.6 | 45 | 179 |
| 38 | 66.6 | -28.6 | 45 | 180 |
| 50.4 | 66.6 | -16.2 | 45 | 181 |
| 87.6 | 66.6 | 21 | 46 | 181 |
| 36.8 | 66.6 | -29.8 | 46 | 182 |
| 16 | 66.6 | -50.6 | 46 | 183 |
| 43.1 | 66.6 | -23.5 | 46 | 184 |
| 42.1 | 66.6 | -24.5 | 46 | 185 |
| ND<1.5 U | 66.6 | -65.1 | 46 | 186 |
| 31.7 | 66.6 | -34.9 | 46 | 187 |
| 12.46 | 66.6 | -54.14 | 46 | 188 |
| 7.655 | 66.6 | -58.945 | 46 | 189 |
| | | | | |
| 63.5 | 51.5 | 12 | 47 | 189 |
| 55.8 | 51.5 | 4.3 | 48 | 189 |
| 35.1 | 51.5 | -16.4 | 48 | 190 |
| 14.5 | 51.5 | -37 | 48 | 191 |
| 82.9 | 51.5 | 31.4 | 49 | 191 |
| 80.3 | 51.5 | 28.8 | 50 | 191 |
| 38 | 51.5 | -13.5 | 50 | 192 |
| 38 | 51.5 | -13.5 | 50 | 193 |
| 50.4 | 51.5 | -1.1 | 50 | 194 |
| 87.6 | 51.5 | 36.1 | 51 | 194 |
| 36.8 | 51.5 | -14.7 | 51 | 195 |
| 16 | 51.5 | -35.5 | 51 | 196 |
| 43.1 | 51.5 | -8.4 | 51 | 197 |
| 42.1 | 51.5 | -9.4 | 51 | 198 |
| ND<1.5 U | 51.5 | -50 | 51 | 199 |
| 31.7 | 51.5 | -19.8 | 51 | 200 |
| 12.46 | 51.5 | -39.04 | 51 | 201 |
| 7.655 | 51.5 | -43.845 | 51 | 202 |
| | | | | |
| 55.8 | 63.5 | -7.7 | 51 | 203 |
| 35.1 | 63.5 | -28.4 | 51 | 204 |
| 14.5 | 63.5 | -49 | 51 | 205 |
| 82.9 | 63.5 | 19.4 | 52 | 205 |
| 80.3 | 63.5 | 16.8 | 53 | 205 |
| 38 | 63.5 | -25.5 | 53 | 206 |
| 38 | 63.5 | -25.5 | 53 | 207 |
| 50.4 | 63.5 | -13.1 | 53 | 208 |
| 87.6 | 63.5 | 24.1 | 54 | 208 |
| 36.8 | 63.5 | -26.7 | 54 | 209 |
| 16 | 63.5 | -47.5 | 54 | 210 |

| | | | | |
|---|---|---|---|---|
| 43.1 | 63.5 | -20.4 | 54 | 211 |
| 42.1 | 63.5 | -21.4 | 54 | 212 |
| ND<1.5 U | 63.5 | -62 | 54 | 213 |
| 31.7 | 63.5 | -31.8 | 54 | 214 |
| 12.46 | 63.5 | -51.04 | 54 | 215 |
| 7.655 | 63.5 | -55.845 | 54 | 216 |
| | | | | |
| 35.1 | 55.8 | -20.7 | 54 | 217 |
| 14.5 | 55.8 | -41.3 | 54 | 218 |
| 82.9 | 55.8 | 27.1 | 55 | 218 |
| 80.3 | 55.8 | 24.5 | 56 | 218 |
| 38 | 55.8 | -17.8 | 56 | 219 |
| 38 | 55.8 | -17.8 | 56 | 220 |
| 50.4 | 55.8 | -5.4 | 56 | 221 |
| 87.6 | 55.8 | 31.8 | 57 | 221 |
| 36.8 | 55.8 | -19 | 57 | 222 |
| 16 | 55.8 | -39.8 | 57 | 223 |
| 43.1 | 55.8 | -12.7 | 57 | 224 |
| 42.1 | 55.8 | -13.7 | 57 | 225 |
| ND<1.5 U | 55.8 | -54.3 | 57 | 226 |
| 31.7 | 55.8 | -24.1 | 57 | 227 |
| 12.46 | 55.8 | -43.34 | 57 | 228 |
| 7.655 | 55.8 | -48.145 | 57 | 229 |
| | | | | |
| 14.5 | 35.1 | -20.6 | 57 | 230 |
| 82.9 | 35.1 | 47.8 | 58 | 230 |
| 80.3 | 35.1 | 45.2 | 59 | 230 |
| 38 | 35.1 | 2.9 | 60 | 230 |
| 38 | 35.1 | 2.9 | 61 | 230 |
| 50.4 | 35.1 | 15.3 | 62 | 230 |
| 87.6 | 35.1 | 52.5 | 63 | 230 |
| 36.8 | 35.1 | 1.7 | 64 | 230 |
| 16 | 35.1 | -19.1 | 64 | 231 |
| 43.1 | 35.1 | 8 | 65 | 231 |
| 42.1 | 35.1 | 7 | 66 | 231 |
| ND<1.5 U | 35.1 | -33.6 | 66 | 232 |
| 31.7 | 35.1 | -3.4 | 66 | 233 |
| 12.46 | 35.1 | -22.64 | 66 | 234 |
| 7.655 | 35.1 | -27.445 | 66 | 235 |
| | | | | |
| 82.9 | 14.5 | 68.4 | 67 | 235 |
| 80.3 | 14.5 | 65.8 | 68 | 235 |
| 38 | 14.5 | 23.5 | 69 | 235 |
| 38 | 14.5 | 23.5 | 70 | 235 |
| 50.4 | 14.5 | 35.9 | 71 | 235 |
| 87.6 | 14.5 | 73.1 | 72 | 235 |
| 36.8 | 14.5 | 22.3 | 73 | 235 |
| 16 | 14.5 | 1.5 | 74 | 235 |
| 43.1 | 14.5 | 28.6 | 75 | 235 |
| 42.1 | 14.5 | 27.6 | 76 | 235 |
| ND<1.5 U | 14.5 | -13 | 76 | 236 |
| 31.7 | 14.5 | 17.2 | 77 | 236 |
| 12.46 | 14.5 | -2.04 | 77 | 237 |
| 7.655 | 14.5 | -6.845 | 77 | 238 |
| | | | | |
| 80.3 | 82.9 | Same Date | 77 | 238 |
| 38 | 82.9 | -44.9 | 77 | 239 |

| | | | | |
|---|---|---|---|---|
| 38 | 82.9 | -44.9 | 77 | 240 |
| 50.4 | 82.9 | -32.5 | 77 | 241 |
| 87.6 | 82.9 | 4.7 | 78 | 241 |
| 36.8 | 82.9 | -46.1 | 78 | 242 |
| 16 | 82.9 | -66.9 | 78 | 243 |
| 43.1 | 82.9 | -39.8 | 78 | 244 |
| 42.1 | 82.9 | -40.8 | 78 | 245 |
| ND<1.5 U | 82.9 | -81.4 | 78 | 246 |
| 31.7 | 82.9 | -51.2 | 78 | 247 |
| 12.46 | 82.9 | -70.44 | 78 | 248 |
| 7.655 | 82.9 | -75.245 | 78 | 249 |
| | | | | |
| 38 | 80.3 | -42.3 | 78 | 250 |
| 38 | 80.3 | -42.3 | 78 | 251 |
| 50.4 | 80.3 | -29.9 | 78 | 252 |
| 87.6 | 80.3 | 7.3 | 79 | 252 |
| 36.8 | 80.3 | -43.5 | 79 | 253 |
| 16 | 80.3 | -64.3 | 79 | 254 |
| 43.1 | 80.3 | -37.2 | 79 | 255 |
| 42.1 | 80.3 | -38.2 | 79 | 256 |
| ND<1.5 U | 80.3 | -78.8 | 79 | 257 |
| 31.7 | 80.3 | -48.6 | 79 | 258 |
| 12.46 | 80.3 | -67.84 | 79 | 259 |
| 7.655 | 80.3 | -72.645 | 79 | 260 |
| | | | | |
| 38 | 38 | Same Date | 79 | 260 |
| 50.4 | 38 | 12.4 | 80 | 260 |
| 87.6 | 38 | 49.6 | 81 | 260 |
| 36.8 | 38 | -1.2 | 81 | 261 |
| 16 | 38 | -22 | 81 | 262 |
| 43.1 | 38 | 5.1 | 82 | 262 |
| 42.1 | 38 | 4.1 | 83 | 262 |
| ND<1.5 U | 38 | -36.5 | 83 | 263 |
| 31.7 | 38 | -6.3 | 83 | 264 |
| 12.46 | 38 | -25.54 | 83 | 265 |
| 7.655 | 38 | -30.345 | 83 | 266 |
| | | | | |
| 50.4 | 38 | 12.4 | 84 | 266 |
| 87.6 | 38 | 49.6 | 85 | 266 |
| 36.8 | 38 | -1.2 | 85 | 267 |
| 16 | 38 | -22 | 85 | 268 |
| 43.1 | 38 | 5.1 | 86 | 268 |
| 42.1 | 38 | 4.1 | 87 | 268 |
| ND<1.5 U | 38 | -36.5 | 87 | 269 |
| 31.7 | 38 | -6.3 | 87 | 270 |
| 12.46 | 38 | -25.54 | 87 | 271 |
| 7.655 | 38 | -30.345 | 87 | 272 |
| | | | | |
| 87.6 | 50.4 | 37.2 | 88 | 272 |
| 36.8 | 50.4 | -13.6 | 88 | 273 |
| 16 | 50.4 | -34.4 | 88 | 274 |
| 43.1 | 50.4 | -7.3 | 88 | 275 |
| 42.1 | 50.4 | -8.3 | 88 | 276 |
| ND<1.5 U | 50.4 | -48.9 | 88 | 277 |
| 31.7 | 50.4 | -18.7 | 88 | 278 |
| 12.46 | 50.4 | -37.94 | 88 | 279 |
| 7.655 | 50.4 | -42.745 | 88 | 280 |

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|---|---|---|---|---|
| 36.8 | 87.6 | -50.8 | 88 | 281 |
| 16 | 87.6 | -71.6 | 88 | 282 |
| 43.1 | 87.6 | -44.5 | 88 | 283 |
| 42.1 | 87.6 | -45.5 | 88 | 284 |
| ND<1.5 U | 87.6 | -86.1 | 88 | 285 |
| 31.7 | 87.6 | -55.9 | 88 | 286 |
| 12.46 | 87.6 | -75.14 | 88 | 287 |
| 7.655 | 87.6 | -79.945 | 88 | 288 |
| | | | | |
| 16 | 36.8 | -20.8 | 88 | 289 |
| 43.1 | 36.8 | 6.3 | 89 | 289 |
| 42.1 | 36.8 | 5.3 | 90 | 289 |
| ND<1.5 U | 36.8 | -35.3 | 90 | 290 |
| 31.7 | 36.8 | -5.1 | 90 | 291 |
| 12.46 | 36.8 | -24.34 | 90 | 292 |
| 7.655 | 36.8 | -29.145 | 90 | 293 |
| | | | | |
| 43.1 | 16 | 27.1 | 91 | 293 |
| 42.1 | 16 | 26.1 | 92 | 293 |
| ND<1.5 U | 16 | -14.5 | 92 | 294 |
| 31.7 | 16 | 15.7 | 93 | 294 |
| 12.46 | 16 | -3.54 | 93 | 295 |
| 7.655 | 16 | -8.345 | 93 | 296 |
| | | | | |
| 42.1 | 43.1 | -1 | 93 | 297 |
| ND<1.5 U | 43.1 | -41.6 | 93 | 298 |
| 31.7 | 43.1 | -11.4 | 93 | 299 |
| 12.46 | 43.1 | -30.64 | 93 | 300 |
| 7.655 | 43.1 | -35.445 | 93 | 301 |
| | | | | |
| ND<1.5 U | 42.1 | -40.6 | 93 | 302 |
| 31.7 | 42.1 | -10.4 | 93 | 303 |
| 12.46 | 42.1 | -29.64 | 93 | 304 |
| 7.655 | 42.1 | -34.445 | 93 | 305 |
| | | | | |
| 31.7 | ND<1.5 U | 30.2 | 94 | 305 |
| 12.46 | ND<1.5 U | 10.96 | 95 | 305 |
| 7.655 | ND<1.5 U | 6.155 | 96 | 305 |
| | | | | |
| 12.46 | 31.7 | -19.24 | 96 | 306 |
| 7.655 | 31.7 | -24.045 | 96 | 307 |
| | | | | |
| 7.655 | 12.46 | -4.805 | 96 | 308 |

S Statistic = 96 - 308 = -212

| Tied Group | Value | Members |
|---|---|---|
| 1 | 38 | 2 |

| Time Period | Observations |
|---|---|
| 2/1/2017 | 1 |
| 3/1/2017 | 1 |
| 4/1/2017 | 1 |
| 5/1/2017 | 1 |
| 6/1/2017 | 1 |

| | |
|---|---|
| 7/1/2017 | 1 |
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 3/1/2022 | 1 |
| 3/1/2023 | 1 |
| 3/1/2024 | 1 |

There are 2 time periods with multiple data

---

A = 18
B = 36
C = 0
D = 0
E = 2
F = 4
a = 51156
b = 197316
c = 1624
Group Variance = 2839
Z-Score = -3.96004
Comparison Level at 95% confidence level = 1.65463 (upward trend)
-3.96004 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RW19-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 3450 | 3760 | -310 | 0 | 1 |
| 3380 MH | 3760 | -380 | 0 | 2 |
| 2770 | 3760 | -990 | 0 | 3 |
| 2280 | 3760 | -1480 | 0 | 4 |
| 2550 | 3760 | -1210 | 0 | 5 |
| 1670 | 3760 | -2090 | 0 | 6 |
| 1320 | 3760 | -2440 | 0 | 7 |
| 1710 | 3760 | -2050 | 0 | 8 |
| 1770 | 3760 | -1990 | 0 | 9 |
| 1710 | 3760 | -2050 | 0 | 10 |
| 1880 | 3760 | -1880 | 0 | 11 |
| 1700 | 3760 | -2060 | 0 | 12 |
| 1560 | 3760 | -2200 | 0 | 13 |
| 1610 | 3760 | -2150 | 0 | 14 |
| 1330 | 3760 | -2430 | 0 | 15 |
| 1320 | 3760 | -2440 | 0 | 16 |
| 2440 | 3760 | -1320 | 0 | 17 |
| 2420 | 3760 | -1340 | 0 | 18 |
| 1580 | 3760 | -2180 | 0 | 19 |
| 1500 | 3760 | -2260 | 0 | 20 |
| 1400 | 3760 | -2360 | 0 | 21 |
| 3390 | 3760 | -370 | 0 | 22 |
| 1630 | 3760 | -2130 | 0 | 23 |
| 1540 | 3760 | -2220 | 0 | 24 |
| 112 | 3760 | -3648 | 0 | 25 |
| 109 | 3760 | -3651 | 0 | 26 |
| ND<0.1 U | 3760 | -3759.9 | 0 | 27 |
| 259.6 | 3760 | -3500.4 | 0 | 28 |
| | | | | |
| 3380 MH | 3450 | -70 | 0 | 29 |
| 2770 | 3450 | -680 | 0 | 30 |
| 2280 | 3450 | -1170 | 0 | 31 |
| 2550 | 3450 | -900 | 0 | 32 |
| 1670 | 3450 | -1780 | 0 | 33 |
| 1320 | 3450 | -2130 | 0 | 34 |
| 1710 | 3450 | -1740 | 0 | 35 |
| 1770 | 3450 | -1680 | 0 | 36 |
| 1710 | 3450 | -1740 | 0 | 37 |
| 1880 | 3450 | -1570 | 0 | 38 |
| 1700 | 3450 | -1750 | 0 | 39 |
| 1560 | 3450 | -1890 | 0 | 40 |
| 1610 | 3450 | -1840 | 0 | 41 |
| 1330 | 3450 | -2120 | 0 | 42 |
| 1320 | 3450 | -2130 | 0 | 43 |
| 2440 | 3450 | -1010 | 0 | 44 |
| 2420 | 3450 | -1030 | 0 | 45 |
| 1580 | 3450 | -1870 | 0 | 46 |

| | | | | |
|---|---|---|---|---|
| 1500 | 3450 | -1950 | 0 | 47 |
| 1400 | 3450 | -2050 | 0 | 48 |
| 3390 | 3450 | -60 | 0 | 49 |
| 1630 | 3450 | -1820 | 0 | 50 |
| 1540 | 3450 | -1910 | 0 | 51 |
| 112 | 3450 | -3338 | 0 | 52 |
| 109 | 3450 | -3341 | 0 | 53 |
| ND<0.1 U | 3450 | -3449.9 | 0 | 54 |
| 259.6 | 3450 | -3190.4 | 0 | 55 |
| | | | | |
| 2770 | 3380 MH | -610 | 0 | 56 |
| 2280 | 3380 MH | -1100 | 0 | 57 |
| 2550 | 3380 MH | -830 | 0 | 58 |
| 1670 | 3380 MH | -1710 | 0 | 59 |
| 1320 | 3380 MH | -2060 | 0 | 60 |
| 1710 | 3380 MH | -1670 | 0 | 61 |
| 1770 | 3380 MH | -1610 | 0 | 62 |
| 1710 | 3380 MH | -1670 | 0 | 63 |
| 1880 | 3380 MH | -1500 | 0 | 64 |
| 1700 | 3380 MH | -1680 | 0 | 65 |
| 1560 | 3380 MH | -1820 | 0 | 66 |
| 1610 | 3380 MH | -1770 | 0 | 67 |
| 1330 | 3380 MH | -2050 | 0 | 68 |
| 1320 | 3380 MH | -2060 | 0 | 69 |
| 2440 | 3380 MH | -940 | 0 | 70 |
| 2420 | 3380 MH | -960 | 0 | 71 |
| 1580 | 3380 MH | -1800 | 0 | 72 |
| 1500 | 3380 MH | -1880 | 0 | 73 |
| 1400 | 3380 MH | -1980 | 0 | 74 |
| 3390 | 3380 MH | 10 | 1 | 74 |
| 1630 | 3380 MH | -1750 | 1 | 75 |
| 1540 | 3380 MH | -1840 | 1 | 76 |
| 112 | 3380 MH | -3268 | 1 | 77 |
| 109 | 3380 MH | -3271 | 1 | 78 |
| ND<0.1 U | 3380 MH | -3379.9 | 1 | 79 |
| 259.6 | 3380 MH | -3120.4 | 1 | 80 |
| | | | | |
| 2280 | 2770 | -490 | 1 | 81 |
| 2550 | 2770 | -220 | 1 | 82 |
| 1670 | 2770 | -1100 | 1 | 83 |
| 1320 | 2770 | -1450 | 1 | 84 |
| 1710 | 2770 | -1060 | 1 | 85 |
| 1770 | 2770 | -1000 | 1 | 86 |
| 1710 | 2770 | -1060 | 1 | 87 |
| 1880 | 2770 | -890 | 1 | 88 |
| 1700 | 2770 | -1070 | 1 | 89 |
| 1560 | 2770 | -1210 | 1 | 90 |
| 1610 | 2770 | -1160 | 1 | 91 |
| 1330 | 2770 | -1440 | 1 | 92 |
| 1320 | 2770 | -1450 | 1 | 93 |
| 2440 | 2770 | -330 | 1 | 94 |
| 2420 | 2770 | -350 | 1 | 95 |
| 1580 | 2770 | -1190 | 1 | 96 |
| 1500 | 2770 | -1270 | 1 | 97 |
| 1400 | 2770 | -1370 | 1 | 98 |
| 3390 | 2770 | 620 | 2 | 98 |
| 1630 | 2770 | -1140 | 2 | 99 |

| | | | | |
|---|---|---|---|---|
| 1540 | 2770 | -1230 | 2 | 100 |
| 112 | 2770 | -2658 | 2 | 101 |
| 109 | 2770 | -2661 | 2 | 102 |
| ND<0.1 U | 2770 | -2769.9 | 2 | 103 |
| 259.6 | 2770 | -2510.4 | 2 | 104 |
| | | | | |
| 2550 | 2280 | 270 | 3 | 104 |
| 1670 | 2280 | -610 | 3 | 105 |
| 1320 | 2280 | -960 | 3 | 106 |
| 1710 | 2280 | -570 | 3 | 107 |
| 1770 | 2280 | -510 | 3 | 108 |
| 1710 | 2280 | -570 | 3 | 109 |
| 1880 | 2280 | -400 | 3 | 110 |
| 1700 | 2280 | -580 | 3 | 111 |
| 1560 | 2280 | -720 | 3 | 112 |
| 1610 | 2280 | -670 | 3 | 113 |
| 1330 | 2280 | -950 | 3 | 114 |
| 1320 | 2280 | -960 | 3 | 115 |
| 2440 | 2280 | 160 | 4 | 115 |
| 2420 | 2280 | 140 | 5 | 115 |
| 1580 | 2280 | -700 | 5 | 116 |
| 1500 | 2280 | -780 | 5 | 117 |
| 1400 | 2280 | -880 | 5 | 118 |
| 3390 | 2280 | 1110 | 6 | 118 |
| 1630 | 2280 | -650 | 6 | 119 |
| 1540 | 2280 | -740 | 6 | 120 |
| 112 | 2280 | -2168 | 6 | 121 |
| 109 | 2280 | -2171 | 6 | 122 |
| ND<0.1 U | 2280 | -2279.9 | 6 | 123 |
| 259.6 | 2280 | -2020.4 | 6 | 124 |
| | | | | |
| 1670 | 2550 | -880 | 6 | 125 |
| 1320 | 2550 | -1230 | 6 | 126 |
| 1710 | 2550 | -840 | 6 | 127 |
| 1770 | 2550 | -780 | 6 | 128 |
| 1710 | 2550 | -840 | 6 | 129 |
| 1880 | 2550 | -670 | 6 | 130 |
| 1700 | 2550 | -850 | 6 | 131 |
| 1560 | 2550 | -990 | 6 | 132 |
| 1610 | 2550 | -940 | 6 | 133 |
| 1330 | 2550 | -1220 | 6 | 134 |
| 1320 | 2550 | -1230 | 6 | 135 |
| 2440 | 2550 | -110 | 6 | 136 |
| 2420 | 2550 | -130 | 6 | 137 |
| 1580 | 2550 | -970 | 6 | 138 |
| 1500 | 2550 | -1050 | 6 | 139 |
| 1400 | 2550 | -1150 | 6 | 140 |
| 3390 | 2550 | 840 | 7 | 140 |
| 1630 | 2550 | -920 | 7 | 141 |
| 1540 | 2550 | -1010 | 7 | 142 |
| 112 | 2550 | -2438 | 7 | 143 |
| 109 | 2550 | -2441 | 7 | 144 |
| ND<0.1 U | 2550 | -2549.9 | 7 | 145 |
| 259.6 | 2550 | -2290.4 | 7 | 146 |
| | | | | |
| 1320 | 1670 | -350 | 7 | 147 |
| 1710 | 1670 | 40 | 8 | 147 |

| | | | | |
|---|---|---|---|---|
| 1770 | 1670 | 100 | 9 | 147 |
| 1710 | 1670 | 40 | 10 | 147 |
| 1880 | 1670 | 210 | 11 | 147 |
| 1700 | 1670 | 30 | 12 | 147 |
| 1560 | 1670 | -110 | 12 | 148 |
| 1610 | 1670 | -60 | 12 | 149 |
| 1330 | 1670 | -340 | 12 | 150 |
| 1320 | 1670 | -350 | 12 | 151 |
| 2440 | 1670 | 770 | 13 | 151 |
| 2420 | 1670 | 750 | 14 | 151 |
| 1580 | 1670 | -90 | 14 | 152 |
| 1500 | 1670 | -170 | 14 | 153 |
| 1400 | 1670 | -270 | 14 | 154 |
| 3390 | 1670 | 1720 | 15 | 154 |
| 1630 | 1670 | -40 | 15 | 155 |
| 1540 | 1670 | -130 | 15 | 156 |
| 112 | 1670 | -1558 | 15 | 157 |
| 109 | 1670 | -1561 | 15 | 158 |
| ND<0.1 U | 1670 | -1669.9 | 15 | 159 |
| 259.6 | 1670 | -1410.4 | 15 | 160 |
| | | | | |
| 1710 | 1320 | 390 | 16 | 160 |
| 1770 | 1320 | 450 | 17 | 160 |
| 1710 | 1320 | 390 | 18 | 160 |
| 1880 | 1320 | 560 | 19 | 160 |
| 1700 | 1320 | 380 | 20 | 160 |
| 1560 | 1320 | 240 | 21 | 160 |
| 1610 | 1320 | 290 | 22 | 160 |
| 1330 | 1320 | 10 | 23 | 160 |
| 1320 | 1320 | 0 | 23 | 160 |
| 2440 | 1320 | 1120 | 24 | 160 |
| 2420 | 1320 | 1100 | 25 | 160 |
| 1580 | 1320 | 260 | 26 | 160 |
| 1500 | 1320 | 180 | 27 | 160 |
| 1400 | 1320 | 80 | 28 | 160 |
| 3390 | 1320 | 2070 | 29 | 160 |
| 1630 | 1320 | 310 | 30 | 160 |
| 1540 | 1320 | 220 | 31 | 160 |
| 112 | 1320 | -1208 | 31 | 161 |
| 109 | 1320 | -1211 | 31 | 162 |
| ND<0.1 U | 1320 | -1319.9 | 31 | 163 |
| 259.6 | 1320 | -1060.4 | 31 | 164 |
| | | | | |
| 1770 | 1710 | 60 | 32 | 164 |
| 1710 | 1710 | 0 | 32 | 164 |
| 1880 | 1710 | 170 | 33 | 164 |
| 1700 | 1710 | -10 | 33 | 165 |
| 1560 | 1710 | -150 | 33 | 166 |
| 1610 | 1710 | -100 | 33 | 167 |
| 1330 | 1710 | -380 | 33 | 168 |
| 1320 | 1710 | -390 | 33 | 169 |
| 2440 | 1710 | 730 | 34 | 169 |
| 2420 | 1710 | 710 | 35 | 169 |
| 1580 | 1710 | -130 | 35 | 170 |
| 1500 | 1710 | -210 | 35 | 171 |
| 1400 | 1710 | -310 | 35 | 172 |
| 3390 | 1710 | 1680 | 36 | 172 |

| | | | | |
|---|---|---|---|---|
| 1630 | 1710 | -80 | 36 | 173 |
| 1540 | 1710 | -170 | 36 | 174 |
| 112 | 1710 | -1598 | 36 | 175 |
| 109 | 1710 | -1601 | 36 | 176 |
| ND<0.1 U | 1710 | -1709.9 | 36 | 177 |
| 259.6 | 1710 | -1450.4 | 36 | 178 |
| | | | | |
| 1710 | 1770 | -60 | 36 | 179 |
| 1880 | 1770 | 110 | 37 | 179 |
| 1700 | 1770 | -70 | 37 | 180 |
| 1560 | 1770 | -210 | 37 | 181 |
| 1610 | 1770 | -160 | 37 | 182 |
| 1330 | 1770 | -440 | 37 | 183 |
| 1320 | 1770 | -450 | 37 | 184 |
| 2440 | 1770 | 670 | 38 | 184 |
| 2420 | 1770 | 650 | 39 | 184 |
| 1580 | 1770 | -190 | 39 | 185 |
| 1500 | 1770 | -270 | 39 | 186 |
| 1400 | 1770 | -370 | 39 | 187 |
| 3390 | 1770 | 1620 | 40 | 187 |
| 1630 | 1770 | -140 | 40 | 188 |
| 1540 | 1770 | -230 | 40 | 189 |
| 112 | 1770 | -1658 | 40 | 190 |
| 109 | 1770 | -1661 | 40 | 191 |
| ND<0.1 U | 1770 | -1769.9 | 40 | 192 |
| 259.6 | 1770 | -1510.4 | 40 | 193 |
| | | | | |
| 1880 | 1710 | 170 | 41 | 193 |
| 1700 | 1710 | -10 | 41 | 194 |
| 1560 | 1710 | -150 | 41 | 195 |
| 1610 | 1710 | -100 | 41 | 196 |
| 1330 | 1710 | -380 | 41 | 197 |
| 1320 | 1710 | -390 | 41 | 198 |
| 2440 | 1710 | 730 | 42 | 198 |
| 2420 | 1710 | 710 | 43 | 198 |
| 1580 | 1710 | -130 | 43 | 199 |
| 1500 | 1710 | -210 | 43 | 200 |
| 1400 | 1710 | -310 | 43 | 201 |
| 3390 | 1710 | 1680 | 44 | 201 |
| 1630 | 1710 | -80 | 44 | 202 |
| 1540 | 1710 | -170 | 44 | 203 |
| 112 | 1710 | -1598 | 44 | 204 |
| 109 | 1710 | -1601 | 44 | 205 |
| ND<0.1 U | 1710 | -1709.9 | 44 | 206 |
| 259.6 | 1710 | -1450.4 | 44 | 207 |
| | | | | |
| 1700 | 1880 | -180 | 44 | 208 |
| 1560 | 1880 | -320 | 44 | 209 |
| 1610 | 1880 | -270 | 44 | 210 |
| 1330 | 1880 | -550 | 44 | 211 |
| 1320 | 1880 | -560 | 44 | 212 |
| 2440 | 1880 | 560 | 45 | 212 |
| 2420 | 1880 | 540 | 46 | 212 |
| 1580 | 1880 | -300 | 46 | 213 |
| 1500 | 1880 | -380 | 46 | 214 |
| 1400 | 1880 | -480 | 46 | 215 |
| 3390 | 1880 | 1510 | 47 | 215 |

| | | | | |
|---|---|---|---|---|
| 1630 | 1880 | -250 | 47 | 216 |
| 1540 | 1880 | -340 | 47 | 217 |
| 112 | 1880 | -1768 | 47 | 218 |
| 109 | 1880 | -1771 | 47 | 219 |
| ND<0.1 U | 1880 | -1879.9 | 47 | 220 |
| 259.6 | 1880 | -1620.4 | 47 | 221 |
| | | | | |
| 1560 | 1700 | -140 | 47 | 222 |
| 1610 | 1700 | -90 | 47 | 223 |
| 1330 | 1700 | -370 | 47 | 224 |
| 1320 | 1700 | -380 | 47 | 225 |
| 2440 | 1700 | 740 | 48 | 225 |
| 2420 | 1700 | 720 | 49 | 225 |
| 1580 | 1700 | -120 | 49 | 226 |
| 1500 | 1700 | -200 | 49 | 227 |
| 1400 | 1700 | -300 | 49 | 228 |
| 3390 | 1700 | 1690 | 50 | 228 |
| 1630 | 1700 | -70 | 50 | 229 |
| 1540 | 1700 | -160 | 50 | 230 |
| 112 | 1700 | -1588 | 50 | 231 |
| 109 | 1700 | -1591 | 50 | 232 |
| ND<0.1 U | 1700 | -1699.9 | 50 | 233 |
| 259.6 | 1700 | -1440.4 | 50 | 234 |
| | | | | |
| 1610 | 1560 | 50 | 51 | 234 |
| 1330 | 1560 | -230 | 51 | 235 |
| 1320 | 1560 | -240 | 51 | 236 |
| 2440 | 1560 | 880 | 52 | 236 |
| 2420 | 1560 | 860 | 53 | 236 |
| 1580 | 1560 | 20 | 54 | 236 |
| 1500 | 1560 | -60 | 54 | 237 |
| 1400 | 1560 | -160 | 54 | 238 |
| 3390 | 1560 | 1830 | 55 | 238 |
| 1630 | 1560 | 70 | 56 | 238 |
| 1540 | 1560 | -20 | 56 | 239 |
| 112 | 1560 | -1448 | 56 | 240 |
| 109 | 1560 | -1451 | 56 | 241 |
| ND<0.1 U | 1560 | -1559.9 | 56 | 242 |
| 259.6 | 1560 | -1300.4 | 56 | 243 |
| | | | | |
| 1330 | 1610 | -280 | 56 | 244 |
| 1320 | 1610 | -290 | 56 | 245 |
| 2440 | 1610 | 830 | 57 | 245 |
| 2420 | 1610 | 810 | 58 | 245 |
| 1580 | 1610 | -30 | 58 | 246 |
| 1500 | 1610 | -110 | 58 | 247 |
| 1400 | 1610 | -210 | 58 | 248 |
| 3390 | 1610 | 1780 | 59 | 248 |
| 1630 | 1610 | 20 | 60 | 248 |
| 1540 | 1610 | -70 | 60 | 249 |
| 112 | 1610 | -1498 | 60 | 250 |
| 109 | 1610 | -1501 | 60 | 251 |
| ND<0.1 U | 1610 | -1609.9 | 60 | 252 |
| 259.6 | 1610 | -1350.4 | 60 | 253 |
| | | | | |
| 1320 | 1330 | Same Date | 60 | 253 |
| 2440 | 1330 | 1110 | 61 | 253 |

| | | | | |
|---|---|---|---|---|
| 2420 | 1330 | 1090 | 62 | 253 |
| 1580 | 1330 | 250 | 63 | 253 |
| 1500 | 1330 | 170 | 64 | 253 |
| 1400 | 1330 | 70 | 65 | 253 |
| 3390 | 1330 | 2060 | 66 | 253 |
| 1630 | 1330 | 300 | 67 | 253 |
| 1540 | 1330 | 210 | 68 | 253 |
| 112 | 1330 | -1218 | 68 | 254 |
| 109 | 1330 | -1221 | 68 | 255 |
| ND<0.1 U | 1330 | -1329.9 | 68 | 256 |
| 259.6 | 1330 | -1070.4 | 68 | 257 |
| | | | | |
| 2440 | 1320 | 1120 | 69 | 257 |
| 2420 | 1320 | 1100 | 70 | 257 |
| 1580 | 1320 | 260 | 71 | 257 |
| 1500 | 1320 | 180 | 72 | 257 |
| 1400 | 1320 | 80 | 73 | 257 |
| 3390 | 1320 | 2070 | 74 | 257 |
| 1630 | 1320 | 310 | 75 | 257 |
| 1540 | 1320 | 220 | 76 | 257 |
| 112 | 1320 | -1208 | 76 | 258 |
| 109 | 1320 | -1211 | 76 | 259 |
| ND<0.1 U | 1320 | -1319.9 | 76 | 260 |
| 259.6 | 1320 | -1060.4 | 76 | 261 |
| | | | | |
| 2420 | 2440 | Same Date | 76 | 261 |
| 1580 | 2440 | -860 | 76 | 262 |
| 1500 | 2440 | -940 | 76 | 263 |
| 1400 | 2440 | -1040 | 76 | 264 |
| 3390 | 2440 | 950 | 77 | 264 |
| 1630 | 2440 | -810 | 77 | 265 |
| 1540 | 2440 | -900 | 77 | 266 |
| 112 | 2440 | -2328 | 77 | 267 |
| 109 | 2440 | -2331 | 77 | 268 |
| ND<0.1 U | 2440 | -2439.9 | 77 | 269 |
| 259.6 | 2440 | -2180.4 | 77 | 270 |
| | | | | |
| 1580 | 2420 | -840 | 77 | 271 |
| 1500 | 2420 | -920 | 77 | 272 |
| 1400 | 2420 | -1020 | 77 | 273 |
| 3390 | 2420 | 970 | 78 | 273 |
| 1630 | 2420 | -790 | 78 | 274 |
| 1540 | 2420 | -880 | 78 | 275 |
| 112 | 2420 | -2308 | 78 | 276 |
| 109 | 2420 | -2311 | 78 | 277 |
| ND<0.1 U | 2420 | -2419.9 | 78 | 278 |
| 259.6 | 2420 | -2160.4 | 78 | 279 |
| | | | | |
| 1500 | 1580 | -80 | 78 | 280 |
| 1400 | 1580 | -180 | 78 | 281 |
| 3390 | 1580 | 1810 | 79 | 281 |
| 1630 | 1580 | 50 | 80 | 281 |
| 1540 | 1580 | -40 | 80 | 282 |
| 112 | 1580 | -1468 | 80 | 283 |
| 109 | 1580 | -1471 | 80 | 284 |
| ND<0.1 U | 1580 | -1579.9 | 80 | 285 |
| 259.6 | 1580 | -1320.4 | 80 | 286 |

| | | | | |
|---|---|---|---|---|
| 1400 | 1500 | -100 | 80 | 287 |
| 3390 | 1500 | 1890 | 81 | 287 |
| 1630 | 1500 | 130 | 82 | 287 |
| 1540 | 1500 | 40 | 83 | 287 |
| 112 | 1500 | -1388 | 83 | 288 |
| 109 | 1500 | -1391 | 83 | 289 |
| ND<0.1 U | 1500 | -1499.9 | 83 | 290 |
| 259.6 | 1500 | -1240.4 | 83 | 291 |
| | | | | |
| 3390 | 1400 | 1990 | 84 | 291 |
| 1630 | 1400 | 230 | 85 | 291 |
| 1540 | 1400 | 140 | 86 | 291 |
| 112 | 1400 | -1288 | 86 | 292 |
| 109 | 1400 | -1291 | 86 | 293 |
| ND<0.1 U | 1400 | -1399.9 | 86 | 294 |
| 259.6 | 1400 | -1140.4 | 86 | 295 |
| | | | | |
| 1630 | 3390 | -1760 | 86 | 296 |
| 1540 | 3390 | -1850 | 86 | 297 |
| 112 | 3390 | -3278 | 86 | 298 |
| 109 | 3390 | -3281 | 86 | 299 |
| ND<0.1 U | 3390 | -3389.9 | 86 | 300 |
| 259.6 | 3390 | -3130.4 | 86 | 301 |
| | | | | |
| 1540 | 1630 | -90 | 86 | 302 |
| 112 | 1630 | -1518 | 86 | 303 |
| 109 | 1630 | -1521 | 86 | 304 |
| ND<0.1 U | 1630 | -1629.9 | 86 | 305 |
| 259.6 | 1630 | -1370.4 | 86 | 306 |
| | | | | |
| 112 | 1540 | -1428 | 86 | 307 |
| 109 | 1540 | -1431 | 86 | 308 |
| ND<0.1 U | 1540 | -1539.9 | 86 | 309 |
| 259.6 | 1540 | -1280.4 | 86 | 310 |
| | | | | |
| 109 | 112 | -3 | 86 | 311 |
| ND<0.1 U | 112 | -111.9 | 86 | 312 |
| 259.6 | 112 | 147.6 | 87 | 312 |
| | | | | |
| ND<0.1 U | 109 | -108.9 | 87 | 313 |
| 259.6 | 109 | 150.6 | 88 | 313 |
| | | | | |
| 259.6 | ND<0.1 U | 259.5 | 89 | 313 |

S Statistic = 89 - 313 = -224

| Tied Group | Value | Members |
|---|---|---|
| 1 | 1320 | 2 |
| 2 | 1710 | 2 |

| Time Period | Observations |
|---|---|
| 2/1/2017 | 1 |
| 3/1/2017 | 1 |
| 4/1/2017 | 1 |
| 5/1/2017 | 1 |

| | |
|---|---|
| 6/1/2017 | 1 |
| 7/1/2017 | 1 |
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 3/1/2022 | 1 |
| 3/1/2023 | 1 |
| 3/1/2024 | 1 |

There are 2 time periods with multiple data

---

A = 36
B = 36
C = 0
D = 0
E = 4
F = 4
a = 51156
b = 197316
c = 1624
Group Variance = 2838.01
Z-Score = -4.18599
Comparison Level at 95% confidence level = 1.65463 (upward trend)
-4.18599 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RW21-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 53.9 | 50.2 | Same Date | 0 | 0 |
| 22.5 1c | 50.2 | -27.7 | 0 | 1 |
| 33.1 | 50.2 | -17.1 | 0 | 2 |
| 39.8 | 50.2 | -10.4 | 0 | 3 |
| 34 | 50.2 | -16.2 | 0 | 4 |
| 29.4 1c | 50.2 | -20.8 | 0 | 5 |
| 27.8 | 50.2 | -22.4 | 0 | 6 |
| 1.6 J | 50.2 | -48.6 | 0 | 7 |
| 34.2 | 50.2 | -16 | 0 | 8 |
| 32.7 | 50.2 | -17.5 | 0 | 9 |
| 46.27 | 50.2 | -3.93 | 0 | 10 |
| 30.4 | 50.2 | -19.8 | 0 | 11 |
| | | | | |
| 22.5 1c | 53.9 | -31.4 | 0 | 12 |
| 33.1 | 53.9 | -20.8 | 0 | 13 |
| 39.8 | 53.9 | -14.1 | 0 | 14 |
| 34 | 53.9 | -19.9 | 0 | 15 |
| 29.4 1c | 53.9 | -24.5 | 0 | 16 |
| 27.8 | 53.9 | -26.1 | 0 | 17 |
| 1.6 J | 53.9 | -52.3 | 0 | 18 |
| 34.2 | 53.9 | -19.7 | 0 | 19 |
| 32.7 | 53.9 | -21.2 | 0 | 20 |
| 46.27 | 53.9 | -7.63 | 0 | 21 |
| 30.4 | 53.9 | -23.5 | 0 | 22 |
| | | | | |
| 33.1 | 22.5 1c | 10.6 | 1 | 22 |
| 39.8 | 22.5 1c | 17.3 | 2 | 22 |
| 34 | 22.5 1c | 11.5 | 3 | 22 |
| 29.4 1c | 22.5 1c | 6.9 | 4 | 22 |
| 27.8 | 22.5 1c | 5.3 | 5 | 22 |
| 1.6 J | 22.5 1c | -20.9 | 5 | 23 |
| 34.2 | 22.5 1c | 11.7 | 6 | 23 |
| 32.7 | 22.5 1c | 10.2 | 7 | 23 |
| 46.27 | 22.5 1c | 23.77 | 8 | 23 |
| 30.4 | 22.5 1c | 7.9 | 9 | 23 |
| | | | | |
| 39.8 | 33.1 | 6.7 | 10 | 23 |
| 34 | 33.1 | 0.9 | 11 | 23 |
| 29.4 1c | 33.1 | -3.7 | 11 | 24 |
| 27.8 | 33.1 | -5.3 | 11 | 25 |
| 1.6 J | 33.1 | -31.5 | 11 | 26 |
| 34.2 | 33.1 | 1.1 | 12 | 26 |
| 32.7 | 33.1 | -0.4 | 12 | 27 |
| 46.27 | 33.1 | 13.17 | 13 | 27 |
| 30.4 | 33.1 | -2.7 | 13 | 28 |
| | | | | |
| 34 | 39.8 | -5.8 | 13 | 29 |

| | | | | |
|---|---|---|---|---|
| 29.4 1c | 39.8 | -10.4 | 13 | 30 |
| 27.8 | 39.8 | -12 | 13 | 31 |
| 1.6 J | 39.8 | -38.2 | 13 | 32 |
| 34.2 | 39.8 | -5.6 | 13 | 33 |
| 32.7 | 39.8 | -7.1 | 13 | 34 |
| 46.27 | 39.8 | 6.47 | 14 | 34 |
| 30.4 | 39.8 | -9.4 | 14 | 35 |
| | | | | |
| 29.4 1c | 34 | -4.6 | 14 | 36 |
| 27.8 | 34 | -6.2 | 14 | 37 |
| 1.6 J | 34 | -32.4 | 14 | 38 |
| 34.2 | 34 | 0.2 | 15 | 38 |
| 32.7 | 34 | -1.3 | 15 | 39 |
| 46.27 | 34 | 12.27 | 16 | 39 |
| 30.4 | 34 | -3.6 | 16 | 40 |
| | | | | |
| 27.8 | 29.4 1c | -1.6 | 16 | 41 |
| 1.6 J | 29.4 1c | -27.8 | 16 | 42 |
| 34.2 | 29.4 1c | 4.8 | 17 | 42 |
| 32.7 | 29.4 1c | 3.3 | 18 | 42 |
| 46.27 | 29.4 1c | 16.87 | 19 | 42 |
| 30.4 | 29.4 1c | 1 | 20 | 42 |
| | | | | |
| 1.6 J | 27.8 | Same Date | 20 | 42 |
| 34.2 | 27.8 | 6.4 | 21 | 42 |
| 32.7 | 27.8 | 4.9 | 22 | 42 |
| 46.27 | 27.8 | 18.47 | 23 | 42 |
| 30.4 | 27.8 | 2.6 | 24 | 42 |
| | | | | |
| 34.2 | 1.6 J | 32.6 | 25 | 42 |
| 32.7 | 1.6 J | 31.1 | 26 | 42 |
| 46.27 | 1.6 J | 44.67 | 27 | 42 |
| 30.4 | 1.6 J | 28.8 | 28 | 42 |
| | | | | |
| 32.7 | 34.2 | -1.5 | 28 | 43 |
| 46.27 | 34.2 | 12.07 | 29 | 43 |
| 30.4 | 34.2 | -3.8 | 29 | 44 |
| | | | | |
| 46.27 | 32.7 | 13.57 | 30 | 44 |
| 30.4 | 32.7 | -2.3 | 30 | 45 |
| | | | | |
| 30.4 | 46.27 | -15.87 | 30 | 46 |

S Statistic = 30 - 46 = -16

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 2 |
| 6/1/2021 | 1 |

3/1/2022 1
3/1/2023 1
3/1/2024 1
There are 2 time periods with multiple data

---

A = 0
B = 36
C = 0
D = 0
E = 0
F = 4
a = 4836
b = 15444
c = 312
Group Variance = 266.667
Z-Score = -0.918559
Comparison Level at 95% confidence level = 1.65463 (upward trend)
-0.918559 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RW22R-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| ND<1.5 U | ND<1.5 U | Same Date | 0 | 0 |
| ND<1.5 U | ND<1.5 U | Same Date | 0 | 0 |
| ND<1.5 U | ND<1.5 U | Same Date | 0 | 0 |
| 0.92 J | ND<1.5 U | Same Date | 0 | 0 |
| 0.92 J | ND<1.5 U | Same Date | 0 | 0 |
| ND<1.5 U1c3c | ND<1.5 U | Same Date | 0 | 0 |
| ND<1.5 U2c | ND<1.5 U | Same Date | 0 | 0 |
| 0.92 J | ND<1.5 U | Same Date | 0 | 0 |
| 0.92 J | ND<1.5 U | Same Date | 0 | 0 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 0 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 0 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 0 |
| 2 J | ND<1.5 U | 0.5 | 1 | 0 |
| 2.4 J | ND<1.5 U | 0.9 | 2 | 0 |
| 3.4 | ND<1.5 U | 1.9 | 3 | 0 |
| 2.5 J | ND<1.5 U | 1 | 4 | 0 |
| 3.4 | ND<1.5 U | 1.9 | 5 | 0 |
| 5.722 | ND<1.5 U | 4.222 | 6 | 0 |
| 5.722 | ND<1.5 U | 4.222 | 7 | 0 |
| 5.194 | ND<1.5 U | 3.694 | 8 | 0 |
| 4.492 | ND<1.5 U | 2.992 | 9 | 0 |
| 1.893 | ND<1.5 U | 0.393 | 10 | 0 |
| 1.564 | ND<1.5 U | 0.064 | 11 | 0 |
| | | | | |
| ND<1.5 U | ND<1.5 U | Same Date | 11 | 0 |
| ND<1.5 U | ND<1.5 U | Same Date | 11 | 0 |
| 0.92 J | ND<1.5 U | Same Date | 11 | 0 |
| 0.92 J | ND<1.5 U | Same Date | 11 | 0 |
| ND<1.5 U1c3c | ND<1.5 U | Same Date | 11 | 0 |
| ND<1.5 U2c | ND<1.5 U | Same Date | 11 | 0 |
| 0.92 J | ND<1.5 U | Same Date | 11 | 0 |
| 0.92 J | ND<1.5 U | Same Date | 11 | 0 |
| ND<1.5 U | ND<1.5 U | 0 | 11 | 0 |
| ND<1.5 U | ND<1.5 U | 0 | 11 | 0 |
| ND<1.5 U | ND<1.5 U | 0 | 11 | 0 |
| 2 J | ND<1.5 U | 0.5 | 12 | 0 |
| 2.4 J | ND<1.5 U | 0.9 | 13 | 0 |
| 3.4 | ND<1.5 U | 1.9 | 14 | 0 |
| 2.5 J | ND<1.5 U | 1 | 15 | 0 |
| 3.4 | ND<1.5 U | 1.9 | 16 | 0 |
| 5.722 | ND<1.5 U | 4.222 | 17 | 0 |
| 5.722 | ND<1.5 U | 4.222 | 18 | 0 |
| 5.194 | ND<1.5 U | 3.694 | 19 | 0 |
| 4.492 | ND<1.5 U | 2.992 | 20 | 0 |
| 1.893 | ND<1.5 U | 0.393 | 21 | 0 |
| 1.564 | ND<1.5 U | 0.064 | 22 | 0 |

| | | | | |
|---|---|---|---|---|
| ND<1.5 U | ND<1.5 U | Same Date | 22 | 0 |
| 0.92 J | ND<1.5 U | Same Date | 22 | 0 |
| 0.92 J | ND<1.5 U | Same Date | 22 | 0 |
| ND<1.5 U1c3c | ND<1.5 U | Same Date | 22 | 0 |
| ND<1.5 U2c | ND<1.5 U | Same Date | 22 | 0 |
| 0.92 J | ND<1.5 U | Same Date | 22 | 0 |
| 0.92 J | ND<1.5 U | Same Date | 22 | 0 |
| ND<1.5 U | ND<1.5 U | 0 | 22 | 0 |
| ND<1.5 U | ND<1.5 U | 0 | 22 | 0 |
| ND<1.5 U | ND<1.5 U | 0 | 22 | 0 |
| 2 J | ND<1.5 U | 0.5 | 23 | 0 |
| 2.4 J | ND<1.5 U | 0.9 | 24 | 0 |
| 3.4 | ND<1.5 U | 1.9 | 25 | 0 |
| 2.5 J | ND<1.5 U | 1 | 26 | 0 |
| 3.4 | ND<1.5 U | 1.9 | 27 | 0 |
| 5.722 | ND<1.5 U | 4.222 | 28 | 0 |
| 5.722 | ND<1.5 U | 4.222 | 29 | 0 |
| 5.194 | ND<1.5 U | 3.694 | 30 | 0 |
| 4.492 | ND<1.5 U | 2.992 | 31 | 0 |
| 1.893 | ND<1.5 U | 0.393 | 32 | 0 |
| 1.564 | ND<1.5 U | 0.064 | 33 | 0 |
| | | | | |
| 0.92 J | ND<1.5 U | Same Date | 33 | 0 |
| 0.92 J | ND<1.5 U | Same Date | 33 | 0 |
| ND<1.5 U1c3c | ND<1.5 U | Same Date | 33 | 0 |
| ND<1.5 U2c | ND<1.5 U | Same Date | 33 | 0 |
| 0.92 J | ND<1.5 U | Same Date | 33 | 0 |
| 0.92 J | ND<1.5 U | Same Date | 33 | 0 |
| ND<1.5 U | ND<1.5 U | 0 | 33 | 0 |
| ND<1.5 U | ND<1.5 U | 0 | 33 | 0 |
| ND<1.5 U | ND<1.5 U | 0 | 33 | 0 |
| 2 J | ND<1.5 U | 0.5 | 34 | 0 |
| 2.4 J | ND<1.5 U | 0.9 | 35 | 0 |
| 3.4 | ND<1.5 U | 1.9 | 36 | 0 |
| 2.5 J | ND<1.5 U | 1 | 37 | 0 |
| 3.4 | ND<1.5 U | 1.9 | 38 | 0 |
| 5.722 | ND<1.5 U | 4.222 | 39 | 0 |
| 5.722 | ND<1.5 U | 4.222 | 40 | 0 |
| 5.194 | ND<1.5 U | 3.694 | 41 | 0 |
| 4.492 | ND<1.5 U | 2.992 | 42 | 0 |
| 1.893 | ND<1.5 U | 0.393 | 43 | 0 |
| 1.564 | ND<1.5 U | 0.064 | 44 | 0 |
| | | | | |
| 0.92 J | 0.92 J | Same Date | 44 | 0 |
| ND<1.5 U1c3c | 0.92 J | Same Date | 44 | 0 |
| ND<1.5 U2c | 0.92 J | Same Date | 44 | 0 |
| 0.92 J | 0.92 J | Same Date | 44 | 0 |
| 0.92 J | 0.92 J | Same Date | 44 | 0 |
| ND<1.5 U | 0.92 J | 0.58 | 45 | 0 |
| ND<1.5 U | 0.92 J | 0.58 | 46 | 0 |
| ND<1.5 U | 0.92 J | 0.58 | 47 | 0 |
| 2 J | 0.92 J | 1.08 | 48 | 0 |
| 2.4 J | 0.92 J | 1.48 | 49 | 0 |
| 3.4 | 0.92 J | 2.48 | 50 | 0 |
| 2.5 J | 0.92 J | 1.58 | 51 | 0 |
| 3.4 | 0.92 J | 2.48 | 52 | 0 |
| 5.722 | 0.92 J | 4.802 | 53 | 0 |

| | | | | |
|---|---|---|---|---|
| 5.722 | 0.92 J | 4.802 | 54 | 0 |
| 5.194 | 0.92 J | 4.274 | 55 | 0 |
| 4.492 | 0.92 J | 3.572 | 56 | 0 |
| 1.893 | 0.92 J | 0.973 | 57 | 0 |
| 1.564 | 0.92 J | 0.644 | 58 | 0 |
| | | | | |
| ND<1.5 U1c3c | 0.92 J | Same Date | 58 | 0 |
| ND<1.5 U2c | 0.92 J | Same Date | 58 | 0 |
| 0.92 J | 0.92 J | Same Date | 58 | 0 |
| 0.92 J | 0.92 J | Same Date | 58 | 0 |
| ND<1.5 U | 0.92 J | 0.58 | 59 | 0 |
| ND<1.5 U | 0.92 J | 0.58 | 60 | 0 |
| ND<1.5 U | 0.92 J | 0.58 | 61 | 0 |
| 2 J | 0.92 J | 1.08 | 62 | 0 |
| 2.4 J | 0.92 J | 1.48 | 63 | 0 |
| 3.4 | 0.92 J | 2.48 | 64 | 0 |
| 2.5 J | 0.92 J | 1.58 | 65 | 0 |
| 3.4 | 0.92 J | 2.48 | 66 | 0 |
| 5.722 | 0.92 J | 4.802 | 67 | 0 |
| 5.722 | 0.92 J | 4.802 | 68 | 0 |
| 5.194 | 0.92 J | 4.274 | 69 | 0 |
| 4.492 | 0.92 J | 3.572 | 70 | 0 |
| 1.893 | 0.92 J | 0.973 | 71 | 0 |
| 1.564 | 0.92 J | 0.644 | 72 | 0 |
| | | | | |
| ND<1.5 U2c | ND<1.5 U1c3c | Same Date | 72 | 0 |
| 0.92 J | ND<1.5 U1c3c | Same Date | 72 | 0 |
| 0.92 J | ND<1.5 U1c3c | Same Date | 72 | 0 |
| ND<1.5 U | ND<1.5 U1c3c | 0 | 72 | 0 |
| ND<1.5 U | ND<1.5 U1c3c | 0 | 72 | 0 |
| ND<1.5 U | ND<1.5 U1c3c | 0 | 72 | 0 |
| 2 J | ND<1.5 U1c3c | 0.5 | 73 | 0 |
| 2.4 J | ND<1.5 U1c3c | 0.9 | 74 | 0 |
| 3.4 | ND<1.5 U1c3c | 1.9 | 75 | 0 |
| 2.5 J | ND<1.5 U1c3c | 1 | 76 | 0 |
| 3.4 | ND<1.5 U1c3c | 1.9 | 77 | 0 |
| 5.722 | ND<1.5 U1c3c | 4.222 | 78 | 0 |
| 5.722 | ND<1.5 U1c3c | 4.222 | 79 | 0 |
| 5.194 | ND<1.5 U1c3c | 3.694 | 80 | 0 |
| 4.492 | ND<1.5 U1c3c | 2.992 | 81 | 0 |
| 1.893 | ND<1.5 U1c3c | 0.393 | 82 | 0 |
| 1.564 | ND<1.5 U1c3c | 0.064 | 83 | 0 |
| | | | | |
| 0.92 J | ND<1.5 U2c | Same Date | 83 | 0 |
| 0.92 J | ND<1.5 U2c | Same Date | 83 | 0 |
| ND<1.5 U | ND<1.5 U2c | 0 | 83 | 0 |
| ND<1.5 U | ND<1.5 U2c | 0 | 83 | 0 |
| ND<1.5 U | ND<1.5 U2c | 0 | 83 | 0 |
| 2 J | ND<1.5 U2c | 0.5 | 84 | 0 |
| 2.4 J | ND<1.5 U2c | 0.9 | 85 | 0 |
| 3.4 | ND<1.5 U2c | 1.9 | 86 | 0 |
| 2.5 J | ND<1.5 U2c | 1 | 87 | 0 |
| 3.4 | ND<1.5 U2c | 1.9 | 88 | 0 |
| 5.722 | ND<1.5 U2c | 4.222 | 89 | 0 |
| 5.722 | ND<1.5 U2c | 4.222 | 90 | 0 |
| 5.194 | ND<1.5 U2c | 3.694 | 91 | 0 |
| 4.492 | ND<1.5 U2c | 2.992 | 92 | 0 |

| | | | | |
|---|---|---|---|---|
| 1.893 | ND<1.5 U2c | 0.393 | 93 | 0 |
| 1.564 | ND<1.5 U2c | 0.064 | 94 | 0 |
| | | | | |
| 0.92 J | 0.92 J | Same Date | 94 | 0 |
| ND<1.5 U | 0.92 J | 0.58 | 95 | 0 |
| ND<1.5 U | 0.92 J | 0.58 | 96 | 0 |
| ND<1.5 U | 0.92 J | 0.58 | 97 | 0 |
| 2 J | 0.92 J | 1.08 | 98 | 0 |
| 2.4 J | 0.92 J | 1.48 | 99 | 0 |
| 3.4 | 0.92 J | 2.48 | 100 | 0 |
| 2.5 J | 0.92 J | 1.58 | 101 | 0 |
| 3.4 | 0.92 J | 2.48 | 102 | 0 |
| 5.722 | 0.92 J | 4.802 | 103 | 0 |
| 5.722 | 0.92 J | 4.802 | 104 | 0 |
| 5.194 | 0.92 J | 4.274 | 105 | 0 |
| 4.492 | 0.92 J | 3.572 | 106 | 0 |
| 1.893 | 0.92 J | 0.973 | 107 | 0 |
| 1.564 | 0.92 J | 0.644 | 108 | 0 |
| | | | | |
| ND<1.5 U | 0.92 J | 0.58 | 109 | 0 |
| ND<1.5 U | 0.92 J | 0.58 | 110 | 0 |
| ND<1.5 U | 0.92 J | 0.58 | 111 | 0 |
| 2 J | 0.92 J | 1.08 | 112 | 0 |
| 2.4 J | 0.92 J | 1.48 | 113 | 0 |
| 3.4 | 0.92 J | 2.48 | 114 | 0 |
| 2.5 J | 0.92 J | 1.58 | 115 | 0 |
| 3.4 | 0.92 J | 2.48 | 116 | 0 |
| 5.722 | 0.92 J | 4.802 | 117 | 0 |
| 5.722 | 0.92 J | 4.802 | 118 | 0 |
| 5.194 | 0.92 J | 4.274 | 119 | 0 |
| 4.492 | 0.92 J | 3.572 | 120 | 0 |
| 1.893 | 0.92 J | 0.973 | 121 | 0 |
| 1.564 | 0.92 J | 0.644 | 122 | 0 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 122 | 0 |
| ND<1.5 U | ND<1.5 U | 0 | 122 | 0 |
| 2 J | ND<1.5 U | 0.5 | 123 | 0 |
| 2.4 J | ND<1.5 U | 0.9 | 124 | 0 |
| 3.4 | ND<1.5 U | 1.9 | 125 | 0 |
| 2.5 J | ND<1.5 U | 1 | 126 | 0 |
| 3.4 | ND<1.5 U | 1.9 | 127 | 0 |
| 5.722 | ND<1.5 U | 4.222 | 128 | 0 |
| 5.722 | ND<1.5 U | 4.222 | 129 | 0 |
| 5.194 | ND<1.5 U | 3.694 | 130 | 0 |
| 4.492 | ND<1.5 U | 2.992 | 131 | 0 |
| 1.893 | ND<1.5 U | 0.393 | 132 | 0 |
| 1.564 | ND<1.5 U | 0.064 | 133 | 0 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 133 | 0 |
| 2 J | ND<1.5 U | 0.5 | 134 | 0 |
| 2.4 J | ND<1.5 U | 0.9 | 135 | 0 |
| 3.4 | ND<1.5 U | 1.9 | 136 | 0 |
| 2.5 J | ND<1.5 U | 1 | 137 | 0 |
| 3.4 | ND<1.5 U | 1.9 | 138 | 0 |
| 5.722 | ND<1.5 U | 4.222 | 139 | 0 |
| 5.722 | ND<1.5 U | 4.222 | 140 | 0 |
| 5.194 | ND<1.5 U | 3.694 | 141 | 0 |

| | | | | |
|---|---|---|---|---|
| 4.492 | ND<1.5 U | 2.992 | 142 | 0 |
| 1.893 | ND<1.5 U | 0.393 | 143 | 0 |
| 1.564 | ND<1.5 U | 0.064 | 144 | 0 |
| | | | | |
| 2 J | ND<1.5 U | 0.5 | 145 | 0 |
| 2.4 J | ND<1.5 U | 0.9 | 146 | 0 |
| 3.4 | ND<1.5 U | 1.9 | 147 | 0 |
| 2.5 J | ND<1.5 U | 1 | 148 | 0 |
| 3.4 | ND<1.5 U | 1.9 | 149 | 0 |
| 5.722 | ND<1.5 U | 4.222 | 150 | 0 |
| 5.722 | ND<1.5 U | 4.222 | 151 | 0 |
| 5.194 | ND<1.5 U | 3.694 | 152 | 0 |
| 4.492 | ND<1.5 U | 2.992 | 153 | 0 |
| 1.893 | ND<1.5 U | 0.393 | 154 | 0 |
| 1.564 | ND<1.5 U | 0.064 | 155 | 0 |
| | | | | |
| 2.4 J | 2 J | 0.4 | 156 | 0 |
| 3.4 | 2 J | 1.4 | 157 | 0 |
| 2.5 J | 2 J | 0.5 | 158 | 0 |
| 3.4 | 2 J | 1.4 | 159 | 0 |
| 5.722 | 2 J | 3.722 | 160 | 0 |
| 5.722 | 2 J | 3.722 | 161 | 0 |
| 5.194 | 2 J | 3.194 | 162 | 0 |
| 4.492 | 2 J | 2.492 | 163 | 0 |
| 1.893 | 2 J | -0.107 | 163 | 1 |
| 1.564 | 2 J | -0.436 | 163 | 2 |
| | | | | |
| 3.4 | 2.4 J | 1 | 164 | 2 |
| 2.5 J | 2.4 J | 0.1 | 165 | 2 |
| 3.4 | 2.4 J | 1 | 166 | 2 |
| 5.722 | 2.4 J | 3.322 | 167 | 2 |
| 5.722 | 2.4 J | 3.322 | 168 | 2 |
| 5.194 | 2.4 J | 2.794 | 169 | 2 |
| 4.492 | 2.4 J | 2.092 | 170 | 2 |
| 1.893 | 2.4 J | -0.507 | 170 | 3 |
| 1.564 | 2.4 J | -0.836 | 170 | 4 |
| | | | | |
| 2.5 J | 3.4 | -0.9 | 170 | 5 |
| 3.4 | 3.4 | 0 | 170 | 5 |
| 5.722 | 3.4 | 2.322 | 171 | 5 |
| 5.722 | 3.4 | 2.322 | 172 | 5 |
| 5.194 | 3.4 | 1.794 | 173 | 5 |
| 4.492 | 3.4 | 1.092 | 174 | 5 |
| 1.893 | 3.4 | -1.507 | 174 | 6 |
| 1.564 | 3.4 | -1.836 | 174 | 7 |
| | | | | |
| 3.4 | 2.5 J | 0.9 | 175 | 7 |
| 5.722 | 2.5 J | 3.222 | 176 | 7 |
| 5.722 | 2.5 J | 3.222 | 177 | 7 |
| 5.194 | 2.5 J | 2.694 | 178 | 7 |
| 4.492 | 2.5 J | 1.992 | 179 | 7 |
| 1.893 | 2.5 J | -0.607 | 179 | 8 |
| 1.564 | 2.5 J | -0.936 | 179 | 9 |
| | | | | |
| 5.722 | 3.4 | 2.322 | 180 | 9 |
| 5.722 | 3.4 | 2.322 | 181 | 9 |
| 5.194 | 3.4 | 1.794 | 182 | 9 |

| | | | | |
|---|---|---|---|---|
| 4.492 | 3.4 | 1.092 | 183 | 9 |
| 1.893 | 3.4 | -1.507 | 183 | 10 |
| 1.564 | 3.4 | -1.836 | 183 | 11 |
| | | | | |
| 5.722 | 5.722 | Same Date | 183 | 11 |
| 5.194 | 5.722 | -0.528 | 183 | 12 |
| 4.492 | 5.722 | -1.23 | 183 | 13 |
| 1.893 | 5.722 | -3.829 | 183 | 14 |
| 1.564 | 5.722 | -4.158 | 183 | 15 |
| | | | | |
| 5.194 | 5.722 | -0.528 | 183 | 16 |
| 4.492 | 5.722 | -1.23 | 183 | 17 |
| 1.893 | 5.722 | -3.829 | 183 | 18 |
| 1.564 | 5.722 | -4.158 | 183 | 19 |
| | | | | |
| 4.492 | 5.194 | -0.702 | 183 | 20 |
| 1.893 | 5.194 | -3.301 | 183 | 21 |
| 1.564 | 5.194 | -3.63 | 183 | 22 |
| | | | | |
| 1.893 | 4.492 | -2.599 | 183 | 23 |
| 1.564 | 4.492 | -2.928 | 183 | 24 |
| | | | | |
| 1.564 | 1.893 | -0.329 | 183 | 25 |

S Statistic = 183 - 25 = 158

| Tied Group | Value | Members |
|---|---|---|
| 1 | 1.5 | 9 |
| 2 | 0.92 | 4 |
| 3 | 3.4 | 2 |
| 4 | 5.722 | 2 |

| Time Period | Observations |
|---|---|
| 5/1/2019 | 10 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 2 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 2 time periods with multiple data

A = 1848
B = 2268
C = 528
D = 720
E = 88
F = 92
a = 29256

b = 109296
c = 1104
Group Variance = 1407.48
Z-Score = 4.18484
Comparison Level at 95% confidence level = 1.65463 (upward trend)
**4.18484 > 1.65463 indicating an upward trend**

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RW23-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 2270 | 2340 | Same Date | 0 | 0 |
| 2800 | 2340 | 460 | 1 | 0 |
| 2680 | 2340 | 340 | 2 | 0 |
| 2600 | 2340 | 260 | 3 | 0 |
| 2740 | 2340 | 400 | 4 | 0 |
| 2500 1c | 2340 | 160 | 5 | 0 |
| 2340 | 2340 | 0 | 5 | 0 |
| 2870 | 2340 | 530 | 6 | 0 |
| 2590 | 2340 | 250 | 7 | 0 |
| 2610 | 2340 | 270 | 8 | 0 |
| 2844 | 2340 | 504 | 9 | 0 |
| 3005 | 2340 | 665 | 10 | 0 |
| 3222 | 2340 | 882 | 11 | 0 |
| 2687 | 2340 | 347 | 12 | 0 |
| 3342 | 2340 | 1002 | 13 | 0 |
| | | | | |
| 2800 | 2270 | 530 | 14 | 0 |
| 2680 | 2270 | 410 | 15 | 0 |
| 2600 | 2270 | 330 | 16 | 0 |
| 2740 | 2270 | 470 | 17 | 0 |
| 2500 1c | 2270 | 230 | 18 | 0 |
| 2340 | 2270 | 70 | 19 | 0 |
| 2870 | 2270 | 600 | 20 | 0 |
| 2590 | 2270 | 320 | 21 | 0 |
| 2610 | 2270 | 340 | 22 | 0 |
| 2844 | 2270 | 574 | 23 | 0 |
| 3005 | 2270 | 735 | 24 | 0 |
| 3222 | 2270 | 952 | 25 | 0 |
| 2687 | 2270 | 417 | 26 | 0 |
| 3342 | 2270 | 1072 | 27 | 0 |
| | | | | |
| 2680 | 2800 | -120 | 27 | 1 |
| 2600 | 2800 | -200 | 27 | 2 |
| 2740 | 2800 | -60 | 27 | 3 |
| 2500 1c | 2800 | -300 | 27 | 4 |
| 2340 | 2800 | -460 | 27 | 5 |
| 2870 | 2800 | 70 | 28 | 5 |
| 2590 | 2800 | -210 | 28 | 6 |
| 2610 | 2800 | -190 | 28 | 7 |
| 2844 | 2800 | 44 | 29 | 7 |
| 3005 | 2800 | 205 | 30 | 7 |
| 3222 | 2800 | 422 | 31 | 7 |
| 2687 | 2800 | -113 | 31 | 8 |
| 3342 | 2800 | 542 | 32 | 8 |
| | | | | |
| 2600 | 2680 | -80 | 32 | 9 |
| 2740 | 2680 | 60 | 33 | 9 |

| | | | | |
|---|---|---|---|---|
| 2500 1c | 2680 | -180 | 33 | 10 |
| 2340 | 2680 | -340 | 33 | 11 |
| 2870 | 2680 | 190 | 34 | 11 |
| 2590 | 2680 | -90 | 34 | 12 |
| 2610 | 2680 | -70 | 34 | 13 |
| 2844 | 2680 | 164 | 35 | 13 |
| 3005 | 2680 | 325 | 36 | 13 |
| 3222 | 2680 | 542 | 37 | 13 |
| 2687 | 2680 | 7 | 38 | 13 |
| 3342 | 2680 | 662 | 39 | 13 |
| | | | | |
| 2740 | 2600 | 140 | 40 | 13 |
| 2500 1c | 2600 | -100 | 40 | 14 |
| 2340 | 2600 | -260 | 40 | 15 |
| 2870 | 2600 | 270 | 41 | 15 |
| 2590 | 2600 | -10 | 41 | 16 |
| 2610 | 2600 | 10 | 42 | 16 |
| 2844 | 2600 | 244 | 43 | 16 |
| 3005 | 2600 | 405 | 44 | 16 |
| 3222 | 2600 | 622 | 45 | 16 |
| 2687 | 2600 | 87 | 46 | 16 |
| 3342 | 2600 | 742 | 47 | 16 |
| | | | | |
| 2500 1c | 2740 | -240 | 47 | 17 |
| 2340 | 2740 | -400 | 47 | 18 |
| 2870 | 2740 | 130 | 48 | 18 |
| 2590 | 2740 | -150 | 48 | 19 |
| 2610 | 2740 | -130 | 48 | 20 |
| 2844 | 2740 | 104 | 49 | 20 |
| 3005 | 2740 | 265 | 50 | 20 |
| 3222 | 2740 | 482 | 51 | 20 |
| 2687 | 2740 | -53 | 51 | 21 |
| 3342 | 2740 | 602 | 52 | 21 |
| | | | | |
| 2340 | 2500 1c | -160 | 52 | 22 |
| 2870 | 2500 1c | 370 | 53 | 22 |
| 2590 | 2500 1c | 90 | 54 | 22 |
| 2610 | 2500 1c | 110 | 55 | 22 |
| 2844 | 2500 1c | 344 | 56 | 22 |
| 3005 | 2500 1c | 505 | 57 | 22 |
| 3222 | 2500 1c | 722 | 58 | 22 |
| 2687 | 2500 1c | 187 | 59 | 22 |
| 3342 | 2500 1c | 842 | 60 | 22 |
| | | | | |
| 2870 | 2340 | 530 | 61 | 22 |
| 2590 | 2340 | 250 | 62 | 22 |
| 2610 | 2340 | 270 | 63 | 22 |
| 2844 | 2340 | 504 | 64 | 22 |
| 3005 | 2340 | 665 | 65 | 22 |
| 3222 | 2340 | 882 | 66 | 22 |
| 2687 | 2340 | 347 | 67 | 22 |
| 3342 | 2340 | 1002 | 68 | 22 |
| | | | | |
| 2590 | 2870 | -280 | 68 | 23 |
| 2610 | 2870 | -260 | 68 | 24 |
| 2844 | 2870 | -26 | 68 | 25 |
| 3005 | 2870 | 135 | 69 | 25 |

| | | | | |
|---|---|---|---|---|
| 3222 | 2870 | 352 | 70 | 25 |
| 2687 | 2870 | -183 | 70 | 26 |
| 3342 | 2870 | 472 | 71 | 26 |
| | | | | |
| 2610 | 2590 | 20 | 72 | 26 |
| 2844 | 2590 | 254 | 73 | 26 |
| 3005 | 2590 | 415 | 74 | 26 |
| 3222 | 2590 | 632 | 75 | 26 |
| 2687 | 2590 | 97 | 76 | 26 |
| 3342 | 2590 | 752 | 77 | 26 |
| | | | | |
| 2844 | 2610 | 234 | 78 | 26 |
| 3005 | 2610 | 395 | 79 | 26 |
| 3222 | 2610 | 612 | 80 | 26 |
| 2687 | 2610 | 77 | 81 | 26 |
| 3342 | 2610 | 732 | 82 | 26 |
| | | | | |
| 3005 | 2844 | 161 | 83 | 26 |
| 3222 | 2844 | 378 | 84 | 26 |
| 2687 | 2844 | -157 | 84 | 27 |
| 3342 | 2844 | 498 | 85 | 27 |
| | | | | |
| 3222 | 3005 | 217 | 86 | 27 |
| 2687 | 3005 | -318 | 86 | 28 |
| 3342 | 3005 | 337 | 87 | 28 |
| | | | | |
| 2687 | 3222 | -535 | 87 | 29 |
| 3342 | 3222 | 120 | 88 | 29 |
| | | | | |
| 3342 | 2687 | 655 | 89 | 29 |

S Statistic = 89 - 29 = 60

| Tied Group | Value | Members |
|---|---|---|
| 1 | 2340 | 2 |

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 18
B = 18

C = 0
D = 0
E = 2
F = 2
a = 8880
b = 30240
c = 480
Group Variance = 491.342
Z-Score = 2.66171
Comparison Level at 95% confidence level = 1.65463 (upward trend)
**2.66171 > 1.65463 indicating an upward trend**

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RW24-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 1580 | 1610 | Same Date | 0 | 0 |
| 1540 | 1610 | -70 | 0 | 1 |
| 1250 | 1610 | -360 | 0 | 2 |
| 1190 | 1610 | -420 | 0 | 3 |
| 1050 | 1610 | -560 | 0 | 4 |
| 922 | 1610 | -688 | 0 | 5 |
| 842 | 1610 | -768 | 0 | 6 |
| 890 | 1610 | -720 | 0 | 7 |
| 1200 | 1610 | -410 | 0 | 8 |
| 1113 | 1610 | -497 | 0 | 9 |
| 2122 | 1610 | 512 | 1 | 9 |
| | | | | |
| 1540 | 1580 | -40 | 1 | 10 |
| 1250 | 1580 | -330 | 1 | 11 |
| 1190 | 1580 | -390 | 1 | 12 |
| 1050 | 1580 | -530 | 1 | 13 |
| 922 | 1580 | -658 | 1 | 14 |
| 842 | 1580 | -738 | 1 | 15 |
| 890 | 1580 | -690 | 1 | 16 |
| 1200 | 1580 | -380 | 1 | 17 |
| 1113 | 1580 | -467 | 1 | 18 |
| 2122 | 1580 | 542 | 2 | 18 |
| | | | | |
| 1250 | 1540 | -290 | 2 | 19 |
| 1190 | 1540 | -350 | 2 | 20 |
| 1050 | 1540 | -490 | 2 | 21 |
| 922 | 1540 | -618 | 2 | 22 |
| 842 | 1540 | -698 | 2 | 23 |
| 890 | 1540 | -650 | 2 | 24 |
| 1200 | 1540 | -340 | 2 | 25 |
| 1113 | 1540 | -427 | 2 | 26 |
| 2122 | 1540 | 582 | 3 | 26 |
| | | | | |
| 1190 | 1250 | -60 | 3 | 27 |
| 1050 | 1250 | -200 | 3 | 28 |
| 922 | 1250 | -328 | 3 | 29 |
| 842 | 1250 | -408 | 3 | 30 |
| 890 | 1250 | -360 | 3 | 31 |
| 1200 | 1250 | -50 | 3 | 32 |
| 1113 | 1250 | -137 | 3 | 33 |
| 2122 | 1250 | 872 | 4 | 33 |
| | | | | |
| 1050 | 1190 | -140 | 4 | 34 |
| 922 | 1190 | -268 | 4 | 35 |
| 842 | 1190 | -348 | 4 | 36 |
| 890 | 1190 | -300 | 4 | 37 |
| 1200 | 1190 | 10 | 5 | 37 |

| | | | | |
|---|---|---|---|---|
| 1113 | 1190 | -77 | 5 | 38 |
| 2122 | 1190 | 932 | 6 | 38 |
| | | | | |
| 922 | 1050 | -128 | 6 | 39 |
| 842 | 1050 | -208 | 6 | 40 |
| 890 | 1050 | -160 | 6 | 41 |
| 1200 | 1050 | 150 | 7 | 41 |
| 1113 | 1050 | 63 | 8 | 41 |
| 2122 | 1050 | 1072 | 9 | 41 |
| | | | | |
| 842 | 922 | -80 | 9 | 42 |
| 890 | 922 | -32 | 9 | 43 |
| 1200 | 922 | 278 | 10 | 43 |
| 1113 | 922 | 191 | 11 | 43 |
| 2122 | 922 | 1200 | 12 | 43 |
| | | | | |
| 890 | 842 | 48 | 13 | 43 |
| 1200 | 842 | 358 | 14 | 43 |
| 1113 | 842 | 271 | 15 | 43 |
| 2122 | 842 | 1280 | 16 | 43 |
| | | | | |
| 1200 | 890 | 310 | 17 | 43 |
| 1113 | 890 | 223 | 18 | 43 |
| 2122 | 890 | 1232 | 19 | 43 |
| | | | | |
| 1113 | 1200 | -87 | 19 | 44 |
| 2122 | 1200 | 922 | 20 | 44 |
| | | | | |
| 2122 | 1113 | 1009 | 21 | 44 |

S Statistic = 21 - 44 = -23

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 3/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 0
B = 18
C = 0
D = 0
E = 0
F = 2
a = 3828
b = 11880

c = 264
Group Variance = 211.667
Z-Score = -1.51216
Comparison Level at 95% confidence level = 1.65463 (upward trend)
-1.51216 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RW25-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 507 | 500 | Same Date | 0 | 0 |
| 9.9 | 500 | -490.1 | 0 | 1 |
| 622 | 500 | 122 | 1 | 1 |
| 633 | 500 | 133 | 2 | 1 |
| 652 | 500 | 152 | 3 | 1 |
| 708 | 500 | 208 | 4 | 1 |
| 703 | 500 | 203 | 5 | 1 |
| 626 | 500 | 126 | 6 | 1 |
| 926 | 500 | 426 | 7 | 1 |
| 640.3 | 500 | 140.3 | 8 | 1 |
| 1156 | 500 | 656 | 9 | 1 |
| | | | | |
| 9.9 | 507 | -497.1 | 9 | 2 |
| 622 | 507 | 115 | 10 | 2 |
| 633 | 507 | 126 | 11 | 2 |
| 652 | 507 | 145 | 12 | 2 |
| 708 | 507 | 201 | 13 | 2 |
| 703 | 507 | 196 | 14 | 2 |
| 626 | 507 | 119 | 15 | 2 |
| 926 | 507 | 419 | 16 | 2 |
| 640.3 | 507 | 133.3 | 17 | 2 |
| 1156 | 507 | 649 | 18 | 2 |
| | | | | |
| 622 | 9.9 | 612.1 | 19 | 2 |
| 633 | 9.9 | 623.1 | 20 | 2 |
| 652 | 9.9 | 642.1 | 21 | 2 |
| 708 | 9.9 | 698.1 | 22 | 2 |
| 703 | 9.9 | 693.1 | 23 | 2 |
| 626 | 9.9 | 616.1 | 24 | 2 |
| 926 | 9.9 | 916.1 | 25 | 2 |
| 640.3 | 9.9 | 630.4 | 26 | 2 |
| 1156 | 9.9 | 1146.1 | 27 | 2 |
| | | | | |
| 633 | 622 | 11 | 28 | 2 |
| 652 | 622 | 30 | 29 | 2 |
| 708 | 622 | 86 | 30 | 2 |
| 703 | 622 | 81 | 31 | 2 |
| 626 | 622 | 4 | 32 | 2 |
| 926 | 622 | 304 | 33 | 2 |
| 640.3 | 622 | 18.3 | 34 | 2 |
| 1156 | 622 | 534 | 35 | 2 |
| | | | | |
| 652 | 633 | 19 | 36 | 2 |
| 708 | 633 | 75 | 37 | 2 |
| 703 | 633 | 70 | 38 | 2 |
| 626 | 633 | -7 | 38 | 3 |
| 926 | 633 | 293 | 39 | 3 |

| | | | | |
|---|---|---|---|---|
| 640.3 | 633 | 7.3 | 40 | 3 |
| 1156 | 633 | 523 | 41 | 3 |
| | | | | |
| 708 | 652 | 56 | 42 | 3 |
| 703 | 652 | 51 | 43 | 3 |
| 626 | 652 | -26 | 43 | 4 |
| 926 | 652 | 274 | 44 | 4 |
| 640.3 | 652 | -11.7 | 44 | 5 |
| 1156 | 652 | 504 | 45 | 5 |
| | | | | |
| 703 | 708 | -5 | 45 | 6 |
| 626 | 708 | -82 | 45 | 7 |
| 926 | 708 | 218 | 46 | 7 |
| 640.3 | 708 | -67.7 | 46 | 8 |
| 1156 | 708 | 448 | 47 | 8 |
| | | | | |
| 626 | 703 | -77 | 47 | 9 |
| 926 | 703 | 223 | 48 | 9 |
| 640.3 | 703 | -62.7 | 48 | 10 |
| 1156 | 703 | 453 | 49 | 10 |
| | | | | |
| 926 | 626 | 300 | 50 | 10 |
| 640.3 | 626 | 14.3 | 51 | 10 |
| 1156 | 626 | 530 | 52 | 10 |
| | | | | |
| 640.3 | 926 | -285.7 | 52 | 11 |
| 1156 | 926 | 230 | 53 | 11 |
| | | | | |
| 1156 | 640.3 | 515.7 | 54 | 11 |

S Statistic = 54 - 11 = 43

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 3/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 0
B = 18
C = 0
D = 0
E = 0
F = 2
a = 3828
b = 11880

c = 264
Group Variance = 211.667
Z-Score = 2.88684
Comparison Level at 95% confidence level = 1.65463 (upward trend)
**2.88684 > 1.65463 indicating an upward trend**

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RWA-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 6960 M6 | 6960 M6 | Same Date | 0 | 0 |
| 7060 M6 | 6960 M6 | Same Date | 0 | 0 |
| 7060 M6 | 6960 M6 | Same Date | 0 | 0 |
| 7060 M6 | 6960 M6 | Same Date | 0 | 0 |
| 7060 M6 | 6960 M6 | Same Date | 0 | 0 |
| 6960 M6 | 6960 M6 | Same Date | 0 | 0 |
| 6960 M6 | 6960 M6 | Same Date | 0 | 0 |
| 6970 1c2c | 6960 M6 | Same Date | 0 | 0 |
| 6830 | 6960 M6 | Same Date | 0 | 0 |
| 7740 | 6960 M6 | 780 | 1 | 0 |
| 9020 | 6960 M6 | 2060 | 2 | 0 |
| 12600 | 6960 M6 | 5640 | 3 | 0 |
| 10200 | 6960 M6 | 3240 | 4 | 0 |
| 7630 | 6960 M6 | 670 | 5 | 0 |
| 10100 MH | 6960 M6 | 3140 | 6 | 0 |
| 11700 | 6960 M6 | 4740 | 7 | 0 |
| 8510 | 6960 M6 | 1550 | 8 | 0 |
| 9840 | 6960 M6 | 2880 | 9 | 0 |
| 8587 | 6960 M6 | 1627 | 10 | 0 |
| 8051 | 6960 M6 | 1091 | 11 | 0 |
| 7977 | 6960 M6 | 1017 | 12 | 0 |
| 8386 | 6960 M6 | 1426 | 13 | 0 |
| 8451 | 6960 M6 | 1491 | 14 | 0 |
| | | | | |
| 7060 M6 | 6960 M6 | Same Date | 14 | 0 |
| 7060 M6 | 6960 M6 | Same Date | 14 | 0 |
| 7060 M6 | 6960 M6 | Same Date | 14 | 0 |
| 7060 M6 | 6960 M6 | Same Date | 14 | 0 |
| 6960 M6 | 6960 M6 | Same Date | 14 | 0 |
| 6960 M6 | 6960 M6 | Same Date | 14 | 0 |
| 6970 1c2c | 6960 M6 | Same Date | 14 | 0 |
| 6830 | 6960 M6 | Same Date | 14 | 0 |
| 7740 | 6960 M6 | 780 | 15 | 0 |
| 9020 | 6960 M6 | 2060 | 16 | 0 |
| 12600 | 6960 M6 | 5640 | 17 | 0 |
| 10200 | 6960 M6 | 3240 | 18 | 0 |
| 7630 | 6960 M6 | 670 | 19 | 0 |
| 10100 MH | 6960 M6 | 3140 | 20 | 0 |
| 11700 | 6960 M6 | 4740 | 21 | 0 |
| 8510 | 6960 M6 | 1550 | 22 | 0 |
| 9840 | 6960 M6 | 2880 | 23 | 0 |
| 8587 | 6960 M6 | 1627 | 24 | 0 |
| 8051 | 6960 M6 | 1091 | 25 | 0 |
| 7977 | 6960 M6 | 1017 | 26 | 0 |
| 8386 | 6960 M6 | 1426 | 27 | 0 |
| 8451 | 6960 M6 | 1491 | 28 | 0 |

| | | | | |
|---|---|---|---|---|
| 7060 M6 | 7060 M6 | Same Date | 28 | 0 |
| 7060 M6 | 7060 M6 | Same Date | 28 | 0 |
| 7060 M6 | 7060 M6 | Same Date | 28 | 0 |
| 6960 M6 | 7060 M6 | Same Date | 28 | 0 |
| 6960 M6 | 7060 M6 | Same Date | 28 | 0 |
| 6970 1c2c | 7060 M6 | Same Date | 28 | 0 |
| 6830 | 7060 M6 | Same Date | 28 | 0 |
| 7740 | 7060 M6 | 680 | 29 | 0 |
| 9020 | 7060 M6 | 1960 | 30 | 0 |
| 12600 | 7060 M6 | 5540 | 31 | 0 |
| 10200 | 7060 M6 | 3140 | 32 | 0 |
| 7630 | 7060 M6 | 570 | 33 | 0 |
| 10100 MH | 7060 M6 | 3040 | 34 | 0 |
| 11700 | 7060 M6 | 4640 | 35 | 0 |
| 8510 | 7060 M6 | 1450 | 36 | 0 |
| 9840 | 7060 M6 | 2780 | 37 | 0 |
| 8587 | 7060 M6 | 1527 | 38 | 0 |
| 8051 | 7060 M6 | 991 | 39 | 0 |
| 7977 | 7060 M6 | 917 | 40 | 0 |
| 8386 | 7060 M6 | 1326 | 41 | 0 |
| 8451 | 7060 M6 | 1391 | 42 | 0 |

| | | | | |
|---|---|---|---|---|
| 7060 M6 | 7060 M6 | Same Date | 42 | 0 |
| 7060 M6 | 7060 M6 | Same Date | 42 | 0 |
| 6960 M6 | 7060 M6 | Same Date | 42 | 0 |
| 6960 M6 | 7060 M6 | Same Date | 42 | 0 |
| 6970 1c2c | 7060 M6 | Same Date | 42 | 0 |
| 6830 | 7060 M6 | Same Date | 42 | 0 |
| 7740 | 7060 M6 | 680 | 43 | 0 |
| 9020 | 7060 M6 | 1960 | 44 | 0 |
| 12600 | 7060 M6 | 5540 | 45 | 0 |
| 10200 | 7060 M6 | 3140 | 46 | 0 |
| 7630 | 7060 M6 | 570 | 47 | 0 |
| 10100 MH | 7060 M6 | 3040 | 48 | 0 |
| 11700 | 7060 M6 | 4640 | 49 | 0 |
| 8510 | 7060 M6 | 1450 | 50 | 0 |
| 9840 | 7060 M6 | 2780 | 51 | 0 |
| 8587 | 7060 M6 | 1527 | 52 | 0 |
| 8051 | 7060 M6 | 991 | 53 | 0 |
| 7977 | 7060 M6 | 917 | 54 | 0 |
| 8386 | 7060 M6 | 1326 | 55 | 0 |
| 8451 | 7060 M6 | 1391 | 56 | 0 |

| | | | | |
|---|---|---|---|---|
| 7060 M6 | 7060 M6 | Same Date | 56 | 0 |
| 6960 M6 | 7060 M6 | Same Date | 56 | 0 |
| 6960 M6 | 7060 M6 | Same Date | 56 | 0 |
| 6970 1c2c | 7060 M6 | Same Date | 56 | 0 |
| 6830 | 7060 M6 | Same Date | 56 | 0 |
| 7740 | 7060 M6 | 680 | 57 | 0 |
| 9020 | 7060 M6 | 1960 | 58 | 0 |
| 12600 | 7060 M6 | 5540 | 59 | 0 |
| 10200 | 7060 M6 | 3140 | 60 | 0 |
| 7630 | 7060 M6 | 570 | 61 | 0 |
| 10100 MH | 7060 M6 | 3040 | 62 | 0 |
| 11700 | 7060 M6 | 4640 | 63 | 0 |
| 8510 | 7060 M6 | 1450 | 64 | 0 |
| 9840 | 7060 M6 | 2780 | 65 | 0 |

| | | | | |
|---|---|---|---|---|
| 8587 | 7060 M6 | 1527 | 66 | 0 |
| 8051 | 7060 M6 | 991 | 67 | 0 |
| 7977 | 7060 M6 | 917 | 68 | 0 |
| 8386 | 7060 M6 | 1326 | 69 | 0 |
| 8451 | 7060 M6 | 1391 | 70 | 0 |
| | | | | |
| 6960 M6 | 7060 M6 | Same Date | 70 | 0 |
| 6960 M6 | 7060 M6 | Same Date | 70 | 0 |
| 6970 1c2c | 7060 M6 | Same Date | 70 | 0 |
| 6830 | 7060 M6 | Same Date | 70 | 0 |
| 7740 | 7060 M6 | 680 | 71 | 0 |
| 9020 | 7060 M6 | 1960 | 72 | 0 |
| 12600 | 7060 M6 | 5540 | 73 | 0 |
| 10200 | 7060 M6 | 3140 | 74 | 0 |
| 7630 | 7060 M6 | 570 | 75 | 0 |
| 10100 MH | 7060 M6 | 3040 | 76 | 0 |
| 11700 | 7060 M6 | 4640 | 77 | 0 |
| 8510 | 7060 M6 | 1450 | 78 | 0 |
| 9840 | 7060 M6 | 2780 | 79 | 0 |
| 8587 | 7060 M6 | 1527 | 80 | 0 |
| 8051 | 7060 M6 | 991 | 81 | 0 |
| 7977 | 7060 M6 | 917 | 82 | 0 |
| 8386 | 7060 M6 | 1326 | 83 | 0 |
| 8451 | 7060 M6 | 1391 | 84 | 0 |
| | | | | |
| 6960 M6 | 6960 M6 | Same Date | 84 | 0 |
| 6970 1c2c | 6960 M6 | Same Date | 84 | 0 |
| 6830 | 6960 M6 | Same Date | 84 | 0 |
| 7740 | 6960 M6 | 780 | 85 | 0 |
| 9020 | 6960 M6 | 2060 | 86 | 0 |
| 12600 | 6960 M6 | 5640 | 87 | 0 |
| 10200 | 6960 M6 | 3240 | 88 | 0 |
| 7630 | 6960 M6 | 670 | 89 | 0 |
| 10100 MH | 6960 M6 | 3140 | 90 | 0 |
| 11700 | 6960 M6 | 4740 | 91 | 0 |
| 8510 | 6960 M6 | 1550 | 92 | 0 |
| 9840 | 6960 M6 | 2880 | 93 | 0 |
| 8587 | 6960 M6 | 1627 | 94 | 0 |
| 8051 | 6960 M6 | 1091 | 95 | 0 |
| 7977 | 6960 M6 | 1017 | 96 | 0 |
| 8386 | 6960 M6 | 1426 | 97 | 0 |
| 8451 | 6960 M6 | 1491 | 98 | 0 |
| | | | | |
| 6970 1c2c | 6960 M6 | Same Date | 98 | 0 |
| 6830 | 6960 M6 | Same Date | 98 | 0 |
| 7740 | 6960 M6 | 780 | 99 | 0 |
| 9020 | 6960 M6 | 2060 | 100 | 0 |
| 12600 | 6960 M6 | 5640 | 101 | 0 |
| 10200 | 6960 M6 | 3240 | 102 | 0 |
| 7630 | 6960 M6 | 670 | 103 | 0 |
| 10100 MH | 6960 M6 | 3140 | 104 | 0 |
| 11700 | 6960 M6 | 4740 | 105 | 0 |
| 8510 | 6960 M6 | 1550 | 106 | 0 |
| 9840 | 6960 M6 | 2880 | 107 | 0 |
| 8587 | 6960 M6 | 1627 | 108 | 0 |
| 8051 | 6960 M6 | 1091 | 109 | 0 |
| 7977 | 6960 M6 | 1017 | 110 | 0 |

| | | | | |
|---|---|---|---|---|
| 8386 | 6960 M6 | 1426 | 111 | 0 |
| 8451 | 6960 M6 | 1491 | 112 | 0 |
| | | | | |
| 6830 | 6970 1c2c | Same Date | 112 | 0 |
| 7740 | 6970 1c2c | 770 | 113 | 0 |
| 9020 | 6970 1c2c | 2050 | 114 | 0 |
| 12600 | 6970 1c2c | 5630 | 115 | 0 |
| 10200 | 6970 1c2c | 3230 | 116 | 0 |
| 7630 | 6970 1c2c | 660 | 117 | 0 |
| 10100 MH | 6970 1c2c | 3130 | 118 | 0 |
| 11700 | 6970 1c2c | 4730 | 119 | 0 |
| 8510 | 6970 1c2c | 1540 | 120 | 0 |
| 9840 | 6970 1c2c | 2870 | 121 | 0 |
| 8587 | 6970 1c2c | 1617 | 122 | 0 |
| 8051 | 6970 1c2c | 1081 | 123 | 0 |
| 7977 | 6970 1c2c | 1007 | 124 | 0 |
| 8386 | 6970 1c2c | 1416 | 125 | 0 |
| 8451 | 6970 1c2c | 1481 | 126 | 0 |
| | | | | |
| 7740 | 6830 | 910 | 127 | 0 |
| 9020 | 6830 | 2190 | 128 | 0 |
| 12600 | 6830 | 5770 | 129 | 0 |
| 10200 | 6830 | 3370 | 130 | 0 |
| 7630 | 6830 | 800 | 131 | 0 |
| 10100 MH | 6830 | 3270 | 132 | 0 |
| 11700 | 6830 | 4870 | 133 | 0 |
| 8510 | 6830 | 1680 | 134 | 0 |
| 9840 | 6830 | 3010 | 135 | 0 |
| 8587 | 6830 | 1757 | 136 | 0 |
| 8051 | 6830 | 1221 | 137 | 0 |
| 7977 | 6830 | 1147 | 138 | 0 |
| 8386 | 6830 | 1556 | 139 | 0 |
| 8451 | 6830 | 1621 | 140 | 0 |
| | | | | |
| 9020 | 7740 | 1280 | 141 | 0 |
| 12600 | 7740 | 4860 | 142 | 0 |
| 10200 | 7740 | 2460 | 143 | 0 |
| 7630 | 7740 | -110 | 143 | 1 |
| 10100 MH | 7740 | 2360 | 144 | 1 |
| 11700 | 7740 | 3960 | 145 | 1 |
| 8510 | 7740 | 770 | 146 | 1 |
| 9840 | 7740 | 2100 | 147 | 1 |
| 8587 | 7740 | 847 | 148 | 1 |
| 8051 | 7740 | 311 | 149 | 1 |
| 7977 | 7740 | 237 | 150 | 1 |
| 8386 | 7740 | 646 | 151 | 1 |
| 8451 | 7740 | 711 | 152 | 1 |
| | | | | |
| 12600 | 9020 | 3580 | 153 | 1 |
| 10200 | 9020 | 1180 | 154 | 1 |
| 7630 | 9020 | -1390 | 154 | 2 |
| 10100 MH | 9020 | 1080 | 155 | 2 |
| 11700 | 9020 | 2680 | 156 | 2 |
| 8510 | 9020 | -510 | 156 | 3 |
| 9840 | 9020 | 820 | 157 | 3 |
| 8587 | 9020 | -433 | 157 | 4 |
| 8051 | 9020 | -969 | 157 | 5 |

| | | | | |
|---|---|---|---|---|
| 7977 | 9020 | -1043 | 157 | 6 |
| 8386 | 9020 | -634 | 157 | 7 |
| 8451 | 9020 | -569 | 157 | 8 |
| | | | | |
| 10200 | 12600 | -2400 | 157 | 9 |
| 7630 | 12600 | -4970 | 157 | 10 |
| 10100 MH | 12600 | -2500 | 157 | 11 |
| 11700 | 12600 | -900 | 157 | 12 |
| 8510 | 12600 | -4090 | 157 | 13 |
| 9840 | 12600 | -2760 | 157 | 14 |
| 8587 | 12600 | -4013 | 157 | 15 |
| 8051 | 12600 | -4549 | 157 | 16 |
| 7977 | 12600 | -4623 | 157 | 17 |
| 8386 | 12600 | -4214 | 157 | 18 |
| 8451 | 12600 | -4149 | 157 | 19 |
| | | | | |
| 7630 | 10200 | -2570 | 157 | 20 |
| 10100 MH | 10200 | -100 | 157 | 21 |
| 11700 | 10200 | 1500 | 158 | 21 |
| 8510 | 10200 | -1690 | 158 | 22 |
| 9840 | 10200 | -360 | 158 | 23 |
| 8587 | 10200 | -1613 | 158 | 24 |
| 8051 | 10200 | -2149 | 158 | 25 |
| 7977 | 10200 | -2223 | 158 | 26 |
| 8386 | 10200 | -1814 | 158 | 27 |
| 8451 | 10200 | -1749 | 158 | 28 |
| | | | | |
| 10100 MH | 7630 | 2470 | 159 | 28 |
| 11700 | 7630 | 4070 | 160 | 28 |
| 8510 | 7630 | 880 | 161 | 28 |
| 9840 | 7630 | 2210 | 162 | 28 |
| 8587 | 7630 | 957 | 163 | 28 |
| 8051 | 7630 | 421 | 164 | 28 |
| 7977 | 7630 | 347 | 165 | 28 |
| 8386 | 7630 | 756 | 166 | 28 |
| 8451 | 7630 | 821 | 167 | 28 |
| | | | | |
| 11700 | 10100 MH | 1600 | 168 | 28 |
| 8510 | 10100 MH | -1590 | 168 | 29 |
| 9840 | 10100 MH | -260 | 168 | 30 |
| 8587 | 10100 MH | -1513 | 168 | 31 |
| 8051 | 10100 MH | -2049 | 168 | 32 |
| 7977 | 10100 MH | -2123 | 168 | 33 |
| 8386 | 10100 MH | -1714 | 168 | 34 |
| 8451 | 10100 MH | -1649 | 168 | 35 |
| | | | | |
| 8510 | 11700 | -3190 | 168 | 36 |
| 9840 | 11700 | -1860 | 168 | 37 |
| 8587 | 11700 | -3113 | 168 | 38 |
| 8051 | 11700 | -3649 | 168 | 39 |
| 7977 | 11700 | -3723 | 168 | 40 |
| 8386 | 11700 | -3314 | 168 | 41 |
| 8451 | 11700 | -3249 | 168 | 42 |
| | | | | |
| 9840 | 8510 | 1330 | 169 | 42 |
| 8587 | 8510 | 77 | 170 | 42 |
| 8051 | 8510 | -459 | 170 | 43 |

| | | | | |
|---|---|---|---|---|
| 7977 | 8510 | -533 | 170 | 44 |
| 8386 | 8510 | -124 | 170 | 45 |
| 8451 | 8510 | -59 | 170 | 46 |
| | | | | |
| 8587 | 9840 | -1253 | 170 | 47 |
| 8051 | 9840 | -1789 | 170 | 48 |
| 7977 | 9840 | -1863 | 170 | 49 |
| 8386 | 9840 | -1454 | 170 | 50 |
| 8451 | 9840 | -1389 | 170 | 51 |
| | | | | |
| 8051 | 8587 | -536 | 170 | 52 |
| 7977 | 8587 | -610 | 170 | 53 |
| 8386 | 8587 | -201 | 170 | 54 |
| 8451 | 8587 | -136 | 170 | 55 |
| | | | | |
| 7977 | 8051 | -74 | 170 | 56 |
| 8386 | 8051 | 335 | 171 | 56 |
| 8451 | 8051 | 400 | 172 | 56 |
| | | | | |
| 8386 | 7977 | 409 | 173 | 56 |
| 8451 | 7977 | 474 | 174 | 56 |
| | | | | |
| 8451 | 8386 | 65 | 175 | 56 |

S Statistic = 175 - 56 = 119

| Tied Group | Value | Members |
|---|---|---|
| 1 | 6960 | 4 |
| 2 | 7060 | 4 |

| Time Period | Observations |
|---|---|
| 5/1/2019 | 10 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 312
B = 2250
C = 48
D = 720
E = 24
F = 90
a = 29256
b = 109296

c = 1104
Group Variance = 1485.27
Z-Score = 3.06181
Comparison Level at 95% confidence level = 1.65463 (upward trend)
**3.06181 > 1.65463 indicating an upward trend**

## Mann-Kendall Trend Analysis
### Parameter: Cadmium
### Location: RWB-MWI
**Original Data (Not Transformed)**
**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| ND<1.5 U | ND<1.5 U1c2c | Same Date | 0 | 0 |
| ND<1.5 U | ND<1.5 U1c2c | Same Date | 0 | 0 |
| ND<1.5 U | ND<1.5 U1c2c | Same Date | 0 | 0 |
| ND<1.5 U | ND<1.5 U1c2c | Same Date | 0 | 0 |
| ND<1.5 U | ND<1.5 U1c2c | Same Date | 0 | 0 |
| ND<1.5 U | ND<1.5 U1c2c | Same Date | 0 | 0 |
| ND<1.5 U | ND<1.5 U1c2c | Same Date | 0 | 0 |
| ND<1.5 U | ND<1.5 U1c2c | Same Date | 0 | 0 |
| ND<1.5 U | ND<1.5 U1c2c | Same Date | 0 | 0 |
| ND<1.5 U | ND<1.5 U1c2c | 0 | 0 | 0 |
| ND<1.5 U | ND<1.5 U1c2c | 0 | 0 | 0 |
| ND<1.5 U | ND<1.5 U1c2c | 0 | 0 | 0 |
| ND<1.5 U | ND<1.5 U1c2c | 0 | 0 | 0 |
| 0.59 J | ND<1.5 U1c2c | -0.91 | 0 | 1 |
| ND<1.5 U | ND<1.5 U1c2c | 0 | 0 | 1 |
| 0.34 J | ND<1.5 U1c2c | -1.16 | 0 | 2 |
| ND<0.5 U | ND<1.5 U1c2c | -1 | 0 | 3 |
| ND<1 U | ND<1.5 U1c2c | -0.5 | 0 | 4 |
| 0.062 J | ND<1.5 U1c2c | -1.438 | 0 | 5 |
| ND<0.1 U | ND<1.5 U1c2c | -1.4 | 0 | 6 |
| ND<0.1 U | ND<1.5 U1c2c | -1.4 | 0 | 7 |
| ND<0.1 U | ND<1.5 U1c2c | -1.4 | 0 | 8 |
| ND<0.1 U | ND<1.5 U1c2c | -1.4 | 0 | 9 |
| | | | | |
| ND<1.5 U | ND<1.5 U | Same Date | 0 | 9 |
| ND<1.5 U | ND<1.5 U | Same Date | 0 | 9 |
| ND<1.5 U | ND<1.5 U | Same Date | 0 | 9 |
| ND<1.5 U | ND<1.5 U | Same Date | 0 | 9 |
| ND<1.5 U | ND<1.5 U | Same Date | 0 | 9 |
| ND<1.5 U | ND<1.5 U | Same Date | 0 | 9 |
| ND<1.5 U | ND<1.5 U | Same Date | 0 | 9 |
| ND<1.5 U | ND<1.5 U | Same Date | 0 | 9 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 9 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 9 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 9 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 9 |
| 0.59 J | ND<1.5 U | -0.91 | 0 | 10 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 10 |
| 0.34 J | ND<1.5 U | -1.16 | 0 | 11 |
| ND<0.5 U | ND<1.5 U | -1 | 0 | 12 |
| ND<1 U | ND<1.5 U | -0.5 | 0 | 13 |
| 0.062 J | ND<1.5 U | -1.438 | 0 | 14 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 15 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 16 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 17 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 18 |

| | | | | |
|---|---|---|---|---|
| ND<1.5 U | ND<1.5 U | Same Date | 0 | 18 |
| ND<1.5 U | ND<1.5 U | Same Date | 0 | 18 |
| ND<1.5 U | ND<1.5 U | Same Date | 0 | 18 |
| ND<1.5 U | ND<1.5 U | Same Date | 0 | 18 |
| ND<1.5 U | ND<1.5 U | Same Date | 0 | 18 |
| ND<1.5 U | ND<1.5 U | Same Date | 0 | 18 |
| ND<1.5 U | ND<1.5 U | Same Date | 0 | 18 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 18 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 18 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 18 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 18 |
| 0.59 J | ND<1.5 U | -0.91 | 0 | 19 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 19 |
| 0.34 J | ND<1.5 U | -1.16 | 0 | 20 |
| ND<0.5 U | ND<1.5 U | -1 | 0 | 21 |
| ND<1 U | ND<1.5 U | -0.5 | 0 | 22 |
| 0.062 J | ND<1.5 U | -1.438 | 0 | 23 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 24 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 25 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 26 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 27 |
| | | | | |
| ND<1.5 U | ND<1.5 U | Same Date | 0 | 27 |
| ND<1.5 U | ND<1.5 U | Same Date | 0 | 27 |
| ND<1.5 U | ND<1.5 U | Same Date | 0 | 27 |
| ND<1.5 U | ND<1.5 U | Same Date | 0 | 27 |
| ND<1.5 U | ND<1.5 U | Same Date | 0 | 27 |
| ND<1.5 U | ND<1.5 U | Same Date | 0 | 27 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 27 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 27 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 27 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 27 |
| 0.59 J | ND<1.5 U | -0.91 | 0 | 28 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 28 |
| 0.34 J | ND<1.5 U | -1.16 | 0 | 29 |
| ND<0.5 U | ND<1.5 U | -1 | 0 | 30 |
| ND<1 U | ND<1.5 U | -0.5 | 0 | 31 |
| 0.062 J | ND<1.5 U | -1.438 | 0 | 32 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 33 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 34 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 35 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 36 |
| | | | | |
| ND<1.5 U | ND<1.5 U | Same Date | 0 | 36 |
| ND<1.5 U | ND<1.5 U | Same Date | 0 | 36 |
| ND<1.5 U | ND<1.5 U | Same Date | 0 | 36 |
| ND<1.5 U | ND<1.5 U | Same Date | 0 | 36 |
| ND<1.5 U | ND<1.5 U | Same Date | 0 | 36 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 36 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 36 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 36 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 36 |
| 0.59 J | ND<1.5 U | -0.91 | 0 | 37 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 37 |
| 0.34 J | ND<1.5 U | -1.16 | 0 | 38 |
| ND<0.5 U | ND<1.5 U | -1 | 0 | 39 |
| ND<1 U | ND<1.5 U | -0.5 | 0 | 40 |

| | | | | |
|---|---|---|---|---|
| 0.062 J | ND<1.5 U | -1.438 | 0 | 41 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 42 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 43 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 44 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 45 |
| | | | | |
| ND<1.5 U | ND<1.5 U | Same Date | 0 | 45 |
| ND<1.5 U | ND<1.5 U | Same Date | 0 | 45 |
| ND<1.5 U | ND<1.5 U | Same Date | 0 | 45 |
| ND<1.5 U | ND<1.5 U | Same Date | 0 | 45 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 45 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 45 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 45 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 45 |
| 0.59 J | ND<1.5 U | -0.91 | 0 | 46 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 46 |
| 0.34 J | ND<1.5 U | -1.16 | 0 | 47 |
| ND<0.5 U | ND<1.5 U | -1 | 0 | 48 |
| ND<1 U | ND<1.5 U | -0.5 | 0 | 49 |
| 0.062 J | ND<1.5 U | -1.438 | 0 | 50 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 51 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 52 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 53 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 54 |
| | | | | |
| ND<1.5 U | ND<1.5 U | Same Date | 0 | 54 |
| ND<1.5 U | ND<1.5 U | Same Date | 0 | 54 |
| ND<1.5 U | ND<1.5 U | Same Date | 0 | 54 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 54 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 54 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 54 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 54 |
| 0.59 J | ND<1.5 U | -0.91 | 0 | 55 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 55 |
| 0.34 J | ND<1.5 U | -1.16 | 0 | 56 |
| ND<0.5 U | ND<1.5 U | -1 | 0 | 57 |
| ND<1 U | ND<1.5 U | -0.5 | 0 | 58 |
| 0.062 J | ND<1.5 U | -1.438 | 0 | 59 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 60 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 61 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 62 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 63 |
| | | | | |
| ND<1.5 U | ND<1.5 U | Same Date | 0 | 63 |
| ND<1.5 U | ND<1.5 U | Same Date | 0 | 63 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 63 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 63 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 63 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 63 |
| 0.59 J | ND<1.5 U | -0.91 | 0 | 64 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 64 |
| 0.34 J | ND<1.5 U | -1.16 | 0 | 65 |
| ND<0.5 U | ND<1.5 U | -1 | 0 | 66 |
| ND<1 U | ND<1.5 U | -0.5 | 0 | 67 |
| 0.062 J | ND<1.5 U | -1.438 | 0 | 68 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 69 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 70 |

| | | | | |
|---|---|---|---|---|
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 71 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 72 |
| | | | | |
| ND<1.5 U | ND<1.5 U | Same Date | 0 | 72 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 72 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 72 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 72 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 72 |
| 0.59 J | ND<1.5 U | -0.91 | 0 | 73 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 73 |
| 0.34 J | ND<1.5 U | -1.16 | 0 | 74 |
| ND<0.5 U | ND<1.5 U | -1 | 0 | 75 |
| ND<1 U | ND<1.5 U | -0.5 | 0 | 76 |
| 0.062 J | ND<1.5 U | -1.438 | 0 | 77 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 78 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 79 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 80 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 81 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 81 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 81 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 81 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 81 |
| 0.59 J | ND<1.5 U | -0.91 | 0 | 82 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 82 |
| 0.34 J | ND<1.5 U | -1.16 | 0 | 83 |
| ND<0.5 U | ND<1.5 U | -1 | 0 | 84 |
| ND<1 U | ND<1.5 U | -0.5 | 0 | 85 |
| 0.062 J | ND<1.5 U | -1.438 | 0 | 86 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 87 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 88 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 89 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 90 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 90 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 90 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 90 |
| 0.59 J | ND<1.5 U | -0.91 | 0 | 91 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 91 |
| 0.34 J | ND<1.5 U | -1.16 | 0 | 92 |
| ND<0.5 U | ND<1.5 U | -1 | 0 | 93 |
| ND<1 U | ND<1.5 U | -0.5 | 0 | 94 |
| 0.062 J | ND<1.5 U | -1.438 | 0 | 95 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 96 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 97 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 98 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 99 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 99 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 99 |
| 0.59 J | ND<1.5 U | -0.91 | 0 | 100 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 100 |
| 0.34 J | ND<1.5 U | -1.16 | 0 | 101 |
| ND<0.5 U | ND<1.5 U | -1 | 0 | 102 |
| ND<1 U | ND<1.5 U | -0.5 | 0 | 103 |
| 0.062 J | ND<1.5 U | -1.438 | 0 | 104 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 105 |

| | | | | |
|---|---|---|---|---|
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 106 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 107 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 108 |
| | | | | |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 108 |
| 0.59 J | ND<1.5 U | -0.91 | 0 | 109 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 109 |
| 0.34 J | ND<1.5 U | -1.16 | 0 | 110 |
| ND<0.5 U | ND<1.5 U | -1 | 0 | 111 |
| ND<1 U | ND<1.5 U | -0.5 | 0 | 112 |
| 0.062 J | ND<1.5 U | -1.438 | 0 | 113 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 114 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 115 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 116 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 117 |
| | | | | |
| 0.59 J | ND<1.5 U | -0.91 | 0 | 118 |
| ND<1.5 U | ND<1.5 U | 0 | 0 | 118 |
| 0.34 J | ND<1.5 U | -1.16 | 0 | 119 |
| ND<0.5 U | ND<1.5 U | -1 | 0 | 120 |
| ND<1 U | ND<1.5 U | -0.5 | 0 | 121 |
| 0.062 J | ND<1.5 U | -1.438 | 0 | 122 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 123 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 124 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 125 |
| ND<0.1 U | ND<1.5 U | -1.4 | 0 | 126 |
| | | | | |
| ND<1.5 U | 0.59 J | 0.91 | 1 | 126 |
| 0.34 J | 0.59 J | -0.25 | 1 | 127 |
| ND<0.5 U | 0.59 J | -0.09 | 1 | 128 |
| ND<1 U | 0.59 J | 0.41 | 2 | 128 |
| 0.062 J | 0.59 J | -0.528 | 2 | 129 |
| ND<0.1 U | 0.59 J | -0.49 | 2 | 130 |
| ND<0.1 U | 0.59 J | -0.49 | 2 | 131 |
| ND<0.1 U | 0.59 J | -0.49 | 2 | 132 |
| ND<0.1 U | 0.59 J | -0.49 | 2 | 133 |
| | | | | |
| 0.34 J | ND<1.5 U | -1.16 | 2 | 134 |
| ND<0.5 U | ND<1.5 U | -1 | 2 | 135 |
| ND<1 U | ND<1.5 U | -0.5 | 2 | 136 |
| 0.062 J | ND<1.5 U | -1.438 | 2 | 137 |
| ND<0.1 U | ND<1.5 U | -1.4 | 2 | 138 |
| ND<0.1 U | ND<1.5 U | -1.4 | 2 | 139 |
| ND<0.1 U | ND<1.5 U | -1.4 | 2 | 140 |
| ND<0.1 U | ND<1.5 U | -1.4 | 2 | 141 |
| | | | | |
| ND<0.5 U | 0.34 J | 0.16 | 3 | 141 |
| ND<1 U | 0.34 J | 0.66 | 4 | 141 |
| 0.062 J | 0.34 J | -0.278 | 4 | 142 |
| ND<0.1 U | 0.34 J | -0.24 | 4 | 143 |
| ND<0.1 U | 0.34 J | -0.24 | 4 | 144 |
| ND<0.1 U | 0.34 J | -0.24 | 4 | 145 |
| ND<0.1 U | 0.34 J | -0.24 | 4 | 146 |
| | | | | |
| ND<1 U | ND<0.5 U | 0.5 | 5 | 146 |
| 0.062 J | ND<0.5 U | -0.438 | 5 | 147 |
| ND<0.1 U | ND<0.5 U | -0.4 | 5 | 148 |

| | | | | |
|---|---|---|---|---|
| ND<0.1 U | ND<0.5 U | -0.4 | 5 | 149 |
| ND<0.1 U | ND<0.5 U | -0.4 | 5 | 150 |
| ND<0.1 U | ND<0.5 U | -0.4 | 5 | 151 |
| | | | | |
| 0.062 J | ND<1 U | -0.938 | 5 | 152 |
| ND<0.1 U | ND<1 U | -0.9 | 5 | 153 |
| ND<0.1 U | ND<1 U | -0.9 | 5 | 154 |
| ND<0.1 U | ND<1 U | -0.9 | 5 | 155 |
| ND<0.1 U | ND<1 U | -0.9 | 5 | 156 |
| | | | | |
| ND<0.1 U | 0.062 J | 0.038 | 6 | 156 |
| ND<0.1 U | 0.062 J | 0.038 | 7 | 156 |
| ND<0.1 U | 0.062 J | 0.038 | 8 | 156 |
| ND<0.1 U | 0.062 J | 0.038 | 9 | 156 |
| | | | | |
| ND<0.1 U | ND<0.1 U | 0 | 9 | 156 |
| ND<0.1 U | ND<0.1 U | 0 | 9 | 156 |
| ND<0.1 U | ND<0.1 U | 0 | 9 | 156 |
| | | | | |
| ND<0.1 U | ND<0.1 U | 0 | 9 | 156 |
| ND<0.1 U | ND<0.1 U | 0 | 9 | 156 |
| | | | | |
| ND<0.1 U | ND<0.1 U | 0 | 9 | 156 |

S Statistic = 9 - 156 = -147

| Tied Group | Value | Members |
|---|---|---|
| 1 | 1.5 | 15 |
| 2 | 0.1 | 4 |

| Time Period | Observations |
|---|---|
| 5/1/2019 | 10 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 7506
B = 2250
C = 2754
D = 720
E = 222
F = 90
a = 29256
b = 109296

c = 1104
Group Variance = 1119.57
Z-Score = -4.36342
Comparison Level at 95% confidence level = 1.65463 (upward trend)
-4.36342 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RWD-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 395 2c | 402 1c3c | Same Date | 0 | 0 |
| 514 | 402 1c3c | 112 | 1 | 0 |
| 586 | 402 1c3c | 184 | 2 | 0 |
| 555 | 402 1c3c | 153 | 3 | 0 |
| 515 | 402 1c3c | 113 | 4 | 0 |
| 541 | 402 1c3c | 139 | 5 | 0 |
| 596 | 402 1c3c | 194 | 6 | 0 |
| 713 | 402 1c3c | 311 | 7 | 0 |
| 536 | 402 1c3c | 134 | 8 | 0 |
| 567 | 402 1c3c | 165 | 9 | 0 |
| 487.9 | 402 1c3c | 85.9 | 10 | 0 |
| 487.9 | 402 1c3c | 85.9 | 11 | 0 |
| 477.2 | 402 1c3c | 75.2 | 12 | 0 |
| 442.3 | 402 1c3c | 40.3 | 13 | 0 |
| 497.4 | 402 1c3c | 95.4 | 14 | 0 |
| 504.3 | 402 1c3c | 102.3 | 15 | 0 |
| | | | | |
| 514 | 395 2c | 119 | 16 | 0 |
| 586 | 395 2c | 191 | 17 | 0 |
| 555 | 395 2c | 160 | 18 | 0 |
| 515 | 395 2c | 120 | 19 | 0 |
| 541 | 395 2c | 146 | 20 | 0 |
| 596 | 395 2c | 201 | 21 | 0 |
| 713 | 395 2c | 318 | 22 | 0 |
| 536 | 395 2c | 141 | 23 | 0 |
| 567 | 395 2c | 172 | 24 | 0 |
| 487.9 | 395 2c | 92.9 | 25 | 0 |
| 487.9 | 395 2c | 92.9 | 26 | 0 |
| 477.2 | 395 2c | 82.2 | 27 | 0 |
| 442.3 | 395 2c | 47.3 | 28 | 0 |
| 497.4 | 395 2c | 102.4 | 29 | 0 |
| 504.3 | 395 2c | 109.3 | 30 | 0 |
| | | | | |
| 586 | 514 | 72 | 31 | 0 |
| 555 | 514 | 41 | 32 | 0 |
| 515 | 514 | 1 | 33 | 0 |
| 541 | 514 | 27 | 34 | 0 |
| 596 | 514 | 82 | 35 | 0 |
| 713 | 514 | 199 | 36 | 0 |
| 536 | 514 | 22 | 37 | 0 |
| 567 | 514 | 53 | 38 | 0 |
| 487.9 | 514 | -26.1 | 38 | 1 |
| 487.9 | 514 | -26.1 | 38 | 2 |
| 477.2 | 514 | -36.8 | 38 | 3 |
| 442.3 | 514 | -71.7 | 38 | 4 |
| 497.4 | 514 | -16.6 | 38 | 5 |
| 504.3 | 514 | -9.7 | 38 | 6 |

| | | | | |
|---|---|---|---|---|
| 555 | 586 | -31 | 38 | 7 |
| 515 | 586 | -71 | 38 | 8 |
| 541 | 586 | -45 | 38 | 9 |
| 596 | 586 | 10 | 39 | 9 |
| 713 | 586 | 127 | 40 | 9 |
| 536 | 586 | -50 | 40 | 10 |
| 567 | 586 | -19 | 40 | 11 |
| 487.9 | 586 | -98.1 | 40 | 12 |
| 487.9 | 586 | -98.1 | 40 | 13 |
| 477.2 | 586 | -108.8 | 40 | 14 |
| 442.3 | 586 | -143.7 | 40 | 15 |
| 497.4 | 586 | -88.6 | 40 | 16 |
| 504.3 | 586 | -81.7 | 40 | 17 |
| | | | | |
| 515 | 555 | -40 | 40 | 18 |
| 541 | 555 | -14 | 40 | 19 |
| 596 | 555 | 41 | 41 | 19 |
| 713 | 555 | 158 | 42 | 19 |
| 536 | 555 | -19 | 42 | 20 |
| 567 | 555 | 12 | 43 | 20 |
| 487.9 | 555 | -67.1 | 43 | 21 |
| 487.9 | 555 | -67.1 | 43 | 22 |
| 477.2 | 555 | -77.8 | 43 | 23 |
| 442.3 | 555 | -112.7 | 43 | 24 |
| 497.4 | 555 | -57.6 | 43 | 25 |
| 504.3 | 555 | -50.7 | 43 | 26 |
| | | | | |
| 541 | 515 | 26 | 44 | 26 |
| 596 | 515 | 81 | 45 | 26 |
| 713 | 515 | 198 | 46 | 26 |
| 536 | 515 | 21 | 47 | 26 |
| 567 | 515 | 52 | 48 | 26 |
| 487.9 | 515 | -27.1 | 48 | 27 |
| 487.9 | 515 | -27.1 | 48 | 28 |
| 477.2 | 515 | -37.8 | 48 | 29 |
| 442.3 | 515 | -72.7 | 48 | 30 |
| 497.4 | 515 | -17.6 | 48 | 31 |
| 504.3 | 515 | -10.7 | 48 | 32 |
| | | | | |
| 596 | 541 | 55 | 49 | 32 |
| 713 | 541 | 172 | 50 | 32 |
| 536 | 541 | -5 | 50 | 33 |
| 567 | 541 | 26 | 51 | 33 |
| 487.9 | 541 | -53.1 | 51 | 34 |
| 487.9 | 541 | -53.1 | 51 | 35 |
| 477.2 | 541 | -63.8 | 51 | 36 |
| 442.3 | 541 | -98.7 | 51 | 37 |
| 497.4 | 541 | -43.6 | 51 | 38 |
| 504.3 | 541 | -36.7 | 51 | 39 |
| | | | | |
| 713 | 596 | 117 | 52 | 39 |
| 536 | 596 | -60 | 52 | 40 |
| 567 | 596 | -29 | 52 | 41 |
| 487.9 | 596 | -108.1 | 52 | 42 |
| 487.9 | 596 | -108.1 | 52 | 43 |
| 477.2 | 596 | -118.8 | 52 | 44 |

| | | | | |
|---|---|---|---|---|
| 442.3 | 596 | -153.7 | 52 | 45 |
| 497.4 | 596 | -98.6 | 52 | 46 |
| 504.3 | 596 | -91.7 | 52 | 47 |
| | | | | |
| 536 | 713 | -177 | 52 | 48 |
| 567 | 713 | -146 | 52 | 49 |
| 487.9 | 713 | -225.1 | 52 | 50 |
| 487.9 | 713 | -225.1 | 52 | 51 |
| 477.2 | 713 | -235.8 | 52 | 52 |
| 442.3 | 713 | -270.7 | 52 | 53 |
| 497.4 | 713 | -215.6 | 52 | 54 |
| 504.3 | 713 | -208.7 | 52 | 55 |
| | | | | |
| 567 | 536 | 31 | 53 | 55 |
| 487.9 | 536 | -48.1 | 53 | 56 |
| 487.9 | 536 | -48.1 | 53 | 57 |
| 477.2 | 536 | -58.8 | 53 | 58 |
| 442.3 | 536 | -93.7 | 53 | 59 |
| 497.4 | 536 | -38.6 | 53 | 60 |
| 504.3 | 536 | -31.7 | 53 | 61 |
| | | | | |
| 487.9 | 567 | -79.1 | 53 | 62 |
| 487.9 | 567 | -79.1 | 53 | 63 |
| 477.2 | 567 | -89.8 | 53 | 64 |
| 442.3 | 567 | -124.7 | 53 | 65 |
| 497.4 | 567 | -69.6 | 53 | 66 |
| 504.3 | 567 | -62.7 | 53 | 67 |
| | | | | |
| 487.9 | 487.9 | Same Date | 53 | 67 |
| 477.2 | 487.9 | -10.7 | 53 | 68 |
| 442.3 | 487.9 | -45.6 | 53 | 69 |
| 497.4 | 487.9 | 9.5 | 54 | 69 |
| 504.3 | 487.9 | 16.4 | 55 | 69 |
| | | | | |
| 477.2 | 487.9 | -10.7 | 55 | 70 |
| 442.3 | 487.9 | -45.6 | 55 | 71 |
| 497.4 | 487.9 | 9.5 | 56 | 71 |
| 504.3 | 487.9 | 16.4 | 57 | 71 |
| | | | | |
| 442.3 | 477.2 | -34.9 | 57 | 72 |
| 497.4 | 477.2 | 20.2 | 58 | 72 |
| 504.3 | 477.2 | 27.1 | 59 | 72 |
| | | | | |
| 497.4 | 442.3 | 55.1 | 60 | 72 |
| 504.3 | 442.3 | 62 | 61 | 72 |
| | | | | |
| 504.3 | 497.4 | 6.9 | 62 | 72 |

S Statistic = 62 - 72 = -10

| Tied Group | Value | Members |
|---|---|---|
| 1 | 487.9 | 2 |

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |

| | |
|---|---|
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 2 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 2 time periods with multiple data

---

A = 18
B = 36
C = 0
D = 0
E = 2
F = 4
a = 10608
b = 36720
c = 544
Group Variance = 586.348
Z-Score = -0.371676
Comparison Level at 95% confidence level = 1.65463 (upward trend)
-0.371676 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RWE-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 700 2c | 722 1c3c | Same Date | 0 | 0 |
| 656 | 722 1c3c | -66 | 0 | 1 |
| 707 | 722 1c3c | -15 | 0 | 2 |
| 664 | 722 1c3c | -58 | 0 | 3 |
| 609 | 722 1c3c | -113 | 0 | 4 |
| 584 | 722 1c3c | -138 | 0 | 5 |
| 527 | 722 1c3c | -195 | 0 | 6 |
| 530 | 722 1c3c | -192 | 0 | 7 |
| 497 | 722 1c3c | -225 | 0 | 8 |
| 438 | 722 1c3c | -284 | 0 | 9 |
| 398.8 | 722 1c3c | -323.2 | 0 | 10 |
| 398.8 | 722 1c3c | -323.2 | 0 | 11 |
| 354.7 | 722 1c3c | -367.3 | 0 | 12 |
| 360.3 | 722 1c3c | -361.7 | 0 | 13 |
| 444.8 | 722 1c3c | -277.2 | 0 | 14 |
| 423.6 | 722 1c3c | -298.4 | 0 | 15 |
| | | | | |
| 656 | 700 2c | -44 | 0 | 16 |
| 707 | 700 2c | 7 | 1 | 16 |
| 664 | 700 2c | -36 | 1 | 17 |
| 609 | 700 2c | -91 | 1 | 18 |
| 584 | 700 2c | -116 | 1 | 19 |
| 527 | 700 2c | -173 | 1 | 20 |
| 530 | 700 2c | -170 | 1 | 21 |
| 497 | 700 2c | -203 | 1 | 22 |
| 438 | 700 2c | -262 | 1 | 23 |
| 398.8 | 700 2c | -301.2 | 1 | 24 |
| 398.8 | 700 2c | -301.2 | 1 | 25 |
| 354.7 | 700 2c | -345.3 | 1 | 26 |
| 360.3 | 700 2c | -339.7 | 1 | 27 |
| 444.8 | 700 2c | -255.2 | 1 | 28 |
| 423.6 | 700 2c | -276.4 | 1 | 29 |
| | | | | |
| 707 | 656 | 51 | 2 | 29 |
| 664 | 656 | 8 | 3 | 29 |
| 609 | 656 | -47 | 3 | 30 |
| 584 | 656 | -72 | 3 | 31 |
| 527 | 656 | -129 | 3 | 32 |
| 530 | 656 | -126 | 3 | 33 |
| 497 | 656 | -159 | 3 | 34 |
| 438 | 656 | -218 | 3 | 35 |
| 398.8 | 656 | -257.2 | 3 | 36 |
| 398.8 | 656 | -257.2 | 3 | 37 |
| 354.7 | 656 | -301.3 | 3 | 38 |
| 360.3 | 656 | -295.7 | 3 | 39 |
| 444.8 | 656 | -211.2 | 3 | 40 |
| 423.6 | 656 | -232.4 | 3 | 41 |

| | | | | |
|---|---|---|---|---|
| 664 | 707 | -43 | 3 | 42 |
| 609 | 707 | -98 | 3 | 43 |
| 584 | 707 | -123 | 3 | 44 |
| 527 | 707 | -180 | 3 | 45 |
| 530 | 707 | -177 | 3 | 46 |
| 497 | 707 | -210 | 3 | 47 |
| 438 | 707 | -269 | 3 | 48 |
| 398.8 | 707 | -308.2 | 3 | 49 |
| 398.8 | 707 | -308.2 | 3 | 50 |
| 354.7 | 707 | -352.3 | 3 | 51 |
| 360.3 | 707 | -346.7 | 3 | 52 |
| 444.8 | 707 | -262.2 | 3 | 53 |
| 423.6 | 707 | -283.4 | 3 | 54 |
| | | | | |
| 609 | 664 | -55 | 3 | 55 |
| 584 | 664 | -80 | 3 | 56 |
| 527 | 664 | -137 | 3 | 57 |
| 530 | 664 | -134 | 3 | 58 |
| 497 | 664 | -167 | 3 | 59 |
| 438 | 664 | -226 | 3 | 60 |
| 398.8 | 664 | -265.2 | 3 | 61 |
| 398.8 | 664 | -265.2 | 3 | 62 |
| 354.7 | 664 | -309.3 | 3 | 63 |
| 360.3 | 664 | -303.7 | 3 | 64 |
| 444.8 | 664 | -219.2 | 3 | 65 |
| 423.6 | 664 | -240.4 | 3 | 66 |
| | | | | |
| 584 | 609 | -25 | 3 | 67 |
| 527 | 609 | -82 | 3 | 68 |
| 530 | 609 | -79 | 3 | 69 |
| 497 | 609 | -112 | 3 | 70 |
| 438 | 609 | -171 | 3 | 71 |
| 398.8 | 609 | -210.2 | 3 | 72 |
| 398.8 | 609 | -210.2 | 3 | 73 |
| 354.7 | 609 | -254.3 | 3 | 74 |
| 360.3 | 609 | -248.7 | 3 | 75 |
| 444.8 | 609 | -164.2 | 3 | 76 |
| 423.6 | 609 | -185.4 | 3 | 77 |
| | | | | |
| 527 | 584 | -57 | 3 | 78 |
| 530 | 584 | -54 | 3 | 79 |
| 497 | 584 | -87 | 3 | 80 |
| 438 | 584 | -146 | 3 | 81 |
| 398.8 | 584 | -185.2 | 3 | 82 |
| 398.8 | 584 | -185.2 | 3 | 83 |
| 354.7 | 584 | -229.3 | 3 | 84 |
| 360.3 | 584 | -223.7 | 3 | 85 |
| 444.8 | 584 | -139.2 | 3 | 86 |
| 423.6 | 584 | -160.4 | 3 | 87 |
| | | | | |
| 530 | 527 | 3 | 4 | 87 |
| 497 | 527 | -30 | 4 | 88 |
| 438 | 527 | -89 | 4 | 89 |
| 398.8 | 527 | -128.2 | 4 | 90 |
| 398.8 | 527 | -128.2 | 4 | 91 |
| 354.7 | 527 | -172.3 | 4 | 92 |

| | | | | |
|---|---|---|---|---|
| 360.3 | 527 | -166.7 | 4 | 93 |
| 444.8 | 527 | -82.2 | 4 | 94 |
| 423.6 | 527 | -103.4 | 4 | 95 |
| | | | | |
| 497 | 530 | -33 | 4 | 96 |
| 438 | 530 | -92 | 4 | 97 |
| 398.8 | 530 | -131.2 | 4 | 98 |
| 398.8 | 530 | -131.2 | 4 | 99 |
| 354.7 | 530 | -175.3 | 4 | 100 |
| 360.3 | 530 | -169.7 | 4 | 101 |
| 444.8 | 530 | -85.2 | 4 | 102 |
| 423.6 | 530 | -106.4 | 4 | 103 |
| | | | | |
| 438 | 497 | -59 | 4 | 104 |
| 398.8 | 497 | -98.2 | 4 | 105 |
| 398.8 | 497 | -98.2 | 4 | 106 |
| 354.7 | 497 | -142.3 | 4 | 107 |
| 360.3 | 497 | -136.7 | 4 | 108 |
| 444.8 | 497 | -52.2 | 4 | 109 |
| 423.6 | 497 | -73.4 | 4 | 110 |
| | | | | |
| 398.8 | 438 | -39.2 | 4 | 111 |
| 398.8 | 438 | -39.2 | 4 | 112 |
| 354.7 | 438 | -83.3 | 4 | 113 |
| 360.3 | 438 | -77.7 | 4 | 114 |
| 444.8 | 438 | 6.8 | 5 | 114 |
| 423.6 | 438 | -14.4 | 5 | 115 |
| | | | | |
| 398.8 | 398.8 | Same Date | 5 | 115 |
| 354.7 | 398.8 | -44.1 | 5 | 116 |
| 360.3 | 398.8 | -38.5 | 5 | 117 |
| 444.8 | 398.8 | 46 | 6 | 117 |
| 423.6 | 398.8 | 24.8 | 7 | 117 |
| | | | | |
| 354.7 | 398.8 | -44.1 | 7 | 118 |
| 360.3 | 398.8 | -38.5 | 7 | 119 |
| 444.8 | 398.8 | 46 | 8 | 119 |
| 423.6 | 398.8 | 24.8 | 9 | 119 |
| | | | | |
| 360.3 | 354.7 | 5.6 | 10 | 119 |
| 444.8 | 354.7 | 90.1 | 11 | 119 |
| 423.6 | 354.7 | 68.9 | 12 | 119 |
| | | | | |
| 444.8 | 360.3 | 84.5 | 13 | 119 |
| 423.6 | 360.3 | 63.3 | 14 | 119 |
| | | | | |
| 423.6 | 444.8 | -21.2 | 14 | 120 |

S Statistic = 14 - 120 = -106

| Tied Group | Value | Members |
|---|---|---|
| 1 | 398.8 | 2 |

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |

| | |
|---|---|
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 2 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 2 time periods with multiple data

---

A = 18
B = 36
C = 0
D = 0
E = 2
F = 4
a = 10608
b = 36720
c = 544
Group Variance = 586.348
Z-Score = -4.33622
Comparison Level at 95% confidence level = 1.65463 (upward trend)
-4.33622 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RWF-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 859 | 906 | Same Date | 0 | 0 |
| 1020 | 906 | 114 | 1 | 0 |
| 1340 | 906 | 434 | 2 | 0 |
| 2010 | 906 | 1104 | 3 | 0 |
| 2580 | 906 | 1674 | 4 | 0 |
| 3170 | 906 | 2264 | 5 | 0 |
| 3330 | 906 | 2424 | 6 | 0 |
| 3710 | 906 | 2804 | 7 | 0 |
| 2610 | 906 | 1704 | 8 | 0 |
| 2590 | 906 | 1684 | 9 | 0 |
| 2263 | 906 | 1357 | 10 | 0 |
| 1903 | 906 | 997 | 11 | 0 |
| 1787 | 906 | 881 | 12 | 0 |
| 1558 | 906 | 652 | 13 | 0 |
| 1653 | 906 | 747 | 14 | 0 |
| 1020 | 859 | 161 | 15 | 0 |
| 1340 | 859 | 481 | 16 | 0 |
| 2010 | 859 | 1151 | 17 | 0 |
| 2580 | 859 | 1721 | 18 | 0 |
| 3170 | 859 | 2311 | 19 | 0 |
| 3330 | 859 | 2471 | 20 | 0 |
| 3710 | 859 | 2851 | 21 | 0 |
| 2610 | 859 | 1751 | 22 | 0 |
| 2590 | 859 | 1731 | 23 | 0 |
| 2263 | 859 | 1404 | 24 | 0 |
| 1903 | 859 | 1044 | 25 | 0 |
| 1787 | 859 | 928 | 26 | 0 |
| 1558 | 859 | 699 | 27 | 0 |
| 1653 | 859 | 794 | 28 | 0 |
| 1340 | 1020 | 320 | 29 | 0 |
| 2010 | 1020 | 990 | 30 | 0 |
| 2580 | 1020 | 1560 | 31 | 0 |
| 3170 | 1020 | 2150 | 32 | 0 |
| 3330 | 1020 | 2310 | 33 | 0 |
| 3710 | 1020 | 2690 | 34 | 0 |
| 2610 | 1020 | 1590 | 35 | 0 |
| 2590 | 1020 | 1570 | 36 | 0 |
| 2263 | 1020 | 1243 | 37 | 0 |
| 1903 | 1020 | 883 | 38 | 0 |
| 1787 | 1020 | 767 | 39 | 0 |
| 1558 | 1020 | 538 | 40 | 0 |
| 1653 | 1020 | 633 | 41 | 0 |
| 2010 | 1340 | 670 | 42 | 0 |
| 2580 | 1340 | 1240 | 43 | 0 |

| | | | | |
|---|---|---|---|---|
| 3170 | 1340 | 1830 | 44 | 0 |
| 3330 | 1340 | 1990 | 45 | 0 |
| 3710 | 1340 | 2370 | 46 | 0 |
| 2610 | 1340 | 1270 | 47 | 0 |
| 2590 | 1340 | 1250 | 48 | 0 |
| 2263 | 1340 | 923 | 49 | 0 |
| 1903 | 1340 | 563 | 50 | 0 |
| 1787 | 1340 | 447 | 51 | 0 |
| 1558 | 1340 | 218 | 52 | 0 |
| 1653 | 1340 | 313 | 53 | 0 |
| | | | | |
| 2580 | 2010 | 570 | 54 | 0 |
| 3170 | 2010 | 1160 | 55 | 0 |
| 3330 | 2010 | 1320 | 56 | 0 |
| 3710 | 2010 | 1700 | 57 | 0 |
| 2610 | 2010 | 600 | 58 | 0 |
| 2590 | 2010 | 580 | 59 | 0 |
| 2263 | 2010 | 253 | 60 | 0 |
| 1903 | 2010 | -107 | 60 | 1 |
| 1787 | 2010 | -223 | 60 | 2 |
| 1558 | 2010 | -452 | 60 | 3 |
| 1653 | 2010 | -357 | 60 | 4 |
| | | | | |
| 3170 | 2580 | 590 | 61 | 4 |
| 3330 | 2580 | 750 | 62 | 4 |
| 3710 | 2580 | 1130 | 63 | 4 |
| 2610 | 2580 | 30 | 64 | 4 |
| 2590 | 2580 | 10 | 65 | 4 |
| 2263 | 2580 | -317 | 65 | 5 |
| 1903 | 2580 | -677 | 65 | 6 |
| 1787 | 2580 | -793 | 65 | 7 |
| 1558 | 2580 | -1022 | 65 | 8 |
| 1653 | 2580 | -927 | 65 | 9 |
| | | | | |
| 3330 | 3170 | 160 | 66 | 9 |
| 3710 | 3170 | 540 | 67 | 9 |
| 2610 | 3170 | -560 | 67 | 10 |
| 2590 | 3170 | -580 | 67 | 11 |
| 2263 | 3170 | -907 | 67 | 12 |
| 1903 | 3170 | -1267 | 67 | 13 |
| 1787 | 3170 | -1383 | 67 | 14 |
| 1558 | 3170 | -1612 | 67 | 15 |
| 1653 | 3170 | -1517 | 67 | 16 |
| | | | | |
| 3710 | 3330 | 380 | 68 | 16 |
| 2610 | 3330 | -720 | 68 | 17 |
| 2590 | 3330 | -740 | 68 | 18 |
| 2263 | 3330 | -1067 | 68 | 19 |
| 1903 | 3330 | -1427 | 68 | 20 |
| 1787 | 3330 | -1543 | 68 | 21 |
| 1558 | 3330 | -1772 | 68 | 22 |
| 1653 | 3330 | -1677 | 68 | 23 |
| | | | | |
| 2610 | 3710 | -1100 | 68 | 24 |
| 2590 | 3710 | -1120 | 68 | 25 |
| 2263 | 3710 | -1447 | 68 | 26 |
| 1903 | 3710 | -1807 | 68 | 27 |

| | | | | |
|---|---|---|---|---|
| 1787 | 3710 | -1923 | 68 | 28 |
| 1558 | 3710 | -2152 | 68 | 29 |
| 1653 | 3710 | -2057 | 68 | 30 |
| | | | | |
| 2590 | 2610 | -20 | 68 | 31 |
| 2263 | 2610 | -347 | 68 | 32 |
| 1903 | 2610 | -707 | 68 | 33 |
| 1787 | 2610 | -823 | 68 | 34 |
| 1558 | 2610 | -1052 | 68 | 35 |
| 1653 | 2610 | -957 | 68 | 36 |
| | | | | |
| 2263 | 2590 | -327 | 68 | 37 |
| 1903 | 2590 | -687 | 68 | 38 |
| 1787 | 2590 | -803 | 68 | 39 |
| 1558 | 2590 | -1032 | 68 | 40 |
| 1653 | 2590 | -937 | 68 | 41 |
| | | | | |
| 1903 | 2263 | -360 | 68 | 42 |
| 1787 | 2263 | -476 | 68 | 43 |
| 1558 | 2263 | -705 | 68 | 44 |
| 1653 | 2263 | -610 | 68 | 45 |
| | | | | |
| 1787 | 1903 | -116 | 68 | 46 |
| 1558 | 1903 | -345 | 68 | 47 |
| 1653 | 1903 | -250 | 68 | 48 |
| | | | | |
| 1558 | 1787 | -229 | 68 | 49 |
| 1653 | 1787 | -134 | 68 | 50 |
| | | | | |
| 1653 | 1558 | 95 | 69 | 50 |

S Statistic = 69 - 50 = 19

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 0
B = 18
C = 0

D = 0
E = 0
F = 2
a = 8880
b = 30240
c = 480
Group Variance = 492.333
Z-Score = 0.811228
Comparison Level at 95% confidence level = 1.65463 (upward trend)
0.811228 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RWG-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 22.9 2c | 23.9 1c3c | Same Date | 0 | 0 |
| 15.4 | 23.9 1c3c | -8.5 | 0 | 1 |
| 26 | 23.9 1c3c | 2.1 | 1 | 1 |
| 38.2 | 23.9 1c3c | 14.3 | 2 | 1 |
| 26.7 | 23.9 1c3c | 2.8 | 3 | 1 |
| 38.2 | 23.9 1c3c | 14.3 | 4 | 1 |
| 40 | 23.9 1c3c | 16.1 | 5 | 1 |
| 1.8 | 23.9 1c3c | -22.1 | 5 | 2 |
| 8.6 | 23.9 1c3c | -15.3 | 5 | 3 |
| 51.02 | 23.9 1c3c | 27.12 | 6 | 3 |
| 130.7 | 23.9 1c3c | 106.8 | 7 | 3 |
| | | | | |
| 15.4 | 22.9 2c | -7.5 | 7 | 4 |
| 26 | 22.9 2c | 3.1 | 8 | 4 |
| 38.2 | 22.9 2c | 15.3 | 9 | 4 |
| 26.7 | 22.9 2c | 3.8 | 10 | 4 |
| 38.2 | 22.9 2c | 15.3 | 11 | 4 |
| 40 | 22.9 2c | 17.1 | 12 | 4 |
| 1.8 | 22.9 2c | -21.1 | 12 | 5 |
| 8.6 | 22.9 2c | -14.3 | 12 | 6 |
| 51.02 | 22.9 2c | 28.12 | 13 | 6 |
| 130.7 | 22.9 2c | 107.8 | 14 | 6 |
| | | | | |
| 26 | 15.4 | 10.6 | 15 | 6 |
| 38.2 | 15.4 | 22.8 | 16 | 6 |
| 26.7 | 15.4 | 11.3 | 17 | 6 |
| 38.2 | 15.4 | 22.8 | 18 | 6 |
| 40 | 15.4 | 24.6 | 19 | 6 |
| 1.8 | 15.4 | -13.6 | 19 | 7 |
| 8.6 | 15.4 | -6.8 | 19 | 8 |
| 51.02 | 15.4 | 35.62 | 20 | 8 |
| 130.7 | 15.4 | 115.3 | 21 | 8 |
| | | | | |
| 38.2 | 26 | 12.2 | 22 | 8 |
| 26.7 | 26 | 0.7 | 23 | 8 |
| 38.2 | 26 | 12.2 | 24 | 8 |
| 40 | 26 | 14 | 25 | 8 |
| 1.8 | 26 | -24.2 | 25 | 9 |
| 8.6 | 26 | -17.4 | 25 | 10 |
| 51.02 | 26 | 25.02 | 26 | 10 |
| 130.7 | 26 | 104.7 | 27 | 10 |
| | | | | |
| 26.7 | 38.2 | -11.5 | 27 | 11 |
| 38.2 | 38.2 | 0 | 27 | 11 |
| 40 | 38.2 | 1.8 | 28 | 11 |
| 1.8 | 38.2 | -36.4 | 28 | 12 |
| 8.6 | 38.2 | -29.6 | 28 | 13 |

| | | | | |
|---|---|---|---|---|
| 51.02 | 38.2 | 12.82 | 29 | 13 |
| 130.7 | 38.2 | 92.5 | 30 | 13 |
| | | | | |
| 38.2 | 26.7 | 11.5 | 31 | 13 |
| 40 | 26.7 | 13.3 | 32 | 13 |
| 1.8 | 26.7 | -24.9 | 32 | 14 |
| 8.6 | 26.7 | -18.1 | 32 | 15 |
| 51.02 | 26.7 | 24.32 | 33 | 15 |
| 130.7 | 26.7 | 104 | 34 | 15 |
| | | | | |
| 40 | 38.2 | 1.8 | 35 | 15 |
| 1.8 | 38.2 | -36.4 | 35 | 16 |
| 8.6 | 38.2 | -29.6 | 35 | 17 |
| 51.02 | 38.2 | 12.82 | 36 | 17 |
| 130.7 | 38.2 | 92.5 | 37 | 17 |
| | | | | |
| 1.8 | 40 | -38.2 | 37 | 18 |
| 8.6 | 40 | -31.4 | 37 | 19 |
| 51.02 | 40 | 11.02 | 38 | 19 |
| 130.7 | 40 | 90.7 | 39 | 19 |
| | | | | |
| 8.6 | 1.8 | 6.8 | 40 | 19 |
| 51.02 | 1.8 | 49.22 | 41 | 19 |
| 130.7 | 1.8 | 128.9 | 42 | 19 |
| | | | | |
| 51.02 | 8.6 | 42.42 | 43 | 19 |
| 130.7 | 8.6 | 122.1 | 44 | 19 |
| | | | | |
| 130.7 | 51.02 | 79.68 | 45 | 19 |

S Statistic = 45 - 19 = 26

| Tied Group | Value | Members |
|---|---|---|
| 1 | 38.2 | 2 |

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 11/1/2021 | 1 |
| 3/1/2022 | 1 |
| 3/1/2023 | 1 |
| 3/1/2024 | 1 |

There are 1 time periods with multiple data

A = 18
B = 18
C = 0
D = 0
E = 2
F = 2
a = 3828

b = 11880
c = 264
Group Variance = 210.682
Z-Score = 1.72237
Comparison Level at 95% confidence level = 1.65463 (upward trend)
**1.72237 > 1.65463 indicating an upward trend**

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RWH-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 92.4 | 103 | Same Date | 0 | 0 |
| 1380 1c | 103 | 1277 | 1 | 0 |
| 3580 | 103 | 3477 | 2 | 0 |
| 3210 | 103 | 3107 | 3 | 0 |
| 4610 | 103 | 4507 | 4 | 0 |
| 4330 | 103 | 4227 | 5 | 0 |
| 6650 | 103 | 6547 | 6 | 0 |
| 6760 | 103 | 6657 | 7 | 0 |
| 4220 | 103 | 4117 | 8 | 0 |
| 5150 M1 | 103 | 5047 | 9 | 0 |
| 2520 | 103 | 2417 | 10 | 0 |
| 4700 | 103 | 4597 | 11 | 0 |
| 3385 | 103 | 3282 | 12 | 0 |
| 5315 | 103 | 5212 | 13 | 0 |
| 4904 | 103 | 4801 | 14 | 0 |
| 1380 1c | 92.4 | 1287.6 | 15 | 0 |
| 3580 | 92.4 | 3487.6 | 16 | 0 |
| 3210 | 92.4 | 3117.6 | 17 | 0 |
| 4610 | 92.4 | 4517.6 | 18 | 0 |
| 4330 | 92.4 | 4237.6 | 19 | 0 |
| 6650 | 92.4 | 6557.6 | 20 | 0 |
| 6760 | 92.4 | 6667.6 | 21 | 0 |
| 4220 | 92.4 | 4127.6 | 22 | 0 |
| 5150 M1 | 92.4 | 5057.6 | 23 | 0 |
| 2520 | 92.4 | 2427.6 | 24 | 0 |
| 4700 | 92.4 | 4607.6 | 25 | 0 |
| 3385 | 92.4 | 3292.6 | 26 | 0 |
| 5315 | 92.4 | 5222.6 | 27 | 0 |
| 4904 | 92.4 | 4811.6 | 28 | 0 |
| 3580 | 1380 1c | 2200 | 29 | 0 |
| 3210 | 1380 1c | 1830 | 30 | 0 |
| 4610 | 1380 1c | 3230 | 31 | 0 |
| 4330 | 1380 1c | 2950 | 32 | 0 |
| 6650 | 1380 1c | 5270 | 33 | 0 |
| 6760 | 1380 1c | 5380 | 34 | 0 |
| 4220 | 1380 1c | 2840 | 35 | 0 |
| 5150 M1 | 1380 1c | 3770 | 36 | 0 |
| 2520 | 1380 1c | 1140 | 37 | 0 |
| 4700 | 1380 1c | 3320 | 38 | 0 |
| 3385 | 1380 1c | 2005 | 39 | 0 |
| 5315 | 1380 1c | 3935 | 40 | 0 |
| 4904 | 1380 1c | 3524 | 41 | 0 |
| 3210 | 3580 | -370 | 41 | 1 |
| 4610 | 3580 | 1030 | 42 | 1 |

| | | | | |
|---|---|---|---|---|
| 4330 | 3580 | 750 | 43 | 1 |
| 6650 | 3580 | 3070 | 44 | 1 |
| 6760 | 3580 | 3180 | 45 | 1 |
| 4220 | 3580 | 640 | 46 | 1 |
| 5150 M1 | 3580 | 1570 | 47 | 1 |
| 2520 | 3580 | -1060 | 47 | 2 |
| 4700 | 3580 | 1120 | 48 | 2 |
| 3385 | 3580 | -195 | 48 | 3 |
| 5315 | 3580 | 1735 | 49 | 3 |
| 4904 | 3580 | 1324 | 50 | 3 |
| | | | | |
| 4610 | 3210 | 1400 | 51 | 3 |
| 4330 | 3210 | 1120 | 52 | 3 |
| 6650 | 3210 | 3440 | 53 | 3 |
| 6760 | 3210 | 3550 | 54 | 3 |
| 4220 | 3210 | 1010 | 55 | 3 |
| 5150 M1 | 3210 | 1940 | 56 | 3 |
| 2520 | 3210 | -690 | 56 | 4 |
| 4700 | 3210 | 1490 | 57 | 4 |
| 3385 | 3210 | 175 | 58 | 4 |
| 5315 | 3210 | 2105 | 59 | 4 |
| 4904 | 3210 | 1694 | 60 | 4 |
| | | | | |
| 4330 | 4610 | -280 | 60 | 5 |
| 6650 | 4610 | 2040 | 61 | 5 |
| 6760 | 4610 | 2150 | 62 | 5 |
| 4220 | 4610 | -390 | 62 | 6 |
| 5150 M1 | 4610 | 540 | 63 | 6 |
| 2520 | 4610 | -2090 | 63 | 7 |
| 4700 | 4610 | 90 | 64 | 7 |
| 3385 | 4610 | -1225 | 64 | 8 |
| 5315 | 4610 | 705 | 65 | 8 |
| 4904 | 4610 | 294 | 66 | 8 |
| | | | | |
| 6650 | 4330 | 2320 | 67 | 8 |
| 6760 | 4330 | 2430 | 68 | 8 |
| 4220 | 4330 | -110 | 68 | 9 |
| 5150 M1 | 4330 | 820 | 69 | 9 |
| 2520 | 4330 | -1810 | 69 | 10 |
| 4700 | 4330 | 370 | 70 | 10 |
| 3385 | 4330 | -945 | 70 | 11 |
| 5315 | 4330 | 985 | 71 | 11 |
| 4904 | 4330 | 574 | 72 | 11 |
| | | | | |
| 6760 | 6650 | 110 | 73 | 11 |
| 4220 | 6650 | -2430 | 73 | 12 |
| 5150 M1 | 6650 | -1500 | 73 | 13 |
| 2520 | 6650 | -4130 | 73 | 14 |
| 4700 | 6650 | -1950 | 73 | 15 |
| 3385 | 6650 | -3265 | 73 | 16 |
| 5315 | 6650 | -1335 | 73 | 17 |
| 4904 | 6650 | -1746 | 73 | 18 |
| | | | | |
| 4220 | 6760 | -2540 | 73 | 19 |
| 5150 M1 | 6760 | -1610 | 73 | 20 |
| 2520 | 6760 | -4240 | 73 | 21 |
| 4700 | 6760 | -2060 | 73 | 22 |

| | | | | |
|---|---|---|---|---|
| 3385 | 6760 | -3375 | 73 | 23 |
| 5315 | 6760 | -1445 | 73 | 24 |
| 4904 | 6760 | -1856 | 73 | 25 |
| | | | | |
| 5150 M1 | 4220 | 930 | 74 | 25 |
| 2520 | 4220 | -1700 | 74 | 26 |
| 4700 | 4220 | 480 | 75 | 26 |
| 3385 | 4220 | -835 | 75 | 27 |
| 5315 | 4220 | 1095 | 76 | 27 |
| 4904 | 4220 | 684 | 77 | 27 |
| | | | | |
| 2520 | 5150 M1 | -2630 | 77 | 28 |
| 4700 | 5150 M1 | -450 | 77 | 29 |
| 3385 | 5150 M1 | -1765 | 77 | 30 |
| 5315 | 5150 M1 | 165 | 78 | 30 |
| 4904 | 5150 M1 | -246 | 78 | 31 |
| | | | | |
| 4700 | 2520 | 2180 | 79 | 31 |
| 3385 | 2520 | 865 | 80 | 31 |
| 5315 | 2520 | 2795 | 81 | 31 |
| 4904 | 2520 | 2384 | 82 | 31 |
| | | | | |
| 3385 | 4700 | -1315 | 82 | 32 |
| 5315 | 4700 | 615 | 83 | 32 |
| 4904 | 4700 | 204 | 84 | 32 |
| | | | | |
| 5315 | 3385 | 1930 | 85 | 32 |
| 4904 | 3385 | 1519 | 86 | 32 |
| | | | | |
| 4904 | 5315 | -411 | 86 | 33 |

S Statistic = 86 - 33 = 53

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 0
B = 18
C = 0

D = 0
E = 0
F = 2
a = 8880
b = 30240
c = 480
Group Variance = 492.333
Z-Score = 2.34355
Comparison Level at 95% confidence level = 1.65463 (upward trend)
**2.34355 > 1.65463 indicating an upward trend**

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RWI-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 8950 | 8050 | Same Date | 0 | 0 |
| 8120 1c | 8050 | 70 | 1 | 0 |
| 8270 | 8050 | 220 | 2 | 0 |
| 13300 | 8050 | 5250 | 3 | 0 |
| 10800 | 8050 | 2750 | 4 | 0 |
| 6810 | 8050 | -1240 | 4 | 1 |
| 5230 | 8050 | -2820 | 4 | 2 |
| 5797 | 8050 | -2253 | 4 | 3 |
| 7153 | 8050 | -897 | 4 | 4 |
| | | | | |
| 8120 1c | 8950 | -830 | 4 | 5 |
| 8270 | 8950 | -680 | 4 | 6 |
| 13300 | 8950 | 4350 | 5 | 6 |
| 10800 | 8950 | 1850 | 6 | 6 |
| 6810 | 8950 | -2140 | 6 | 7 |
| 5230 | 8950 | -3720 | 6 | 8 |
| 5797 | 8950 | -3153 | 6 | 9 |
| 7153 | 8950 | -1797 | 6 | 10 |
| | | | | |
| 8270 | 8120 1c | 150 | 7 | 10 |
| 13300 | 8120 1c | 5180 | 8 | 10 |
| 10800 | 8120 1c | 2680 | 9 | 10 |
| 6810 | 8120 1c | -1310 | 9 | 11 |
| 5230 | 8120 1c | -2890 | 9 | 12 |
| 5797 | 8120 1c | -2323 | 9 | 13 |
| 7153 | 8120 1c | -967 | 9 | 14 |
| | | | | |
| 13300 | 8270 | 5030 | 10 | 14 |
| 10800 | 8270 | 2530 | 11 | 14 |
| 6810 | 8270 | -1460 | 11 | 15 |
| 5230 | 8270 | -3040 | 11 | 16 |
| 5797 | 8270 | -2473 | 11 | 17 |
| 7153 | 8270 | -1117 | 11 | 18 |
| | | | | |
| 10800 | 13300 | -2500 | 11 | 19 |
| 6810 | 13300 | -6490 | 11 | 20 |
| 5230 | 13300 | -8070 | 11 | 21 |
| 5797 | 13300 | -7503 | 11 | 22 |
| 7153 | 13300 | -6147 | 11 | 23 |
| | | | | |
| 6810 | 10800 | -3990 | 11 | 24 |
| 5230 | 10800 | -5570 | 11 | 25 |
| 5797 | 10800 | -5003 | 11 | 26 |
| 7153 | 10800 | -3647 | 11 | 27 |
| | | | | |
| 5230 | 6810 | -1580 | 11 | 28 |
| 5797 | 6810 | -1013 | 11 | 29 |

| | | | | |
|---|---|---|---|---|
| 7153 | 6810 | 343 | 12 | 29 |
| 5797 | 5230 | 567 | 13 | 29 |
| 7153 | 5230 | 1923 | 14 | 29 |
| 7153 | 5797 | 1356 | 15 | 29 |

S Statistic = 15 - 29 = -14

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 6/1/2021 | 1 |
| 3/1/2022 | 1 |
| 3/1/2023 | 1 |
| 3/1/2024 | 1 |

There are 1 time periods with multiple data

A = 0
B = 18
C = 0
D = 0
E = 0
F = 2
a = 2250
b = 6480
c = 180
Group Variance = 124
Z-Score = -1.16743
Comparison Level at 95% confidence level = 1.65463 (upward trend)
-1.16743 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RWJ-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 61.2 1c | 61.4 | Same Date | 0 | 0 |
| 12.8 | 61.4 | Same Date | 0 | 0 |
| 11.8 1c | 61.4 | -49.6 | 0 | 1 |
| 45.7 | 61.4 | -15.7 | 0 | 2 |
| 30 | 61.4 | -31.4 | 0 | 3 |
| 2.1 J | 61.4 | -59.3 | 0 | 4 |
| 2.3 J | 61.4 | -59.1 | 0 | 5 |
| 2.4 J | 61.4 | -59 | 0 | 6 |
| 31.3 | 61.4 | -30.1 | 0 | 7 |
| 49.1 | 61.4 | -12.3 | 0 | 8 |
| 52.8 | 61.4 | -8.6 | 0 | 9 |
| 18.01 | 61.4 | -43.39 | 0 | 10 |
| 65.27 | 61.4 | 3.87 | 1 | 10 |
| 80.59 | 61.4 | 19.19 | 2 | 10 |
| 109.5 | 61.4 | 48.1 | 3 | 10 |
| 30.18 | 61.4 | -31.22 | 3 | 11 |
| | | | | |
| 12.8 | 61.2 1c | Same Date | 3 | 11 |
| 11.8 1c | 61.2 1c | -49.4 | 3 | 12 |
| 45.7 | 61.2 1c | -15.5 | 3 | 13 |
| 30 | 61.2 1c | -31.2 | 3 | 14 |
| 2.1 J | 61.2 1c | -59.1 | 3 | 15 |
| 2.3 J | 61.2 1c | -58.9 | 3 | 16 |
| 2.4 J | 61.2 1c | -58.8 | 3 | 17 |
| 31.3 | 61.2 1c | -29.9 | 3 | 18 |
| 49.1 | 61.2 1c | -12.1 | 3 | 19 |
| 52.8 | 61.2 1c | -8.4 | 3 | 20 |
| 18.01 | 61.2 1c | -43.19 | 3 | 21 |
| 65.27 | 61.2 1c | 4.07 | 4 | 21 |
| 80.59 | 61.2 1c | 19.39 | 5 | 21 |
| 109.5 | 61.2 1c | 48.3 | 6 | 21 |
| 30.18 | 61.2 1c | -31.02 | 6 | 22 |
| | | | | |
| 11.8 1c | 12.8 | -1 | 6 | 23 |
| 45.7 | 12.8 | 32.9 | 7 | 23 |
| 30 | 12.8 | 17.2 | 8 | 23 |
| 2.1 J | 12.8 | -10.7 | 8 | 24 |
| 2.3 J | 12.8 | -10.5 | 8 | 25 |
| 2.4 J | 12.8 | -10.4 | 8 | 26 |
| 31.3 | 12.8 | 18.5 | 9 | 26 |
| 49.1 | 12.8 | 36.3 | 10 | 26 |
| 52.8 | 12.8 | 40 | 11 | 26 |
| 18.01 | 12.8 | 5.21 | 12 | 26 |
| 65.27 | 12.8 | 52.47 | 13 | 26 |
| 80.59 | 12.8 | 67.79 | 14 | 26 |
| 109.5 | 12.8 | 96.7 | 15 | 26 |
| 30.18 | 12.8 | 17.38 | 16 | 26 |

| | | | | |
|---|---|---|---|---|
| 45.7 | 11.8 1c | 33.9 | 17 | 26 |
| 30 | 11.8 1c | 18.2 | 18 | 26 |
| 2.1 J | 11.8 1c | -9.7 | 18 | 27 |
| 2.3 J | 11.8 1c | -9.5 | 18 | 28 |
| 2.4 J | 11.8 1c | -9.4 | 18 | 29 |
| 31.3 | 11.8 1c | 19.5 | 19 | 29 |
| 49.1 | 11.8 1c | 37.3 | 20 | 29 |
| 52.8 | 11.8 1c | 41 | 21 | 29 |
| 18.01 | 11.8 1c | 6.21 | 22 | 29 |
| 65.27 | 11.8 1c | 53.47 | 23 | 29 |
| 80.59 | 11.8 1c | 68.79 | 24 | 29 |
| 109.5 | 11.8 1c | 97.7 | 25 | 29 |
| 30.18 | 11.8 1c | 18.38 | 26 | 29 |
| | | | | |
| 30 | 45.7 | -15.7 | 26 | 30 |
| 2.1 J | 45.7 | -43.6 | 26 | 31 |
| 2.3 J | 45.7 | -43.4 | 26 | 32 |
| 2.4 J | 45.7 | -43.3 | 26 | 33 |
| 31.3 | 45.7 | -14.4 | 26 | 34 |
| 49.1 | 45.7 | 3.4 | 27 | 34 |
| 52.8 | 45.7 | 7.1 | 28 | 34 |
| 18.01 | 45.7 | -27.69 | 28 | 35 |
| 65.27 | 45.7 | 19.57 | 29 | 35 |
| 80.59 | 45.7 | 34.89 | 30 | 35 |
| 109.5 | 45.7 | 63.8 | 31 | 35 |
| 30.18 | 45.7 | -15.52 | 31 | 36 |
| | | | | |
| 2.1 J | 30 | -27.9 | 31 | 37 |
| 2.3 J | 30 | -27.7 | 31 | 38 |
| 2.4 J | 30 | -27.6 | 31 | 39 |
| 31.3 | 30 | 1.3 | 32 | 39 |
| 49.1 | 30 | 19.1 | 33 | 39 |
| 52.8 | 30 | 22.8 | 34 | 39 |
| 18.01 | 30 | -11.99 | 34 | 40 |
| 65.27 | 30 | 35.27 | 35 | 40 |
| 80.59 | 30 | 50.59 | 36 | 40 |
| 109.5 | 30 | 79.5 | 37 | 40 |
| 30.18 | 30 | 0.18 | 38 | 40 |
| | | | | |
| 2.3 J | 2.1 J | 0.2 | 39 | 40 |
| 2.4 J | 2.1 J | 0.3 | 40 | 40 |
| 31.3 | 2.1 J | 29.2 | 41 | 40 |
| 49.1 | 2.1 J | 47 | 42 | 40 |
| 52.8 | 2.1 J | 50.7 | 43 | 40 |
| 18.01 | 2.1 J | 15.91 | 44 | 40 |
| 65.27 | 2.1 J | 63.17 | 45 | 40 |
| 80.59 | 2.1 J | 78.49 | 46 | 40 |
| 109.5 | 2.1 J | 107.4 | 47 | 40 |
| 30.18 | 2.1 J | 28.08 | 48 | 40 |
| | | | | |
| 2.4 J | 2.3 J | 0.1 | 49 | 40 |
| 31.3 | 2.3 J | 29 | 50 | 40 |
| 49.1 | 2.3 J | 46.8 | 51 | 40 |
| 52.8 | 2.3 J | 50.5 | 52 | 40 |
| 18.01 | 2.3 J | 15.71 | 53 | 40 |
| 65.27 | 2.3 J | 62.97 | 54 | 40 |

| | | | | |
|---|---|---|---|---|
| 80.59 | 2.3 J | 78.29 | 55 | 40 |
| 109.5 | 2.3 J | 107.2 | 56 | 40 |
| 30.18 | 2.3 J | 27.88 | 57 | 40 |
| | | | | |
| 31.3 | 2.4 J | 28.9 | 58 | 40 |
| 49.1 | 2.4 J | 46.7 | 59 | 40 |
| 52.8 | 2.4 J | 50.4 | 60 | 40 |
| 18.01 | 2.4 J | 15.61 | 61 | 40 |
| 65.27 | 2.4 J | 62.87 | 62 | 40 |
| 80.59 | 2.4 J | 78.19 | 63 | 40 |
| 109.5 | 2.4 J | 107.1 | 64 | 40 |
| 30.18 | 2.4 J | 27.78 | 65 | 40 |
| | | | | |
| 49.1 | 31.3 | 17.8 | 66 | 40 |
| 52.8 | 31.3 | 21.5 | 67 | 40 |
| 18.01 | 31.3 | -13.29 | 67 | 41 |
| 65.27 | 31.3 | 33.97 | 68 | 41 |
| 80.59 | 31.3 | 49.29 | 69 | 41 |
| 109.5 | 31.3 | 78.2 | 70 | 41 |
| 30.18 | 31.3 | -1.12 | 70 | 42 |
| | | | | |
| 52.8 | 49.1 | 3.7 | 71 | 42 |
| 18.01 | 49.1 | -31.09 | 71 | 43 |
| 65.27 | 49.1 | 16.17 | 72 | 43 |
| 80.59 | 49.1 | 31.49 | 73 | 43 |
| 109.5 | 49.1 | 60.4 | 74 | 43 |
| 30.18 | 49.1 | -18.92 | 74 | 44 |
| | | | | |
| 18.01 | 52.8 | -34.79 | 74 | 45 |
| 65.27 | 52.8 | 12.47 | 75 | 45 |
| 80.59 | 52.8 | 27.79 | 76 | 45 |
| 109.5 | 52.8 | 56.7 | 77 | 45 |
| 30.18 | 52.8 | -22.62 | 77 | 46 |
| | | | | |
| 65.27 | 18.01 | 47.26 | 78 | 46 |
| 80.59 | 18.01 | 62.58 | 79 | 46 |
| 109.5 | 18.01 | 91.49 | 80 | 46 |
| 30.18 | 18.01 | 12.17 | 81 | 46 |
| | | | | |
| 80.59 | 65.27 | 15.32 | 82 | 46 |
| 109.5 | 65.27 | 44.23 | 83 | 46 |
| 30.18 | 65.27 | -35.09 | 83 | 47 |
| | | | | |
| 109.5 | 80.59 | 28.91 | 84 | 47 |
| 30.18 | 80.59 | -50.41 | 84 | 48 |
| | | | | |
| 30.18 | 109.5 | -79.32 | 84 | 49 |

S Statistic = 84 - 49 = 35

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 5/1/2019 | 3 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |

| | |
|---|---|
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

---

A = 0
B = 66
C = 0
D = 6
E = 0
F = 6
a = 10608
b = 36720
c = 544
Group Variance = 585.667
Z-Score = 1.40493
Comparison Level at 95% confidence level = 1.65463 (upward trend)
1.40493 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RWK-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 46.7 | 33.5 1c | Same Date | 0 | 0 |
| 65.6 1c | 33.5 1c | 32.1 | 1 | 0 |
| 99.5 | 33.5 1c | 66 | 2 | 0 |
| 89.1 | 33.5 1c | 55.6 | 3 | 0 |
| 76.9 | 33.5 1c | 43.4 | 4 | 0 |
| 79.1 | 33.5 1c | 45.6 | 5 | 0 |
| 74.4 | 33.5 1c | 40.9 | 6 | 0 |
| 97.8 | 33.5 1c | 64.3 | 7 | 0 |
| 77.6 | 33.5 1c | 44.1 | 8 | 0 |
| 62.8 | 33.5 1c | 29.3 | 9 | 0 |
| 72.73 | 33.5 1c | 39.23 | 10 | 0 |
| 57.36 | 33.5 1c | 23.86 | 11 | 0 |
| 89.91 | 33.5 1c | 56.41 | 12 | 0 |
| 168.8 | 33.5 1c | 135.3 | 13 | 0 |
| 238.8 | 33.5 1c | 205.3 | 14 | 0 |
| | | | | |
| 65.6 1c | 46.7 | 18.9 | 15 | 0 |
| 99.5 | 46.7 | 52.8 | 16 | 0 |
| 89.1 | 46.7 | 42.4 | 17 | 0 |
| 76.9 | 46.7 | 30.2 | 18 | 0 |
| 79.1 | 46.7 | 32.4 | 19 | 0 |
| 74.4 | 46.7 | 27.7 | 20 | 0 |
| 97.8 | 46.7 | 51.1 | 21 | 0 |
| 77.6 | 46.7 | 30.9 | 22 | 0 |
| 62.8 | 46.7 | 16.1 | 23 | 0 |
| 72.73 | 46.7 | 26.03 | 24 | 0 |
| 57.36 | 46.7 | 10.66 | 25 | 0 |
| 89.91 | 46.7 | 43.21 | 26 | 0 |
| 168.8 | 46.7 | 122.1 | 27 | 0 |
| 238.8 | 46.7 | 192.1 | 28 | 0 |
| | | | | |
| 99.5 | 65.6 1c | 33.9 | 29 | 0 |
| 89.1 | 65.6 1c | 23.5 | 30 | 0 |
| 76.9 | 65.6 1c | 11.3 | 31 | 0 |
| 79.1 | 65.6 1c | 13.5 | 32 | 0 |
| 74.4 | 65.6 1c | 8.8 | 33 | 0 |
| 97.8 | 65.6 1c | 32.2 | 34 | 0 |
| 77.6 | 65.6 1c | 12 | 35 | 0 |
| 62.8 | 65.6 1c | -2.8 | 35 | 1 |
| 72.73 | 65.6 1c | 7.13 | 36 | 1 |
| 57.36 | 65.6 1c | -8.24 | 36 | 2 |
| 89.91 | 65.6 1c | 24.31 | 37 | 2 |
| 168.8 | 65.6 1c | 103.2 | 38 | 2 |
| 238.8 | 65.6 1c | 173.2 | 39 | 2 |
| | | | | |
| 89.1 | 99.5 | -10.4 | 39 | 3 |
| 76.9 | 99.5 | -22.6 | 39 | 4 |

| | | | | |
|---|---|---|---|---|
| 79.1 | 99.5 | -20.4 | 39 | 5 |
| 74.4 | 99.5 | -25.1 | 39 | 6 |
| 97.8 | 99.5 | -1.7 | 39 | 7 |
| 77.6 | 99.5 | -21.9 | 39 | 8 |
| 62.8 | 99.5 | -36.7 | 39 | 9 |
| 72.73 | 99.5 | -26.77 | 39 | 10 |
| 57.36 | 99.5 | -42.14 | 39 | 11 |
| 89.91 | 99.5 | -9.59 | 39 | 12 |
| 168.8 | 99.5 | 69.3 | 40 | 12 |
| 238.8 | 99.5 | 139.3 | 41 | 12 |
| | | | | |
| 76.9 | 89.1 | -12.2 | 41 | 13 |
| 79.1 | 89.1 | -10 | 41 | 14 |
| 74.4 | 89.1 | -14.7 | 41 | 15 |
| 97.8 | 89.1 | 8.7 | 42 | 15 |
| 77.6 | 89.1 | -11.5 | 42 | 16 |
| 62.8 | 89.1 | -26.3 | 42 | 17 |
| 72.73 | 89.1 | -16.37 | 42 | 18 |
| 57.36 | 89.1 | -31.74 | 42 | 19 |
| 89.91 | 89.1 | 0.81 | 43 | 19 |
| 168.8 | 89.1 | 79.7 | 44 | 19 |
| 238.8 | 89.1 | 149.7 | 45 | 19 |
| | | | | |
| 79.1 | 76.9 | 2.2 | 46 | 19 |
| 74.4 | 76.9 | -2.5 | 46 | 20 |
| 97.8 | 76.9 | 20.9 | 47 | 20 |
| 77.6 | 76.9 | 0.7 | 48 | 20 |
| 62.8 | 76.9 | -14.1 | 48 | 21 |
| 72.73 | 76.9 | -4.17 | 48 | 22 |
| 57.36 | 76.9 | -19.54 | 48 | 23 |
| 89.91 | 76.9 | 13.01 | 49 | 23 |
| 168.8 | 76.9 | 91.9 | 50 | 23 |
| 238.8 | 76.9 | 161.9 | 51 | 23 |
| | | | | |
| 74.4 | 79.1 | -4.7 | 51 | 24 |
| 97.8 | 79.1 | 18.7 | 52 | 24 |
| 77.6 | 79.1 | -1.5 | 52 | 25 |
| 62.8 | 79.1 | -16.3 | 52 | 26 |
| 72.73 | 79.1 | -6.37 | 52 | 27 |
| 57.36 | 79.1 | -21.74 | 52 | 28 |
| 89.91 | 79.1 | 10.81 | 53 | 28 |
| 168.8 | 79.1 | 89.7 | 54 | 28 |
| 238.8 | 79.1 | 159.7 | 55 | 28 |
| | | | | |
| 97.8 | 74.4 | 23.4 | 56 | 28 |
| 77.6 | 74.4 | 3.2 | 57 | 28 |
| 62.8 | 74.4 | -11.6 | 57 | 29 |
| 72.73 | 74.4 | -1.67 | 57 | 30 |
| 57.36 | 74.4 | -17.04 | 57 | 31 |
| 89.91 | 74.4 | 15.51 | 58 | 31 |
| 168.8 | 74.4 | 94.4 | 59 | 31 |
| 238.8 | 74.4 | 164.4 | 60 | 31 |
| | | | | |
| 77.6 | 97.8 | -20.2 | 60 | 32 |
| 62.8 | 97.8 | -35 | 60 | 33 |
| 72.73 | 97.8 | -25.07 | 60 | 34 |
| 57.36 | 97.8 | -40.44 | 60 | 35 |

| | | | | |
|---|---|---|---|---|
| 89.91 | 97.8 | -7.89 | 60 | 36 |
| 168.8 | 97.8 | 71 | 61 | 36 |
| 238.8 | 97.8 | 141 | 62 | 36 |
| | | | | |
| 62.8 | 77.6 | -14.8 | 62 | 37 |
| 72.73 | 77.6 | -4.87 | 62 | 38 |
| 57.36 | 77.6 | -20.24 | 62 | 39 |
| 89.91 | 77.6 | 12.31 | 63 | 39 |
| 168.8 | 77.6 | 91.2 | 64 | 39 |
| 238.8 | 77.6 | 161.2 | 65 | 39 |
| | | | | |
| 72.73 | 62.8 | 9.93 | 66 | 39 |
| 57.36 | 62.8 | -5.44 | 66 | 40 |
| 89.91 | 62.8 | 27.11 | 67 | 40 |
| 168.8 | 62.8 | 106 | 68 | 40 |
| 238.8 | 62.8 | 176 | 69 | 40 |
| | | | | |
| 57.36 | 72.73 | -15.37 | 69 | 41 |
| 89.91 | 72.73 | 17.18 | 70 | 41 |
| 168.8 | 72.73 | 96.07 | 71 | 41 |
| 238.8 | 72.73 | 166.07 | 72 | 41 |
| | | | | |
| 89.91 | 57.36 | 32.55 | 73 | 41 |
| 168.8 | 57.36 | 111.44 | 74 | 41 |
| 238.8 | 57.36 | 181.44 | 75 | 41 |
| | | | | |
| 168.8 | 89.91 | 78.89 | 76 | 41 |
| 238.8 | 89.91 | 148.89 | 77 | 41 |
| | | | | |
| 238.8 | 168.8 | 70 | 78 | 41 |

S Statistic = 78 - 41 = 37

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 0
B = 18
C = 0

D = 0
E = 0
F = 2
a = 8880
b = 30240
c = 480
Group Variance = 492.333
Z-Score = 1.62246
Comparison Level at 95% confidence level = 1.65463 (upward trend)
1.62246 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RWL-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 1230 | 1260 | Same Date | 0 | 0 |
| 1240 1c | 1260 | -20 | 0 | 1 |
| 1280 | 1260 | 20 | 1 | 1 |
| 1170 | 1260 | -90 | 1 | 2 |
| 1140 | 1260 | -120 | 1 | 3 |
| 1210 1c | 1260 | -50 | 1 | 4 |
| 1160 | 1260 | -100 | 1 | 5 |
| 1290 | 1260 | 30 | 2 | 5 |
| 1230 | 1260 | -30 | 2 | 6 |
| 1230 | 1260 | -30 | 2 | 7 |
| 818.6 | 1260 | -441.4 | 2 | 8 |
| 738.7 | 1260 | -521.3 | 2 | 9 |
| 850.5 | 1260 | -409.5 | 2 | 10 |
| 787.8 | 1260 | -472.2 | 2 | 11 |
| 1114 | 1260 | -146 | 2 | 12 |
| | | | | |
| 1240 1c | 1230 | 10 | 3 | 12 |
| 1280 | 1230 | 50 | 4 | 12 |
| 1170 | 1230 | -60 | 4 | 13 |
| 1140 | 1230 | -90 | 4 | 14 |
| 1210 1c | 1230 | -20 | 4 | 15 |
| 1160 | 1230 | -70 | 4 | 16 |
| 1290 | 1230 | 60 | 5 | 16 |
| 1230 | 1230 | 0 | 5 | 16 |
| 1230 | 1230 | 0 | 5 | 16 |
| 818.6 | 1230 | -411.4 | 5 | 17 |
| 738.7 | 1230 | -491.3 | 5 | 18 |
| 850.5 | 1230 | -379.5 | 5 | 19 |
| 787.8 | 1230 | -442.2 | 5 | 20 |
| 1114 | 1230 | -116 | 5 | 21 |
| | | | | |
| 1280 | 1240 1c | 40 | 6 | 21 |
| 1170 | 1240 1c | -70 | 6 | 22 |
| 1140 | 1240 1c | -100 | 6 | 23 |
| 1210 1c | 1240 1c | -30 | 6 | 24 |
| 1160 | 1240 1c | -80 | 6 | 25 |
| 1290 | 1240 1c | 50 | 7 | 25 |
| 1230 | 1240 1c | -10 | 7 | 26 |
| 1230 | 1240 1c | -10 | 7 | 27 |
| 818.6 | 1240 1c | -421.4 | 7 | 28 |
| 738.7 | 1240 1c | -501.3 | 7 | 29 |
| 850.5 | 1240 1c | -389.5 | 7 | 30 |
| 787.8 | 1240 1c | -452.2 | 7 | 31 |
| 1114 | 1240 1c | -126 | 7 | 32 |
| | | | | |
| 1170 | 1280 | -110 | 7 | 33 |
| 1140 | 1280 | -140 | 7 | 34 |

| | | | | |
|---|---|---|---|---|
| 1210 1c | 1280 | -70 | 7 | 35 |
| 1160 | 1280 | -120 | 7 | 36 |
| 1290 | 1280 | 10 | 8 | 36 |
| 1230 | 1280 | -50 | 8 | 37 |
| 1230 | 1280 | -50 | 8 | 38 |
| 818.6 | 1280 | -461.4 | 8 | 39 |
| 738.7 | 1280 | -541.3 | 8 | 40 |
| 850.5 | 1280 | -429.5 | 8 | 41 |
| 787.8 | 1280 | -492.2 | 8 | 42 |
| 1114 | 1280 | -166 | 8 | 43 |
| | | | | |
| 1140 | 1170 | -30 | 8 | 44 |
| 1210 1c | 1170 | 40 | 9 | 44 |
| 1160 | 1170 | -10 | 9 | 45 |
| 1290 | 1170 | 120 | 10 | 45 |
| 1230 | 1170 | 60 | 11 | 45 |
| 1230 | 1170 | 60 | 12 | 45 |
| 818.6 | 1170 | -351.4 | 12 | 46 |
| 738.7 | 1170 | -431.3 | 12 | 47 |
| 850.5 | 1170 | -319.5 | 12 | 48 |
| 787.8 | 1170 | -382.2 | 12 | 49 |
| 1114 | 1170 | -56 | 12 | 50 |
| | | | | |
| 1210 1c | 1140 | 70 | 13 | 50 |
| 1160 | 1140 | 20 | 14 | 50 |
| 1290 | 1140 | 150 | 15 | 50 |
| 1230 | 1140 | 90 | 16 | 50 |
| 1230 | 1140 | 90 | 17 | 50 |
| 818.6 | 1140 | -321.4 | 17 | 51 |
| 738.7 | 1140 | -401.3 | 17 | 52 |
| 850.5 | 1140 | -289.5 | 17 | 53 |
| 787.8 | 1140 | -352.2 | 17 | 54 |
| 1114 | 1140 | -26 | 17 | 55 |
| | | | | |
| 1160 | 1210 1c | -50 | 17 | 56 |
| 1290 | 1210 1c | 80 | 18 | 56 |
| 1230 | 1210 1c | 20 | 19 | 56 |
| 1230 | 1210 1c | 20 | 20 | 56 |
| 818.6 | 1210 1c | -391.4 | 20 | 57 |
| 738.7 | 1210 1c | -471.3 | 20 | 58 |
| 850.5 | 1210 1c | -359.5 | 20 | 59 |
| 787.8 | 1210 1c | -422.2 | 20 | 60 |
| 1114 | 1210 1c | -96 | 20 | 61 |
| | | | | |
| 1290 | 1160 | 130 | 21 | 61 |
| 1230 | 1160 | 70 | 22 | 61 |
| 1230 | 1160 | 70 | 23 | 61 |
| 818.6 | 1160 | -341.4 | 23 | 62 |
| 738.7 | 1160 | -421.3 | 23 | 63 |
| 850.5 | 1160 | -309.5 | 23 | 64 |
| 787.8 | 1160 | -372.2 | 23 | 65 |
| 1114 | 1160 | -46 | 23 | 66 |
| | | | | |
| 1230 | 1290 | -60 | 23 | 67 |
| 1230 | 1290 | -60 | 23 | 68 |
| 818.6 | 1290 | -471.4 | 23 | 69 |
| 738.7 | 1290 | -551.3 | 23 | 70 |

| | | | | |
|---|---|---|---|---|
| 850.5 | 1290 | -439.5 | 23 | 71 |
| 787.8 | 1290 | -502.2 | 23 | 72 |
| 1114 | 1290 | -176 | 23 | 73 |
| | | | | |
| 1230 | 1230 | 0 | 23 | 73 |
| 818.6 | 1230 | -411.4 | 23 | 74 |
| 738.7 | 1230 | -491.3 | 23 | 75 |
| 850.5 | 1230 | -379.5 | 23 | 76 |
| 787.8 | 1230 | -442.2 | 23 | 77 |
| 1114 | 1230 | -116 | 23 | 78 |
| | | | | |
| 818.6 | 1230 | -411.4 | 23 | 79 |
| 738.7 | 1230 | -491.3 | 23 | 80 |
| 850.5 | 1230 | -379.5 | 23 | 81 |
| 787.8 | 1230 | -442.2 | 23 | 82 |
| 1114 | 1230 | -116 | 23 | 83 |
| | | | | |
| 738.7 | 818.6 | -79.9 | 23 | 84 |
| 850.5 | 818.6 | 31.9 | 24 | 84 |
| 787.8 | 818.6 | -30.8 | 24 | 85 |
| 1114 | 818.6 | 295.4 | 25 | 85 |
| | | | | |
| 850.5 | 738.7 | 111.8 | 26 | 85 |
| 787.8 | 738.7 | 49.1 | 27 | 85 |
| 1114 | 738.7 | 375.3 | 28 | 85 |
| | | | | |
| 787.8 | 850.5 | -62.7 | 28 | 86 |
| 1114 | 850.5 | 263.5 | 29 | 86 |
| | | | | |
| 1114 | 787.8 | 326.2 | 30 | 86 |

S Statistic = 30 - 86 = -56

| Tied Group | Value | Members |
|---|---|---|
| 1 | 1230 | 3 |

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 66
B = 18

C = 6
D = 0
E = 6
F = 2
a = 8880
b = 30240
c = 480
Group Variance = 488.692
Z-Score = -2.48797
Comparison Level at 95% confidence level = 1.65463 (upward trend)
-2.48797 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RWM-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 1130 | 1080 | Same Date | 0 | 0 |
| 1200 | 1080 | 120 | 1 | 0 |
| 1230 | 1080 | 150 | 2 | 0 |
| 1120 | 1080 | 40 | 3 | 0 |
| 1040 | 1080 | -40 | 3 | 1 |
| 1060 1c | 1080 | -20 | 3 | 2 |
| 1120 | 1080 | 40 | 4 | 2 |
| 1220 | 1080 | 140 | 5 | 2 |
| 1250 | 1080 | 170 | 6 | 2 |
| 1286 | 1080 | 206 | 7 | 2 |
| 1353 | 1080 | 273 | 8 | 2 |
| | | | | |
| 1200 | 1130 | 70 | 9 | 2 |
| 1230 | 1130 | 100 | 10 | 2 |
| 1120 | 1130 | -10 | 10 | 3 |
| 1040 | 1130 | -90 | 10 | 4 |
| 1060 1c | 1130 | -70 | 10 | 5 |
| 1120 | 1130 | -10 | 10 | 6 |
| 1220 | 1130 | 90 | 11 | 6 |
| 1250 | 1130 | 120 | 12 | 6 |
| 1286 | 1130 | 156 | 13 | 6 |
| 1353 | 1130 | 223 | 14 | 6 |
| | | | | |
| 1230 | 1200 | 30 | 15 | 6 |
| 1120 | 1200 | -80 | 15 | 7 |
| 1040 | 1200 | -160 | 15 | 8 |
| 1060 1c | 1200 | -140 | 15 | 9 |
| 1120 | 1200 | -80 | 15 | 10 |
| 1220 | 1200 | 20 | 16 | 10 |
| 1250 | 1200 | 50 | 17 | 10 |
| 1286 | 1200 | 86 | 18 | 10 |
| 1353 | 1200 | 153 | 19 | 10 |
| | | | | |
| 1120 | 1230 | -110 | 19 | 11 |
| 1040 | 1230 | -190 | 19 | 12 |
| 1060 1c | 1230 | -170 | 19 | 13 |
| 1120 | 1230 | -110 | 19 | 14 |
| 1220 | 1230 | -10 | 19 | 15 |
| 1250 | 1230 | 20 | 20 | 15 |
| 1286 | 1230 | 56 | 21 | 15 |
| 1353 | 1230 | 123 | 22 | 15 |
| | | | | |
| 1040 | 1120 | -80 | 22 | 16 |
| 1060 1c | 1120 | -60 | 22 | 17 |
| 1120 | 1120 | 0 | 22 | 17 |
| 1220 | 1120 | 100 | 23 | 17 |
| 1250 | 1120 | 130 | 24 | 17 |

| | | | | |
|---|---|---|---|---|
| 1286 | 1120 | 166 | 25 | 17 |
| 1353 | 1120 | 233 | 26 | 17 |
| | | | | |
| 1060 1c | 1040 | 20 | 27 | 17 |
| 1120 | 1040 | 80 | 28 | 17 |
| 1220 | 1040 | 180 | 29 | 17 |
| 1250 | 1040 | 210 | 30 | 17 |
| 1286 | 1040 | 246 | 31 | 17 |
| 1353 | 1040 | 313 | 32 | 17 |
| | | | | |
| 1120 | 1060 1c | 60 | 33 | 17 |
| 1220 | 1060 1c | 160 | 34 | 17 |
| 1250 | 1060 1c | 190 | 35 | 17 |
| 1286 | 1060 1c | 226 | 36 | 17 |
| 1353 | 1060 1c | 293 | 37 | 17 |
| | | | | |
| 1220 | 1120 | 100 | 38 | 17 |
| 1250 | 1120 | 130 | 39 | 17 |
| 1286 | 1120 | 166 | 40 | 17 |
| 1353 | 1120 | 233 | 41 | 17 |
| | | | | |
| 1250 | 1220 | 30 | 42 | 17 |
| 1286 | 1220 | 66 | 43 | 17 |
| 1353 | 1220 | 133 | 44 | 17 |
| | | | | |
| 1286 | 1250 | 36 | 45 | 17 |
| 1353 | 1250 | 103 | 46 | 17 |
| | | | | |
| 1353 | 1286 | 67 | 47 | 17 |

S Statistic = 47 - 17 = 30

| Tied Group | Value | Members |
|---|---|---|
| 1 | 1120 | 2 |

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 3/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 18
B = 18
C = 0
D = 0
E = 2
F = 2
a = 3828

b = 11880
c = 264
Group Variance = 210.682
Z-Score = 1.99795
Comparison Level at 95% confidence level = 1.65463 (upward trend)
**1.99795 > 1.65463 indicating an upward trend**

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RWO-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 68.2 2c | 70.3 1c4c | Same Date | 0 | 0 |
| 72.1 1c | 70.3 1c4c | 1.8 | 1 | 0 |
| 55.4 | 70.3 1c4c | -14.9 | 1 | 1 |
| 54.3 | 70.3 1c4c | -16 | 1 | 2 |
| 66.2 | 70.3 1c4c | -4.1 | 1 | 3 |
| 57.8 1c | 70.3 1c4c | -12.5 | 1 | 4 |
| 27.9 | 70.3 1c4c | -42.4 | 1 | 5 |
| 35.8 | 70.3 1c4c | -34.5 | 1 | 6 |
| 31.4 | 70.3 1c4c | -38.9 | 1 | 7 |
| 10.1 | 70.3 1c4c | -60.2 | 1 | 8 |
| 26.3 | 70.3 1c4c | -44 | 1 | 9 |
| 27.33 | 70.3 1c4c | -42.97 | 1 | 10 |
| 18.07 | 70.3 1c4c | -52.23 | 1 | 11 |
| 30.13 | 70.3 1c4c | -40.17 | 1 | 12 |
| 17.06 | 70.3 1c4c | -53.24 | 1 | 13 |
| 64.04 | 70.3 1c4c | -6.26 | 1 | 14 |
| | | | | |
| 72.1 1c | 68.2 2c | 3.9 | 2 | 14 |
| 55.4 | 68.2 2c | -12.8 | 2 | 15 |
| 54.3 | 68.2 2c | -13.9 | 2 | 16 |
| 66.2 | 68.2 2c | -2 | 2 | 17 |
| 57.8 1c | 68.2 2c | -10.4 | 2 | 18 |
| 27.9 | 68.2 2c | -40.3 | 2 | 19 |
| 35.8 | 68.2 2c | -32.4 | 2 | 20 |
| 31.4 | 68.2 2c | -36.8 | 2 | 21 |
| 10.1 | 68.2 2c | -58.1 | 2 | 22 |
| 26.3 | 68.2 2c | -41.9 | 2 | 23 |
| 27.33 | 68.2 2c | -40.87 | 2 | 24 |
| 18.07 | 68.2 2c | -50.13 | 2 | 25 |
| 30.13 | 68.2 2c | -38.07 | 2 | 26 |
| 17.06 | 68.2 2c | -51.14 | 2 | 27 |
| 64.04 | 68.2 2c | -4.16 | 2 | 28 |
| | | | | |
| 55.4 | 72.1 1c | -16.7 | 2 | 29 |
| 54.3 | 72.1 1c | -17.8 | 2 | 30 |
| 66.2 | 72.1 1c | -5.9 | 2 | 31 |
| 57.8 1c | 72.1 1c | -14.3 | 2 | 32 |
| 27.9 | 72.1 1c | -44.2 | 2 | 33 |
| 35.8 | 72.1 1c | -36.3 | 2 | 34 |
| 31.4 | 72.1 1c | -40.7 | 2 | 35 |
| 10.1 | 72.1 1c | -62 | 2 | 36 |
| 26.3 | 72.1 1c | -45.8 | 2 | 37 |
| 27.33 | 72.1 1c | -44.77 | 2 | 38 |
| 18.07 | 72.1 1c | -54.03 | 2 | 39 |
| 30.13 | 72.1 1c | -41.97 | 2 | 40 |
| 17.06 | 72.1 1c | -55.04 | 2 | 41 |
| 64.04 | 72.1 1c | -8.06 | 2 | 42 |

| | | | | |
|---|---|---|---|---|
| 54.3 | 55.4 | -1.1 | 2 | 43 |
| 66.2 | 55.4 | 10.8 | 3 | 43 |
| 57.8 1c | 55.4 | 2.4 | 4 | 43 |
| 27.9 | 55.4 | -27.5 | 4 | 44 |
| 35.8 | 55.4 | -19.6 | 4 | 45 |
| 31.4 | 55.4 | -24 | 4 | 46 |
| 10.1 | 55.4 | -45.3 | 4 | 47 |
| 26.3 | 55.4 | -29.1 | 4 | 48 |
| 27.33 | 55.4 | -28.07 | 4 | 49 |
| 18.07 | 55.4 | -37.33 | 4 | 50 |
| 30.13 | 55.4 | -25.27 | 4 | 51 |
| 17.06 | 55.4 | -38.34 | 4 | 52 |
| 64.04 | 55.4 | 8.64 | 5 | 52 |
| | | | | |
| 66.2 | 54.3 | 11.9 | 6 | 52 |
| 57.8 1c | 54.3 | 3.5 | 7 | 52 |
| 27.9 | 54.3 | -26.4 | 7 | 53 |
| 35.8 | 54.3 | -18.5 | 7 | 54 |
| 31.4 | 54.3 | -22.9 | 7 | 55 |
| 10.1 | 54.3 | -44.2 | 7 | 56 |
| 26.3 | 54.3 | -28 | 7 | 57 |
| 27.33 | 54.3 | -26.97 | 7 | 58 |
| 18.07 | 54.3 | -36.23 | 7 | 59 |
| 30.13 | 54.3 | -24.17 | 7 | 60 |
| 17.06 | 54.3 | -37.24 | 7 | 61 |
| 64.04 | 54.3 | 9.74 | 8 | 61 |
| | | | | |
| 57.8 1c | 66.2 | -8.4 | 8 | 62 |
| 27.9 | 66.2 | -38.3 | 8 | 63 |
| 35.8 | 66.2 | -30.4 | 8 | 64 |
| 31.4 | 66.2 | -34.8 | 8 | 65 |
| 10.1 | 66.2 | -56.1 | 8 | 66 |
| 26.3 | 66.2 | -39.9 | 8 | 67 |
| 27.33 | 66.2 | -38.87 | 8 | 68 |
| 18.07 | 66.2 | -48.13 | 8 | 69 |
| 30.13 | 66.2 | -36.07 | 8 | 70 |
| 17.06 | 66.2 | -49.14 | 8 | 71 |
| 64.04 | 66.2 | -2.16 | 8 | 72 |
| | | | | |
| 27.9 | 57.8 1c | -29.9 | 8 | 73 |
| 35.8 | 57.8 1c | -22 | 8 | 74 |
| 31.4 | 57.8 1c | -26.4 | 8 | 75 |
| 10.1 | 57.8 1c | -47.7 | 8 | 76 |
| 26.3 | 57.8 1c | -31.5 | 8 | 77 |
| 27.33 | 57.8 1c | -30.47 | 8 | 78 |
| 18.07 | 57.8 1c | -39.73 | 8 | 79 |
| 30.13 | 57.8 1c | -27.67 | 8 | 80 |
| 17.06 | 57.8 1c | -40.74 | 8 | 81 |
| 64.04 | 57.8 1c | 6.24 | 9 | 81 |
| | | | | |
| 35.8 | 27.9 | 7.9 | 10 | 81 |
| 31.4 | 27.9 | 3.5 | 11 | 81 |
| 10.1 | 27.9 | -17.8 | 11 | 82 |
| 26.3 | 27.9 | -1.6 | 11 | 83 |
| 27.33 | 27.9 | -0.57 | 11 | 84 |
| 18.07 | 27.9 | -9.83 | 11 | 85 |

| | | | | |
|---|---|---|---|---|
| 30.13 | 27.9 | 2.23 | 12 | 85 |
| 17.06 | 27.9 | -10.84 | 12 | 86 |
| 64.04 | 27.9 | 36.14 | 13 | 86 |
| | | | | |
| 31.4 | 35.8 | -4.4 | 13 | 87 |
| 10.1 | 35.8 | -25.7 | 13 | 88 |
| 26.3 | 35.8 | -9.5 | 13 | 89 |
| 27.33 | 35.8 | -8.47 | 13 | 90 |
| 18.07 | 35.8 | -17.73 | 13 | 91 |
| 30.13 | 35.8 | -5.67 | 13 | 92 |
| 17.06 | 35.8 | -18.74 | 13 | 93 |
| 64.04 | 35.8 | 28.24 | 14 | 93 |
| | | | | |
| 10.1 | 31.4 | -21.3 | 14 | 94 |
| 26.3 | 31.4 | -5.1 | 14 | 95 |
| 27.33 | 31.4 | -4.07 | 14 | 96 |
| 18.07 | 31.4 | -13.33 | 14 | 97 |
| 30.13 | 31.4 | -1.27 | 14 | 98 |
| 17.06 | 31.4 | -14.34 | 14 | 99 |
| 64.04 | 31.4 | 32.64 | 15 | 99 |
| | | | | |
| 26.3 | 10.1 | 16.2 | 16 | 99 |
| 27.33 | 10.1 | 17.23 | 17 | 99 |
| 18.07 | 10.1 | 7.97 | 18 | 99 |
| 30.13 | 10.1 | 20.03 | 19 | 99 |
| 17.06 | 10.1 | 6.96 | 20 | 99 |
| 64.04 | 10.1 | 53.94 | 21 | 99 |
| | | | | |
| 27.33 | 26.3 | 1.03 | 22 | 99 |
| 18.07 | 26.3 | -8.23 | 22 | 100 |
| 30.13 | 26.3 | 3.83 | 23 | 100 |
| 17.06 | 26.3 | -9.24 | 23 | 101 |
| 64.04 | 26.3 | 37.74 | 24 | 101 |
| | | | | |
| 18.07 | 27.33 | -9.26 | 24 | 102 |
| 30.13 | 27.33 | 2.8 | 25 | 102 |
| 17.06 | 27.33 | -10.27 | 25 | 103 |
| 64.04 | 27.33 | 36.71 | 26 | 103 |
| | | | | |
| 30.13 | 18.07 | 12.06 | 27 | 103 |
| 17.06 | 18.07 | -1.01 | 27 | 104 |
| 64.04 | 18.07 | 45.97 | 28 | 104 |
| | | | | |
| 17.06 | 30.13 | -13.07 | 28 | 105 |
| 64.04 | 30.13 | 33.91 | 29 | 105 |
| | | | | |
| 64.04 | 17.06 | 46.98 | 30 | 105 |

S Statistic = 30 - 105 = -75

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |

| | |
|---|---|
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 11/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

---

A = 0
B = 18
C = 0
D = 0
E = 0
F = 2
a = 10608
b = 36720
c = 544
Group Variance = 588.333
Z-Score = -3.05084
Comparison Level at 95% confidence level = 1.65463 (upward trend)
-3.05084 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RWP-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 2790 | 2810 | Same Date | 0 | 0 |
| 6990 1c | 2810 | 4180 | 1 | 0 |
| 8910 | 2810 | 6100 | 2 | 0 |
| 5560 | 2810 | 2750 | 3 | 0 |
| 7090 | 2810 | 4280 | 4 | 0 |
| 7220 | 2810 | 4410 | 5 | 0 |
| 7700 | 2810 | 4890 | 6 | 0 |
| 8430 | 2810 | 5620 | 7 | 0 |
| 1.9 | 2810 | -2808.1 | 7 | 1 |
| 5340 | 2810 | 2530 | 8 | 1 |
| 6136 | 2810 | 3326 | 9 | 1 |
| 0.6083 | 2810 | -2809.39 | 9 | 2 |
| 5384 | 2810 | 2574 | 10 | 2 |
| 6017 | 2810 | 3207 | 11 | 2 |
| 6930 | 2810 | 4120 | 12 | 2 |
| | | | | |
| 6990 1c | 2790 | 4200 | 13 | 2 |
| 8910 | 2790 | 6120 | 14 | 2 |
| 5560 | 2790 | 2770 | 15 | 2 |
| 7090 | 2790 | 4300 | 16 | 2 |
| 7220 | 2790 | 4430 | 17 | 2 |
| 7700 | 2790 | 4910 | 18 | 2 |
| 8430 | 2790 | 5640 | 19 | 2 |
| 1.9 | 2790 | -2788.1 | 19 | 3 |
| 5340 | 2790 | 2550 | 20 | 3 |
| 6136 | 2790 | 3346 | 21 | 3 |
| 0.6083 | 2790 | -2789.39 | 21 | 4 |
| 5384 | 2790 | 2594 | 22 | 4 |
| 6017 | 2790 | 3227 | 23 | 4 |
| 6930 | 2790 | 4140 | 24 | 4 |
| | | | | |
| 8910 | 6990 1c | 1920 | 25 | 4 |
| 5560 | 6990 1c | -1430 | 25 | 5 |
| 7090 | 6990 1c | 100 | 26 | 5 |
| 7220 | 6990 1c | 230 | 27 | 5 |
| 7700 | 6990 1c | 710 | 28 | 5 |
| 8430 | 6990 1c | 1440 | 29 | 5 |
| 1.9 | 6990 1c | -6988.1 | 29 | 6 |
| 5340 | 6990 1c | -1650 | 29 | 7 |
| 6136 | 6990 1c | -854 | 29 | 8 |
| 0.6083 | 6990 1c | -6989.39 | 29 | 9 |
| 5384 | 6990 1c | -1606 | 29 | 10 |
| 6017 | 6990 1c | -973 | 29 | 11 |
| 6930 | 6990 1c | -60 | 29 | 12 |
| | | | | |
| 5560 | 8910 | -3350 | 29 | 13 |
| 7090 | 8910 | -1820 | 29 | 14 |

| | | | | |
|---|---|---|---|---|
| 7220 | 8910 | -1690 | 29 | 15 |
| 7700 | 8910 | -1210 | 29 | 16 |
| 8430 | 8910 | -480 | 29 | 17 |
| 1.9 | 8910 | -8908.1 | 29 | 18 |
| 5340 | 8910 | -3570 | 29 | 19 |
| 6136 | 8910 | -2774 | 29 | 20 |
| 0.6083 | 8910 | -8909.39 | 29 | 21 |
| 5384 | 8910 | -3526 | 29 | 22 |
| 6017 | 8910 | -2893 | 29 | 23 |
| 6930 | 8910 | -1980 | 29 | 24 |
| | | | | |
| 7090 | 5560 | 1530 | 30 | 24 |
| 7220 | 5560 | 1660 | 31 | 24 |
| 7700 | 5560 | 2140 | 32 | 24 |
| 8430 | 5560 | 2870 | 33 | 24 |
| 1.9 | 5560 | -5558.1 | 33 | 25 |
| 5340 | 5560 | -220 | 33 | 26 |
| 6136 | 5560 | 576 | 34 | 26 |
| 0.6083 | 5560 | -5559.39 | 34 | 27 |
| 5384 | 5560 | -176 | 34 | 28 |
| 6017 | 5560 | 457 | 35 | 28 |
| 6930 | 5560 | 1370 | 36 | 28 |
| | | | | |
| 7220 | 7090 | 130 | 37 | 28 |
| 7700 | 7090 | 610 | 38 | 28 |
| 8430 | 7090 | 1340 | 39 | 28 |
| 1.9 | 7090 | -7088.1 | 39 | 29 |
| 5340 | 7090 | -1750 | 39 | 30 |
| 6136 | 7090 | -954 | 39 | 31 |
| 0.6083 | 7090 | -7089.39 | 39 | 32 |
| 5384 | 7090 | -1706 | 39 | 33 |
| 6017 | 7090 | -1073 | 39 | 34 |
| 6930 | 7090 | -160 | 39 | 35 |
| | | | | |
| 7700 | 7220 | 480 | 40 | 35 |
| 8430 | 7220 | 1210 | 41 | 35 |
| 1.9 | 7220 | -7218.1 | 41 | 36 |
| 5340 | 7220 | -1880 | 41 | 37 |
| 6136 | 7220 | -1084 | 41 | 38 |
| 0.6083 | 7220 | -7219.39 | 41 | 39 |
| 5384 | 7220 | -1836 | 41 | 40 |
| 6017 | 7220 | -1203 | 41 | 41 |
| 6930 | 7220 | -290 | 41 | 42 |
| | | | | |
| 8430 | 7700 | 730 | 42 | 42 |
| 1.9 | 7700 | -7698.1 | 42 | 43 |
| 5340 | 7700 | -2360 | 42 | 44 |
| 6136 | 7700 | -1564 | 42 | 45 |
| 0.6083 | 7700 | -7699.39 | 42 | 46 |
| 5384 | 7700 | -2316 | 42 | 47 |
| 6017 | 7700 | -1683 | 42 | 48 |
| 6930 | 7700 | -770 | 42 | 49 |
| | | | | |
| 1.9 | 8430 | -8428.1 | 42 | 50 |
| 5340 | 8430 | -3090 | 42 | 51 |
| 6136 | 8430 | -2294 | 42 | 52 |
| 0.6083 | 8430 | -8429.39 | 42 | 53 |

| | | | | |
|---|---|---|---|---|
| 5384 | 8430 | -3046 | 42 | 54 |
| 6017 | 8430 | -2413 | 42 | 55 |
| 6930 | 8430 | -1500 | 42 | 56 |
| | | | | |
| 5340 | 1.9 | 5338.1 | 43 | 56 |
| 6136 | 1.9 | 6134.1 | 44 | 56 |
| 0.6083 | 1.9 | -1.2917 | 44 | 57 |
| 5384 | 1.9 | 5382.1 | 45 | 57 |
| 6017 | 1.9 | 6015.1 | 46 | 57 |
| 6930 | 1.9 | 6928.1 | 47 | 57 |
| | | | | |
| 6136 | 5340 | 796 | 48 | 57 |
| 0.6083 | 5340 | -5339.39 | 48 | 58 |
| 5384 | 5340 | 44 | 49 | 58 |
| 6017 | 5340 | 677 | 50 | 58 |
| 6930 | 5340 | 1590 | 51 | 58 |
| | | | | |
| 0.6083 | 6136 | -6135.39 | 51 | 59 |
| 5384 | 6136 | -752 | 51 | 60 |
| 6017 | 6136 | -119 | 51 | 61 |
| 6930 | 6136 | 794 | 52 | 61 |
| | | | | |
| 5384 | 0.6083 | 5383.39 | 53 | 61 |
| 6017 | 0.6083 | 6016.39 | 54 | 61 |
| 6930 | 0.6083 | 6929.39 | 55 | 61 |
| | | | | |
| 6017 | 5384 | 633 | 56 | 61 |
| 6930 | 5384 | 1546 | 57 | 61 |
| | | | | |
| 6930 | 6017 | 913 | 58 | 61 |

S Statistic = 58 - 61 = -3

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 11/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 0
B = 18
C = 0

D = 0
E = 0
F = 2
a = 8880
b = 30240
c = 480
Group Variance = 492.333
Z-Score = -0.0901364
Comparison Level at 95% confidence level = 1.65463 (upward trend)
-0.0901364 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RWQ-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 28.3 | 26.2 | Same Date | 0 | 0 |
| ND<1.5 U1c | 26.2 | -24.7 | 0 | 1 |
| 2.9 J | 26.2 | -23.3 | 0 | 2 |
| 1.9 J | 26.2 | -24.3 | 0 | 3 |
| 3.7 | 26.2 | -22.5 | 0 | 4 |
| 4.2 1c | 26.2 | -22 | 0 | 5 |
| 2.9 J | 26.2 | -23.3 | 0 | 6 |
| 6.1 | 26.2 | -20.1 | 0 | 7 |
| 10.6 | 26.2 | -15.6 | 0 | 8 |
| 23.3 | 26.2 | -2.9 | 0 | 9 |
| ND<1 U | 26.2 | -25.2 | 0 | 10 |
| ND<0.1 U | 26.2 | -26.1 | 0 | 11 |
| 55.91 | 26.2 | 29.71 | 1 | 11 |
| 62.38 | 26.2 | 36.18 | 2 | 11 |
| 89.56 | 26.2 | 63.36 | 3 | 11 |
| | | | | |
| ND<1.5 U1c | 28.3 | -26.8 | 3 | 12 |
| 2.9 J | 28.3 | -25.4 | 3 | 13 |
| 1.9 J | 28.3 | -26.4 | 3 | 14 |
| 3.7 | 28.3 | -24.6 | 3 | 15 |
| 4.2 1c | 28.3 | -24.1 | 3 | 16 |
| 2.9 J | 28.3 | -25.4 | 3 | 17 |
| 6.1 | 28.3 | -22.2 | 3 | 18 |
| 10.6 | 28.3 | -17.7 | 3 | 19 |
| 23.3 | 28.3 | -5 | 3 | 20 |
| ND<1 U | 28.3 | -27.3 | 3 | 21 |
| ND<0.1 U | 28.3 | -28.2 | 3 | 22 |
| 55.91 | 28.3 | 27.61 | 4 | 22 |
| 62.38 | 28.3 | 34.08 | 5 | 22 |
| 89.56 | 28.3 | 61.26 | 6 | 22 |
| | | | | |
| 2.9 J | ND<1.5 U1c | 1.4 | 7 | 22 |
| 1.9 J | ND<1.5 U1c | 0.4 | 8 | 22 |
| 3.7 | ND<1.5 U1c | 2.2 | 9 | 22 |
| 4.2 1c | ND<1.5 U1c | 2.7 | 10 | 22 |
| 2.9 J | ND<1.5 U1c | 1.4 | 11 | 22 |
| 6.1 | ND<1.5 U1c | 4.6 | 12 | 22 |
| 10.6 | ND<1.5 U1c | 9.1 | 13 | 22 |
| 23.3 | ND<1.5 U1c | 21.8 | 14 | 22 |
| ND<1 U | ND<1.5 U1c | -0.5 | 14 | 23 |
| ND<0.1 U | ND<1.5 U1c | -1.4 | 14 | 24 |
| 55.91 | ND<1.5 U1c | 54.41 | 15 | 24 |
| 62.38 | ND<1.5 U1c | 60.88 | 16 | 24 |
| 89.56 | ND<1.5 U1c | 88.06 | 17 | 24 |
| | | | | |
| 1.9 J | 2.9 J | -1 | 17 | 25 |
| 3.7 | 2.9 J | 0.8 | 18 | 25 |

| | | | | |
|---|---|---|---|---|
| 4.2 1c | 2.9 J | 1.3 | 19 | 25 |
| 2.9 J | 2.9 J | 0 | 19 | 25 |
| 6.1 | 2.9 J | 3.2 | 20 | 25 |
| 10.6 | 2.9 J | 7.7 | 21 | 25 |
| 23.3 | 2.9 J | 20.4 | 22 | 25 |
| ND<1 U | 2.9 J | -1.9 | 22 | 26 |
| ND<0.1 U | 2.9 J | -2.8 | 22 | 27 |
| 55.91 | 2.9 J | 53.01 | 23 | 27 |
| 62.38 | 2.9 J | 59.48 | 24 | 27 |
| 89.56 | 2.9 J | 86.66 | 25 | 27 |
| | | | | |
| 3.7 | 1.9 J | 1.8 | 26 | 27 |
| 4.2 1c | 1.9 J | 2.3 | 27 | 27 |
| 2.9 J | 1.9 J | 1 | 28 | 27 |
| 6.1 | 1.9 J | 4.2 | 29 | 27 |
| 10.6 | 1.9 J | 8.7 | 30 | 27 |
| 23.3 | 1.9 J | 21.4 | 31 | 27 |
| ND<1 U | 1.9 J | -0.9 | 31 | 28 |
| ND<0.1 U | 1.9 J | -1.8 | 31 | 29 |
| 55.91 | 1.9 J | 54.01 | 32 | 29 |
| 62.38 | 1.9 J | 60.48 | 33 | 29 |
| 89.56 | 1.9 J | 87.66 | 34 | 29 |
| | | | | |
| 4.2 1c | 3.7 | 0.5 | 35 | 29 |
| 2.9 J | 3.7 | -0.8 | 35 | 30 |
| 6.1 | 3.7 | 2.4 | 36 | 30 |
| 10.6 | 3.7 | 6.9 | 37 | 30 |
| 23.3 | 3.7 | 19.6 | 38 | 30 |
| ND<1 U | 3.7 | -2.7 | 38 | 31 |
| ND<0.1 U | 3.7 | -3.6 | 38 | 32 |
| 55.91 | 3.7 | 52.21 | 39 | 32 |
| 62.38 | 3.7 | 58.68 | 40 | 32 |
| 89.56 | 3.7 | 85.86 | 41 | 32 |
| | | | | |
| 2.9 J | 4.2 1c | -1.3 | 41 | 33 |
| 6.1 | 4.2 1c | 1.9 | 42 | 33 |
| 10.6 | 4.2 1c | 6.4 | 43 | 33 |
| 23.3 | 4.2 1c | 19.1 | 44 | 33 |
| ND<1 U | 4.2 1c | -3.2 | 44 | 34 |
| ND<0.1 U | 4.2 1c | -4.1 | 44 | 35 |
| 55.91 | 4.2 1c | 51.71 | 45 | 35 |
| 62.38 | 4.2 1c | 58.18 | 46 | 35 |
| 89.56 | 4.2 1c | 85.36 | 47 | 35 |
| | | | | |
| 6.1 | 2.9 J | 3.2 | 48 | 35 |
| 10.6 | 2.9 J | 7.7 | 49 | 35 |
| 23.3 | 2.9 J | 20.4 | 50 | 35 |
| ND<1 U | 2.9 J | -1.9 | 50 | 36 |
| ND<0.1 U | 2.9 J | -2.8 | 50 | 37 |
| 55.91 | 2.9 J | 53.01 | 51 | 37 |
| 62.38 | 2.9 J | 59.48 | 52 | 37 |
| 89.56 | 2.9 J | 86.66 | 53 | 37 |
| | | | | |
| 10.6 | 6.1 | 4.5 | 54 | 37 |
| 23.3 | 6.1 | 17.2 | 55 | 37 |
| ND<1 U | 6.1 | -5.1 | 55 | 38 |
| ND<0.1 U | 6.1 | -6 | 55 | 39 |

| | | | | |
|---|---|---|---|---|
| 55.91 | 6.1 | 49.81 | 56 | 39 |
| 62.38 | 6.1 | 56.28 | 57 | 39 |
| 89.56 | 6.1 | 83.46 | 58 | 39 |
| | | | | |
| 23.3 | 10.6 | 12.7 | 59 | 39 |
| ND<1 U | 10.6 | -9.6 | 59 | 40 |
| ND<0.1 U | 10.6 | -10.5 | 59 | 41 |
| 55.91 | 10.6 | 45.31 | 60 | 41 |
| 62.38 | 10.6 | 51.78 | 61 | 41 |
| 89.56 | 10.6 | 78.96 | 62 | 41 |
| | | | | |
| ND<1 U | 23.3 | -22.3 | 62 | 42 |
| ND<0.1 U | 23.3 | -23.2 | 62 | 43 |
| 55.91 | 23.3 | 32.61 | 63 | 43 |
| 62.38 | 23.3 | 39.08 | 64 | 43 |
| 89.56 | 23.3 | 66.26 | 65 | 43 |
| | | | | |
| ND<0.1 U | ND<1 U | -0.9 | 65 | 44 |
| 55.91 | ND<1 U | 54.91 | 66 | 44 |
| 62.38 | ND<1 U | 61.38 | 67 | 44 |
| 89.56 | ND<1 U | 88.56 | 68 | 44 |
| | | | | |
| 55.91 | ND<0.1 U | 55.81 | 69 | 44 |
| 62.38 | ND<0.1 U | 62.28 | 70 | 44 |
| 89.56 | ND<0.1 U | 89.46 | 71 | 44 |
| | | | | |
| 62.38 | 55.91 | 6.47 | 72 | 44 |
| 89.56 | 55.91 | 33.65 | 73 | 44 |
| | | | | |
| 89.56 | 62.38 | 27.18 | 74 | 44 |

S Statistic = 74 - 44 = 30

| Tied Group | Value | Members |
|---|---|---|
| 1 | 2.9 | 2 |

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 18
B = 18

C = 0
D = 0
E = 2
F = 2
a = 8880
b = 30240
c = 480
Group Variance = 491.342
Z-Score = 1.3083
Comparison Level at 95% confidence level = 1.65463 (upward trend)
1.3083 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RWR-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 457 1c4c | 440 2c | Same Date | 0 | 0 |
| 535 1c | 440 2c | 95 | 1 | 0 |
| 650 | 440 2c | 210 | 2 | 0 |
| 340 | 440 2c | -100 | 2 | 1 |
| 508 | 440 2c | 68 | 3 | 1 |
| 425 | 440 2c | -15 | 3 | 2 |
| 398 | 440 2c | -42 | 3 | 3 |
| 367 | 440 2c | -73 | 3 | 4 |
| 753 | 440 2c | 313 | 4 | 4 |
| 295 | 440 2c | -145 | 4 | 5 |
| 340.4 | 440 2c | -99.6 | 4 | 6 |
| 530.9 | 440 2c | 90.9 | 5 | 6 |
| 422.3 | 440 2c | -17.7 | 5 | 7 |
| 684.9 | 440 2c | 244.9 | 6 | 7 |
| 1203 | 440 2c | 763 | 7 | 7 |
| | | | | |
| 535 1c | 457 1c4c | 78 | 8 | 7 |
| 650 | 457 1c4c | 193 | 9 | 7 |
| 340 | 457 1c4c | -117 | 9 | 8 |
| 508 | 457 1c4c | 51 | 10 | 8 |
| 425 | 457 1c4c | -32 | 10 | 9 |
| 398 | 457 1c4c | -59 | 10 | 10 |
| 367 | 457 1c4c | -90 | 10 | 11 |
| 753 | 457 1c4c | 296 | 11 | 11 |
| 295 | 457 1c4c | -162 | 11 | 12 |
| 340.4 | 457 1c4c | -116.6 | 11 | 13 |
| 530.9 | 457 1c4c | 73.9 | 12 | 13 |
| 422.3 | 457 1c4c | -34.7 | 12 | 14 |
| 684.9 | 457 1c4c | 227.9 | 13 | 14 |
| 1203 | 457 1c4c | 746 | 14 | 14 |
| | | | | |
| 650 | 535 1c | 115 | 15 | 14 |
| 340 | 535 1c | -195 | 15 | 15 |
| 508 | 535 1c | -27 | 15 | 16 |
| 425 | 535 1c | -110 | 15 | 17 |
| 398 | 535 1c | -137 | 15 | 18 |
| 367 | 535 1c | -168 | 15 | 19 |
| 753 | 535 1c | 218 | 16 | 19 |
| 295 | 535 1c | -240 | 16 | 20 |
| 340.4 | 535 1c | -194.6 | 16 | 21 |
| 530.9 | 535 1c | -4.1 | 16 | 22 |
| 422.3 | 535 1c | -112.7 | 16 | 23 |
| 684.9 | 535 1c | 149.9 | 17 | 23 |
| 1203 | 535 1c | 668 | 18 | 23 |
| | | | | |
| 340 | 650 | -310 | 18 | 24 |
| 508 | 650 | -142 | 18 | 25 |

| | | | | |
|---|---|---|---|---|
| 425 | 650 | -225 | 18 | 26 |
| 398 | 650 | -252 | 18 | 27 |
| 367 | 650 | -283 | 18 | 28 |
| 753 | 650 | 103 | 19 | 28 |
| 295 | 650 | -355 | 19 | 29 |
| 340.4 | 650 | -309.6 | 19 | 30 |
| 530.9 | 650 | -119.1 | 19 | 31 |
| 422.3 | 650 | -227.7 | 19 | 32 |
| 684.9 | 650 | 34.9 | 20 | 32 |
| 1203 | 650 | 553 | 21 | 32 |
| | | | | |
| 508 | 340 | 168 | 22 | 32 |
| 425 | 340 | 85 | 23 | 32 |
| 398 | 340 | 58 | 24 | 32 |
| 367 | 340 | 27 | 25 | 32 |
| 753 | 340 | 413 | 26 | 32 |
| 295 | 340 | -45 | 26 | 33 |
| 340.4 | 340 | 0.4 | 27 | 33 |
| 530.9 | 340 | 190.9 | 28 | 33 |
| 422.3 | 340 | 82.3 | 29 | 33 |
| 684.9 | 340 | 344.9 | 30 | 33 |
| 1203 | 340 | 863 | 31 | 33 |
| | | | | |
| 425 | 508 | -83 | 31 | 34 |
| 398 | 508 | -110 | 31 | 35 |
| 367 | 508 | -141 | 31 | 36 |
| 753 | 508 | 245 | 32 | 36 |
| 295 | 508 | -213 | 32 | 37 |
| 340.4 | 508 | -167.6 | 32 | 38 |
| 530.9 | 508 | 22.9 | 33 | 38 |
| 422.3 | 508 | -85.7 | 33 | 39 |
| 684.9 | 508 | 176.9 | 34 | 39 |
| 1203 | 508 | 695 | 35 | 39 |
| | | | | |
| 398 | 425 | -27 | 35 | 40 |
| 367 | 425 | -58 | 35 | 41 |
| 753 | 425 | 328 | 36 | 41 |
| 295 | 425 | -130 | 36 | 42 |
| 340.4 | 425 | -84.6 | 36 | 43 |
| 530.9 | 425 | 105.9 | 37 | 43 |
| 422.3 | 425 | -2.7 | 37 | 44 |
| 684.9 | 425 | 259.9 | 38 | 44 |
| 1203 | 425 | 778 | 39 | 44 |
| | | | | |
| 367 | 398 | -31 | 39 | 45 |
| 753 | 398 | 355 | 40 | 45 |
| 295 | 398 | -103 | 40 | 46 |
| 340.4 | 398 | -57.6 | 40 | 47 |
| 530.9 | 398 | 132.9 | 41 | 47 |
| 422.3 | 398 | 24.3 | 42 | 47 |
| 684.9 | 398 | 286.9 | 43 | 47 |
| 1203 | 398 | 805 | 44 | 47 |
| | | | | |
| 753 | 367 | 386 | 45 | 47 |
| 295 | 367 | -72 | 45 | 48 |
| 340.4 | 367 | -26.6 | 45 | 49 |
| 530.9 | 367 | 163.9 | 46 | 49 |

| | | | | |
|---|---|---|---|---|
| 422.3 | 367 | 55.3 | 47 | 49 |
| 684.9 | 367 | 317.9 | 48 | 49 |
| 1203 | 367 | 836 | 49 | 49 |
| | | | | |
| 295 | 753 | -458 | 49 | 50 |
| 340.4 | 753 | -412.6 | 49 | 51 |
| 530.9 | 753 | -222.1 | 49 | 52 |
| 422.3 | 753 | -330.7 | 49 | 53 |
| 684.9 | 753 | -68.1 | 49 | 54 |
| 1203 | 753 | 450 | 50 | 54 |
| | | | | |
| 340.4 | 295 | 45.4 | 51 | 54 |
| 530.9 | 295 | 235.9 | 52 | 54 |
| 422.3 | 295 | 127.3 | 53 | 54 |
| 684.9 | 295 | 389.9 | 54 | 54 |
| 1203 | 295 | 908 | 55 | 54 |
| | | | | |
| 530.9 | 340.4 | 190.5 | 56 | 54 |
| 422.3 | 340.4 | 81.9 | 57 | 54 |
| 684.9 | 340.4 | 344.5 | 58 | 54 |
| 1203 | 340.4 | 862.6 | 59 | 54 |
| | | | | |
| 422.3 | 530.9 | -108.6 | 59 | 55 |
| 684.9 | 530.9 | 154 | 60 | 55 |
| 1203 | 530.9 | 672.1 | 61 | 55 |
| | | | | |
| 684.9 | 422.3 | 262.6 | 62 | 55 |
| 1203 | 422.3 | 780.7 | 63 | 55 |
| | | | | |
| 1203 | 684.9 | 518.1 | 64 | 55 |

S Statistic = 64 - 55 = 9

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 0
B = 18
C = 0

D = 0
E = 0
F = 2
a = 8880
b = 30240
c = 480
Group Variance = 492.333
Z-Score = 0.360546
Comparison Level at 95% confidence level = 1.65463 (upward trend)
0.360546 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Cadmium

### Location: RWS-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| ND<1.5 U | ND<1.5 U | Same Date | 0 | 0 |
| ND<1.5 U1c | ND<1.5 U | 0 | 0 | 0 |
| 1.6 J | ND<1.5 U | 0.1 | 1 | 0 |
| ND<1.5 U | ND<1.5 U | 0 | 1 | 0 |
| 0.58 J | ND<1.5 U | -0.92 | 1 | 1 |
| 1.8 J | ND<1.5 U | 0.3 | 2 | 1 |
| 1.7 J | ND<1.5 U | 0.2 | 3 | 1 |
| 0.86 J | ND<1.5 U | -0.64 | 3 | 2 |
| 4.7 J | ND<1.5 U | 3.2 | 4 | 2 |
| ND<10 U | ND<1.5 U | 8.5 | 5 | 2 |
| 25.68 | ND<1.5 U | 24.18 | 6 | 2 |
| ND<0.1 U | ND<1.5 U | -1.4 | 6 | 3 |
| ND<1 U | ND<1.5 U | -0.5 | 6 | 4 |
| 0.0805 J | ND<1.5 U | -1.4195 | 6 | 5 |
| 0.1143 J | ND<1.5 U | -1.3857 | 6 | 6 |
| | | | | |
| ND<1.5 U1c | ND<1.5 U | 0 | 6 | 6 |
| 1.6 J | ND<1.5 U | 0.1 | 7 | 6 |
| ND<1.5 U | ND<1.5 U | 0 | 7 | 6 |
| 0.58 J | ND<1.5 U | -0.92 | 7 | 7 |
| 1.8 J | ND<1.5 U | 0.3 | 8 | 7 |
| 1.7 J | ND<1.5 U | 0.2 | 9 | 7 |
| 0.86 J | ND<1.5 U | -0.64 | 9 | 8 |
| 4.7 J | ND<1.5 U | 3.2 | 10 | 8 |
| ND<10 U | ND<1.5 U | 8.5 | 11 | 8 |
| 25.68 | ND<1.5 U | 24.18 | 12 | 8 |
| ND<0.1 U | ND<1.5 U | -1.4 | 12 | 9 |
| ND<1 U | ND<1.5 U | -0.5 | 12 | 10 |
| 0.0805 J | ND<1.5 U | -1.4195 | 12 | 11 |
| 0.1143 J | ND<1.5 U | -1.3857 | 12 | 12 |
| | | | | |
| 1.6 J | ND<1.5 U1c | 0.1 | 13 | 12 |
| ND<1.5 U | ND<1.5 U1c | 0 | 13 | 12 |
| 0.58 J | ND<1.5 U1c | -0.92 | 13 | 13 |
| 1.8 J | ND<1.5 U1c | 0.3 | 14 | 13 |
| 1.7 J | ND<1.5 U1c | 0.2 | 15 | 13 |
| 0.86 J | ND<1.5 U1c | -0.64 | 15 | 14 |
| 4.7 J | ND<1.5 U1c | 3.2 | 16 | 14 |
| ND<10 U | ND<1.5 U1c | 8.5 | 17 | 14 |
| 25.68 | ND<1.5 U1c | 24.18 | 18 | 14 |
| ND<0.1 U | ND<1.5 U1c | -1.4 | 18 | 15 |
| ND<1 U | ND<1.5 U1c | -0.5 | 18 | 16 |
| 0.0805 J | ND<1.5 U1c | -1.4195 | 18 | 17 |
| 0.1143 J | ND<1.5 U1c | -1.3857 | 18 | 18 |
| | | | | |
| ND<1.5 U | 1.6 J | -0.1 | 18 | 19 |
| 0.58 J | 1.6 J | -1.02 | 18 | 20 |

| | | | | |
|---|---|---|---|---|
| 1.8 J | 1.6 J | 0.2 | 19 | 20 |
| 1.7 J | 1.6 J | 0.1 | 20 | 20 |
| 0.86 J | 1.6 J | -0.74 | 20 | 21 |
| 4.7 J | 1.6 J | 3.1 | 21 | 21 |
| ND<10 U | 1.6 J | 8.4 | 22 | 21 |
| 25.68 | 1.6 J | 24.08 | 23 | 21 |
| ND<0.1 U | 1.6 J | -1.5 | 23 | 22 |
| ND<1 U | 1.6 J | -0.6 | 23 | 23 |
| 0.0805 J | 1.6 J | -1.5195 | 23 | 24 |
| 0.1143 J | 1.6 J | -1.4857 | 23 | 25 |
| | | | | |
| 0.58 J | ND<1.5 U | -0.92 | 23 | 26 |
| 1.8 J | ND<1.5 U | 0.3 | 24 | 26 |
| 1.7 J | ND<1.5 U | 0.2 | 25 | 26 |
| 0.86 J | ND<1.5 U | -0.64 | 25 | 27 |
| 4.7 J | ND<1.5 U | 3.2 | 26 | 27 |
| ND<10 U | ND<1.5 U | 8.5 | 27 | 27 |
| 25.68 | ND<1.5 U | 24.18 | 28 | 27 |
| ND<0.1 U | ND<1.5 U | -1.4 | 28 | 28 |
| ND<1 U | ND<1.5 U | -0.5 | 28 | 29 |
| 0.0805 J | ND<1.5 U | -1.4195 | 28 | 30 |
| 0.1143 J | ND<1.5 U | -1.3857 | 28 | 31 |
| | | | | |
| 1.8 J | 0.58 J | 1.22 | 29 | 31 |
| 1.7 J | 0.58 J | 1.12 | 30 | 31 |
| 0.86 J | 0.58 J | 0.28 | 31 | 31 |
| 4.7 J | 0.58 J | 4.12 | 32 | 31 |
| ND<10 U | 0.58 J | 9.42 | 33 | 31 |
| 25.68 | 0.58 J | 25.1 | 34 | 31 |
| ND<0.1 U | 0.58 J | -0.48 | 34 | 32 |
| ND<1 U | 0.58 J | 0.42 | 35 | 32 |
| 0.0805 J | 0.58 J | -0.4995 | 35 | 33 |
| 0.1143 J | 0.58 J | -0.4657 | 35 | 34 |
| | | | | |
| 1.7 J | 1.8 J | -0.1 | 35 | 35 |
| 0.86 J | 1.8 J | -0.94 | 35 | 36 |
| 4.7 J | 1.8 J | 2.9 | 36 | 36 |
| ND<10 U | 1.8 J | 8.2 | 37 | 36 |
| 25.68 | 1.8 J | 23.88 | 38 | 36 |
| ND<0.1 U | 1.8 J | -1.7 | 38 | 37 |
| ND<1 U | 1.8 J | -0.8 | 38 | 38 |
| 0.0805 J | 1.8 J | -1.7195 | 38 | 39 |
| 0.1143 J | 1.8 J | -1.6857 | 38 | 40 |
| | | | | |
| 0.86 J | 1.7 J | -0.84 | 38 | 41 |
| 4.7 J | 1.7 J | 3 | 39 | 41 |
| ND<10 U | 1.7 J | 8.3 | 40 | 41 |
| 25.68 | 1.7 J | 23.98 | 41 | 41 |
| ND<0.1 U | 1.7 J | -1.6 | 41 | 42 |
| ND<1 U | 1.7 J | -0.7 | 41 | 43 |
| 0.0805 J | 1.7 J | -1.6195 | 41 | 44 |
| 0.1143 J | 1.7 J | -1.5857 | 41 | 45 |
| | | | | |
| 4.7 J | 0.86 J | 3.84 | 42 | 45 |
| ND<10 U | 0.86 J | 9.14 | 43 | 45 |
| 25.68 | 0.86 J | 24.82 | 44 | 45 |
| ND<0.1 U | 0.86 J | -0.76 | 44 | 46 |

| | | | | |
|---|---|---|---|---|
| ND<1 U | 0.86 J | 0.14 | 45 | 46 |
| 0.0805 J | 0.86 J | -0.7795 | 45 | 47 |
| 0.1143 J | 0.86 J | -0.7457 | 45 | 48 |
| | | | | |
| ND<10 U | 4.7 J | 5.3 | 46 | 48 |
| 25.68 | 4.7 J | 20.98 | 47 | 48 |
| ND<0.1 U | 4.7 J | -4.6 | 47 | 49 |
| ND<1 U | 4.7 J | -3.7 | 47 | 50 |
| 0.0805 J | 4.7 J | -4.6195 | 47 | 51 |
| 0.1143 J | 4.7 J | -4.5857 | 47 | 52 |
| | | | | |
| 25.68 | ND<10 U | 15.68 | 48 | 52 |
| ND<0.1 U | ND<10 U | -9.9 | 48 | 53 |
| ND<1 U | ND<10 U | -9 | 48 | 54 |
| 0.0805 J | ND<10 U | -9.9195 | 48 | 55 |
| 0.1143 J | ND<10 U | -9.8857 | 48 | 56 |
| | | | | |
| ND<0.1 U | 25.68 | -25.58 | 48 | 57 |
| ND<1 U | 25.68 | -24.68 | 48 | 58 |
| 0.0805 J | 25.68 | -25.5995 | 48 | 59 |
| 0.1143 J | 25.68 | -25.5657 | 48 | 60 |
| | | | | |
| ND<1 U | ND<0.1 U | 0.9 | 49 | 60 |
| 0.0805 J | ND<0.1 U | -0.0195 | 49 | 61 |
| 0.1143 J | ND<0.1 U | 0.0143 | 50 | 61 |
| | | | | |
| 0.0805 J | ND<1 U | -0.9195 | 50 | 62 |
| 0.1143 J | ND<1 U | -0.8857 | 50 | 63 |
| | | | | |
| 0.1143 J | 0.0805 J | 0.0338 | 51 | 63 |

S Statistic = 51 - 63 = -12

| Tied Group | Value | Members |
|---|---|---|
| 1 | 1.5 | 4 |

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 156
B = 18

C = 24
D = 0
E = 12
F = 2
a = 8880
b = 30240
c = 480
Group Variance = 483.717
Z-Score = -0.500146
Comparison Level at 95% confidence level = 1.65463 (upward trend)
-0.500146 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RW01-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 90 | 11600 | -11510 | 0 | 1 |
| 13700 | 11600 | 2100 | 1 | 1 |
| 29 | 11600 | -11571 | 1 | 2 |
| 41000 | 11600 | 29400 | 2 | 2 |
| 104 | 11600 | -11496 | 2 | 3 |
| 576 | 11600 | -11024 | 2 | 4 |
| 9710 | 11600 | -1890 | 2 | 5 |
| 143 | 11600 | -11457 | 2 | 6 |
| 2480 | 11600 | -9120 | 2 | 7 |
| 2460 | 11600 | -9140 | 2 | 8 |
| 5670 | 11600 | -5930 | 2 | 9 |
| 5980 | 11600 | -5620 | 2 | 10 |
| 5940 2c | 11600 | -5660 | 2 | 11 |
| 2060 | 11600 | -9540 | 2 | 12 |
| 8120 | 11600 | -3480 | 2 | 13 |
| 13700 | 11600 | 2100 | 3 | 13 |
| 3.7 J | 11600 | -11596.3 | 3 | 14 |
| 15200 | 11600 | 3600 | 4 | 14 |
| 26600 | 11600 | 15000 | 5 | 14 |
| 24000 | 11600 | 12400 | 6 | 14 |
| 37300 M1 | 11600 | 25700 | 7 | 14 |
| 29010 | 11600 | 17410 | 8 | 14 |
| 30440 | 11600 | 18840 | 9 | 14 |
| | | | | |
| 13700 | 90 | 13610 | 10 | 14 |
| 29 | 90 | -61 | 10 | 15 |
| 41000 | 90 | 40910 | 11 | 15 |
| 104 | 90 | 14 | 12 | 15 |
| 576 | 90 | 486 | 13 | 15 |
| 9710 | 90 | 9620 | 14 | 15 |
| 143 | 90 | 53 | 15 | 15 |
| 2480 | 90 | 2390 | 16 | 15 |
| 2460 | 90 | 2370 | 17 | 15 |
| 5670 | 90 | 5580 | 18 | 15 |
| 5980 | 90 | 5890 | 19 | 15 |
| 5940 2c | 90 | 5850 | 20 | 15 |
| 2060 | 90 | 1970 | 21 | 15 |
| 8120 | 90 | 8030 | 22 | 15 |
| 13700 | 90 | 13610 | 23 | 15 |
| 3.7 J | 90 | -86.3 | 23 | 16 |
| 15200 | 90 | 15110 | 24 | 16 |
| 26600 | 90 | 26510 | 25 | 16 |
| 24000 | 90 | 23910 | 26 | 16 |
| 37300 M1 | 90 | 37210 | 27 | 16 |
| 29010 | 90 | 28920 | 28 | 16 |
| 30440 | 90 | 30350 | 29 | 16 |

| | | | | |
|---|---|---|---|---|
| 29 | 13700 | -13671 | 29 | 17 |
| 41000 | 13700 | 27300 | 30 | 17 |
| 104 | 13700 | -13596 | 30 | 18 |
| 576 | 13700 | -13124 | 30 | 19 |
| 9710 | 13700 | -3990 | 30 | 20 |
| 143 | 13700 | -13557 | 30 | 21 |
| 2480 | 13700 | -11220 | 30 | 22 |
| 2460 | 13700 | -11240 | 30 | 23 |
| 5670 | 13700 | -8030 | 30 | 24 |
| 5980 | 13700 | -7720 | 30 | 25 |
| 5940 2c | 13700 | -7760 | 30 | 26 |
| 2060 | 13700 | -11640 | 30 | 27 |
| 8120 | 13700 | -5580 | 30 | 28 |
| 13700 | 13700 | 0 | 30 | 28 |
| 3.7 J | 13700 | -13696.3 | 30 | 29 |
| 15200 | 13700 | 1500 | 31 | 29 |
| 26600 | 13700 | 12900 | 32 | 29 |
| 24000 | 13700 | 10300 | 33 | 29 |
| 37300 M1 | 13700 | 23600 | 34 | 29 |
| 29010 | 13700 | 15310 | 35 | 29 |
| 30440 | 13700 | 16740 | 36 | 29 |
| | | | | |
| 41000 | 29 | 40971 | 37 | 29 |
| 104 | 29 | 75 | 38 | 29 |
| 576 | 29 | 547 | 39 | 29 |
| 9710 | 29 | 9681 | 40 | 29 |
| 143 | 29 | 114 | 41 | 29 |
| 2480 | 29 | 2451 | 42 | 29 |
| 2460 | 29 | 2431 | 43 | 29 |
| 5670 | 29 | 5641 | 44 | 29 |
| 5980 | 29 | 5951 | 45 | 29 |
| 5940 2c | 29 | 5911 | 46 | 29 |
| 2060 | 29 | 2031 | 47 | 29 |
| 8120 | 29 | 8091 | 48 | 29 |
| 13700 | 29 | 13671 | 49 | 29 |
| 3.7 J | 29 | -25.3 | 49 | 30 |
| 15200 | 29 | 15171 | 50 | 30 |
| 26600 | 29 | 26571 | 51 | 30 |
| 24000 | 29 | 23971 | 52 | 30 |
| 37300 M1 | 29 | 37271 | 53 | 30 |
| 29010 | 29 | 28981 | 54 | 30 |
| 30440 | 29 | 30411 | 55 | 30 |
| | | | | |
| 104 | 41000 | -40896 | 55 | 31 |
| 576 | 41000 | -40424 | 55 | 32 |
| 9710 | 41000 | -31290 | 55 | 33 |
| 143 | 41000 | -40857 | 55 | 34 |
| 2480 | 41000 | -38520 | 55 | 35 |
| 2460 | 41000 | -38540 | 55 | 36 |
| 5670 | 41000 | -35330 | 55 | 37 |
| 5980 | 41000 | -35020 | 55 | 38 |
| 5940 2c | 41000 | -35060 | 55 | 39 |
| 2060 | 41000 | -38940 | 55 | 40 |
| 8120 | 41000 | -32880 | 55 | 41 |
| 13700 | 41000 | -27300 | 55 | 42 |
| 3.7 J | 41000 | -40996.3 | 55 | 43 |
| 15200 | 41000 | -25800 | 55 | 44 |

| | | | | |
|---|---|---|---|---|
| 26600 | 41000 | -14400 | 55 | 45 |
| 24000 | 41000 | -17000 | 55 | 46 |
| 37300 M1 | 41000 | -3700 | 55 | 47 |
| 29010 | 41000 | -11990 | 55 | 48 |
| 30440 | 41000 | -10560 | 55 | 49 |
| | | | | |
| 576 | 104 | 472 | 56 | 49 |
| 9710 | 104 | 9606 | 57 | 49 |
| 143 | 104 | 39 | 58 | 49 |
| 2480 | 104 | 2376 | 59 | 49 |
| 2460 | 104 | 2356 | 60 | 49 |
| 5670 | 104 | 5566 | 61 | 49 |
| 5980 | 104 | 5876 | 62 | 49 |
| 5940 2c | 104 | 5836 | 63 | 49 |
| 2060 | 104 | 1956 | 64 | 49 |
| 8120 | 104 | 8016 | 65 | 49 |
| 13700 | 104 | 13596 | 66 | 49 |
| 3.7 J | 104 | -100.3 | 66 | 50 |
| 15200 | 104 | 15096 | 67 | 50 |
| 26600 | 104 | 26496 | 68 | 50 |
| 24000 | 104 | 23896 | 69 | 50 |
| 37300 M1 | 104 | 37196 | 70 | 50 |
| 29010 | 104 | 28906 | 71 | 50 |
| 30440 | 104 | 30336 | 72 | 50 |
| | | | | |
| 9710 | 576 | 9134 | 73 | 50 |
| 143 | 576 | -433 | 73 | 51 |
| 2480 | 576 | 1904 | 74 | 51 |
| 2460 | 576 | 1884 | 75 | 51 |
| 5670 | 576 | 5094 | 76 | 51 |
| 5980 | 576 | 5404 | 77 | 51 |
| 5940 2c | 576 | 5364 | 78 | 51 |
| 2060 | 576 | 1484 | 79 | 51 |
| 8120 | 576 | 7544 | 80 | 51 |
| 13700 | 576 | 13124 | 81 | 51 |
| 3.7 J | 576 | -572.3 | 81 | 52 |
| 15200 | 576 | 14624 | 82 | 52 |
| 26600 | 576 | 26024 | 83 | 52 |
| 24000 | 576 | 23424 | 84 | 52 |
| 37300 M1 | 576 | 36724 | 85 | 52 |
| 29010 | 576 | 28434 | 86 | 52 |
| 30440 | 576 | 29864 | 87 | 52 |
| | | | | |
| 143 | 9710 | -9567 | 87 | 53 |
| 2480 | 9710 | -7230 | 87 | 54 |
| 2460 | 9710 | -7250 | 87 | 55 |
| 5670 | 9710 | -4040 | 87 | 56 |
| 5980 | 9710 | -3730 | 87 | 57 |
| 5940 2c | 9710 | -3770 | 87 | 58 |
| 2060 | 9710 | -7650 | 87 | 59 |
| 8120 | 9710 | -1590 | 87 | 60 |
| 13700 | 9710 | 3990 | 88 | 60 |
| 3.7 J | 9710 | -9706.3 | 88 | 61 |
| 15200 | 9710 | 5490 | 89 | 61 |
| 26600 | 9710 | 16890 | 90 | 61 |
| 24000 | 9710 | 14290 | 91 | 61 |
| 37300 M1 | 9710 | 27590 | 92 | 61 |

| | | | | |
|---|---|---|---|---|
| 29010 | 9710 | 19300 | 93 | 61 |
| 30440 | 9710 | 20730 | 94 | 61 |
| | | | | |
| 2480 | 143 | 2337 | 95 | 61 |
| 2460 | 143 | 2317 | 96 | 61 |
| 5670 | 143 | 5527 | 97 | 61 |
| 5980 | 143 | 5837 | 98 | 61 |
| 5940 2c | 143 | 5797 | 99 | 61 |
| 2060 | 143 | 1917 | 100 | 61 |
| 8120 | 143 | 7977 | 101 | 61 |
| 13700 | 143 | 13557 | 102 | 61 |
| 3.7 J | 143 | -139.3 | 102 | 62 |
| 15200 | 143 | 15057 | 103 | 62 |
| 26600 | 143 | 26457 | 104 | 62 |
| 24000 | 143 | 23857 | 105 | 62 |
| 37300 M1 | 143 | 37157 | 106 | 62 |
| 29010 | 143 | 28867 | 107 | 62 |
| 30440 | 143 | 30297 | 108 | 62 |
| | | | | |
| 2460 | 2480 | Same Date | 108 | 62 |
| 5670 | 2480 | 3190 | 109 | 62 |
| 5980 | 2480 | 3500 | 110 | 62 |
| 5940 2c | 2480 | 3460 | 111 | 62 |
| 2060 | 2480 | -420 | 111 | 63 |
| 8120 | 2480 | 5640 | 112 | 63 |
| 13700 | 2480 | 11220 | 113 | 63 |
| 3.7 J | 2480 | -2476.3 | 113 | 64 |
| 15200 | 2480 | 12720 | 114 | 64 |
| 26600 | 2480 | 24120 | 115 | 64 |
| 24000 | 2480 | 21520 | 116 | 64 |
| 37300 M1 | 2480 | 34820 | 117 | 64 |
| 29010 | 2480 | 26530 | 118 | 64 |
| 30440 | 2480 | 27960 | 119 | 64 |
| | | | | |
| 5670 | 2460 | 3210 | 120 | 64 |
| 5980 | 2460 | 3520 | 121 | 64 |
| 5940 2c | 2460 | 3480 | 122 | 64 |
| 2060 | 2460 | -400 | 122 | 65 |
| 8120 | 2460 | 5660 | 123 | 65 |
| 13700 | 2460 | 11240 | 124 | 65 |
| 3.7 J | 2460 | -2456.3 | 124 | 66 |
| 15200 | 2460 | 12740 | 125 | 66 |
| 26600 | 2460 | 24140 | 126 | 66 |
| 24000 | 2460 | 21540 | 127 | 66 |
| 37300 M1 | 2460 | 34840 | 128 | 66 |
| 29010 | 2460 | 26550 | 129 | 66 |
| 30440 | 2460 | 27980 | 130 | 66 |
| | | | | |
| 5980 | 5670 | Same Date | 130 | 66 |
| 5940 2c | 5670 | 270 | 131 | 66 |
| 2060 | 5670 | -3610 | 131 | 67 |
| 8120 | 5670 | 2450 | 132 | 67 |
| 13700 | 5670 | 8030 | 133 | 67 |
| 3.7 J | 5670 | -5666.3 | 133 | 68 |
| 15200 | 5670 | 9530 | 134 | 68 |
| 26600 | 5670 | 20930 | 135 | 68 |
| 24000 | 5670 | 18330 | 136 | 68 |

| | | | | |
|---|---|---|---|---|
| 37300 M1 | 5670 | 31630 | 137 | 68 |
| 29010 | 5670 | 23340 | 138 | 68 |
| 30440 | 5670 | 24770 | 139 | 68 |
| | | | | |
| 5940 2c | 5980 | -40 | 139 | 69 |
| 2060 | 5980 | -3920 | 139 | 70 |
| 8120 | 5980 | 2140 | 140 | 70 |
| 13700 | 5980 | 7720 | 141 | 70 |
| 3.7 J | 5980 | -5976.3 | 141 | 71 |
| 15200 | 5980 | 9220 | 142 | 71 |
| 26600 | 5980 | 20620 | 143 | 71 |
| 24000 | 5980 | 18020 | 144 | 71 |
| 37300 M1 | 5980 | 31320 | 145 | 71 |
| 29010 | 5980 | 23030 | 146 | 71 |
| 30440 | 5980 | 24460 | 147 | 71 |
| | | | | |
| 2060 | 5940 2c | -3880 | 147 | 72 |
| 8120 | 5940 2c | 2180 | 148 | 72 |
| 13700 | 5940 2c | 7760 | 149 | 72 |
| 3.7 J | 5940 2c | -5936.3 | 149 | 73 |
| 15200 | 5940 2c | 9260 | 150 | 73 |
| 26600 | 5940 2c | 20660 | 151 | 73 |
| 24000 | 5940 2c | 18060 | 152 | 73 |
| 37300 M1 | 5940 2c | 31360 | 153 | 73 |
| 29010 | 5940 2c | 23070 | 154 | 73 |
| 30440 | 5940 2c | 24500 | 155 | 73 |
| | | | | |
| 8120 | 2060 | 6060 | 156 | 73 |
| 13700 | 2060 | 11640 | 157 | 73 |
| 3.7 J | 2060 | -2056.3 | 157 | 74 |
| 15200 | 2060 | 13140 | 158 | 74 |
| 26600 | 2060 | 24540 | 159 | 74 |
| 24000 | 2060 | 21940 | 160 | 74 |
| 37300 M1 | 2060 | 35240 | 161 | 74 |
| 29010 | 2060 | 26950 | 162 | 74 |
| 30440 | 2060 | 28380 | 163 | 74 |
| | | | | |
| 13700 | 8120 | 5580 | 164 | 74 |
| 3.7 J | 8120 | -8116.3 | 164 | 75 |
| 15200 | 8120 | 7080 | 165 | 75 |
| 26600 | 8120 | 18480 | 166 | 75 |
| 24000 | 8120 | 15880 | 167 | 75 |
| 37300 M1 | 8120 | 29180 | 168 | 75 |
| 29010 | 8120 | 20890 | 169 | 75 |
| 30440 | 8120 | 22320 | 170 | 75 |
| | | | | |
| 3.7 J | 13700 | -13696.3 | 170 | 76 |
| 15200 | 13700 | 1500 | 171 | 76 |
| 26600 | 13700 | 12900 | 172 | 76 |
| 24000 | 13700 | 10300 | 173 | 76 |
| 37300 M1 | 13700 | 23600 | 174 | 76 |
| 29010 | 13700 | 15310 | 175 | 76 |
| 30440 | 13700 | 16740 | 176 | 76 |
| | | | | |
| 15200 | 3.7 J | 15196.3 | 177 | 76 |
| 26600 | 3.7 J | 26596.3 | 178 | 76 |
| 24000 | 3.7 J | 23996.3 | 179 | 76 |

| | | | | |
|---|---|---|---|---|
| 37300 M1 | 3.7 J | 37296.3 | 180 | 76 |
| 29010 | 3.7 J | 29006.3 | 181 | 76 |
| 30440 | 3.7 J | 30436.3 | 182 | 76 |
| | | | | |
| 26600 | 15200 | 11400 | 183 | 76 |
| 24000 | 15200 | 8800 | 184 | 76 |
| 37300 M1 | 15200 | 22100 | 185 | 76 |
| 29010 | 15200 | 13810 | 186 | 76 |
| 30440 | 15200 | 15240 | 187 | 76 |
| | | | | |
| 24000 | 26600 | -2600 | 187 | 77 |
| 37300 M1 | 26600 | 10700 | 188 | 77 |
| 29010 | 26600 | 2410 | 189 | 77 |
| 30440 | 26600 | 3840 | 190 | 77 |
| | | | | |
| 37300 M1 | 24000 | 13300 | 191 | 77 |
| 29010 | 24000 | 5010 | 192 | 77 |
| 30440 | 24000 | 6440 | 193 | 77 |
| | | | | |
| 29010 | 37300 M1 | -8290 | 193 | 78 |
| 30440 | 37300 M1 | -6860 | 193 | 79 |
| | | | | |
| 30440 | 29010 | 1430 | 194 | 79 |

S Statistic = 194 - 79 = 115

| Tied Group | Value | Members |
|---|---|---|
| 1 | 13700 | 2 |

| Time Period | Observations |
|---|---|
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |

There are 2 time periods with multiple data

A = 18
B = 36

C = 0
D = 0
E = 2
F = 4
a = 29256
b = 109296
c = 1104
Group Variance = 1622.34
Z-Score = 2.83031
Comparison Level at 95% confidence level = 1.65463 (upward trend)
**2.83031 > 1.65463 indicating an upward trend**

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RW02-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 203 | 18200 | -17997 | 0 | 1 |
| 290 | 18200 | -17910 | 0 | 2 |
| 38.6 | 18200 | -18161.4 | 0 | 3 |
| 186 | 18200 | -18014 | 0 | 4 |
| 573 | 18200 | -17627 | 0 | 5 |
| 452 | 18200 | -17748 | 0 | 6 |
| 5030 ML | 18200 | -13170 | 0 | 7 |
| 3240 | 18200 | -14960 | 0 | 8 |
| 21500 | 18200 | 3300 | 1 | 8 |
| 18500 | 18200 | 300 | 2 | 8 |
| 56600 | 18200 | 38400 | 3 | 8 |
| 58700 M6 | 18200 | 40500 | 4 | 8 |
| 72000 2c | 18200 | 53800 | 5 | 8 |
| 17200 | 18200 | -1000 | 5 | 9 |
| 14100 | 18200 | -4100 | 5 | 10 |
| 34900 | 18200 | 16700 | 6 | 10 |
| 123 | 18200 | -18077 | 6 | 11 |
| 20200 | 18200 | 2000 | 7 | 11 |
| 104 | 18200 | -18096 | 7 | 12 |
| 433 | 18200 | -17767 | 7 | 13 |
| 751 | 18200 | -17449 | 7 | 14 |
| 8598 | 18200 | -9602 | 7 | 15 |
| 41190 | 18200 | 22990 | 8 | 15 |
| | | | | |
| 290 | 203 | 87 | 9 | 15 |
| 38.6 | 203 | -164.4 | 9 | 16 |
| 186 | 203 | -17 | 9 | 17 |
| 573 | 203 | 370 | 10 | 17 |
| 452 | 203 | 249 | 11 | 17 |
| 5030 ML | 203 | 4827 | 12 | 17 |
| 3240 | 203 | 3037 | 13 | 17 |
| 21500 | 203 | 21297 | 14 | 17 |
| 18500 | 203 | 18297 | 15 | 17 |
| 56600 | 203 | 56397 | 16 | 17 |
| 58700 M6 | 203 | 58497 | 17 | 17 |
| 72000 2c | 203 | 71797 | 18 | 17 |
| 17200 | 203 | 16997 | 19 | 17 |
| 14100 | 203 | 13897 | 20 | 17 |
| 34900 | 203 | 34697 | 21 | 17 |
| 123 | 203 | -80 | 21 | 18 |
| 20200 | 203 | 19997 | 22 | 18 |
| 104 | 203 | -99 | 22 | 19 |
| 433 | 203 | 230 | 23 | 19 |
| 751 | 203 | 548 | 24 | 19 |
| 8598 | 203 | 8395 | 25 | 19 |
| 41190 | 203 | 40987 | 26 | 19 |

| | | | | |
|---|---|---|---|---|
| 38.6 | 290 | -251.4 | 26 | 20 |
| 186 | 290 | -104 | 26 | 21 |
| 573 | 290 | 283 | 27 | 21 |
| 452 | 290 | 162 | 28 | 21 |
| 5030 ML | 290 | 4740 | 29 | 21 |
| 3240 | 290 | 2950 | 30 | 21 |
| 21500 | 290 | 21210 | 31 | 21 |
| 18500 | 290 | 18210 | 32 | 21 |
| 56600 | 290 | 56310 | 33 | 21 |
| 58700 M6 | 290 | 58410 | 34 | 21 |
| 72000 2c | 290 | 71710 | 35 | 21 |
| 17200 | 290 | 16910 | 36 | 21 |
| 14100 | 290 | 13810 | 37 | 21 |
| 34900 | 290 | 34610 | 38 | 21 |
| 123 | 290 | -167 | 38 | 22 |
| 20200 | 290 | 19910 | 39 | 22 |
| 104 | 290 | -186 | 39 | 23 |
| 433 | 290 | 143 | 40 | 23 |
| 751 | 290 | 461 | 41 | 23 |
| 8598 | 290 | 8308 | 42 | 23 |
| 41190 | 290 | 40900 | 43 | 23 |
| | | | | |
| 186 | 38.6 | 147.4 | 44 | 23 |
| 573 | 38.6 | 534.4 | 45 | 23 |
| 452 | 38.6 | 413.4 | 46 | 23 |
| 5030 ML | 38.6 | 4991.4 | 47 | 23 |
| 3240 | 38.6 | 3201.4 | 48 | 23 |
| 21500 | 38.6 | 21461.4 | 49 | 23 |
| 18500 | 38.6 | 18461.4 | 50 | 23 |
| 56600 | 38.6 | 56561.4 | 51 | 23 |
| 58700 M6 | 38.6 | 58661.4 | 52 | 23 |
| 72000 2c | 38.6 | 71961.4 | 53 | 23 |
| 17200 | 38.6 | 17161.4 | 54 | 23 |
| 14100 | 38.6 | 14061.4 | 55 | 23 |
| 34900 | 38.6 | 34861.4 | 56 | 23 |
| 123 | 38.6 | 84.4 | 57 | 23 |
| 20200 | 38.6 | 20161.4 | 58 | 23 |
| 104 | 38.6 | 65.4 | 59 | 23 |
| 433 | 38.6 | 394.4 | 60 | 23 |
| 751 | 38.6 | 712.4 | 61 | 23 |
| 8598 | 38.6 | 8559.4 | 62 | 23 |
| 41190 | 38.6 | 41151.4 | 63 | 23 |
| | | | | |
| 573 | 186 | 387 | 64 | 23 |
| 452 | 186 | 266 | 65 | 23 |
| 5030 ML | 186 | 4844 | 66 | 23 |
| 3240 | 186 | 3054 | 67 | 23 |
| 21500 | 186 | 21314 | 68 | 23 |
| 18500 | 186 | 18314 | 69 | 23 |
| 56600 | 186 | 56414 | 70 | 23 |
| 58700 M6 | 186 | 58514 | 71 | 23 |
| 72000 2c | 186 | 71814 | 72 | 23 |
| 17200 | 186 | 17014 | 73 | 23 |
| 14100 | 186 | 13914 | 74 | 23 |
| 34900 | 186 | 34714 | 75 | 23 |
| 123 | 186 | -63 | 75 | 24 |
| 20200 | 186 | 20014 | 76 | 24 |

| | | | | |
|---|---|---|---|---|
| 104 | 186 | -82 | 76 | 25 |
| 433 | 186 | 247 | 77 | 25 |
| 751 | 186 | 565 | 78 | 25 |
| 8598 | 186 | 8412 | 79 | 25 |
| 41190 | 186 | 41004 | 80 | 25 |
| | | | | |
| 452 | 573 | -121 | 80 | 26 |
| 5030 ML | 573 | 4457 | 81 | 26 |
| 3240 | 573 | 2667 | 82 | 26 |
| 21500 | 573 | 20927 | 83 | 26 |
| 18500 | 573 | 17927 | 84 | 26 |
| 56600 | 573 | 56027 | 85 | 26 |
| 58700 M6 | 573 | 58127 | 86 | 26 |
| 72000 2c | 573 | 71427 | 87 | 26 |
| 17200 | 573 | 16627 | 88 | 26 |
| 14100 | 573 | 13527 | 89 | 26 |
| 34900 | 573 | 34327 | 90 | 26 |
| 123 | 573 | -450 | 90 | 27 |
| 20200 | 573 | 19627 | 91 | 27 |
| 104 | 573 | -469 | 91 | 28 |
| 433 | 573 | -140 | 91 | 29 |
| 751 | 573 | 178 | 92 | 29 |
| 8598 | 573 | 8025 | 93 | 29 |
| 41190 | 573 | 40617 | 94 | 29 |
| | | | | |
| 5030 ML | 452 | 4578 | 95 | 29 |
| 3240 | 452 | 2788 | 96 | 29 |
| 21500 | 452 | 21048 | 97 | 29 |
| 18500 | 452 | 18048 | 98 | 29 |
| 56600 | 452 | 56148 | 99 | 29 |
| 58700 M6 | 452 | 58248 | 100 | 29 |
| 72000 2c | 452 | 71548 | 101 | 29 |
| 17200 | 452 | 16748 | 102 | 29 |
| 14100 | 452 | 13648 | 103 | 29 |
| 34900 | 452 | 34448 | 104 | 29 |
| 123 | 452 | -329 | 104 | 30 |
| 20200 | 452 | 19748 | 105 | 30 |
| 104 | 452 | -348 | 105 | 31 |
| 433 | 452 | -19 | 105 | 32 |
| 751 | 452 | 299 | 106 | 32 |
| 8598 | 452 | 8146 | 107 | 32 |
| 41190 | 452 | 40738 | 108 | 32 |
| | | | | |
| 3240 | 5030 ML | -1790 | 108 | 33 |
| 21500 | 5030 ML | 16470 | 109 | 33 |
| 18500 | 5030 ML | 13470 | 110 | 33 |
| 56600 | 5030 ML | 51570 | 111 | 33 |
| 58700 M6 | 5030 ML | 53670 | 112 | 33 |
| 72000 2c | 5030 ML | 66970 | 113 | 33 |
| 17200 | 5030 ML | 12170 | 114 | 33 |
| 14100 | 5030 ML | 9070 | 115 | 33 |
| 34900 | 5030 ML | 29870 | 116 | 33 |
| 123 | 5030 ML | -4907 | 116 | 34 |
| 20200 | 5030 ML | 15170 | 117 | 34 |
| 104 | 5030 ML | -4926 | 117 | 35 |
| 433 | 5030 ML | -4597 | 117 | 36 |
| 751 | 5030 ML | -4279 | 117 | 37 |

| | | | | |
|---|---|---|---|---|
| 8598 | 5030 ML | 3568 | 118 | 37 |
| 41190 | 5030 ML | 36160 | 119 | 37 |
| | | | | |
| 21500 | 3240 | 18260 | 120 | 37 |
| 18500 | 3240 | 15260 | 121 | 37 |
| 56600 | 3240 | 53360 | 122 | 37 |
| 58700 M6 | 3240 | 55460 | 123 | 37 |
| 72000 2c | 3240 | 68760 | 124 | 37 |
| 17200 | 3240 | 13960 | 125 | 37 |
| 14100 | 3240 | 10860 | 126 | 37 |
| 34900 | 3240 | 31660 | 127 | 37 |
| 123 | 3240 | -3117 | 127 | 38 |
| 20200 | 3240 | 16960 | 128 | 38 |
| 104 | 3240 | -3136 | 128 | 39 |
| 433 | 3240 | -2807 | 128 | 40 |
| 751 | 3240 | -2489 | 128 | 41 |
| 8598 | 3240 | 5358 | 129 | 41 |
| 41190 | 3240 | 37950 | 130 | 41 |
| | | | | |
| 18500 | 21500 | Same Date | 130 | 41 |
| 56600 | 21500 | 35100 | 131 | 41 |
| 58700 M6 | 21500 | 37200 | 132 | 41 |
| 72000 2c | 21500 | 50500 | 133 | 41 |
| 17200 | 21500 | -4300 | 133 | 42 |
| 14100 | 21500 | -7400 | 133 | 43 |
| 34900 | 21500 | 13400 | 134 | 43 |
| 123 | 21500 | -21377 | 134 | 44 |
| 20200 | 21500 | -1300 | 134 | 45 |
| 104 | 21500 | -21396 | 134 | 46 |
| 433 | 21500 | -21067 | 134 | 47 |
| 751 | 21500 | -20749 | 134 | 48 |
| 8598 | 21500 | -12902 | 134 | 49 |
| 41190 | 21500 | 19690 | 135 | 49 |
| | | | | |
| 56600 | 18500 | 38100 | 136 | 49 |
| 58700 M6 | 18500 | 40200 | 137 | 49 |
| 72000 2c | 18500 | 53500 | 138 | 49 |
| 17200 | 18500 | -1300 | 138 | 50 |
| 14100 | 18500 | -4400 | 138 | 51 |
| 34900 | 18500 | 16400 | 139 | 51 |
| 123 | 18500 | -18377 | 139 | 52 |
| 20200 | 18500 | 1700 | 140 | 52 |
| 104 | 18500 | -18396 | 140 | 53 |
| 433 | 18500 | -18067 | 140 | 54 |
| 751 | 18500 | -17749 | 140 | 55 |
| 8598 | 18500 | -9902 | 140 | 56 |
| 41190 | 18500 | 22690 | 141 | 56 |
| | | | | |
| 58700 M6 | 56600 | Same Date | 141 | 56 |
| 72000 2c | 56600 | 15400 | 142 | 56 |
| 17200 | 56600 | -39400 | 142 | 57 |
| 14100 | 56600 | -42500 | 142 | 58 |
| 34900 | 56600 | -21700 | 142 | 59 |
| 123 | 56600 | -56477 | 142 | 60 |
| 20200 | 56600 | -36400 | 142 | 61 |
| 104 | 56600 | -56496 | 142 | 62 |
| 433 | 56600 | -56167 | 142 | 63 |

| | | | | |
|---|---|---|---|---|
| 751 | 56600 | -55849 | 142 | 64 |
| 8598 | 56600 | -48002 | 142 | 65 |
| 41190 | 56600 | -15410 | 142 | 66 |
| | | | | |
| 72000 2c | 58700 M6 | 13300 | 143 | 66 |
| 17200 | 58700 M6 | -41500 | 143 | 67 |
| 14100 | 58700 M6 | -44600 | 143 | 68 |
| 34900 | 58700 M6 | -23800 | 143 | 69 |
| 123 | 58700 M6 | -58577 | 143 | 70 |
| 20200 | 58700 M6 | -38500 | 143 | 71 |
| 104 | 58700 M6 | -58596 | 143 | 72 |
| 433 | 58700 M6 | -58267 | 143 | 73 |
| 751 | 58700 M6 | -57949 | 143 | 74 |
| 8598 | 58700 M6 | -50102 | 143 | 75 |
| 41190 | 58700 M6 | -17510 | 143 | 76 |
| | | | | |
| 17200 | 72000 2c | -54800 | 143 | 77 |
| 14100 | 72000 2c | -57900 | 143 | 78 |
| 34900 | 72000 2c | -37100 | 143 | 79 |
| 123 | 72000 2c | -71877 | 143 | 80 |
| 20200 | 72000 2c | -51800 | 143 | 81 |
| 104 | 72000 2c | -71896 | 143 | 82 |
| 433 | 72000 2c | -71567 | 143 | 83 |
| 751 | 72000 2c | -71249 | 143 | 84 |
| 8598 | 72000 2c | -63402 | 143 | 85 |
| 41190 | 72000 2c | -30810 | 143 | 86 |
| | | | | |
| 14100 | 17200 | -3100 | 143 | 87 |
| 34900 | 17200 | 17700 | 144 | 87 |
| 123 | 17200 | -17077 | 144 | 88 |
| 20200 | 17200 | 3000 | 145 | 88 |
| 104 | 17200 | -17096 | 145 | 89 |
| 433 | 17200 | -16767 | 145 | 90 |
| 751 | 17200 | -16449 | 145 | 91 |
| 8598 | 17200 | -8602 | 145 | 92 |
| 41190 | 17200 | 23990 | 146 | 92 |
| | | | | |
| 34900 | 14100 | 20800 | 147 | 92 |
| 123 | 14100 | -13977 | 147 | 93 |
| 20200 | 14100 | 6100 | 148 | 93 |
| 104 | 14100 | -13996 | 148 | 94 |
| 433 | 14100 | -13667 | 148 | 95 |
| 751 | 14100 | -13349 | 148 | 96 |
| 8598 | 14100 | -5502 | 148 | 97 |
| 41190 | 14100 | 27090 | 149 | 97 |
| | | | | |
| 123 | 34900 | -34777 | 149 | 98 |
| 20200 | 34900 | -14700 | 149 | 99 |
| 104 | 34900 | -34796 | 149 | 100 |
| 433 | 34900 | -34467 | 149 | 101 |
| 751 | 34900 | -34149 | 149 | 102 |
| 8598 | 34900 | -26302 | 149 | 103 |
| 41190 | 34900 | 6290 | 150 | 103 |
| | | | | |
| 20200 | 123 | 20077 | 151 | 103 |
| 104 | 123 | -19 | 151 | 104 |
| 433 | 123 | 310 | 152 | 104 |

| | | | | |
|---|---|---|---|---|
| 751 | 123 | 628 | 153 | 104 |
| 8598 | 123 | 8475 | 154 | 104 |
| 41190 | 123 | 41067 | 155 | 104 |
| | | | | |
| 104 | 20200 | -20096 | 155 | 105 |
| 433 | 20200 | -19767 | 155 | 106 |
| 751 | 20200 | -19449 | 155 | 107 |
| 8598 | 20200 | -11602 | 155 | 108 |
| 41190 | 20200 | 20990 | 156 | 108 |
| | | | | |
| 433 | 104 | 329 | 157 | 108 |
| 751 | 104 | 647 | 158 | 108 |
| 8598 | 104 | 8494 | 159 | 108 |
| 41190 | 104 | 41086 | 160 | 108 |
| | | | | |
| 751 | 433 | 318 | 161 | 108 |
| 8598 | 433 | 8165 | 162 | 108 |
| 41190 | 433 | 40757 | 163 | 108 |
| | | | | |
| 8598 | 751 | 7847 | 164 | 108 |
| 41190 | 751 | 40439 | 165 | 108 |
| | | | | |
| 41190 | 8598 | 32592 | 166 | 108 |

S Statistic = 166 - 108 = 58

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |

There are 2 time periods with multiple data

A = 0
B = 36
C = 0

D = 0
E = 0
F = 4
a = 29256
b = 109296
c = 1104
Group Variance = 1623.33
Z-Score = 1.41472
Comparison Level at 95% confidence level = 1.65463 (upward trend)
1.41472 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RW03R-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 11250 | 3063 | 8187 | 1 | 0 |
| 16920 | 3063 | 13857 | 2 | 0 |
| 196.1 | 3063 | -2866.9 | 2 | 1 |
| ND<250 U | 3063 | -2813 | 2 | 2 |
| | | | | |
| 16920 | 11250 | 5670 | 3 | 2 |
| 196.1 | 11250 | -11053.9 | 3 | 3 |
| ND<250 U | 11250 | -11000 | 3 | 4 |
| | | | | |
| 196.1 | 16920 | -16723.9 | 3 | 5 |
| ND<250 U | 16920 | -16670 | 3 | 6 |
| | | | | |
| ND<250 U | 196.1 | 53.9 | 4 | 6 |

S Statistic = 4 - 6 = -2
Comparing at 95% confidence level (upward trend)
Probability of obtaining S >= -2 is 0.408
S < 0 or 0.408 >= 0.05 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RW05-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 1730 | 374 | 1356 | 1 | 0 |
| 1730 | 374 | 1356 | 2 | 0 |
| 328 | 374 | -46 | 2 | 1 |
| 349 | 374 | -25 | 2 | 2 |
| 502 | 374 | 128 | 3 | 2 |
| 205 | 374 | -169 | 3 | 3 |
| 173 | 374 | -201 | 3 | 4 |
| 402 | 374 | 28 | 4 | 4 |
| 282 | 374 | -92 | 4 | 5 |
| 110 | 374 | -264 | 4 | 6 |
| 490 1c | 374 | 116 | 5 | 6 |
| 7.5 J2c | 374 | -366.5 | 5 | 7 |
| 76600 | 374 | 76226 | 6 | 7 |
| | | | | |
| 1730 | 1730 | 0 | 6 | 7 |
| 328 | 1730 | -1402 | 6 | 8 |
| 349 | 1730 | -1381 | 6 | 9 |
| 502 | 1730 | -1228 | 6 | 10 |
| 205 | 1730 | -1525 | 6 | 11 |
| 173 | 1730 | -1557 | 6 | 12 |
| 402 | 1730 | -1328 | 6 | 13 |
| 282 | 1730 | -1448 | 6 | 14 |
| 110 | 1730 | -1620 | 6 | 15 |
| 490 1c | 1730 | -1240 | 6 | 16 |
| 7.5 J2c | 1730 | -1722.5 | 6 | 17 |
| 76600 | 1730 | 74870 | 7 | 17 |
| | | | | |
| 328 | 1730 | -1402 | 7 | 18 |
| 349 | 1730 | -1381 | 7 | 19 |
| 502 | 1730 | -1228 | 7 | 20 |
| 205 | 1730 | -1525 | 7 | 21 |
| 173 | 1730 | -1557 | 7 | 22 |
| 402 | 1730 | -1328 | 7 | 23 |
| 282 | 1730 | -1448 | 7 | 24 |
| 110 | 1730 | -1620 | 7 | 25 |
| 490 1c | 1730 | -1240 | 7 | 26 |
| 7.5 J2c | 1730 | -1722.5 | 7 | 27 |
| 76600 | 1730 | 74870 | 8 | 27 |
| | | | | |
| 349 | 328 | 21 | 9 | 27 |
| 502 | 328 | 174 | 10 | 27 |
| 205 | 328 | -123 | 10 | 28 |
| 173 | 328 | -155 | 10 | 29 |
| 402 | 328 | 74 | 11 | 29 |
| 282 | 328 | -46 | 11 | 30 |
| 110 | 328 | -218 | 11 | 31 |
| 490 1c | 328 | 162 | 12 | 31 |

| | | | | |
|---|---|---|---|---|
| 7.5 J2c | 328 | -320.5 | 12 | 32 |
| 76600 | 328 | 76272 | 13 | 32 |
| | | | | |
| 502 | 349 | 153 | 14 | 32 |
| 205 | 349 | -144 | 14 | 33 |
| 173 | 349 | -176 | 14 | 34 |
| 402 | 349 | 53 | 15 | 34 |
| 282 | 349 | -67 | 15 | 35 |
| 110 | 349 | -239 | 15 | 36 |
| 490 1c | 349 | 141 | 16 | 36 |
| 7.5 J2c | 349 | -341.5 | 16 | 37 |
| 76600 | 349 | 76251 | 17 | 37 |
| | | | | |
| 205 | 502 | -297 | 17 | 38 |
| 173 | 502 | -329 | 17 | 39 |
| 402 | 502 | -100 | 17 | 40 |
| 282 | 502 | -220 | 17 | 41 |
| 110 | 502 | -392 | 17 | 42 |
| 490 1c | 502 | -12 | 17 | 43 |
| 7.5 J2c | 502 | -494.5 | 17 | 44 |
| 76600 | 502 | 76098 | 18 | 44 |
| | | | | |
| 173 | 205 | -32 | 18 | 45 |
| 402 | 205 | 197 | 19 | 45 |
| 282 | 205 | 77 | 20 | 45 |
| 110 | 205 | -95 | 20 | 46 |
| 490 1c | 205 | 285 | 21 | 46 |
| 7.5 J2c | 205 | -197.5 | 21 | 47 |
| 76600 | 205 | 76395 | 22 | 47 |
| | | | | |
| 402 | 173 | 229 | 23 | 47 |
| 282 | 173 | 109 | 24 | 47 |
| 110 | 173 | -63 | 24 | 48 |
| 490 1c | 173 | 317 | 25 | 48 |
| 7.5 J2c | 173 | -165.5 | 25 | 49 |
| 76600 | 173 | 76427 | 26 | 49 |
| | | | | |
| 282 | 402 | -120 | 26 | 50 |
| 110 | 402 | -292 | 26 | 51 |
| 490 1c | 402 | 88 | 27 | 51 |
| 7.5 J2c | 402 | -394.5 | 27 | 52 |
| 76600 | 402 | 76198 | 28 | 52 |
| | | | | |
| 110 | 282 | -172 | 28 | 53 |
| 490 1c | 282 | 208 | 29 | 53 |
| 7.5 J2c | 282 | -274.5 | 29 | 54 |
| 76600 | 282 | 76318 | 30 | 54 |
| | | | | |
| 490 1c | 110 | 380 | 31 | 54 |
| 7.5 J2c | 110 | -102.5 | 31 | 55 |
| 76600 | 110 | 76490 | 32 | 55 |
| | | | | |
| 7.5 J2c | 490 1c | Same Date | 32 | 55 |
| 76600 | 490 1c | 76110 | 33 | 55 |
| | | | | |
| 76600 | 7.5 J2c | 76592.5 | 34 | 55 |

S Statistic = 34 - 55 = -21

| Tied Group | Value | Members |
|---|---|---|
| 1 | 1730 | 2 |

| Time Period | Observations |
|---|---|
| 6/1/2017 | 1 |
| 7/1/2017 | 1 |
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 6/1/2020 | 1 |

There are 1 time periods with multiple data

A = 18
B = 18
C = 0
D = 0
E = 2
F = 2
a = 6006
b = 19656
c = 364
Group Variance = 331.678
Z-Score = -1.09818
Comparison Level at 95% confidence level = 1.65463 (upward trend)
-1.09818 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RW05R-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 68400 1c3c | 66800 2c | Same Date | 0 | 0 |
| 71700 2c | 66800 2c | 4900 | 1 | 0 |
| 83400 | 66800 2c | 16600 | 2 | 0 |
| 70700 | 66800 2c | 3900 | 3 | 0 |
| 80000 ML1c | 66800 2c | 13200 | 4 | 0 |
| 68200 1c | 66800 2c | 1400 | 5 | 0 |
| 79000 | 66800 2c | 12200 | 6 | 0 |
| ND<100 U | 66800 2c | -66700 | 6 | 1 |
| 55200 | 66800 2c | -11600 | 6 | 2 |
| 60560 | 66800 2c | -6240 | 6 | 3 |
| 53290 | 66800 2c | -13510 | 6 | 4 |
| 63410 | 66800 2c | -3390 | 6 | 5 |
| 60490 | 66800 2c | -6310 | 6 | 6 |
| 81220 | 66800 2c | 14420 | 7 | 6 |
| | | | | |
| 71700 2c | 68400 1c3c | 3300 | 8 | 6 |
| 83400 | 68400 1c3c | 15000 | 9 | 6 |
| 70700 | 68400 1c3c | 2300 | 10 | 6 |
| 80000 ML1c | 68400 1c3c | 11600 | 11 | 6 |
| 68200 1c | 68400 1c3c | -200 | 11 | 7 |
| 79000 | 68400 1c3c | 10600 | 12 | 7 |
| ND<100 U | 68400 1c3c | -68300 | 12 | 8 |
| 55200 | 68400 1c3c | -13200 | 12 | 9 |
| 60560 | 68400 1c3c | -7840 | 12 | 10 |
| 53290 | 68400 1c3c | -15110 | 12 | 11 |
| 63410 | 68400 1c3c | -4990 | 12 | 12 |
| 60490 | 68400 1c3c | -7910 | 12 | 13 |
| 81220 | 68400 1c3c | 12820 | 13 | 13 |
| | | | | |
| 83400 | 71700 2c | 11700 | 14 | 13 |
| 70700 | 71700 2c | -1000 | 14 | 14 |
| 80000 ML1c | 71700 2c | 8300 | 15 | 14 |
| 68200 1c | 71700 2c | -3500 | 15 | 15 |
| 79000 | 71700 2c | 7300 | 16 | 15 |
| ND<100 U | 71700 2c | -71600 | 16 | 16 |
| 55200 | 71700 2c | -16500 | 16 | 17 |
| 60560 | 71700 2c | -11140 | 16 | 18 |
| 53290 | 71700 2c | -18410 | 16 | 19 |
| 63410 | 71700 2c | -8290 | 16 | 20 |
| 60490 | 71700 2c | -11210 | 16 | 21 |
| 81220 | 71700 2c | 9520 | 17 | 21 |
| | | | | |
| 70700 | 83400 | -12700 | 17 | 22 |
| 80000 ML1c | 83400 | -3400 | 17 | 23 |
| 68200 1c | 83400 | -15200 | 17 | 24 |
| 79000 | 83400 | -4400 | 17 | 25 |
| ND<100 U | 83400 | -83300 | 17 | 26 |

| | | | | |
|---|---|---|---|---|
| 55200 | 83400 | -28200 | 17 | 27 |
| 60560 | 83400 | -22840 | 17 | 28 |
| 53290 | 83400 | -30110 | 17 | 29 |
| 63410 | 83400 | -19990 | 17 | 30 |
| 60490 | 83400 | -22910 | 17 | 31 |
| 81220 | 83400 | -2180 | 17 | 32 |
| | | | | |
| 80000 ML1c | 70700 | 9300 | 18 | 32 |
| 68200 1c | 70700 | -2500 | 18 | 33 |
| 79000 | 70700 | 8300 | 19 | 33 |
| ND<100 U | 70700 | -70600 | 19 | 34 |
| 55200 | 70700 | -15500 | 19 | 35 |
| 60560 | 70700 | -10140 | 19 | 36 |
| 53290 | 70700 | -17410 | 19 | 37 |
| 63410 | 70700 | -7290 | 19 | 38 |
| 60490 | 70700 | -10210 | 19 | 39 |
| 81220 | 70700 | 10520 | 20 | 39 |
| | | | | |
| 68200 1c | 80000 ML1c | -11800 | 20 | 40 |
| 79000 | 80000 ML1c | -1000 | 20 | 41 |
| ND<100 U | 80000 ML1c | -79900 | 20 | 42 |
| 55200 | 80000 ML1c | -24800 | 20 | 43 |
| 60560 | 80000 ML1c | -19440 | 20 | 44 |
| 53290 | 80000 ML1c | -26710 | 20 | 45 |
| 63410 | 80000 ML1c | -16590 | 20 | 46 |
| 60490 | 80000 ML1c | -19510 | 20 | 47 |
| 81220 | 80000 ML1c | 1220 | 21 | 47 |
| | | | | |
| 79000 | 68200 1c | 10800 | 22 | 47 |
| ND<100 U | 68200 1c | -68100 | 22 | 48 |
| 55200 | 68200 1c | -13000 | 22 | 49 |
| 60560 | 68200 1c | -7640 | 22 | 50 |
| 53290 | 68200 1c | -14910 | 22 | 51 |
| 63410 | 68200 1c | -4790 | 22 | 52 |
| 60490 | 68200 1c | -7710 | 22 | 53 |
| 81220 | 68200 1c | 13020 | 23 | 53 |
| | | | | |
| ND<100 U | 79000 | -78900 | 23 | 54 |
| 55200 | 79000 | -23800 | 23 | 55 |
| 60560 | 79000 | -18440 | 23 | 56 |
| 53290 | 79000 | -25710 | 23 | 57 |
| 63410 | 79000 | -15590 | 23 | 58 |
| 60490 | 79000 | -18510 | 23 | 59 |
| 81220 | 79000 | 2220 | 24 | 59 |
| | | | | |
| 55200 | ND<100 U | 55100 | 25 | 59 |
| 60560 | ND<100 U | 60460 | 26 | 59 |
| 53290 | ND<100 U | 53190 | 27 | 59 |
| 63410 | ND<100 U | 63310 | 28 | 59 |
| 60490 | ND<100 U | 60390 | 29 | 59 |
| 81220 | ND<100 U | 81120 | 30 | 59 |
| | | | | |
| 60560 | 55200 | 5360 | 31 | 59 |
| 53290 | 55200 | -1910 | 31 | 60 |
| 63410 | 55200 | 8210 | 32 | 60 |
| 60490 | 55200 | 5290 | 33 | 60 |
| 81220 | 55200 | 26020 | 34 | 60 |

| | | | | |
|---|---|---|---|---|
| 53290 | 60560 | -7270 | 34 | 61 |
| 63410 | 60560 | 2850 | 35 | 61 |
| 60490 | 60560 | -70 | 35 | 62 |
| 81220 | 60560 | 20660 | 36 | 62 |
| | | | | |
| 63410 | 53290 | 10120 | 37 | 62 |
| 60490 | 53290 | 7200 | 38 | 62 |
| 81220 | 53290 | 27930 | 39 | 62 |
| | | | | |
| 60490 | 63410 | -2920 | 39 | 63 |
| 81220 | 63410 | 17810 | 40 | 63 |
| | | | | |
| 81220 | 60490 | 20730 | 41 | 63 |

S Statistic = 41 - 63 = -22

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 0
B = 18
C = 0
D = 0
E = 0
F = 2
a = 7350
b = 24570
c = 420
Group Variance = 407.333
Z-Score = -1.04051
Comparison Level at 95% confidence level = 1.65463 (upward trend)
-1.04051 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RW06-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 1680 | 1900 | -220 | 0 | 1 |
| 1420 | 1900 | -480 | 0 | 2 |
| 999 | 1900 | -901 | 0 | 3 |
| 876 | 1900 | -1024 | 0 | 4 |
| 1690 | 1900 | -210 | 0 | 5 |
| 1340 | 1900 | -560 | 0 | 6 |
| 508 | 1900 | -1392 | 0 | 7 |
| 615 | 1900 | -1285 | 0 | 8 |
| 909 | 1900 | -991 | 0 | 9 |
| 1360 | 1900 | -540 | 0 | 10 |
| 1950 | 1900 | 50 | 1 | 10 |
| 27900 | 1900 | 26000 | 2 | 10 |
| 191 | 1900 | -1709 | 2 | 11 |
| 90100 | 1900 | 88200 | 3 | 11 |
| 122000 2c | 1900 | 120100 | 4 | 11 |
| 128000 1c | 1900 | 126100 | 5 | 11 |
| 108000 | 1900 | 106100 | 6 | 11 |
| 109000 | 1900 | 107100 | 7 | 11 |
| 122000 | 1900 | 120100 | 8 | 11 |
| 116000 | 1900 | 114100 | 9 | 11 |
| 117000 | 1900 | 115100 | 10 | 11 |
| 94400 | 1900 | 92500 | 11 | 11 |
| 111000 ML | 1900 | 109100 | 12 | 11 |
| 79.7 | 1900 | -1820.3 | 12 | 12 |
| 109000 | 1900 | 107100 | 13 | 12 |
| 85500 | 1900 | 83600 | 14 | 12 |
| ND<100 U | 1900 | -1800 | 14 | 13 |
| 97570 | 1900 | 95670 | 15 | 13 |
| 51260 | 1900 | 49360 | 16 | 13 |
| | | | | |
| 1420 | 1680 | -260 | 16 | 14 |
| 999 | 1680 | -681 | 16 | 15 |
| 876 | 1680 | -804 | 16 | 16 |
| 1690 | 1680 | 10 | 17 | 16 |
| 1340 | 1680 | -340 | 17 | 17 |
| 508 | 1680 | -1172 | 17 | 18 |
| 615 | 1680 | -1065 | 17 | 19 |
| 909 | 1680 | -771 | 17 | 20 |
| 1360 | 1680 | -320 | 17 | 21 |
| 1950 | 1680 | 270 | 18 | 21 |
| 27900 | 1680 | 26220 | 19 | 21 |
| 191 | 1680 | -1489 | 19 | 22 |
| 90100 | 1680 | 88420 | 20 | 22 |
| 122000 2c | 1680 | 120320 | 21 | 22 |
| 128000 1c | 1680 | 126320 | 22 | 22 |
| 108000 | 1680 | 106320 | 23 | 22 |
| 109000 | 1680 | 107320 | 24 | 22 |

| | | | | |
|---|---|---|---|---|
| 122000 | 1680 | 120320 | 25 | 22 |
| 116000 | 1680 | 114320 | 26 | 22 |
| 117000 | 1680 | 115320 | 27 | 22 |
| 94400 | 1680 | 92720 | 28 | 22 |
| 111000 ML | 1680 | 109320 | 29 | 22 |
| 79.7 | 1680 | -1600.3 | 29 | 23 |
| 109000 | 1680 | 107320 | 30 | 23 |
| 85500 | 1680 | 83820 | 31 | 23 |
| ND<100 U | 1680 | -1580 | 31 | 24 |
| 97570 | 1680 | 95890 | 32 | 24 |
| 51260 | 1680 | 49580 | 33 | 24 |
| | | | | |
| 999 | 1420 | -421 | 33 | 25 |
| 876 | 1420 | -544 | 33 | 26 |
| 1690 | 1420 | 270 | 34 | 26 |
| 1340 | 1420 | -80 | 34 | 27 |
| 508 | 1420 | -912 | 34 | 28 |
| 615 | 1420 | -805 | 34 | 29 |
| 909 | 1420 | -511 | 34 | 30 |
| 1360 | 1420 | -60 | 34 | 31 |
| 1950 | 1420 | 530 | 35 | 31 |
| 27900 | 1420 | 26480 | 36 | 31 |
| 191 | 1420 | -1229 | 36 | 32 |
| 90100 | 1420 | 88680 | 37 | 32 |
| 122000 2c | 1420 | 120580 | 38 | 32 |
| 128000 1c | 1420 | 126580 | 39 | 32 |
| 108000 | 1420 | 106580 | 40 | 32 |
| 109000 | 1420 | 107580 | 41 | 32 |
| 122000 | 1420 | 120580 | 42 | 32 |
| 116000 | 1420 | 114580 | 43 | 32 |
| 117000 | 1420 | 115580 | 44 | 32 |
| 94400 | 1420 | 92980 | 45 | 32 |
| 111000 ML | 1420 | 109580 | 46 | 32 |
| 79.7 | 1420 | -1340.3 | 46 | 33 |
| 109000 | 1420 | 107580 | 47 | 33 |
| 85500 | 1420 | 84080 | 48 | 33 |
| ND<100 U | 1420 | -1320 | 48 | 34 |
| 97570 | 1420 | 96150 | 49 | 34 |
| 51260 | 1420 | 49840 | 50 | 34 |
| | | | | |
| 876 | 999 | -123 | 50 | 35 |
| 1690 | 999 | 691 | 51 | 35 |
| 1340 | 999 | 341 | 52 | 35 |
| 508 | 999 | -491 | 52 | 36 |
| 615 | 999 | -384 | 52 | 37 |
| 909 | 999 | -90 | 52 | 38 |
| 1360 | 999 | 361 | 53 | 38 |
| 1950 | 999 | 951 | 54 | 38 |
| 27900 | 999 | 26901 | 55 | 38 |
| 191 | 999 | -808 | 55 | 39 |
| 90100 | 999 | 89101 | 56 | 39 |
| 122000 2c | 999 | 121001 | 57 | 39 |
| 128000 1c | 999 | 127001 | 58 | 39 |
| 108000 | 999 | 107001 | 59 | 39 |
| 109000 | 999 | 108001 | 60 | 39 |
| 122000 | 999 | 121001 | 61 | 39 |
| 116000 | 999 | 115001 | 62 | 39 |

| | | | | |
|---|---|---|---|---|
| 117000 | 999 | 116001 | 63 | 39 |
| 94400 | 999 | 93401 | 64 | 39 |
| 111000 ML | 999 | 110001 | 65 | 39 |
| 79.7 | 999 | -919.3 | 65 | 40 |
| 109000 | 999 | 108001 | 66 | 40 |
| 85500 | 999 | 84501 | 67 | 40 |
| ND<100 U | 999 | -899 | 67 | 41 |
| 97570 | 999 | 96571 | 68 | 41 |
| 51260 | 999 | 50261 | 69 | 41 |
| | | | | |
| 1690 | 876 | 814 | 70 | 41 |
| 1340 | 876 | 464 | 71 | 41 |
| 508 | 876 | -368 | 71 | 42 |
| 615 | 876 | -261 | 71 | 43 |
| 909 | 876 | 33 | 72 | 43 |
| 1360 | 876 | 484 | 73 | 43 |
| 1950 | 876 | 1074 | 74 | 43 |
| 27900 | 876 | 27024 | 75 | 43 |
| 191 | 876 | -685 | 75 | 44 |
| 90100 | 876 | 89224 | 76 | 44 |
| 122000 2c | 876 | 121124 | 77 | 44 |
| 128000 1c | 876 | 127124 | 78 | 44 |
| 108000 | 876 | 107124 | 79 | 44 |
| 109000 | 876 | 108124 | 80 | 44 |
| 122000 | 876 | 121124 | 81 | 44 |
| 116000 | 876 | 115124 | 82 | 44 |
| 117000 | 876 | 116124 | 83 | 44 |
| 94400 | 876 | 93524 | 84 | 44 |
| 111000 ML | 876 | 110124 | 85 | 44 |
| 79.7 | 876 | -796.3 | 85 | 45 |
| 109000 | 876 | 108124 | 86 | 45 |
| 85500 | 876 | 84624 | 87 | 45 |
| ND<100 U | 876 | -776 | 87 | 46 |
| 97570 | 876 | 96694 | 88 | 46 |
| 51260 | 876 | 50384 | 89 | 46 |
| | | | | |
| 1340 | 1690 | -350 | 89 | 47 |
| 508 | 1690 | -1182 | 89 | 48 |
| 615 | 1690 | -1075 | 89 | 49 |
| 909 | 1690 | -781 | 89 | 50 |
| 1360 | 1690 | -330 | 89 | 51 |
| 1950 | 1690 | 260 | 90 | 51 |
| 27900 | 1690 | 26210 | 91 | 51 |
| 191 | 1690 | -1499 | 91 | 52 |
| 90100 | 1690 | 88410 | 92 | 52 |
| 122000 2c | 1690 | 120310 | 93 | 52 |
| 128000 1c | 1690 | 126310 | 94 | 52 |
| 108000 | 1690 | 106310 | 95 | 52 |
| 109000 | 1690 | 107310 | 96 | 52 |
| 122000 | 1690 | 120310 | 97 | 52 |
| 116000 | 1690 | 114310 | 98 | 52 |
| 117000 | 1690 | 115310 | 99 | 52 |
| 94400 | 1690 | 92710 | 100 | 52 |
| 111000 ML | 1690 | 109310 | 101 | 52 |
| 79.7 | 1690 | -1610.3 | 101 | 53 |
| 109000 | 1690 | 107310 | 102 | 53 |
| 85500 | 1690 | 83810 | 103 | 53 |

| | | | | |
|---|---|---|---|---|
| ND<100 U | 1690 | -1590 | 103 | 54 |
| 97570 | 1690 | 95880 | 104 | 54 |
| 51260 | 1690 | 49570 | 105 | 54 |
| | | | | |
| 508 | 1340 | -832 | 105 | 55 |
| 615 | 1340 | -725 | 105 | 56 |
| 909 | 1340 | -431 | 105 | 57 |
| 1360 | 1340 | 20 | 106 | 57 |
| 1950 | 1340 | 610 | 107 | 57 |
| 27900 | 1340 | 26560 | 108 | 57 |
| 191 | 1340 | -1149 | 108 | 58 |
| 90100 | 1340 | 88760 | 109 | 58 |
| 122000 2c | 1340 | 120660 | 110 | 58 |
| 128000 1c | 1340 | 126660 | 111 | 58 |
| 108000 | 1340 | 106660 | 112 | 58 |
| 109000 | 1340 | 107660 | 113 | 58 |
| 122000 | 1340 | 120660 | 114 | 58 |
| 116000 | 1340 | 114660 | 115 | 58 |
| 117000 | 1340 | 115660 | 116 | 58 |
| 94400 | 1340 | 93060 | 117 | 58 |
| 111000 ML | 1340 | 109660 | 118 | 58 |
| 79.7 | 1340 | -1260.3 | 118 | 59 |
| 109000 | 1340 | 107660 | 119 | 59 |
| 85500 | 1340 | 84160 | 120 | 59 |
| ND<100 U | 1340 | -1240 | 120 | 60 |
| 97570 | 1340 | 96230 | 121 | 60 |
| 51260 | 1340 | 49920 | 122 | 60 |
| | | | | |
| 615 | 508 | 107 | 123 | 60 |
| 909 | 508 | 401 | 124 | 60 |
| 1360 | 508 | 852 | 125 | 60 |
| 1950 | 508 | 1442 | 126 | 60 |
| 27900 | 508 | 27392 | 127 | 60 |
| 191 | 508 | -317 | 127 | 61 |
| 90100 | 508 | 89592 | 128 | 61 |
| 122000 2c | 508 | 121492 | 129 | 61 |
| 128000 1c | 508 | 127492 | 130 | 61 |
| 108000 | 508 | 107492 | 131 | 61 |
| 109000 | 508 | 108492 | 132 | 61 |
| 122000 | 508 | 121492 | 133 | 61 |
| 116000 | 508 | 115492 | 134 | 61 |
| 117000 | 508 | 116492 | 135 | 61 |
| 94400 | 508 | 93892 | 136 | 61 |
| 111000 ML | 508 | 110492 | 137 | 61 |
| 79.7 | 508 | -428.3 | 137 | 62 |
| 109000 | 508 | 108492 | 138 | 62 |
| 85500 | 508 | 84992 | 139 | 62 |
| ND<100 U | 508 | -408 | 139 | 63 |
| 97570 | 508 | 97062 | 140 | 63 |
| 51260 | 508 | 50752 | 141 | 63 |
| | | | | |
| 909 | 615 | 294 | 142 | 63 |
| 1360 | 615 | 745 | 143 | 63 |
| 1950 | 615 | 1335 | 144 | 63 |
| 27900 | 615 | 27285 | 145 | 63 |
| 191 | 615 | -424 | 145 | 64 |
| 90100 | 615 | 89485 | 146 | 64 |

| | | | | |
|---|---|---|---|---|
| 122000 2c | 615 | 121385 | 147 | 64 |
| 128000 1c | 615 | 127385 | 148 | 64 |
| 108000 | 615 | 107385 | 149 | 64 |
| 109000 | 615 | 108385 | 150 | 64 |
| 122000 | 615 | 121385 | 151 | 64 |
| 116000 | 615 | 115385 | 152 | 64 |
| 117000 | 615 | 116385 | 153 | 64 |
| 94400 | 615 | 93785 | 154 | 64 |
| 111000 ML | 615 | 110385 | 155 | 64 |
| 79.7 | 615 | -535.3 | 155 | 65 |
| 109000 | 615 | 108385 | 156 | 65 |
| 85500 | 615 | 84885 | 157 | 65 |
| ND<100 U | 615 | -515 | 157 | 66 |
| 97570 | 615 | 96955 | 158 | 66 |
| 51260 | 615 | 50645 | 159 | 66 |
| | | | | |
| 1360 | 909 | 451 | 160 | 66 |
| 1950 | 909 | 1041 | 161 | 66 |
| 27900 | 909 | 26991 | 162 | 66 |
| 191 | 909 | -718 | 162 | 67 |
| 90100 | 909 | 89191 | 163 | 67 |
| 122000 2c | 909 | 121091 | 164 | 67 |
| 128000 1c | 909 | 127091 | 165 | 67 |
| 108000 | 909 | 107091 | 166 | 67 |
| 109000 | 909 | 108091 | 167 | 67 |
| 122000 | 909 | 121091 | 168 | 67 |
| 116000 | 909 | 115091 | 169 | 67 |
| 117000 | 909 | 116091 | 170 | 67 |
| 94400 | 909 | 93491 | 171 | 67 |
| 111000 ML | 909 | 110091 | 172 | 67 |
| 79.7 | 909 | -829.3 | 172 | 68 |
| 109000 | 909 | 108091 | 173 | 68 |
| 85500 | 909 | 84591 | 174 | 68 |
| ND<100 U | 909 | -809 | 174 | 69 |
| 97570 | 909 | 96661 | 175 | 69 |
| 51260 | 909 | 50351 | 176 | 69 |
| | | | | |
| 1950 | 1360 | 590 | 177 | 69 |
| 27900 | 1360 | 26540 | 178 | 69 |
| 191 | 1360 | -1169 | 178 | 70 |
| 90100 | 1360 | 88740 | 179 | 70 |
| 122000 2c | 1360 | 120640 | 180 | 70 |
| 128000 1c | 1360 | 126640 | 181 | 70 |
| 108000 | 1360 | 106640 | 182 | 70 |
| 109000 | 1360 | 107640 | 183 | 70 |
| 122000 | 1360 | 120640 | 184 | 70 |
| 116000 | 1360 | 114640 | 185 | 70 |
| 117000 | 1360 | 115640 | 186 | 70 |
| 94400 | 1360 | 93040 | 187 | 70 |
| 111000 ML | 1360 | 109640 | 188 | 70 |
| 79.7 | 1360 | -1280.3 | 188 | 71 |
| 109000 | 1360 | 107640 | 189 | 71 |
| 85500 | 1360 | 84140 | 190 | 71 |
| ND<100 U | 1360 | -1260 | 190 | 72 |
| 97570 | 1360 | 96210 | 191 | 72 |
| 51260 | 1360 | 49900 | 192 | 72 |

| | | | | |
|---|---|---|---|---|
| 27900 | 1950 | 25950 | 193 | 72 |
| 191 | 1950 | -1759 | 193 | 73 |
| 90100 | 1950 | 88150 | 194 | 73 |
| 122000 2c | 1950 | 120050 | 195 | 73 |
| 128000 1c | 1950 | 126050 | 196 | 73 |
| 108000 | 1950 | 106050 | 197 | 73 |
| 109000 | 1950 | 107050 | 198 | 73 |
| 122000 | 1950 | 120050 | 199 | 73 |
| 116000 | 1950 | 114050 | 200 | 73 |
| 117000 | 1950 | 115050 | 201 | 73 |
| 94400 | 1950 | 92450 | 202 | 73 |
| 111000 ML | 1950 | 109050 | 203 | 73 |
| 79.7 | 1950 | -1870.3 | 203 | 74 |
| 109000 | 1950 | 107050 | 204 | 74 |
| 85500 | 1950 | 83550 | 205 | 74 |
| ND<100 U | 1950 | -1850 | 205 | 75 |
| 97570 | 1950 | 95620 | 206 | 75 |
| 51260 | 1950 | 49310 | 207 | 75 |
| | | | | |
| 191 | 27900 | -27709 | 207 | 76 |
| 90100 | 27900 | 62200 | 208 | 76 |
| 122000 2c | 27900 | 94100 | 209 | 76 |
| 128000 1c | 27900 | 100100 | 210 | 76 |
| 108000 | 27900 | 80100 | 211 | 76 |
| 109000 | 27900 | 81100 | 212 | 76 |
| 122000 | 27900 | 94100 | 213 | 76 |
| 116000 | 27900 | 88100 | 214 | 76 |
| 117000 | 27900 | 89100 | 215 | 76 |
| 94400 | 27900 | 66500 | 216 | 76 |
| 111000 ML | 27900 | 83100 | 217 | 76 |
| 79.7 | 27900 | -27820.3 | 217 | 77 |
| 109000 | 27900 | 81100 | 218 | 77 |
| 85500 | 27900 | 57600 | 219 | 77 |
| ND<100 U | 27900 | -27800 | 219 | 78 |
| 97570 | 27900 | 69670 | 220 | 78 |
| 51260 | 27900 | 23360 | 221 | 78 |
| | | | | |
| 90100 | 191 | 89909 | 222 | 78 |
| 122000 2c | 191 | 121809 | 223 | 78 |
| 128000 1c | 191 | 127809 | 224 | 78 |
| 108000 | 191 | 107809 | 225 | 78 |
| 109000 | 191 | 108809 | 226 | 78 |
| 122000 | 191 | 121809 | 227 | 78 |
| 116000 | 191 | 115809 | 228 | 78 |
| 117000 | 191 | 116809 | 229 | 78 |
| 94400 | 191 | 94209 | 230 | 78 |
| 111000 ML | 191 | 110809 | 231 | 78 |
| 79.7 | 191 | -111.3 | 231 | 79 |
| 109000 | 191 | 108809 | 232 | 79 |
| 85500 | 191 | 85309 | 233 | 79 |
| ND<100 U | 191 | -91 | 233 | 80 |
| 97570 | 191 | 97379 | 234 | 80 |
| 51260 | 191 | 51069 | 235 | 80 |
| | | | | |
| 122000 2c | 90100 | 31900 | 236 | 80 |
| 128000 1c | 90100 | 37900 | 237 | 80 |
| 108000 | 90100 | 17900 | 238 | 80 |

| | | | | |
|---|---|---|---|---|
| 109000 | 90100 | 18900 | 239 | 80 |
| 122000 | 90100 | 31900 | 240 | 80 |
| 116000 | 90100 | 25900 | 241 | 80 |
| 117000 | 90100 | 26900 | 242 | 80 |
| 94400 | 90100 | 4300 | 243 | 80 |
| 111000 ML | 90100 | 20900 | 244 | 80 |
| 79.7 | 90100 | -90020.3 | 244 | 81 |
| 109000 | 90100 | 18900 | 245 | 81 |
| 85500 | 90100 | -4600 | 245 | 82 |
| ND<100 U | 90100 | -90000 | 245 | 83 |
| 97570 | 90100 | 7470 | 246 | 83 |
| 51260 | 90100 | -38840 | 246 | 84 |
| | | | | |
| 128000 1c | 122000 2c | Same Date | 246 | 84 |
| 108000 | 122000 2c | -14000 | 246 | 85 |
| 109000 | 122000 2c | -13000 | 246 | 86 |
| 122000 | 122000 2c | 0 | 246 | 86 |
| 116000 | 122000 2c | -6000 | 246 | 87 |
| 117000 | 122000 2c | -5000 | 246 | 88 |
| 94400 | 122000 2c | -27600 | 246 | 89 |
| 111000 ML | 122000 2c | -11000 | 246 | 90 |
| 79.7 | 122000 2c | -121920 | 246 | 91 |
| 109000 | 122000 2c | -13000 | 246 | 92 |
| 85500 | 122000 2c | -36500 | 246 | 93 |
| ND<100 U | 122000 2c | -121900 | 246 | 94 |
| 97570 | 122000 2c | -24430 | 246 | 95 |
| 51260 | 122000 2c | -70740 | 246 | 96 |
| | | | | |
| 108000 | 128000 1c | -20000 | 246 | 97 |
| 109000 | 128000 1c | -19000 | 246 | 98 |
| 122000 | 128000 1c | -6000 | 246 | 99 |
| 116000 | 128000 1c | -12000 | 246 | 100 |
| 117000 | 128000 1c | -11000 | 246 | 101 |
| 94400 | 128000 1c | -33600 | 246 | 102 |
| 111000 ML | 128000 1c | -17000 | 246 | 103 |
| 79.7 | 128000 1c | -127920 | 246 | 104 |
| 109000 | 128000 1c | -19000 | 246 | 105 |
| 85500 | 128000 1c | -42500 | 246 | 106 |
| ND<100 U | 128000 1c | -127900 | 246 | 107 |
| 97570 | 128000 1c | -30430 | 246 | 108 |
| 51260 | 128000 1c | -76740 | 246 | 109 |
| | | | | |
| 109000 | 108000 | Same Date | 246 | 109 |
| 122000 | 108000 | 14000 | 247 | 109 |
| 116000 | 108000 | 8000 | 248 | 109 |
| 117000 | 108000 | 9000 | 249 | 109 |
| 94400 | 108000 | -13600 | 249 | 110 |
| 111000 ML | 108000 | 3000 | 250 | 110 |
| 79.7 | 108000 | -107920 | 250 | 111 |
| 109000 | 108000 | 1000 | 251 | 111 |
| 85500 | 108000 | -22500 | 251 | 112 |
| ND<100 U | 108000 | -107900 | 251 | 113 |
| 97570 | 108000 | -10430 | 251 | 114 |
| 51260 | 108000 | -56740 | 251 | 115 |
| | | | | |
| 122000 | 109000 | 13000 | 252 | 115 |
| 116000 | 109000 | 7000 | 253 | 115 |

| | | | | |
|---|---|---|---|---|
| 117000 | 109000 | 8000 | 254 | 115 |
| 94400 | 109000 | -14600 | 254 | 116 |
| 111000 ML | 109000 | 2000 | 255 | 116 |
| 79.7 | 109000 | -108920 | 255 | 117 |
| 109000 | 109000 | 0 | 255 | 117 |
| 85500 | 109000 | -23500 | 255 | 118 |
| ND<100 U | 109000 | -108900 | 255 | 119 |
| 97570 | 109000 | -11430 | 255 | 120 |
| 51260 | 109000 | -57740 | 255 | 121 |
| | | | | |
| 116000 | 122000 | -6000 | 255 | 122 |
| 117000 | 122000 | -5000 | 255 | 123 |
| 94400 | 122000 | -27600 | 255 | 124 |
| 111000 ML | 122000 | -11000 | 255 | 125 |
| 79.7 | 122000 | -121920 | 255 | 126 |
| 109000 | 122000 | -13000 | 255 | 127 |
| 85500 | 122000 | -36500 | 255 | 128 |
| ND<100 U | 122000 | -121900 | 255 | 129 |
| 97570 | 122000 | -24430 | 255 | 130 |
| 51260 | 122000 | -70740 | 255 | 131 |
| | | | | |
| 117000 | 116000 | 1000 | 256 | 131 |
| 94400 | 116000 | -21600 | 256 | 132 |
| 111000 ML | 116000 | -5000 | 256 | 133 |
| 79.7 | 116000 | -115920 | 256 | 134 |
| 109000 | 116000 | -7000 | 256 | 135 |
| 85500 | 116000 | -30500 | 256 | 136 |
| ND<100 U | 116000 | -115900 | 256 | 137 |
| 97570 | 116000 | -18430 | 256 | 138 |
| 51260 | 116000 | -64740 | 256 | 139 |
| | | | | |
| 94400 | 117000 | -22600 | 256 | 140 |
| 111000 ML | 117000 | -6000 | 256 | 141 |
| 79.7 | 117000 | -116920 | 256 | 142 |
| 109000 | 117000 | -8000 | 256 | 143 |
| 85500 | 117000 | -31500 | 256 | 144 |
| ND<100 U | 117000 | -116900 | 256 | 145 |
| 97570 | 117000 | -19430 | 256 | 146 |
| 51260 | 117000 | -65740 | 256 | 147 |
| | | | | |
| 111000 ML | 94400 | 16600 | 257 | 147 |
| 79.7 | 94400 | -94320.3 | 257 | 148 |
| 109000 | 94400 | 14600 | 258 | 148 |
| 85500 | 94400 | -8900 | 258 | 149 |
| ND<100 U | 94400 | -94300 | 258 | 150 |
| 97570 | 94400 | 3170 | 259 | 150 |
| 51260 | 94400 | -43140 | 259 | 151 |
| | | | | |
| 79.7 | 111000 ML | -110920 | 259 | 152 |
| 109000 | 111000 ML | -2000 | 259 | 153 |
| 85500 | 111000 ML | -25500 | 259 | 154 |
| ND<100 U | 111000 ML | -110900 | 259 | 155 |
| 97570 | 111000 ML | -13430 | 259 | 156 |
| 51260 | 111000 ML | -59740 | 259 | 157 |
| | | | | |
| 109000 | 79.7 | 108920 | 260 | 157 |
| 85500 | 79.7 | 85420.3 | 261 | 157 |

| | | | | |
|---|---|---|---|---|
| ND<100 U | 79.7 | 20.3 | 262 | 157 |
| 97570 | 79.7 | 97490.3 | 263 | 157 |
| 51260 | 79.7 | 51180.3 | 264 | 157 |
| | | | | |
| 85500 | 109000 | -23500 | 264 | 158 |
| ND<100 U | 109000 | -108900 | 264 | 159 |
| 97570 | 109000 | -11430 | 264 | 160 |
| 51260 | 109000 | -57740 | 264 | 161 |
| | | | | |
| ND<100 U | 85500 | -85400 | 264 | 162 |
| 97570 | 85500 | 12070 | 265 | 162 |
| 51260 | 85500 | -34240 | 265 | 163 |
| | | | | |
| 97570 | ND<100 U | 97470 | 266 | 163 |
| 51260 | ND<100 U | 51160 | 267 | 163 |
| | | | | |
| 51260 | 97570 | -46310 | 267 | 164 |

S Statistic = 267 - 164 = 103

| Tied Group | Value | Members |
|---|---|---|
| 1 | 122000 | 2 |
| 2 | 109000 | 2 |

| Time Period | Observations |
|---|---|
| 2/1/2017 | 1 |
| 3/1/2017 | 1 |
| 4/1/2017 | 1 |
| 5/1/2017 | 1 |
| 6/1/2017 | 1 |
| 7/1/2017 | 1 |
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |

There are 2 time periods with multiple data

A = 36

B = 36
C = 0
D = 0
E = 4
F = 4
a = 56550
b = 219240
c = 1740
Group Variance = 3137.68
Z-Score = 1.82094
Comparison Level at 95% confidence level = 1.65463 (upward trend)
**1.82094 > 1.65463 indicating an upward trend**

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RW07-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 1210 | 944 | 266 | 1 | 0 |
| 364 | 944 | -580 | 1 | 1 |
| 298 | 944 | -646 | 1 | 2 |
| 432 | 944 | -512 | 1 | 3 |
| 45.7 | 944 | -898.3 | 1 | 4 |
| 62.7 | 944 | -881.3 | 1 | 5 |
| 2840 | 944 | 1896 | 2 | 5 |
| 23.4 | 944 | -920.6 | 2 | 6 |
| 1650 | 944 | 706 | 3 | 6 |
| 39.8 | 944 | -904.2 | 3 | 7 |
| 70.6 | 944 | -873.4 | 3 | 8 |
| 756 | 944 | -188 | 3 | 9 |
| 26300 | 944 | 25356 | 4 | 9 |
| 12200 | 944 | 11256 | 5 | 9 |
| 24800 | 944 | 23856 | 6 | 9 |
| 24200 | 944 | 23256 | 7 | 9 |
| 132000 | 944 | 131056 | 8 | 9 |
| 136000 | 944 | 135056 | 9 | 9 |
| 48300 | 944 | 47356 | 10 | 9 |
| 16600 | 944 | 15656 | 11 | 9 |
| 39000 | 944 | 38056 | 12 | 9 |
| 400 | 944 | -544 | 12 | 10 |
| 53900 | 944 | 52956 | 13 | 10 |
| 65300 | 944 | 64356 | 14 | 10 |
| 47770 | 944 | 46826 | 15 | 10 |
| 307.2 | 944 | -636.8 | 15 | 11 |
| 50180 | 944 | 49236 | 16 | 11 |
| 499.8 | 944 | -444.2 | 16 | 12 |
| 8125 | 944 | 7181 | 17 | 12 |
| | | | | |
| 364 | 1210 | -846 | 17 | 13 |
| 298 | 1210 | -912 | 17 | 14 |
| 432 | 1210 | -778 | 17 | 15 |
| 45.7 | 1210 | -1164.3 | 17 | 16 |
| 62.7 | 1210 | -1147.3 | 17 | 17 |
| 2840 | 1210 | 1630 | 18 | 17 |
| 23.4 | 1210 | -1186.6 | 18 | 18 |
| 1650 | 1210 | 440 | 19 | 18 |
| 39.8 | 1210 | -1170.2 | 19 | 19 |
| 70.6 | 1210 | -1139.4 | 19 | 20 |
| 756 | 1210 | -454 | 19 | 21 |
| 26300 | 1210 | 25090 | 20 | 21 |
| 12200 | 1210 | 10990 | 21 | 21 |
| 24800 | 1210 | 23590 | 22 | 21 |
| 24200 | 1210 | 22990 | 23 | 21 |
| 132000 | 1210 | 130790 | 24 | 21 |
| 136000 | 1210 | 134790 | 25 | 21 |

| | | | | |
|---|---|---|---|---|
| 48300 | 1210 | 47090 | 26 | 21 |
| 16600 | 1210 | 15390 | 27 | 21 |
| 39000 | 1210 | 37790 | 28 | 21 |
| 400 | 1210 | -810 | 28 | 22 |
| 53900 | 1210 | 52690 | 29 | 22 |
| 65300 | 1210 | 64090 | 30 | 22 |
| 47770 | 1210 | 46560 | 31 | 22 |
| 307.2 | 1210 | -902.8 | 31 | 23 |
| 50180 | 1210 | 48970 | 32 | 23 |
| 499.8 | 1210 | -710.2 | 32 | 24 |
| 8125 | 1210 | 6915 | 33 | 24 |
| | | | | |
| 298 | 364 | -66 | 33 | 25 |
| 432 | 364 | 68 | 34 | 25 |
| 45.7 | 364 | -318.3 | 34 | 26 |
| 62.7 | 364 | -301.3 | 34 | 27 |
| 2840 | 364 | 2476 | 35 | 27 |
| 23.4 | 364 | -340.6 | 35 | 28 |
| 1650 | 364 | 1286 | 36 | 28 |
| 39.8 | 364 | -324.2 | 36 | 29 |
| 70.6 | 364 | -293.4 | 36 | 30 |
| 756 | 364 | 392 | 37 | 30 |
| 26300 | 364 | 25936 | 38 | 30 |
| 12200 | 364 | 11836 | 39 | 30 |
| 24800 | 364 | 24436 | 40 | 30 |
| 24200 | 364 | 23836 | 41 | 30 |
| 132000 | 364 | 131636 | 42 | 30 |
| 136000 | 364 | 135636 | 43 | 30 |
| 48300 | 364 | 47936 | 44 | 30 |
| 16600 | 364 | 16236 | 45 | 30 |
| 39000 | 364 | 38636 | 46 | 30 |
| 400 | 364 | 36 | 47 | 30 |
| 53900 | 364 | 53536 | 48 | 30 |
| 65300 | 364 | 64936 | 49 | 30 |
| 47770 | 364 | 47406 | 50 | 30 |
| 307.2 | 364 | -56.8 | 50 | 31 |
| 50180 | 364 | 49816 | 51 | 31 |
| 499.8 | 364 | 135.8 | 52 | 31 |
| 8125 | 364 | 7761 | 53 | 31 |
| | | | | |
| 432 | 298 | 134 | 54 | 31 |
| 45.7 | 298 | -252.3 | 54 | 32 |
| 62.7 | 298 | -235.3 | 54 | 33 |
| 2840 | 298 | 2542 | 55 | 33 |
| 23.4 | 298 | -274.6 | 55 | 34 |
| 1650 | 298 | 1352 | 56 | 34 |
| 39.8 | 298 | -258.2 | 56 | 35 |
| 70.6 | 298 | -227.4 | 56 | 36 |
| 756 | 298 | 458 | 57 | 36 |
| 26300 | 298 | 26002 | 58 | 36 |
| 12200 | 298 | 11902 | 59 | 36 |
| 24800 | 298 | 24502 | 60 | 36 |
| 24200 | 298 | 23902 | 61 | 36 |
| 132000 | 298 | 131702 | 62 | 36 |
| 136000 | 298 | 135702 | 63 | 36 |
| 48300 | 298 | 48002 | 64 | 36 |
| 16600 | 298 | 16302 | 65 | 36 |

| | | | | |
|---|---|---|---|---|
| 39000 | 298 | 38702 | 66 | 36 |
| 400 | 298 | 102 | 67 | 36 |
| 53900 | 298 | 53602 | 68 | 36 |
| 65300 | 298 | 65002 | 69 | 36 |
| 47770 | 298 | 47472 | 70 | 36 |
| 307.2 | 298 | 9.2 | 71 | 36 |
| 50180 | 298 | 49882 | 72 | 36 |
| 499.8 | 298 | 201.8 | 73 | 36 |
| 8125 | 298 | 7827 | 74 | 36 |
| | | | | |
| 45.7 | 432 | -386.3 | 74 | 37 |
| 62.7 | 432 | -369.3 | 74 | 38 |
| 2840 | 432 | 2408 | 75 | 38 |
| 23.4 | 432 | -408.6 | 75 | 39 |
| 1650 | 432 | 1218 | 76 | 39 |
| 39.8 | 432 | -392.2 | 76 | 40 |
| 70.6 | 432 | -361.4 | 76 | 41 |
| 756 | 432 | 324 | 77 | 41 |
| 26300 | 432 | 25868 | 78 | 41 |
| 12200 | 432 | 11768 | 79 | 41 |
| 24800 | 432 | 24368 | 80 | 41 |
| 24200 | 432 | 23768 | 81 | 41 |
| 132000 | 432 | 131568 | 82 | 41 |
| 136000 | 432 | 135568 | 83 | 41 |
| 48300 | 432 | 47868 | 84 | 41 |
| 16600 | 432 | 16168 | 85 | 41 |
| 39000 | 432 | 38568 | 86 | 41 |
| 400 | 432 | -32 | 86 | 42 |
| 53900 | 432 | 53468 | 87 | 42 |
| 65300 | 432 | 64868 | 88 | 42 |
| 47770 | 432 | 47338 | 89 | 42 |
| 307.2 | 432 | -124.8 | 89 | 43 |
| 50180 | 432 | 49748 | 90 | 43 |
| 499.8 | 432 | 67.8 | 91 | 43 |
| 8125 | 432 | 7693 | 92 | 43 |
| | | | | |
| 62.7 | 45.7 | 17 | 93 | 43 |
| 2840 | 45.7 | 2794.3 | 94 | 43 |
| 23.4 | 45.7 | -22.3 | 94 | 44 |
| 1650 | 45.7 | 1604.3 | 95 | 44 |
| 39.8 | 45.7 | -5.9 | 95 | 45 |
| 70.6 | 45.7 | 24.9 | 96 | 45 |
| 756 | 45.7 | 710.3 | 97 | 45 |
| 26300 | 45.7 | 26254.3 | 98 | 45 |
| 12200 | 45.7 | 12154.3 | 99 | 45 |
| 24800 | 45.7 | 24754.3 | 100 | 45 |
| 24200 | 45.7 | 24154.3 | 101 | 45 |
| 132000 | 45.7 | 131954 | 102 | 45 |
| 136000 | 45.7 | 135954 | 103 | 45 |
| 48300 | 45.7 | 48254.3 | 104 | 45 |
| 16600 | 45.7 | 16554.3 | 105 | 45 |
| 39000 | 45.7 | 38954.3 | 106 | 45 |
| 400 | 45.7 | 354.3 | 107 | 45 |
| 53900 | 45.7 | 53854.3 | 108 | 45 |
| 65300 | 45.7 | 65254.3 | 109 | 45 |
| 47770 | 45.7 | 47724.3 | 110 | 45 |
| 307.2 | 45.7 | 261.5 | 111 | 45 |

| | | | | |
|---|---|---|---|---|
| 50180 | 45.7 | 50134.3 | 112 | 45 |
| 499.8 | 45.7 | 454.1 | 113 | 45 |
| 8125 | 45.7 | 8079.3 | 114 | 45 |
| | | | | |
| 2840 | 62.7 | 2777.3 | 115 | 45 |
| 23.4 | 62.7 | -39.3 | 115 | 46 |
| 1650 | 62.7 | 1587.3 | 116 | 46 |
| 39.8 | 62.7 | -22.9 | 116 | 47 |
| 70.6 | 62.7 | 7.9 | 117 | 47 |
| 756 | 62.7 | 693.3 | 118 | 47 |
| 26300 | 62.7 | 26237.3 | 119 | 47 |
| 12200 | 62.7 | 12137.3 | 120 | 47 |
| 24800 | 62.7 | 24737.3 | 121 | 47 |
| 24200 | 62.7 | 24137.3 | 122 | 47 |
| 132000 | 62.7 | 131937 | 123 | 47 |
| 136000 | 62.7 | 135937 | 124 | 47 |
| 48300 | 62.7 | 48237.3 | 125 | 47 |
| 16600 | 62.7 | 16537.3 | 126 | 47 |
| 39000 | 62.7 | 38937.3 | 127 | 47 |
| 400 | 62.7 | 337.3 | 128 | 47 |
| 53900 | 62.7 | 53837.3 | 129 | 47 |
| 65300 | 62.7 | 65237.3 | 130 | 47 |
| 47770 | 62.7 | 47707.3 | 131 | 47 |
| 307.2 | 62.7 | 244.5 | 132 | 47 |
| 50180 | 62.7 | 50117.3 | 133 | 47 |
| 499.8 | 62.7 | 437.1 | 134 | 47 |
| 8125 | 62.7 | 8062.3 | 135 | 47 |
| | | | | |
| 23.4 | 2840 | -2816.6 | 135 | 48 |
| 1650 | 2840 | -1190 | 135 | 49 |
| 39.8 | 2840 | -2800.2 | 135 | 50 |
| 70.6 | 2840 | -2769.4 | 135 | 51 |
| 756 | 2840 | -2084 | 135 | 52 |
| 26300 | 2840 | 23460 | 136 | 52 |
| 12200 | 2840 | 9360 | 137 | 52 |
| 24800 | 2840 | 21960 | 138 | 52 |
| 24200 | 2840 | 21360 | 139 | 52 |
| 132000 | 2840 | 129160 | 140 | 52 |
| 136000 | 2840 | 133160 | 141 | 52 |
| 48300 | 2840 | 45460 | 142 | 52 |
| 16600 | 2840 | 13760 | 143 | 52 |
| 39000 | 2840 | 36160 | 144 | 52 |
| 400 | 2840 | -2440 | 144 | 53 |
| 53900 | 2840 | 51060 | 145 | 53 |
| 65300 | 2840 | 62460 | 146 | 53 |
| 47770 | 2840 | 44930 | 147 | 53 |
| 307.2 | 2840 | -2532.8 | 147 | 54 |
| 50180 | 2840 | 47340 | 148 | 54 |
| 499.8 | 2840 | -2340.2 | 148 | 55 |
| 8125 | 2840 | 5285 | 149 | 55 |
| | | | | |
| 1650 | 23.4 | 1626.6 | 150 | 55 |
| 39.8 | 23.4 | 16.4 | 151 | 55 |
| 70.6 | 23.4 | 47.2 | 152 | 55 |
| 756 | 23.4 | 732.6 | 153 | 55 |
| 26300 | 23.4 | 26276.6 | 154 | 55 |
| 12200 | 23.4 | 12176.6 | 155 | 55 |

| | | | | |
|---|---|---|---|---|
| 24800 | 23.4 | 24776.6 | 156 | 55 |
| 24200 | 23.4 | 24176.6 | 157 | 55 |
| 132000 | 23.4 | 131977 | 158 | 55 |
| 136000 | 23.4 | 135977 | 159 | 55 |
| 48300 | 23.4 | 48276.6 | 160 | 55 |
| 16600 | 23.4 | 16576.6 | 161 | 55 |
| 39000 | 23.4 | 38976.6 | 162 | 55 |
| 400 | 23.4 | 376.6 | 163 | 55 |
| 53900 | 23.4 | 53876.6 | 164 | 55 |
| 65300 | 23.4 | 65276.6 | 165 | 55 |
| 47770 | 23.4 | 47746.6 | 166 | 55 |
| 307.2 | 23.4 | 283.8 | 167 | 55 |
| 50180 | 23.4 | 50156.6 | 168 | 55 |
| 499.8 | 23.4 | 476.4 | 169 | 55 |
| 8125 | 23.4 | 8101.6 | 170 | 55 |
| | | | | |
| 39.8 | 1650 | -1610.2 | 170 | 56 |
| 70.6 | 1650 | -1579.4 | 170 | 57 |
| 756 | 1650 | -894 | 170 | 58 |
| 26300 | 1650 | 24650 | 171 | 58 |
| 12200 | 1650 | 10550 | 172 | 58 |
| 24800 | 1650 | 23150 | 173 | 58 |
| 24200 | 1650 | 22550 | 174 | 58 |
| 132000 | 1650 | 130350 | 175 | 58 |
| 136000 | 1650 | 134350 | 176 | 58 |
| 48300 | 1650 | 46650 | 177 | 58 |
| 16600 | 1650 | 14950 | 178 | 58 |
| 39000 | 1650 | 37350 | 179 | 58 |
| 400 | 1650 | -1250 | 179 | 59 |
| 53900 | 1650 | 52250 | 180 | 59 |
| 65300 | 1650 | 63650 | 181 | 59 |
| 47770 | 1650 | 46120 | 182 | 59 |
| 307.2 | 1650 | -1342.8 | 182 | 60 |
| 50180 | 1650 | 48530 | 183 | 60 |
| 499.8 | 1650 | -1150.2 | 183 | 61 |
| 8125 | 1650 | 6475 | 184 | 61 |
| | | | | |
| 70.6 | 39.8 | 30.8 | 185 | 61 |
| 756 | 39.8 | 716.2 | 186 | 61 |
| 26300 | 39.8 | 26260.2 | 187 | 61 |
| 12200 | 39.8 | 12160.2 | 188 | 61 |
| 24800 | 39.8 | 24760.2 | 189 | 61 |
| 24200 | 39.8 | 24160.2 | 190 | 61 |
| 132000 | 39.8 | 131960 | 191 | 61 |
| 136000 | 39.8 | 135960 | 192 | 61 |
| 48300 | 39.8 | 48260.2 | 193 | 61 |
| 16600 | 39.8 | 16560.2 | 194 | 61 |
| 39000 | 39.8 | 38960.2 | 195 | 61 |
| 400 | 39.8 | 360.2 | 196 | 61 |
| 53900 | 39.8 | 53860.2 | 197 | 61 |
| 65300 | 39.8 | 65260.2 | 198 | 61 |
| 47770 | 39.8 | 47730.2 | 199 | 61 |
| 307.2 | 39.8 | 267.4 | 200 | 61 |
| 50180 | 39.8 | 50140.2 | 201 | 61 |
| 499.8 | 39.8 | 460 | 202 | 61 |
| 8125 | 39.8 | 8085.2 | 203 | 61 |

| | | | | |
|---|---|---|---|---|
| 756 | 70.6 | 685.4 | 204 | 61 |
| 26300 | 70.6 | 26229.4 | 205 | 61 |
| 12200 | 70.6 | 12129.4 | 206 | 61 |
| 24800 | 70.6 | 24729.4 | 207 | 61 |
| 24200 | 70.6 | 24129.4 | 208 | 61 |
| 132000 | 70.6 | 131929 | 209 | 61 |
| 136000 | 70.6 | 135929 | 210 | 61 |
| 48300 | 70.6 | 48229.4 | 211 | 61 |
| 16600 | 70.6 | 16529.4 | 212 | 61 |
| 39000 | 70.6 | 38929.4 | 213 | 61 |
| 400 | 70.6 | 329.4 | 214 | 61 |
| 53900 | 70.6 | 53829.4 | 215 | 61 |
| 65300 | 70.6 | 65229.4 | 216 | 61 |
| 47770 | 70.6 | 47699.4 | 217 | 61 |
| 307.2 | 70.6 | 236.6 | 218 | 61 |
| 50180 | 70.6 | 50109.4 | 219 | 61 |
| 499.8 | 70.6 | 429.2 | 220 | 61 |
| 8125 | 70.6 | 8054.4 | 221 | 61 |
| | | | | |
| 26300 | 756 | 25544 | 222 | 61 |
| 12200 | 756 | 11444 | 223 | 61 |
| 24800 | 756 | 24044 | 224 | 61 |
| 24200 | 756 | 23444 | 225 | 61 |
| 132000 | 756 | 131244 | 226 | 61 |
| 136000 | 756 | 135244 | 227 | 61 |
| 48300 | 756 | 47544 | 228 | 61 |
| 16600 | 756 | 15844 | 229 | 61 |
| 39000 | 756 | 38244 | 230 | 61 |
| 400 | 756 | -356 | 230 | 62 |
| 53900 | 756 | 53144 | 231 | 62 |
| 65300 | 756 | 64544 | 232 | 62 |
| 47770 | 756 | 47014 | 233 | 62 |
| 307.2 | 756 | -448.8 | 233 | 63 |
| 50180 | 756 | 49424 | 234 | 63 |
| 499.8 | 756 | -256.2 | 234 | 64 |
| 8125 | 756 | 7369 | 235 | 64 |
| | | | | |
| 12200 | 26300 | -14100 | 235 | 65 |
| 24800 | 26300 | -1500 | 235 | 66 |
| 24200 | 26300 | -2100 | 235 | 67 |
| 132000 | 26300 | 105700 | 236 | 67 |
| 136000 | 26300 | 109700 | 237 | 67 |
| 48300 | 26300 | 22000 | 238 | 67 |
| 16600 | 26300 | -9700 | 238 | 68 |
| 39000 | 26300 | 12700 | 239 | 68 |
| 400 | 26300 | -25900 | 239 | 69 |
| 53900 | 26300 | 27600 | 240 | 69 |
| 65300 | 26300 | 39000 | 241 | 69 |
| 47770 | 26300 | 21470 | 242 | 69 |
| 307.2 | 26300 | -25992.8 | 242 | 70 |
| 50180 | 26300 | 23880 | 243 | 70 |
| 499.8 | 26300 | -25800.2 | 243 | 71 |
| 8125 | 26300 | -18175 | 243 | 72 |
| | | | | |
| 24800 | 12200 | 12600 | 244 | 72 |
| 24200 | 12200 | 12000 | 245 | 72 |
| 132000 | 12200 | 119800 | 246 | 72 |

| | | | | |
|---|---|---|---|---|
| 136000 | 12200 | 123800 | 247 | 72 |
| 48300 | 12200 | 36100 | 248 | 72 |
| 16600 | 12200 | 4400 | 249 | 72 |
| 39000 | 12200 | 26800 | 250 | 72 |
| 400 | 12200 | -11800 | 250 | 73 |
| 53900 | 12200 | 41700 | 251 | 73 |
| 65300 | 12200 | 53100 | 252 | 73 |
| 47770 | 12200 | 35570 | 253 | 73 |
| 307.2 | 12200 | -11892.8 | 253 | 74 |
| 50180 | 12200 | 37980 | 254 | 74 |
| 499.8 | 12200 | -11700.2 | 254 | 75 |
| 8125 | 12200 | -4075 | 254 | 76 |
| | | | | |
| 24200 | 24800 | Same Date | 254 | 76 |
| 132000 | 24800 | 107200 | 255 | 76 |
| 136000 | 24800 | 111200 | 256 | 76 |
| 48300 | 24800 | 23500 | 257 | 76 |
| 16600 | 24800 | -8200 | 257 | 77 |
| 39000 | 24800 | 14200 | 258 | 77 |
| 400 | 24800 | -24400 | 258 | 78 |
| 53900 | 24800 | 29100 | 259 | 78 |
| 65300 | 24800 | 40500 | 260 | 78 |
| 47770 | 24800 | 22970 | 261 | 78 |
| 307.2 | 24800 | -24492.8 | 261 | 79 |
| 50180 | 24800 | 25380 | 262 | 79 |
| 499.8 | 24800 | -24300.2 | 262 | 80 |
| 8125 | 24800 | -16675 | 262 | 81 |
| | | | | |
| 132000 | 24200 | 107800 | 263 | 81 |
| 136000 | 24200 | 111800 | 264 | 81 |
| 48300 | 24200 | 24100 | 265 | 81 |
| 16600 | 24200 | -7600 | 265 | 82 |
| 39000 | 24200 | 14800 | 266 | 82 |
| 400 | 24200 | -23800 | 266 | 83 |
| 53900 | 24200 | 29700 | 267 | 83 |
| 65300 | 24200 | 41100 | 268 | 83 |
| 47770 | 24200 | 23570 | 269 | 83 |
| 307.2 | 24200 | -23892.8 | 269 | 84 |
| 50180 | 24200 | 25980 | 270 | 84 |
| 499.8 | 24200 | -23700.2 | 270 | 85 |
| 8125 | 24200 | -16075 | 270 | 86 |
| | | | | |
| 136000 | 132000 | Same Date | 270 | 86 |
| 48300 | 132000 | -83700 | 270 | 87 |
| 16600 | 132000 | -115400 | 270 | 88 |
| 39000 | 132000 | -93000 | 270 | 89 |
| 400 | 132000 | -131600 | 270 | 90 |
| 53900 | 132000 | -78100 | 270 | 91 |
| 65300 | 132000 | -66700 | 270 | 92 |
| 47770 | 132000 | -84230 | 270 | 93 |
| 307.2 | 132000 | -131693 | 270 | 94 |
| 50180 | 132000 | -81820 | 270 | 95 |
| 499.8 | 132000 | -131500 | 270 | 96 |
| 8125 | 132000 | -123875 | 270 | 97 |
| | | | | |
| 48300 | 136000 | -87700 | 270 | 98 |
| 16600 | 136000 | -119400 | 270 | 99 |

| | | | | |
|---|---|---|---|---|
| 39000 | 136000 | -97000 | 270 | 100 |
| 400 | 136000 | -135600 | 270 | 101 |
| 53900 | 136000 | -82100 | 270 | 102 |
| 65300 | 136000 | -70700 | 270 | 103 |
| 47770 | 136000 | -88230 | 270 | 104 |
| 307.2 | 136000 | -135693 | 270 | 105 |
| 50180 | 136000 | -85820 | 270 | 106 |
| 499.8 | 136000 | -135500 | 270 | 107 |
| 8125 | 136000 | -127875 | 270 | 108 |
| | | | | |
| 16600 | 48300 | -31700 | 270 | 109 |
| 39000 | 48300 | -9300 | 270 | 110 |
| 400 | 48300 | -47900 | 270 | 111 |
| 53900 | 48300 | 5600 | 271 | 111 |
| 65300 | 48300 | 17000 | 272 | 111 |
| 47770 | 48300 | -530 | 272 | 112 |
| 307.2 | 48300 | -47992.8 | 272 | 113 |
| 50180 | 48300 | 1880 | 273 | 113 |
| 499.8 | 48300 | -47800.2 | 273 | 114 |
| 8125 | 48300 | -40175 | 273 | 115 |
| | | | | |
| 39000 | 16600 | 22400 | 274 | 115 |
| 400 | 16600 | -16200 | 274 | 116 |
| 53900 | 16600 | 37300 | 275 | 116 |
| 65300 | 16600 | 48700 | 276 | 116 |
| 47770 | 16600 | 31170 | 277 | 116 |
| 307.2 | 16600 | -16292.8 | 277 | 117 |
| 50180 | 16600 | 33580 | 278 | 117 |
| 499.8 | 16600 | -16100.2 | 278 | 118 |
| 8125 | 16600 | -8475 | 278 | 119 |
| | | | | |
| 400 | 39000 | -38600 | 278 | 120 |
| 53900 | 39000 | 14900 | 279 | 120 |
| 65300 | 39000 | 26300 | 280 | 120 |
| 47770 | 39000 | 8770 | 281 | 120 |
| 307.2 | 39000 | -38692.8 | 281 | 121 |
| 50180 | 39000 | 11180 | 282 | 121 |
| 499.8 | 39000 | -38500.2 | 282 | 122 |
| 8125 | 39000 | -30875 | 282 | 123 |
| | | | | |
| 53900 | 400 | 53500 | 283 | 123 |
| 65300 | 400 | 64900 | 284 | 123 |
| 47770 | 400 | 47370 | 285 | 123 |
| 307.2 | 400 | -92.8 | 285 | 124 |
| 50180 | 400 | 49780 | 286 | 124 |
| 499.8 | 400 | 99.8 | 287 | 124 |
| 8125 | 400 | 7725 | 288 | 124 |
| | | | | |
| 65300 | 53900 | 11400 | 289 | 124 |
| 47770 | 53900 | -6130 | 289 | 125 |
| 307.2 | 53900 | -53592.8 | 289 | 126 |
| 50180 | 53900 | -3720 | 289 | 127 |
| 499.8 | 53900 | -53400.2 | 289 | 128 |
| 8125 | 53900 | -45775 | 289 | 129 |
| | | | | |
| 47770 | 65300 | -17530 | 289 | 130 |
| 307.2 | 65300 | -64992.8 | 289 | 131 |

| | | | | |
|---|---|---|---|---|
| 50180 | 65300 | -15120 | 289 | 132 |
| 499.8 | 65300 | -64800.2 | 289 | 133 |
| 8125 | 65300 | -57175 | 289 | 134 |
| | | | | |
| 307.2 | 47770 | -47462.8 | 289 | 135 |
| 50180 | 47770 | 2410 | 290 | 135 |
| 499.8 | 47770 | -47270.2 | 290 | 136 |
| 8125 | 47770 | -39645 | 290 | 137 |
| | | | | |
| 50180 | 307.2 | 49872.8 | 291 | 137 |
| 499.8 | 307.2 | 192.6 | 292 | 137 |
| 8125 | 307.2 | 7817.8 | 293 | 137 |
| | | | | |
| 499.8 | 50180 | -49680.2 | 293 | 138 |
| 8125 | 50180 | -42055 | 293 | 139 |
| | | | | |
| 8125 | 499.8 | 7625.2 | 294 | 139 |

S Statistic = 294 - 139 = 155

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 2/1/2017 | 1 |
| 3/1/2017 | 1 |
| 4/1/2017 | 1 |
| 5/1/2017 | 1 |
| 6/1/2017 | 1 |
| 7/1/2017 | 1 |
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 2 time periods with multiple data

A = 0
B = 36
C = 0

D = 0
E = 0
F = 4
a = 56550
b = 219240
c = 1740
Group Variance = 3139.67
Z-Score = 2.74839
Comparison Level at 95% confidence level = 1.65463 (upward trend)
**2.74839 > 1.65463 indicating an upward trend**

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RW08-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 44.6 | 178 | -133.4 | 0 | 1 |
| 85 | 178 | -93 | 0 | 2 |
| 188 | 178 | 10 | 1 | 2 |
| 71.9 | 178 | -106.1 | 1 | 3 |
| 153 | 178 | -25 | 1 | 4 |
| 49.8 | 178 | -128.2 | 1 | 5 |
| 69.4 | 178 | -108.6 | 1 | 6 |
| 16.9 | 178 | -161.1 | 1 | 7 |
| 21.5 | 178 | -156.5 | 1 | 8 |
| 21.4 | 178 | -156.6 | 1 | 9 |
| 108 | 178 | -70 | 1 | 10 |
| 1050 | 178 | 872 | 2 | 10 |
| 2540 | 178 | 2362 | 3 | 10 |
| 256 | 178 | 78 | 4 | 10 |
| ND<5 U2c | 178 | -173 | 4 | 11 |
| 112 1c | 178 | -66 | 4 | 12 |
| ND<5 U | 178 | -173 | 4 | 13 |
| 43.9 | 178 | -134.1 | 4 | 14 |
| 11.2 B | 178 | -166.8 | 4 | 15 |
| 48.9 | 178 | -129.1 | 4 | 16 |
| 33.4 | 178 | -144.6 | 4 | 17 |
| 4.5 J | 178 | -173.5 | 4 | 18 |
| 5.4 J1c | 178 | -172.6 | 4 | 19 |
| 28.3 | 178 | -149.7 | 4 | 20 |
| 2.6 JB | 178 | -175.4 | 4 | 21 |
| ND<10 U | 178 | -168 | 4 | 22 |
| ND<5 U | 178 | -173 | 4 | 23 |
| 62090 | 178 | 61912 | 5 | 23 |
| | | | | |
| 85 | 44.6 | 40.4 | 6 | 23 |
| 188 | 44.6 | 143.4 | 7 | 23 |
| 71.9 | 44.6 | 27.3 | 8 | 23 |
| 153 | 44.6 | 108.4 | 9 | 23 |
| 49.8 | 44.6 | 5.2 | 10 | 23 |
| 69.4 | 44.6 | 24.8 | 11 | 23 |
| 16.9 | 44.6 | -27.7 | 11 | 24 |
| 21.5 | 44.6 | -23.1 | 11 | 25 |
| 21.4 | 44.6 | -23.2 | 11 | 26 |
| 108 | 44.6 | 63.4 | 12 | 26 |
| 1050 | 44.6 | 1005.4 | 13 | 26 |
| 2540 | 44.6 | 2495.4 | 14 | 26 |
| 256 | 44.6 | 211.4 | 15 | 26 |
| ND<5 U2c | 44.6 | -39.6 | 15 | 27 |
| 112 1c | 44.6 | 67.4 | 16 | 27 |
| ND<5 U | 44.6 | -39.6 | 16 | 28 |
| 43.9 | 44.6 | -0.7 | 16 | 29 |
| 11.2 B | 44.6 | -33.4 | 16 | 30 |

| | | | | |
|---|---|---|---|---|
| 48.9 | 44.6 | 4.3 | 17 | 30 |
| 33.4 | 44.6 | -11.2 | 17 | 31 |
| 4.5 J | 44.6 | -40.1 | 17 | 32 |
| 5.4 J1c | 44.6 | -39.2 | 17 | 33 |
| 28.3 | 44.6 | -16.3 | 17 | 34 |
| 2.6 JB | 44.6 | -42 | 17 | 35 |
| ND<10 U | 44.6 | -34.6 | 17 | 36 |
| ND<5 U | 44.6 | -39.6 | 17 | 37 |
| 62090 | 44.6 | 62045.4 | 18 | 37 |
| | | | | |
| 188 | 85 | 103 | 19 | 37 |
| 71.9 | 85 | -13.1 | 19 | 38 |
| 153 | 85 | 68 | 20 | 38 |
| 49.8 | 85 | -35.2 | 20 | 39 |
| 69.4 | 85 | -15.6 | 20 | 40 |
| 16.9 | 85 | -68.1 | 20 | 41 |
| 21.5 | 85 | -63.5 | 20 | 42 |
| 21.4 | 85 | -63.6 | 20 | 43 |
| 108 | 85 | 23 | 21 | 43 |
| 1050 | 85 | 965 | 22 | 43 |
| 2540 | 85 | 2455 | 23 | 43 |
| 256 | 85 | 171 | 24 | 43 |
| ND<5 U2c | 85 | -80 | 24 | 44 |
| 112 1c | 85 | 27 | 25 | 44 |
| ND<5 U | 85 | -80 | 25 | 45 |
| 43.9 | 85 | -41.1 | 25 | 46 |
| 11.2 B | 85 | -73.8 | 25 | 47 |
| 48.9 | 85 | -36.1 | 25 | 48 |
| 33.4 | 85 | -51.6 | 25 | 49 |
| 4.5 J | 85 | -80.5 | 25 | 50 |
| 5.4 J1c | 85 | -79.6 | 25 | 51 |
| 28.3 | 85 | -56.7 | 25 | 52 |
| 2.6 JB | 85 | -82.4 | 25 | 53 |
| ND<10 U | 85 | -75 | 25 | 54 |
| ND<5 U | 85 | -80 | 25 | 55 |
| 62090 | 85 | 62005 | 26 | 55 |
| | | | | |
| 71.9 | 188 | -116.1 | 26 | 56 |
| 153 | 188 | -35 | 26 | 57 |
| 49.8 | 188 | -138.2 | 26 | 58 |
| 69.4 | 188 | -118.6 | 26 | 59 |
| 16.9 | 188 | -171.1 | 26 | 60 |
| 21.5 | 188 | -166.5 | 26 | 61 |
| 21.4 | 188 | -166.6 | 26 | 62 |
| 108 | 188 | -80 | 26 | 63 |
| 1050 | 188 | 862 | 27 | 63 |
| 2540 | 188 | 2352 | 28 | 63 |
| 256 | 188 | 68 | 29 | 63 |
| ND<5 U2c | 188 | -183 | 29 | 64 |
| 112 1c | 188 | -76 | 29 | 65 |
| ND<5 U | 188 | -183 | 29 | 66 |
| 43.9 | 188 | -144.1 | 29 | 67 |
| 11.2 B | 188 | -176.8 | 29 | 68 |
| 48.9 | 188 | -139.1 | 29 | 69 |
| 33.4 | 188 | -154.6 | 29 | 70 |
| 4.5 J | 188 | -183.5 | 29 | 71 |
| 5.4 J1c | 188 | -182.6 | 29 | 72 |

| | | | | |
|---|---|---|---|---|
| 28.3 | 188 | -159.7 | 29 | 73 |
| 2.6 JB | 188 | -185.4 | 29 | 74 |
| ND<10 U | 188 | -178 | 29 | 75 |
| ND<5 U | 188 | -183 | 29 | 76 |
| 62090 | 188 | 61902 | 30 | 76 |
| | | | | |
| 153 | 71.9 | 81.1 | 31 | 76 |
| 49.8 | 71.9 | -22.1 | 31 | 77 |
| 69.4 | 71.9 | -2.5 | 31 | 78 |
| 16.9 | 71.9 | -55 | 31 | 79 |
| 21.5 | 71.9 | -50.4 | 31 | 80 |
| 21.4 | 71.9 | -50.5 | 31 | 81 |
| 108 | 71.9 | 36.1 | 32 | 81 |
| 1050 | 71.9 | 978.1 | 33 | 81 |
| 2540 | 71.9 | 2468.1 | 34 | 81 |
| 256 | 71.9 | 184.1 | 35 | 81 |
| ND<5 U2c | 71.9 | -66.9 | 35 | 82 |
| 112 1c | 71.9 | 40.1 | 36 | 82 |
| ND<5 U | 71.9 | -66.9 | 36 | 83 |
| 43.9 | 71.9 | -28 | 36 | 84 |
| 11.2 B | 71.9 | -60.7 | 36 | 85 |
| 48.9 | 71.9 | -23 | 36 | 86 |
| 33.4 | 71.9 | -38.5 | 36 | 87 |
| 4.5 J | 71.9 | -67.4 | 36 | 88 |
| 5.4 J1c | 71.9 | -66.5 | 36 | 89 |
| 28.3 | 71.9 | -43.6 | 36 | 90 |
| 2.6 JB | 71.9 | -69.3 | 36 | 91 |
| ND<10 U | 71.9 | -61.9 | 36 | 92 |
| ND<5 U | 71.9 | -66.9 | 36 | 93 |
| 62090 | 71.9 | 62018.1 | 37 | 93 |
| | | | | |
| 49.8 | 153 | -103.2 | 37 | 94 |
| 69.4 | 153 | -83.6 | 37 | 95 |
| 16.9 | 153 | -136.1 | 37 | 96 |
| 21.5 | 153 | -131.5 | 37 | 97 |
| 21.4 | 153 | -131.6 | 37 | 98 |
| 108 | 153 | -45 | 37 | 99 |
| 1050 | 153 | 897 | 38 | 99 |
| 2540 | 153 | 2387 | 39 | 99 |
| 256 | 153 | 103 | 40 | 99 |
| ND<5 U2c | 153 | -148 | 40 | 100 |
| 112 1c | 153 | -41 | 40 | 101 |
| ND<5 U | 153 | -148 | 40 | 102 |
| 43.9 | 153 | -109.1 | 40 | 103 |
| 11.2 B | 153 | -141.8 | 40 | 104 |
| 48.9 | 153 | -104.1 | 40 | 105 |
| 33.4 | 153 | -119.6 | 40 | 106 |
| 4.5 J | 153 | -148.5 | 40 | 107 |
| 5.4 J1c | 153 | -147.6 | 40 | 108 |
| 28.3 | 153 | -124.7 | 40 | 109 |
| 2.6 JB | 153 | -150.4 | 40 | 110 |
| ND<10 U | 153 | -143 | 40 | 111 |
| ND<5 U | 153 | -148 | 40 | 112 |
| 62090 | 153 | 61937 | 41 | 112 |
| | | | | |
| 69.4 | 49.8 | 19.6 | 42 | 112 |
| 16.9 | 49.8 | -32.9 | 42 | 113 |

| | | | | |
|---|---|---|---|---|
| 21.5 | 49.8 | -28.3 | 42 | 114 |
| 21.4 | 49.8 | -28.4 | 42 | 115 |
| 108 | 49.8 | 58.2 | 43 | 115 |
| 1050 | 49.8 | 1000.2 | 44 | 115 |
| 2540 | 49.8 | 2490.2 | 45 | 115 |
| 256 | 49.8 | 206.2 | 46 | 115 |
| ND<5 U2c | 49.8 | -44.8 | 46 | 116 |
| 112 1c | 49.8 | 62.2 | 47 | 116 |
| ND<5 U | 49.8 | -44.8 | 47 | 117 |
| 43.9 | 49.8 | -5.9 | 47 | 118 |
| 11.2 B | 49.8 | -38.6 | 47 | 119 |
| 48.9 | 49.8 | -0.9 | 47 | 120 |
| 33.4 | 49.8 | -16.4 | 47 | 121 |
| 4.5 J | 49.8 | -45.3 | 47 | 122 |
| 5.4 J1c | 49.8 | -44.4 | 47 | 123 |
| 28.3 | 49.8 | -21.5 | 47 | 124 |
| 2.6 JB | 49.8 | -47.2 | 47 | 125 |
| ND<10 U | 49.8 | -39.8 | 47 | 126 |
| ND<5 U | 49.8 | -44.8 | 47 | 127 |
| 62090 | 49.8 | 62040.2 | 48 | 127 |
| | | | | |
| 16.9 | 69.4 | -52.5 | 48 | 128 |
| 21.5 | 69.4 | -47.9 | 48 | 129 |
| 21.4 | 69.4 | -48 | 48 | 130 |
| 108 | 69.4 | 38.6 | 49 | 130 |
| 1050 | 69.4 | 980.6 | 50 | 130 |
| 2540 | 69.4 | 2470.6 | 51 | 130 |
| 256 | 69.4 | 186.6 | 52 | 130 |
| ND<5 U2c | 69.4 | -64.4 | 52 | 131 |
| 112 1c | 69.4 | 42.6 | 53 | 131 |
| ND<5 U | 69.4 | -64.4 | 53 | 132 |
| 43.9 | 69.4 | -25.5 | 53 | 133 |
| 11.2 B | 69.4 | -58.2 | 53 | 134 |
| 48.9 | 69.4 | -20.5 | 53 | 135 |
| 33.4 | 69.4 | -36 | 53 | 136 |
| 4.5 J | 69.4 | -64.9 | 53 | 137 |
| 5.4 J1c | 69.4 | -64 | 53 | 138 |
| 28.3 | 69.4 | -41.1 | 53 | 139 |
| 2.6 JB | 69.4 | -66.8 | 53 | 140 |
| ND<10 U | 69.4 | -59.4 | 53 | 141 |
| ND<5 U | 69.4 | -64.4 | 53 | 142 |
| 62090 | 69.4 | 62020.6 | 54 | 142 |
| | | | | |
| 21.5 | 16.9 | 4.6 | 55 | 142 |
| 21.4 | 16.9 | 4.5 | 56 | 142 |
| 108 | 16.9 | 91.1 | 57 | 142 |
| 1050 | 16.9 | 1033.1 | 58 | 142 |
| 2540 | 16.9 | 2523.1 | 59 | 142 |
| 256 | 16.9 | 239.1 | 60 | 142 |
| ND<5 U2c | 16.9 | -11.9 | 60 | 143 |
| 112 1c | 16.9 | 95.1 | 61 | 143 |
| ND<5 U | 16.9 | -11.9 | 61 | 144 |
| 43.9 | 16.9 | 27 | 62 | 144 |
| 11.2 B | 16.9 | -5.7 | 62 | 145 |
| 48.9 | 16.9 | 32 | 63 | 145 |
| 33.4 | 16.9 | 16.5 | 64 | 145 |
| 4.5 J | 16.9 | -12.4 | 64 | 146 |

| | | | | |
|---|---|---|---|---|
| 5.4 J1c | 16.9 | -11.5 | 64 | 147 |
| 28.3 | 16.9 | 11.4 | 65 | 147 |
| 2.6 JB | 16.9 | -14.3 | 65 | 148 |
| ND<10 U | 16.9 | -6.9 | 65 | 149 |
| ND<5 U | 16.9 | -11.9 | 65 | 150 |
| 62090 | 16.9 | 62073.1 | 66 | 150 |
| | | | | |
| 21.4 | 21.5 | -0.1 | 66 | 151 |
| 108 | 21.5 | 86.5 | 67 | 151 |
| 1050 | 21.5 | 1028.5 | 68 | 151 |
| 2540 | 21.5 | 2518.5 | 69 | 151 |
| 256 | 21.5 | 234.5 | 70 | 151 |
| ND<5 U2c | 21.5 | -16.5 | 70 | 152 |
| 112 1c | 21.5 | 90.5 | 71 | 152 |
| ND<5 U | 21.5 | -16.5 | 71 | 153 |
| 43.9 | 21.5 | 22.4 | 72 | 153 |
| 11.2 B | 21.5 | -10.3 | 72 | 154 |
| 48.9 | 21.5 | 27.4 | 73 | 154 |
| 33.4 | 21.5 | 11.9 | 74 | 154 |
| 4.5 J | 21.5 | -17 | 74 | 155 |
| 5.4 J1c | 21.5 | -16.1 | 74 | 156 |
| 28.3 | 21.5 | 6.8 | 75 | 156 |
| 2.6 JB | 21.5 | -18.9 | 75 | 157 |
| ND<10 U | 21.5 | -11.5 | 75 | 158 |
| ND<5 U | 21.5 | -16.5 | 75 | 159 |
| 62090 | 21.5 | 62068.5 | 76 | 159 |
| | | | | |
| 108 | 21.4 | 86.6 | 77 | 159 |
| 1050 | 21.4 | 1028.6 | 78 | 159 |
| 2540 | 21.4 | 2518.6 | 79 | 159 |
| 256 | 21.4 | 234.6 | 80 | 159 |
| ND<5 U2c | 21.4 | -16.4 | 80 | 160 |
| 112 1c | 21.4 | 90.6 | 81 | 160 |
| ND<5 U | 21.4 | -16.4 | 81 | 161 |
| 43.9 | 21.4 | 22.5 | 82 | 161 |
| 11.2 B | 21.4 | -10.2 | 82 | 162 |
| 48.9 | 21.4 | 27.5 | 83 | 162 |
| 33.4 | 21.4 | 12 | 84 | 162 |
| 4.5 J | 21.4 | -16.9 | 84 | 163 |
| 5.4 J1c | 21.4 | -16 | 84 | 164 |
| 28.3 | 21.4 | 6.9 | 85 | 164 |
| 2.6 JB | 21.4 | -18.8 | 85 | 165 |
| ND<10 U | 21.4 | -11.4 | 85 | 166 |
| ND<5 U | 21.4 | -16.4 | 85 | 167 |
| 62090 | 21.4 | 62068.6 | 86 | 167 |
| | | | | |
| 1050 | 108 | 942 | 87 | 167 |
| 2540 | 108 | 2432 | 88 | 167 |
| 256 | 108 | 148 | 89 | 167 |
| ND<5 U2c | 108 | -103 | 89 | 168 |
| 112 1c | 108 | 4 | 90 | 168 |
| ND<5 U | 108 | -103 | 90 | 169 |
| 43.9 | 108 | -64.1 | 90 | 170 |
| 11.2 B | 108 | -96.8 | 90 | 171 |
| 48.9 | 108 | -59.1 | 90 | 172 |
| 33.4 | 108 | -74.6 | 90 | 173 |
| 4.5 J | 108 | -103.5 | 90 | 174 |

| | | | | |
|---|---|---|---|---|
| 5.4 J1c | 108 | -102.6 | 90 | 175 |
| 28.3 | 108 | -79.7 | 90 | 176 |
| 2.6 JB | 108 | -105.4 | 90 | 177 |
| ND<10 U | 108 | -98 | 90 | 178 |
| ND<5 U | 108 | -103 | 90 | 179 |
| 62090 | 108 | 61982 | 91 | 179 |
| | | | | |
| 2540 | 1050 | 1490 | 92 | 179 |
| 256 | 1050 | -794 | 92 | 180 |
| ND<5 U2c | 1050 | -1045 | 92 | 181 |
| 112 1c | 1050 | -938 | 92 | 182 |
| ND<5 U | 1050 | -1045 | 92 | 183 |
| 43.9 | 1050 | -1006.1 | 92 | 184 |
| 11.2 B | 1050 | -1038.8 | 92 | 185 |
| 48.9 | 1050 | -1001.1 | 92 | 186 |
| 33.4 | 1050 | -1016.6 | 92 | 187 |
| 4.5 J | 1050 | -1045.5 | 92 | 188 |
| 5.4 J1c | 1050 | -1044.6 | 92 | 189 |
| 28.3 | 1050 | -1021.7 | 92 | 190 |
| 2.6 JB | 1050 | -1047.4 | 92 | 191 |
| ND<10 U | 1050 | -1040 | 92 | 192 |
| ND<5 U | 1050 | -1045 | 92 | 193 |
| 62090 | 1050 | 61040 | 93 | 193 |
| | | | | |
| 256 | 2540 | -2284 | 93 | 194 |
| ND<5 U2c | 2540 | -2535 | 93 | 195 |
| 112 1c | 2540 | -2428 | 93 | 196 |
| ND<5 U | 2540 | -2535 | 93 | 197 |
| 43.9 | 2540 | -2496.1 | 93 | 198 |
| 11.2 B | 2540 | -2528.8 | 93 | 199 |
| 48.9 | 2540 | -2491.1 | 93 | 200 |
| 33.4 | 2540 | -2506.6 | 93 | 201 |
| 4.5 J | 2540 | -2535.5 | 93 | 202 |
| 5.4 J1c | 2540 | -2534.6 | 93 | 203 |
| 28.3 | 2540 | -2511.7 | 93 | 204 |
| 2.6 JB | 2540 | -2537.4 | 93 | 205 |
| ND<10 U | 2540 | -2530 | 93 | 206 |
| ND<5 U | 2540 | -2535 | 93 | 207 |
| 62090 | 2540 | 59550 | 94 | 207 |
| | | | | |
| ND<5 U2c | 256 | -251 | 94 | 208 |
| 112 1c | 256 | -144 | 94 | 209 |
| ND<5 U | 256 | -251 | 94 | 210 |
| 43.9 | 256 | -212.1 | 94 | 211 |
| 11.2 B | 256 | -244.8 | 94 | 212 |
| 48.9 | 256 | -207.1 | 94 | 213 |
| 33.4 | 256 | -222.6 | 94 | 214 |
| 4.5 J | 256 | -251.5 | 94 | 215 |
| 5.4 J1c | 256 | -250.6 | 94 | 216 |
| 28.3 | 256 | -227.7 | 94 | 217 |
| 2.6 JB | 256 | -253.4 | 94 | 218 |
| ND<10 U | 256 | -246 | 94 | 219 |
| ND<5 U | 256 | -251 | 94 | 220 |
| 62090 | 256 | 61834 | 95 | 220 |
| | | | | |
| 112 1c | ND<5 U2c | Same Date | 95 | 220 |
| ND<5 U | ND<5 U2c | 0 | 95 | 220 |

| | | | | |
|---|---|---|---|---|
| 43.9 | ND<5 U2c | 38.9 | 96 | 220 |
| 11.2 B | ND<5 U2c | 6.2 | 97 | 220 |
| 48.9 | ND<5 U2c | 43.9 | 98 | 220 |
| 33.4 | ND<5 U2c | 28.4 | 99 | 220 |
| 4.5 J | ND<5 U2c | -0.5 | 99 | 221 |
| 5.4 J1c | ND<5 U2c | 0.4 | 100 | 221 |
| 28.3 | ND<5 U2c | 23.3 | 101 | 221 |
| 2.6 JB | ND<5 U2c | -2.4 | 101 | 222 |
| ND<10 U | ND<5 U2c | 5 | 102 | 222 |
| ND<5 U | ND<5 U2c | 0 | 102 | 222 |
| 62090 | ND<5 U2c | 62085 | 103 | 222 |
| | | | | |
| ND<5 U | 112 1c | -107 | 103 | 223 |
| 43.9 | 112 1c | -68.1 | 103 | 224 |
| 11.2 B | 112 1c | -100.8 | 103 | 225 |
| 48.9 | 112 1c | -63.1 | 103 | 226 |
| 33.4 | 112 1c | -78.6 | 103 | 227 |
| 4.5 J | 112 1c | -107.5 | 103 | 228 |
| 5.4 J1c | 112 1c | -106.6 | 103 | 229 |
| 28.3 | 112 1c | -83.7 | 103 | 230 |
| 2.6 JB | 112 1c | -109.4 | 103 | 231 |
| ND<10 U | 112 1c | -102 | 103 | 232 |
| ND<5 U | 112 1c | -107 | 103 | 233 |
| 62090 | 112 1c | 61978 | 104 | 233 |
| | | | | |
| 43.9 | ND<5 U | Same Date | 104 | 233 |
| 11.2 B | ND<5 U | 6.2 | 105 | 233 |
| 48.9 | ND<5 U | 43.9 | 106 | 233 |
| 33.4 | ND<5 U | 28.4 | 107 | 233 |
| 4.5 J | ND<5 U | -0.5 | 107 | 234 |
| 5.4 J1c | ND<5 U | 0.4 | 108 | 234 |
| 28.3 | ND<5 U | 23.3 | 109 | 234 |
| 2.6 JB | ND<5 U | -2.4 | 109 | 235 |
| ND<10 U | ND<5 U | 5 | 110 | 235 |
| ND<5 U | ND<5 U | 0 | 110 | 235 |
| 62090 | ND<5 U | 62085 | 111 | 235 |
| | | | | |
| 11.2 B | 43.9 | -32.7 | 111 | 236 |
| 48.9 | 43.9 | 5 | 112 | 236 |
| 33.4 | 43.9 | -10.5 | 112 | 237 |
| 4.5 J | 43.9 | -39.4 | 112 | 238 |
| 5.4 J1c | 43.9 | -38.5 | 112 | 239 |
| 28.3 | 43.9 | -15.6 | 112 | 240 |
| 2.6 JB | 43.9 | -41.3 | 112 | 241 |
| ND<10 U | 43.9 | -33.9 | 112 | 242 |
| ND<5 U | 43.9 | -38.9 | 112 | 243 |
| 62090 | 43.9 | 62046.1 | 113 | 243 |
| | | | | |
| 48.9 | 11.2 B | 37.7 | 114 | 243 |
| 33.4 | 11.2 B | 22.2 | 115 | 243 |
| 4.5 J | 11.2 B | -6.7 | 115 | 244 |
| 5.4 J1c | 11.2 B | -5.8 | 115 | 245 |
| 28.3 | 11.2 B | 17.1 | 116 | 245 |
| 2.6 JB | 11.2 B | -8.6 | 116 | 246 |
| ND<10 U | 11.2 B | -1.2 | 116 | 247 |
| ND<5 U | 11.2 B | -6.2 | 116 | 248 |
| 62090 | 11.2 B | 62078.8 | 117 | 248 |

| | | | | |
|---|---|---|---|---|
| 33.4 | 48.9 | -15.5 | 117 | 249 |
| 4.5 J | 48.9 | -44.4 | 117 | 250 |
| 5.4 J1c | 48.9 | -43.5 | 117 | 251 |
| 28.3 | 48.9 | -20.6 | 117 | 252 |
| 2.6 JB | 48.9 | -46.3 | 117 | 253 |
| ND<10 U | 48.9 | -38.9 | 117 | 254 |
| ND<5 U | 48.9 | -43.9 | 117 | 255 |
| 62090 | 48.9 | 62041.1 | 118 | 255 |
| | | | | |
| 4.5 J | 33.4 | -28.9 | 118 | 256 |
| 5.4 J1c | 33.4 | -28 | 118 | 257 |
| 28.3 | 33.4 | -5.1 | 118 | 258 |
| 2.6 JB | 33.4 | -30.8 | 118 | 259 |
| ND<10 U | 33.4 | -23.4 | 118 | 260 |
| ND<5 U | 33.4 | -28.4 | 118 | 261 |
| 62090 | 33.4 | 62056.6 | 119 | 261 |
| | | | | |
| 5.4 J1c | 4.5 J | 0.9 | 120 | 261 |
| 28.3 | 4.5 J | 23.8 | 121 | 261 |
| 2.6 JB | 4.5 J | -1.9 | 121 | 262 |
| ND<10 U | 4.5 J | 5.5 | 122 | 262 |
| ND<5 U | 4.5 J | 0.5 | 123 | 262 |
| 62090 | 4.5 J | 62085.5 | 124 | 262 |
| | | | | |
| 28.3 | 5.4 J1c | 22.9 | 125 | 262 |
| 2.6 JB | 5.4 J1c | -2.8 | 125 | 263 |
| ND<10 U | 5.4 J1c | 4.6 | 126 | 263 |
| ND<5 U | 5.4 J1c | -0.4 | 126 | 264 |
| 62090 | 5.4 J1c | 62084.6 | 127 | 264 |
| | | | | |
| 2.6 JB | 28.3 | -25.7 | 127 | 265 |
| ND<10 U | 28.3 | -18.3 | 127 | 266 |
| ND<5 U | 28.3 | -23.3 | 127 | 267 |
| 62090 | 28.3 | 62061.7 | 128 | 267 |
| | | | | |
| ND<10 U | 2.6 JB | 7.4 | 129 | 267 |
| ND<5 U | 2.6 JB | 2.4 | 130 | 267 |
| 62090 | 2.6 JB | 62087.4 | 131 | 267 |
| | | | | |
| ND<5 U | ND<10 U | -5 | 131 | 268 |
| 62090 | ND<10 U | 62080 | 132 | 268 |
| | | | | |
| 62090 | ND<5 U | 62085 | 133 | 268 |

S Statistic = 133 - 268 = -135

| Tied Group | Value | Members |
|---|---|---|
| 1 | 5 | 3 |

| Time Period | Observations |
|---|---|
| 2/1/2017 | 1 |
| 3/1/2017 | 1 |
| 4/1/2017 | 1 |
| 5/1/2017 | 1 |
| 6/1/2017 | 1 |

| | |
|---|---|
| 7/1/2017 | 1 |
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 3/1/2022 | 1 |
| 3/1/2023 | 1 |
| 3/1/2024 | 1 |

There are 2 time periods with multiple data

---

A = 66
B = 36
C = 6
D = 0
E = 6
F = 4
a = 51156
b = 197316
c = 1624
Group Variance = 2836.35
Z-Score = -2.51608
Comparison Level at 95% confidence level = 1.65463 (upward trend)
-2.51608 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RW09-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 51900 | 51000 | 900 | 1 | 0 |
| 57500 | 51000 | 6500 | 2 | 0 |
| 57200 | 51000 | 6200 | 3 | 0 |
| 51900 | 51000 | 900 | 4 | 0 |
| 65600 | 51000 | 14600 | 5 | 0 |
| 55500 | 51000 | 4500 | 6 | 0 |
| 39400 | 51000 | -11600 | 6 | 1 |
| 49700 | 51000 | -1300 | 6 | 2 |
| 67900 | 51000 | 16900 | 7 | 2 |
| 44500 | 51000 | -6500 | 7 | 3 |
| 54700 | 51000 | 3700 | 8 | 3 |
| 38400 | 51000 | -12600 | 8 | 4 |
| 54700 | 51000 | 3700 | 9 | 4 |
| 53800 | 51000 | 2800 | 10 | 4 |
| 59800 1c | 51000 | 8800 | 11 | 4 |
| 57500 2c | 51000 | 6500 | 12 | 4 |
| 68400 M6 | 51000 | 17400 | 13 | 4 |
| 64200 M6 | 51000 | 13200 | 14 | 4 |
| 53300 1c | 51000 | 2300 | 15 | 4 |
| 82000 | 51000 | 31000 | 16 | 4 |
| 65600 | 51000 | 14600 | 17 | 4 |
| 77800 1c | 51000 | 26800 | 18 | 4 |
| 79100 | 51000 | 28100 | 19 | 4 |
| 73700 | 51000 | 22700 | 20 | 4 |
| 93600 B | 51000 | 42600 | 21 | 4 |
| 63000 | 51000 | 12000 | 22 | 4 |
| 78950 | 51000 | 27950 | 23 | 4 |
| 57500 | 51000 | 6500 | 24 | 4 |
| | | | | |
| 57500 | 51900 | 5600 | 25 | 4 |
| 57200 | 51900 | 5300 | 26 | 4 |
| 51900 | 51900 | 0 | 26 | 4 |
| 65600 | 51900 | 13700 | 27 | 4 |
| 55500 | 51900 | 3600 | 28 | 4 |
| 39400 | 51900 | -12500 | 28 | 5 |
| 49700 | 51900 | -2200 | 28 | 6 |
| 67900 | 51900 | 16000 | 29 | 6 |
| 44500 | 51900 | -7400 | 29 | 7 |
| 54700 | 51900 | 2800 | 30 | 7 |
| 38400 | 51900 | -13500 | 30 | 8 |
| 54700 | 51900 | 2800 | 31 | 8 |
| 53800 | 51900 | 1900 | 32 | 8 |
| 59800 1c | 51900 | 7900 | 33 | 8 |
| 57500 2c | 51900 | 5600 | 34 | 8 |
| 68400 M6 | 51900 | 16500 | 35 | 8 |
| 64200 M6 | 51900 | 12300 | 36 | 8 |
| 53300 1c | 51900 | 1400 | 37 | 8 |

| | | | | |
|---|---|---|---|---|
| 82000 | 51900 | 30100 | 38 | 8 |
| 65600 | 51900 | 13700 | 39 | 8 |
| 77800 1c | 51900 | 25900 | 40 | 8 |
| 79100 | 51900 | 27200 | 41 | 8 |
| 73700 | 51900 | 21800 | 42 | 8 |
| 93600 B | 51900 | 41700 | 43 | 8 |
| 63000 | 51900 | 11100 | 44 | 8 |
| 78950 | 51900 | 27050 | 45 | 8 |
| 57500 | 51900 | 5600 | 46 | 8 |
| | | | | |
| 57200 | 57500 | -300 | 46 | 9 |
| 51900 | 57500 | -5600 | 46 | 10 |
| 65600 | 57500 | 8100 | 47 | 10 |
| 55500 | 57500 | -2000 | 47 | 11 |
| 39400 | 57500 | -18100 | 47 | 12 |
| 49700 | 57500 | -7800 | 47 | 13 |
| 67900 | 57500 | 10400 | 48 | 13 |
| 44500 | 57500 | -13000 | 48 | 14 |
| 54700 | 57500 | -2800 | 48 | 15 |
| 38400 | 57500 | -19100 | 48 | 16 |
| 54700 | 57500 | -2800 | 48 | 17 |
| 53800 | 57500 | -3700 | 48 | 18 |
| 59800 1c | 57500 | 2300 | 49 | 18 |
| 57500 2c | 57500 | 0 | 49 | 18 |
| 68400 M6 | 57500 | 10900 | 50 | 18 |
| 64200 M6 | 57500 | 6700 | 51 | 18 |
| 53300 1c | 57500 | -4200 | 51 | 19 |
| 82000 | 57500 | 24500 | 52 | 19 |
| 65600 | 57500 | 8100 | 53 | 19 |
| 77800 1c | 57500 | 20300 | 54 | 19 |
| 79100 | 57500 | 21600 | 55 | 19 |
| 73700 | 57500 | 16200 | 56 | 19 |
| 93600 B | 57500 | 36100 | 57 | 19 |
| 63000 | 57500 | 5500 | 58 | 19 |
| 78950 | 57500 | 21450 | 59 | 19 |
| 57500 | 57500 | 0 | 59 | 19 |
| | | | | |
| 51900 | 57200 | -5300 | 59 | 20 |
| 65600 | 57200 | 8400 | 60 | 20 |
| 55500 | 57200 | -1700 | 60 | 21 |
| 39400 | 57200 | -17800 | 60 | 22 |
| 49700 | 57200 | -7500 | 60 | 23 |
| 67900 | 57200 | 10700 | 61 | 23 |
| 44500 | 57200 | -12700 | 61 | 24 |
| 54700 | 57200 | -2500 | 61 | 25 |
| 38400 | 57200 | -18800 | 61 | 26 |
| 54700 | 57200 | -2500 | 61 | 27 |
| 53800 | 57200 | -3400 | 61 | 28 |
| 59800 1c | 57200 | 2600 | 62 | 28 |
| 57500 2c | 57200 | 300 | 63 | 28 |
| 68400 M6 | 57200 | 11200 | 64 | 28 |
| 64200 M6 | 57200 | 7000 | 65 | 28 |
| 53300 1c | 57200 | -3900 | 65 | 29 |
| 82000 | 57200 | 24800 | 66 | 29 |
| 65600 | 57200 | 8400 | 67 | 29 |
| 77800 1c | 57200 | 20600 | 68 | 29 |
| 79100 | 57200 | 21900 | 69 | 29 |

| | | | | |
|---|---|---|---|---|
| 73700 | 57200 | 16500 | 70 | 29 |
| 93600 B | 57200 | 36400 | 71 | 29 |
| 63000 | 57200 | 5800 | 72 | 29 |
| 78950 | 57200 | 21750 | 73 | 29 |
| 57500 | 57200 | 300 | 74 | 29 |
| | | | | |
| 65600 | 51900 | 13700 | 75 | 29 |
| 55500 | 51900 | 3600 | 76 | 29 |
| 39400 | 51900 | -12500 | 76 | 30 |
| 49700 | 51900 | -2200 | 76 | 31 |
| 67900 | 51900 | 16000 | 77 | 31 |
| 44500 | 51900 | -7400 | 77 | 32 |
| 54700 | 51900 | 2800 | 78 | 32 |
| 38400 | 51900 | -13500 | 78 | 33 |
| 54700 | 51900 | 2800 | 79 | 33 |
| 53800 | 51900 | 1900 | 80 | 33 |
| 59800 1c | 51900 | 7900 | 81 | 33 |
| 57500 2c | 51900 | 5600 | 82 | 33 |
| 68400 M6 | 51900 | 16500 | 83 | 33 |
| 64200 M6 | 51900 | 12300 | 84 | 33 |
| 53300 1c | 51900 | 1400 | 85 | 33 |
| 82000 | 51900 | 30100 | 86 | 33 |
| 65600 | 51900 | 13700 | 87 | 33 |
| 77800 1c | 51900 | 25900 | 88 | 33 |
| 79100 | 51900 | 27200 | 89 | 33 |
| 73700 | 51900 | 21800 | 90 | 33 |
| 93600 B | 51900 | 41700 | 91 | 33 |
| 63000 | 51900 | 11100 | 92 | 33 |
| 78950 | 51900 | 27050 | 93 | 33 |
| 57500 | 51900 | 5600 | 94 | 33 |
| | | | | |
| 55500 | 65600 | -10100 | 94 | 34 |
| 39400 | 65600 | -26200 | 94 | 35 |
| 49700 | 65600 | -15900 | 94 | 36 |
| 67900 | 65600 | 2300 | 95 | 36 |
| 44500 | 65600 | -21100 | 95 | 37 |
| 54700 | 65600 | -10900 | 95 | 38 |
| 38400 | 65600 | -27200 | 95 | 39 |
| 54700 | 65600 | -10900 | 95 | 40 |
| 53800 | 65600 | -11800 | 95 | 41 |
| 59800 1c | 65600 | -5800 | 95 | 42 |
| 57500 2c | 65600 | -8100 | 95 | 43 |
| 68400 M6 | 65600 | 2800 | 96 | 43 |
| 64200 M6 | 65600 | -1400 | 96 | 44 |
| 53300 1c | 65600 | -12300 | 96 | 45 |
| 82000 | 65600 | 16400 | 97 | 45 |
| 65600 | 65600 | 0 | 97 | 45 |
| 77800 1c | 65600 | 12200 | 98 | 45 |
| 79100 | 65600 | 13500 | 99 | 45 |
| 73700 | 65600 | 8100 | 100 | 45 |
| 93600 B | 65600 | 28000 | 101 | 45 |
| 63000 | 65600 | -2600 | 101 | 46 |
| 78950 | 65600 | 13350 | 102 | 46 |
| 57500 | 65600 | -8100 | 102 | 47 |
| | | | | |
| 39400 | 55500 | -16100 | 102 | 48 |
| 49700 | 55500 | -5800 | 102 | 49 |

| | | | | |
|---|---|---|---|---|
| 67900 | 55500 | 12400 | 103 | 49 |
| 44500 | 55500 | -11000 | 103 | 50 |
| 54700 | 55500 | -800 | 103 | 51 |
| 38400 | 55500 | -17100 | 103 | 52 |
| 54700 | 55500 | -800 | 103 | 53 |
| 53800 | 55500 | -1700 | 103 | 54 |
| 59800 1c | 55500 | 4300 | 104 | 54 |
| 57500 2c | 55500 | 2000 | 105 | 54 |
| 68400 M6 | 55500 | 12900 | 106 | 54 |
| 64200 M6 | 55500 | 8700 | 107 | 54 |
| 53300 1c | 55500 | -2200 | 107 | 55 |
| 82000 | 55500 | 26500 | 108 | 55 |
| 65600 | 55500 | 10100 | 109 | 55 |
| 77800 1c | 55500 | 22300 | 110 | 55 |
| 79100 | 55500 | 23600 | 111 | 55 |
| 73700 | 55500 | 18200 | 112 | 55 |
| 93600 B | 55500 | 38100 | 113 | 55 |
| 63000 | 55500 | 7500 | 114 | 55 |
| 78950 | 55500 | 23450 | 115 | 55 |
| 57500 | 55500 | 2000 | 116 | 55 |
| | | | | |
| 49700 | 39400 | 10300 | 117 | 55 |
| 67900 | 39400 | 28500 | 118 | 55 |
| 44500 | 39400 | 5100 | 119 | 55 |
| 54700 | 39400 | 15300 | 120 | 55 |
| 38400 | 39400 | -1000 | 120 | 56 |
| 54700 | 39400 | 15300 | 121 | 56 |
| 53800 | 39400 | 14400 | 122 | 56 |
| 59800 1c | 39400 | 20400 | 123 | 56 |
| 57500 2c | 39400 | 18100 | 124 | 56 |
| 68400 M6 | 39400 | 29000 | 125 | 56 |
| 64200 M6 | 39400 | 24800 | 126 | 56 |
| 53300 1c | 39400 | 13900 | 127 | 56 |
| 82000 | 39400 | 42600 | 128 | 56 |
| 65600 | 39400 | 26200 | 129 | 56 |
| 77800 1c | 39400 | 38400 | 130 | 56 |
| 79100 | 39400 | 39700 | 131 | 56 |
| 73700 | 39400 | 34300 | 132 | 56 |
| 93600 B | 39400 | 54200 | 133 | 56 |
| 63000 | 39400 | 23600 | 134 | 56 |
| 78950 | 39400 | 39550 | 135 | 56 |
| 57500 | 39400 | 18100 | 136 | 56 |
| | | | | |
| 67900 | 49700 | 18200 | 137 | 56 |
| 44500 | 49700 | -5200 | 137 | 57 |
| 54700 | 49700 | 5000 | 138 | 57 |
| 38400 | 49700 | -11300 | 138 | 58 |
| 54700 | 49700 | 5000 | 139 | 58 |
| 53800 | 49700 | 4100 | 140 | 58 |
| 59800 1c | 49700 | 10100 | 141 | 58 |
| 57500 2c | 49700 | 7800 | 142 | 58 |
| 68400 M6 | 49700 | 18700 | 143 | 58 |
| 64200 M6 | 49700 | 14500 | 144 | 58 |
| 53300 1c | 49700 | 3600 | 145 | 58 |
| 82000 | 49700 | 32300 | 146 | 58 |
| 65600 | 49700 | 15900 | 147 | 58 |
| 77800 1c | 49700 | 28100 | 148 | 58 |

| | | | | |
|---|---|---|---|---|
| 79100 | 49700 | 29400 | 149 | 58 |
| 73700 | 49700 | 24000 | 150 | 58 |
| 93600 B | 49700 | 43900 | 151 | 58 |
| 63000 | 49700 | 13300 | 152 | 58 |
| 78950 | 49700 | 29250 | 153 | 58 |
| 57500 | 49700 | 7800 | 154 | 58 |
| | | | | |
| 44500 | 67900 | -23400 | 154 | 59 |
| 54700 | 67900 | -13200 | 154 | 60 |
| 38400 | 67900 | -29500 | 154 | 61 |
| 54700 | 67900 | -13200 | 154 | 62 |
| 53800 | 67900 | -14100 | 154 | 63 |
| 59800 1c | 67900 | -8100 | 154 | 64 |
| 57500 2c | 67900 | -10400 | 154 | 65 |
| 68400 M6 | 67900 | 500 | 155 | 65 |
| 64200 M6 | 67900 | -3700 | 155 | 66 |
| 53300 1c | 67900 | -14600 | 155 | 67 |
| 82000 | 67900 | 14100 | 156 | 67 |
| 65600 | 67900 | -2300 | 156 | 68 |
| 77800 1c | 67900 | 9900 | 157 | 68 |
| 79100 | 67900 | 11200 | 158 | 68 |
| 73700 | 67900 | 5800 | 159 | 68 |
| 93600 B | 67900 | 25700 | 160 | 68 |
| 63000 | 67900 | -4900 | 160 | 69 |
| 78950 | 67900 | 11050 | 161 | 69 |
| 57500 | 67900 | -10400 | 161 | 70 |
| | | | | |
| 54700 | 44500 | 10200 | 162 | 70 |
| 38400 | 44500 | -6100 | 162 | 71 |
| 54700 | 44500 | 10200 | 163 | 71 |
| 53800 | 44500 | 9300 | 164 | 71 |
| 59800 1c | 44500 | 15300 | 165 | 71 |
| 57500 2c | 44500 | 13000 | 166 | 71 |
| 68400 M6 | 44500 | 23900 | 167 | 71 |
| 64200 M6 | 44500 | 19700 | 168 | 71 |
| 53300 1c | 44500 | 8800 | 169 | 71 |
| 82000 | 44500 | 37500 | 170 | 71 |
| 65600 | 44500 | 21100 | 171 | 71 |
| 77800 1c | 44500 | 33300 | 172 | 71 |
| 79100 | 44500 | 34600 | 173 | 71 |
| 73700 | 44500 | 29200 | 174 | 71 |
| 93600 B | 44500 | 49100 | 175 | 71 |
| 63000 | 44500 | 18500 | 176 | 71 |
| 78950 | 44500 | 34450 | 177 | 71 |
| 57500 | 44500 | 13000 | 178 | 71 |
| | | | | |
| 38400 | 54700 | -16300 | 178 | 72 |
| 54700 | 54700 | 0 | 178 | 72 |
| 53800 | 54700 | -900 | 178 | 73 |
| 59800 1c | 54700 | 5100 | 179 | 73 |
| 57500 2c | 54700 | 2800 | 180 | 73 |
| 68400 M6 | 54700 | 13700 | 181 | 73 |
| 64200 M6 | 54700 | 9500 | 182 | 73 |
| 53300 1c | 54700 | -1400 | 182 | 74 |
| 82000 | 54700 | 27300 | 183 | 74 |
| 65600 | 54700 | 10900 | 184 | 74 |
| 77800 1c | 54700 | 23100 | 185 | 74 |

| | | | | |
|---|---|---|---|---|
| 79100 | 54700 | 24400 | 186 | 74 |
| 73700 | 54700 | 19000 | 187 | 74 |
| 93600 B | 54700 | 38900 | 188 | 74 |
| 63000 | 54700 | 8300 | 189 | 74 |
| 78950 | 54700 | 24250 | 190 | 74 |
| 57500 | 54700 | 2800 | 191 | 74 |
| | | | | |
| 54700 | 38400 | 16300 | 192 | 74 |
| 53800 | 38400 | 15400 | 193 | 74 |
| 59800 1c | 38400 | 21400 | 194 | 74 |
| 57500 2c | 38400 | 19100 | 195 | 74 |
| 68400 M6 | 38400 | 30000 | 196 | 74 |
| 64200 M6 | 38400 | 25800 | 197 | 74 |
| 53300 1c | 38400 | 14900 | 198 | 74 |
| 82000 | 38400 | 43600 | 199 | 74 |
| 65600 | 38400 | 27200 | 200 | 74 |
| 77800 1c | 38400 | 39400 | 201 | 74 |
| 79100 | 38400 | 40700 | 202 | 74 |
| 73700 | 38400 | 35300 | 203 | 74 |
| 93600 B | 38400 | 55200 | 204 | 74 |
| 63000 | 38400 | 24600 | 205 | 74 |
| 78950 | 38400 | 40550 | 206 | 74 |
| 57500 | 38400 | 19100 | 207 | 74 |
| | | | | |
| 53800 | 54700 | -900 | 207 | 75 |
| 59800 1c | 54700 | 5100 | 208 | 75 |
| 57500 2c | 54700 | 2800 | 209 | 75 |
| 68400 M6 | 54700 | 13700 | 210 | 75 |
| 64200 M6 | 54700 | 9500 | 211 | 75 |
| 53300 1c | 54700 | -1400 | 211 | 76 |
| 82000 | 54700 | 27300 | 212 | 76 |
| 65600 | 54700 | 10900 | 213 | 76 |
| 77800 1c | 54700 | 23100 | 214 | 76 |
| 79100 | 54700 | 24400 | 215 | 76 |
| 73700 | 54700 | 19000 | 216 | 76 |
| 93600 B | 54700 | 38900 | 217 | 76 |
| 63000 | 54700 | 8300 | 218 | 76 |
| 78950 | 54700 | 24250 | 219 | 76 |
| 57500 | 54700 | 2800 | 220 | 76 |
| | | | | |
| 59800 1c | 53800 | 6000 | 221 | 76 |
| 57500 2c | 53800 | 3700 | 222 | 76 |
| 68400 M6 | 53800 | 14600 | 223 | 76 |
| 64200 M6 | 53800 | 10400 | 224 | 76 |
| 53300 1c | 53800 | -500 | 224 | 77 |
| 82000 | 53800 | 28200 | 225 | 77 |
| 65600 | 53800 | 11800 | 226 | 77 |
| 77800 1c | 53800 | 24000 | 227 | 77 |
| 79100 | 53800 | 25300 | 228 | 77 |
| 73700 | 53800 | 19900 | 229 | 77 |
| 93600 B | 53800 | 39800 | 230 | 77 |
| 63000 | 53800 | 9200 | 231 | 77 |
| 78950 | 53800 | 25150 | 232 | 77 |
| 57500 | 53800 | 3700 | 233 | 77 |
| | | | | |
| 57500 2c | 59800 1c | Same Date | 233 | 77 |
| 68400 M6 | 59800 1c | 8600 | 234 | 77 |

| | | | | |
|---|---|---|---|---|
| 64200 M6 | 59800 1c | 4400 | 235 | 77 |
| 53300 1c | 59800 1c | -6500 | 235 | 78 |
| 82000 | 59800 1c | 22200 | 236 | 78 |
| 65600 | 59800 1c | 5800 | 237 | 78 |
| 77800 1c | 59800 1c | 18000 | 238 | 78 |
| 79100 | 59800 1c | 19300 | 239 | 78 |
| 73700 | 59800 1c | 13900 | 240 | 78 |
| 93600 B | 59800 1c | 33800 | 241 | 78 |
| 63000 | 59800 1c | 3200 | 242 | 78 |
| 78950 | 59800 1c | 19150 | 243 | 78 |
| 57500 | 59800 1c | -2300 | 243 | 79 |
| | | | | |
| 68400 M6 | 57500 2c | 10900 | 244 | 79 |
| 64200 M6 | 57500 2c | 6700 | 245 | 79 |
| 53300 1c | 57500 2c | -4200 | 245 | 80 |
| 82000 | 57500 2c | 24500 | 246 | 80 |
| 65600 | 57500 2c | 8100 | 247 | 80 |
| 77800 1c | 57500 2c | 20300 | 248 | 80 |
| 79100 | 57500 2c | 21600 | 249 | 80 |
| 73700 | 57500 2c | 16200 | 250 | 80 |
| 93600 B | 57500 2c | 36100 | 251 | 80 |
| 63000 | 57500 2c | 5500 | 252 | 80 |
| 78950 | 57500 2c | 21450 | 253 | 80 |
| 57500 | 57500 2c | 0 | 253 | 80 |
| | | | | |
| 64200 M6 | 68400 M6 | Same Date | 253 | 80 |
| 53300 1c | 68400 M6 | -15100 | 253 | 81 |
| 82000 | 68400 M6 | 13600 | 254 | 81 |
| 65600 | 68400 M6 | -2800 | 254 | 82 |
| 77800 1c | 68400 M6 | 9400 | 255 | 82 |
| 79100 | 68400 M6 | 10700 | 256 | 82 |
| 73700 | 68400 M6 | 5300 | 257 | 82 |
| 93600 B | 68400 M6 | 25200 | 258 | 82 |
| 63000 | 68400 M6 | -5400 | 258 | 83 |
| 78950 | 68400 M6 | 10550 | 259 | 83 |
| 57500 | 68400 M6 | -10900 | 259 | 84 |
| | | | | |
| 53300 1c | 64200 M6 | -10900 | 259 | 85 |
| 82000 | 64200 M6 | 17800 | 260 | 85 |
| 65600 | 64200 M6 | 1400 | 261 | 85 |
| 77800 1c | 64200 M6 | 13600 | 262 | 85 |
| 79100 | 64200 M6 | 14900 | 263 | 85 |
| 73700 | 64200 M6 | 9500 | 264 | 85 |
| 93600 B | 64200 M6 | 29400 | 265 | 85 |
| 63000 | 64200 M6 | -1200 | 265 | 86 |
| 78950 | 64200 M6 | 14750 | 266 | 86 |
| 57500 | 64200 M6 | -6700 | 266 | 87 |
| | | | | |
| 82000 | 53300 1c | 28700 | 267 | 87 |
| 65600 | 53300 1c | 12300 | 268 | 87 |
| 77800 1c | 53300 1c | 24500 | 269 | 87 |
| 79100 | 53300 1c | 25800 | 270 | 87 |
| 73700 | 53300 1c | 20400 | 271 | 87 |
| 93600 B | 53300 1c | 40300 | 272 | 87 |
| 63000 | 53300 1c | 9700 | 273 | 87 |
| 78950 | 53300 1c | 25650 | 274 | 87 |
| 57500 | 53300 1c | 4200 | 275 | 87 |

| | | | | |
|---|---|---|---|---|
| 65600 | 82000 | -16400 | 275 | 88 |
| 77800 1c | 82000 | -4200 | 275 | 89 |
| 79100 | 82000 | -2900 | 275 | 90 |
| 73700 | 82000 | -8300 | 275 | 91 |
| 93600 B | 82000 | 11600 | 276 | 91 |
| 63000 | 82000 | -19000 | 276 | 92 |
| 78950 | 82000 | -3050 | 276 | 93 |
| 57500 | 82000 | -24500 | 276 | 94 |
| | | | | |
| 77800 1c | 65600 | 12200 | 277 | 94 |
| 79100 | 65600 | 13500 | 278 | 94 |
| 73700 | 65600 | 8100 | 279 | 94 |
| 93600 B | 65600 | 28000 | 280 | 94 |
| 63000 | 65600 | -2600 | 280 | 95 |
| 78950 | 65600 | 13350 | 281 | 95 |
| 57500 | 65600 | -8100 | 281 | 96 |
| | | | | |
| 79100 | 77800 1c | 1300 | 282 | 96 |
| 73700 | 77800 1c | -4100 | 282 | 97 |
| 93600 B | 77800 1c | 15800 | 283 | 97 |
| 63000 | 77800 1c | -14800 | 283 | 98 |
| 78950 | 77800 1c | 1150 | 284 | 98 |
| 57500 | 77800 1c | -20300 | 284 | 99 |
| | | | | |
| 73700 | 79100 | -5400 | 284 | 100 |
| 93600 B | 79100 | 14500 | 285 | 100 |
| 63000 | 79100 | -16100 | 285 | 101 |
| 78950 | 79100 | -150 | 285 | 102 |
| 57500 | 79100 | -21600 | 285 | 103 |
| | | | | |
| 93600 B | 73700 | 19900 | 286 | 103 |
| 63000 | 73700 | -10700 | 286 | 104 |
| 78950 | 73700 | 5250 | 287 | 104 |
| 57500 | 73700 | -16200 | 287 | 105 |
| | | | | |
| 63000 | 93600 B | -30600 | 287 | 106 |
| 78950 | 93600 B | -14650 | 287 | 107 |
| 57500 | 93600 B | -36100 | 287 | 108 |
| | | | | |
| 78950 | 63000 | 15950 | 288 | 108 |
| 57500 | 63000 | -5500 | 288 | 109 |
| | | | | |
| 57500 | 78950 | -21450 | 288 | 110 |

S Statistic = 288 - 110 = 178

| Tied Group | Value | Members |
|---|---|---|
| 1 | 51900 | 2 |
| 2 | 57500 | 3 |
| 3 | 65600 | 2 |
| 4 | 54700 | 2 |

| Time Period | Observations |
|---|---|
| 2/1/2017 | 1 |
| 3/1/2017 | 1 |

| | |
|---|---|
| 4/1/2017 | 1 |
| 5/1/2017 | 1 |
| 6/1/2017 | 1 |
| 7/1/2017 | 1 |
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 3/1/2022 | 1 |
| 3/1/2023 | 1 |
| 3/1/2024 | 1 |

There are 2 time periods with multiple data

---

A = 120
B = 36
C = 6
D = 0
E = 12
F = 4
a = 51156
b = 197316
c = 1624
Group Variance = 2833.36
Z-Score = 3.32523
Comparison Level at 95% confidence level = 1.65463 (upward trend)
**3.32523 > 1.65463 indicating an upward trend**

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RW10-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 104000 | 111000 | Same Date | 0 | 0 |
| 20.4 | 111000 | -110980 | 0 | 1 |
| 75800 | 111000 | -35200 | 0 | 2 |
| 1150 | 111000 | -109850 | 0 | 3 |
| 34600 | 111000 | -76400 | 0 | 4 |
| 25900 | 111000 | -85100 | 0 | 5 |
| 79.7 | 111000 | -110920 | 0 | 6 |
| 8220 | 111000 | -102780 | 0 | 7 |
| 31000 | 111000 | -80000 | 0 | 8 |
| 39000 | 111000 | -72000 | 0 | 9 |
| 158 | 111000 | -110842 | 0 | 10 |
| 26.5 | 111000 | -110974 | 0 | 11 |
| 13500 | 111000 | -97500 | 0 | 12 |
| 17600 MH | 111000 | -93400 | 0 | 13 |
| 16600 | 111000 | -94400 | 0 | 14 |
| 591 | 111000 | -110409 | 0 | 15 |
| 914 | 111000 | -110086 | 0 | 16 |
| 6150 | 111000 | -104850 | 0 | 17 |
| 5560 | 111000 | -105440 | 0 | 18 |
| 7730 1c | 111000 | -103270 | 0 | 19 |
| 6020 | 111000 | -104980 | 0 | 20 |
| 940 1c | 111000 | -110060 | 0 | 21 |
| 1090 2c | 111000 | -109910 | 0 | 22 |
| 550 | 111000 | -110450 | 0 | 23 |
| 6130 | 111000 | -104870 | 0 | 24 |
| 7440 | 111000 | -103560 | 0 | 25 |
| 102.7 | 111000 | -110897 | 0 | 26 |
| 43.23 | 111000 | -110957 | 0 | 27 |
| | | | | |
| 20.4 | 104000 | -103980 | 0 | 28 |
| 75800 | 104000 | -28200 | 0 | 29 |
| 1150 | 104000 | -102850 | 0 | 30 |
| 34600 | 104000 | -69400 | 0 | 31 |
| 25900 | 104000 | -78100 | 0 | 32 |
| 79.7 | 104000 | -103920 | 0 | 33 |
| 8220 | 104000 | -95780 | 0 | 34 |
| 31000 | 104000 | -73000 | 0 | 35 |
| 39000 | 104000 | -65000 | 0 | 36 |
| 158 | 104000 | -103842 | 0 | 37 |
| 26.5 | 104000 | -103974 | 0 | 38 |
| 13500 | 104000 | -90500 | 0 | 39 |
| 17600 MH | 104000 | -86400 | 0 | 40 |
| 16600 | 104000 | -87400 | 0 | 41 |
| 591 | 104000 | -103409 | 0 | 42 |
| 914 | 104000 | -103086 | 0 | 43 |
| 6150 | 104000 | -97850 | 0 | 44 |
| 5560 | 104000 | -98440 | 0 | 45 |

| | | | | |
|---|---|---|---|---|
| 7730 1c | 104000 | -96270 | 0 | 46 |
| 6020 | 104000 | -97980 | 0 | 47 |
| 940 1c | 104000 | -103060 | 0 | 48 |
| 1090 2c | 104000 | -102910 | 0 | 49 |
| 550 | 104000 | -103450 | 0 | 50 |
| 6130 | 104000 | -97870 | 0 | 51 |
| 7440 | 104000 | -96560 | 0 | 52 |
| 102.7 | 104000 | -103897 | 0 | 53 |
| 43.23 | 104000 | -103957 | 0 | 54 |
| | | | | |
| 75800 | 20.4 | 75779.6 | 1 | 54 |
| 1150 | 20.4 | 1129.6 | 2 | 54 |
| 34600 | 20.4 | 34579.6 | 3 | 54 |
| 25900 | 20.4 | 25879.6 | 4 | 54 |
| 79.7 | 20.4 | 59.3 | 5 | 54 |
| 8220 | 20.4 | 8199.6 | 6 | 54 |
| 31000 | 20.4 | 30979.6 | 7 | 54 |
| 39000 | 20.4 | 38979.6 | 8 | 54 |
| 158 | 20.4 | 137.6 | 9 | 54 |
| 26.5 | 20.4 | 6.1 | 10 | 54 |
| 13500 | 20.4 | 13479.6 | 11 | 54 |
| 17600 MH | 20.4 | 17579.6 | 12 | 54 |
| 16600 | 20.4 | 16579.6 | 13 | 54 |
| 591 | 20.4 | 570.6 | 14 | 54 |
| 914 | 20.4 | 893.6 | 15 | 54 |
| 6150 | 20.4 | 6129.6 | 16 | 54 |
| 5560 | 20.4 | 5539.6 | 17 | 54 |
| 7730 1c | 20.4 | 7709.6 | 18 | 54 |
| 6020 | 20.4 | 5999.6 | 19 | 54 |
| 940 1c | 20.4 | 919.6 | 20 | 54 |
| 1090 2c | 20.4 | 1069.6 | 21 | 54 |
| 550 | 20.4 | 529.6 | 22 | 54 |
| 6130 | 20.4 | 6109.6 | 23 | 54 |
| 7440 | 20.4 | 7419.6 | 24 | 54 |
| 102.7 | 20.4 | 82.3 | 25 | 54 |
| 43.23 | 20.4 | 22.83 | 26 | 54 |
| | | | | |
| 1150 | 75800 | -74650 | 26 | 55 |
| 34600 | 75800 | -41200 | 26 | 56 |
| 25900 | 75800 | -49900 | 26 | 57 |
| 79.7 | 75800 | -75720.3 | 26 | 58 |
| 8220 | 75800 | -67580 | 26 | 59 |
| 31000 | 75800 | -44800 | 26 | 60 |
| 39000 | 75800 | -36800 | 26 | 61 |
| 158 | 75800 | -75642 | 26 | 62 |
| 26.5 | 75800 | -75773.5 | 26 | 63 |
| 13500 | 75800 | -62300 | 26 | 64 |
| 17600 MH | 75800 | -58200 | 26 | 65 |
| 16600 | 75800 | -59200 | 26 | 66 |
| 591 | 75800 | -75209 | 26 | 67 |
| 914 | 75800 | -74886 | 26 | 68 |
| 6150 | 75800 | -69650 | 26 | 69 |
| 5560 | 75800 | -70240 | 26 | 70 |
| 7730 1c | 75800 | -68070 | 26 | 71 |
| 6020 | 75800 | -69780 | 26 | 72 |
| 940 1c | 75800 | -74860 | 26 | 73 |
| 1090 2c | 75800 | -74710 | 26 | 74 |

| | | | | |
|---|---|---|---|---|
| 550 | 75800 | -75250 | 26 | 75 |
| 6130 | 75800 | -69670 | 26 | 76 |
| 7440 | 75800 | -68360 | 26 | 77 |
| 102.7 | 75800 | -75697.3 | 26 | 78 |
| 43.23 | 75800 | -75756.8 | 26 | 79 |
| | | | | |
| 34600 | 1150 | 33450 | 27 | 79 |
| 25900 | 1150 | 24750 | 28 | 79 |
| 79.7 | 1150 | -1070.3 | 28 | 80 |
| 8220 | 1150 | 7070 | 29 | 80 |
| 31000 | 1150 | 29850 | 30 | 80 |
| 39000 | 1150 | 37850 | 31 | 80 |
| 158 | 1150 | -992 | 31 | 81 |
| 26.5 | 1150 | -1123.5 | 31 | 82 |
| 13500 | 1150 | 12350 | 32 | 82 |
| 17600 MH | 1150 | 16450 | 33 | 82 |
| 16600 | 1150 | 15450 | 34 | 82 |
| 591 | 1150 | -559 | 34 | 83 |
| 914 | 1150 | -236 | 34 | 84 |
| 6150 | 1150 | 5000 | 35 | 84 |
| 5560 | 1150 | 4410 | 36 | 84 |
| 7730 1c | 1150 | 6580 | 37 | 84 |
| 6020 | 1150 | 4870 | 38 | 84 |
| 940 1c | 1150 | -210 | 38 | 85 |
| 1090 2c | 1150 | -60 | 38 | 86 |
| 550 | 1150 | -600 | 38 | 87 |
| 6130 | 1150 | 4980 | 39 | 87 |
| 7440 | 1150 | 6290 | 40 | 87 |
| 102.7 | 1150 | -1047.3 | 40 | 88 |
| 43.23 | 1150 | -1106.77 | 40 | 89 |
| | | | | |
| 25900 | 34600 | -8700 | 40 | 90 |
| 79.7 | 34600 | -34520.3 | 40 | 91 |
| 8220 | 34600 | -26380 | 40 | 92 |
| 31000 | 34600 | -3600 | 40 | 93 |
| 39000 | 34600 | 4400 | 41 | 93 |
| 158 | 34600 | -34442 | 41 | 94 |
| 26.5 | 34600 | -34573.5 | 41 | 95 |
| 13500 | 34600 | -21100 | 41 | 96 |
| 17600 MH | 34600 | -17000 | 41 | 97 |
| 16600 | 34600 | -18000 | 41 | 98 |
| 591 | 34600 | -34009 | 41 | 99 |
| 914 | 34600 | -33686 | 41 | 100 |
| 6150 | 34600 | -28450 | 41 | 101 |
| 5560 | 34600 | -29040 | 41 | 102 |
| 7730 1c | 34600 | -26870 | 41 | 103 |
| 6020 | 34600 | -28580 | 41 | 104 |
| 940 1c | 34600 | -33660 | 41 | 105 |
| 1090 2c | 34600 | -33510 | 41 | 106 |
| 550 | 34600 | -34050 | 41 | 107 |
| 6130 | 34600 | -28470 | 41 | 108 |
| 7440 | 34600 | -27160 | 41 | 109 |
| 102.7 | 34600 | -34497.3 | 41 | 110 |
| 43.23 | 34600 | -34556.8 | 41 | 111 |
| | | | | |
| 79.7 | 25900 | -25820.3 | 41 | 112 |
| 8220 | 25900 | -17680 | 41 | 113 |

| | | | | |
|---|---|---|---|---|
| 31000 | 25900 | 5100 | 42 | 113 |
| 39000 | 25900 | 13100 | 43 | 113 |
| 158 | 25900 | -25742 | 43 | 114 |
| 26.5 | 25900 | -25873.5 | 43 | 115 |
| 13500 | 25900 | -12400 | 43 | 116 |
| 17600 MH | 25900 | -8300 | 43 | 117 |
| 16600 | 25900 | -9300 | 43 | 118 |
| 591 | 25900 | -25309 | 43 | 119 |
| 914 | 25900 | -24986 | 43 | 120 |
| 6150 | 25900 | -19750 | 43 | 121 |
| 5560 | 25900 | -20340 | 43 | 122 |
| 7730 1c | 25900 | -18170 | 43 | 123 |
| 6020 | 25900 | -19880 | 43 | 124 |
| 940 1c | 25900 | -24960 | 43 | 125 |
| 1090 2c | 25900 | -24810 | 43 | 126 |
| 550 | 25900 | -25350 | 43 | 127 |
| 6130 | 25900 | -19770 | 43 | 128 |
| 7440 | 25900 | -18460 | 43 | 129 |
| 102.7 | 25900 | -25797.3 | 43 | 130 |
| 43.23 | 25900 | -25856.8 | 43 | 131 |
| | | | | |
| 8220 | 79.7 | 8140.3 | 44 | 131 |
| 31000 | 79.7 | 30920.3 | 45 | 131 |
| 39000 | 79.7 | 38920.3 | 46 | 131 |
| 158 | 79.7 | 78.3 | 47 | 131 |
| 26.5 | 79.7 | -53.2 | 47 | 132 |
| 13500 | 79.7 | 13420.3 | 48 | 132 |
| 17600 MH | 79.7 | 17520.3 | 49 | 132 |
| 16600 | 79.7 | 16520.3 | 50 | 132 |
| 591 | 79.7 | 511.3 | 51 | 132 |
| 914 | 79.7 | 834.3 | 52 | 132 |
| 6150 | 79.7 | 6070.3 | 53 | 132 |
| 5560 | 79.7 | 5480.3 | 54 | 132 |
| 7730 1c | 79.7 | 7650.3 | 55 | 132 |
| 6020 | 79.7 | 5940.3 | 56 | 132 |
| 940 1c | 79.7 | 860.3 | 57 | 132 |
| 1090 2c | 79.7 | 1010.3 | 58 | 132 |
| 550 | 79.7 | 470.3 | 59 | 132 |
| 6130 | 79.7 | 6050.3 | 60 | 132 |
| 7440 | 79.7 | 7360.3 | 61 | 132 |
| 102.7 | 79.7 | 23 | 62 | 132 |
| 43.23 | 79.7 | -36.47 | 62 | 133 |
| | | | | |
| 31000 | 8220 | 22780 | 63 | 133 |
| 39000 | 8220 | 30780 | 64 | 133 |
| 158 | 8220 | -8062 | 64 | 134 |
| 26.5 | 8220 | -8193.5 | 64 | 135 |
| 13500 | 8220 | 5280 | 65 | 135 |
| 17600 MH | 8220 | 9380 | 66 | 135 |
| 16600 | 8220 | 8380 | 67 | 135 |
| 591 | 8220 | -7629 | 67 | 136 |
| 914 | 8220 | -7306 | 67 | 137 |
| 6150 | 8220 | -2070 | 67 | 138 |
| 5560 | 8220 | -2660 | 67 | 139 |
| 7730 1c | 8220 | -490 | 67 | 140 |
| 6020 | 8220 | -2200 | 67 | 141 |
| 940 1c | 8220 | -7280 | 67 | 142 |

| | | | | |
|---|---|---|---|---|
| 1090 2c | 8220 | -7130 | 67 | 143 |
| 550 | 8220 | -7670 | 67 | 144 |
| 6130 | 8220 | -2090 | 67 | 145 |
| 7440 | 8220 | -780 | 67 | 146 |
| 102.7 | 8220 | -8117.3 | 67 | 147 |
| 43.23 | 8220 | -8176.77 | 67 | 148 |
| | | | | |
| 39000 | 31000 | 8000 | 68 | 148 |
| 158 | 31000 | -30842 | 68 | 149 |
| 26.5 | 31000 | -30973.5 | 68 | 150 |
| 13500 | 31000 | -17500 | 68 | 151 |
| 17600 MH | 31000 | -13400 | 68 | 152 |
| 16600 | 31000 | -14400 | 68 | 153 |
| 591 | 31000 | -30409 | 68 | 154 |
| 914 | 31000 | -30086 | 68 | 155 |
| 6150 | 31000 | -24850 | 68 | 156 |
| 5560 | 31000 | -25440 | 68 | 157 |
| 7730 1c | 31000 | -23270 | 68 | 158 |
| 6020 | 31000 | -24980 | 68 | 159 |
| 940 1c | 31000 | -30060 | 68 | 160 |
| 1090 2c | 31000 | -29910 | 68 | 161 |
| 550 | 31000 | -30450 | 68 | 162 |
| 6130 | 31000 | -24870 | 68 | 163 |
| 7440 | 31000 | -23560 | 68 | 164 |
| 102.7 | 31000 | -30897.3 | 68 | 165 |
| 43.23 | 31000 | -30956.8 | 68 | 166 |
| | | | | |
| 158 | 39000 | -38842 | 68 | 167 |
| 26.5 | 39000 | -38973.5 | 68 | 168 |
| 13500 | 39000 | -25500 | 68 | 169 |
| 17600 MH | 39000 | -21400 | 68 | 170 |
| 16600 | 39000 | -22400 | 68 | 171 |
| 591 | 39000 | -38409 | 68 | 172 |
| 914 | 39000 | -38086 | 68 | 173 |
| 6150 | 39000 | -32850 | 68 | 174 |
| 5560 | 39000 | -33440 | 68 | 175 |
| 7730 1c | 39000 | -31270 | 68 | 176 |
| 6020 | 39000 | -32980 | 68 | 177 |
| 940 1c | 39000 | -38060 | 68 | 178 |
| 1090 2c | 39000 | -37910 | 68 | 179 |
| 550 | 39000 | -38450 | 68 | 180 |
| 6130 | 39000 | -32870 | 68 | 181 |
| 7440 | 39000 | -31560 | 68 | 182 |
| 102.7 | 39000 | -38897.3 | 68 | 183 |
| 43.23 | 39000 | -38956.8 | 68 | 184 |
| | | | | |
| 26.5 | 158 | -131.5 | 68 | 185 |
| 13500 | 158 | 13342 | 69 | 185 |
| 17600 MH | 158 | 17442 | 70 | 185 |
| 16600 | 158 | 16442 | 71 | 185 |
| 591 | 158 | 433 | 72 | 185 |
| 914 | 158 | 756 | 73 | 185 |
| 6150 | 158 | 5992 | 74 | 185 |
| 5560 | 158 | 5402 | 75 | 185 |
| 7730 1c | 158 | 7572 | 76 | 185 |
| 6020 | 158 | 5862 | 77 | 185 |
| 940 1c | 158 | 782 | 78 | 185 |

| | | | | |
|---|---|---|---|---|
| 1090 2c | 158 | 932 | 79 | 185 |
| 550 | 158 | 392 | 80 | 185 |
| 6130 | 158 | 5972 | 81 | 185 |
| 7440 | 158 | 7282 | 82 | 185 |
| 102.7 | 158 | -55.3 | 82 | 186 |
| 43.23 | 158 | -114.77 | 82 | 187 |
| | | | | |
| 13500 | 26.5 | 13473.5 | 83 | 187 |
| 17600 MH | 26.5 | 17573.5 | 84 | 187 |
| 16600 | 26.5 | 16573.5 | 85 | 187 |
| 591 | 26.5 | 564.5 | 86 | 187 |
| 914 | 26.5 | 887.5 | 87 | 187 |
| 6150 | 26.5 | 6123.5 | 88 | 187 |
| 5560 | 26.5 | 5533.5 | 89 | 187 |
| 7730 1c | 26.5 | 7703.5 | 90 | 187 |
| 6020 | 26.5 | 5993.5 | 91 | 187 |
| 940 1c | 26.5 | 913.5 | 92 | 187 |
| 1090 2c | 26.5 | 1063.5 | 93 | 187 |
| 550 | 26.5 | 523.5 | 94 | 187 |
| 6130 | 26.5 | 6103.5 | 95 | 187 |
| 7440 | 26.5 | 7413.5 | 96 | 187 |
| 102.7 | 26.5 | 76.2 | 97 | 187 |
| 43.23 | 26.5 | 16.73 | 98 | 187 |
| | | | | |
| 17600 MH | 13500 | 4100 | 99 | 187 |
| 16600 | 13500 | 3100 | 100 | 187 |
| 591 | 13500 | -12909 | 100 | 188 |
| 914 | 13500 | -12586 | 100 | 189 |
| 6150 | 13500 | -7350 | 100 | 190 |
| 5560 | 13500 | -7940 | 100 | 191 |
| 7730 1c | 13500 | -5770 | 100 | 192 |
| 6020 | 13500 | -7480 | 100 | 193 |
| 940 1c | 13500 | -12560 | 100 | 194 |
| 1090 2c | 13500 | -12410 | 100 | 195 |
| 550 | 13500 | -12950 | 100 | 196 |
| 6130 | 13500 | -7370 | 100 | 197 |
| 7440 | 13500 | -6060 | 100 | 198 |
| 102.7 | 13500 | -13397.3 | 100 | 199 |
| 43.23 | 13500 | -13456.8 | 100 | 200 |
| | | | | |
| 16600 | 17600 MH | -1000 | 100 | 201 |
| 591 | 17600 MH | -17009 | 100 | 202 |
| 914 | 17600 MH | -16686 | 100 | 203 |
| 6150 | 17600 MH | -11450 | 100 | 204 |
| 5560 | 17600 MH | -12040 | 100 | 205 |
| 7730 1c | 17600 MH | -9870 | 100 | 206 |
| 6020 | 17600 MH | -11580 | 100 | 207 |
| 940 1c | 17600 MH | -16660 | 100 | 208 |
| 1090 2c | 17600 MH | -16510 | 100 | 209 |
| 550 | 17600 MH | -17050 | 100 | 210 |
| 6130 | 17600 MH | -11470 | 100 | 211 |
| 7440 | 17600 MH | -10160 | 100 | 212 |
| 102.7 | 17600 MH | -17497.3 | 100 | 213 |
| 43.23 | 17600 MH | -17556.8 | 100 | 214 |
| | | | | |
| 591 | 16600 | -16009 | 100 | 215 |
| 914 | 16600 | -15686 | 100 | 216 |

| | | | | |
|---|---|---|---|---|
| 6150 | 16600 | -10450 | 100 | 217 |
| 5560 | 16600 | -11040 | 100 | 218 |
| 7730 1c | 16600 | -8870 | 100 | 219 |
| 6020 | 16600 | -10580 | 100 | 220 |
| 940 1c | 16600 | -15660 | 100 | 221 |
| 1090 2c | 16600 | -15510 | 100 | 222 |
| 550 | 16600 | -16050 | 100 | 223 |
| 6130 | 16600 | -10470 | 100 | 224 |
| 7440 | 16600 | -9160 | 100 | 225 |
| 102.7 | 16600 | -16497.3 | 100 | 226 |
| 43.23 | 16600 | -16556.8 | 100 | 227 |
| | | | | |
| 914 | 591 | Same Date | 100 | 227 |
| 6150 | 591 | 5559 | 101 | 227 |
| 5560 | 591 | 4969 | 102 | 227 |
| 7730 1c | 591 | 7139 | 103 | 227 |
| 6020 | 591 | 5429 | 104 | 227 |
| 940 1c | 591 | 349 | 105 | 227 |
| 1090 2c | 591 | 499 | 106 | 227 |
| 550 | 591 | -41 | 106 | 228 |
| 6130 | 591 | 5539 | 107 | 228 |
| 7440 | 591 | 6849 | 108 | 228 |
| 102.7 | 591 | -488.3 | 108 | 229 |
| 43.23 | 591 | -547.77 | 108 | 230 |
| | | | | |
| 6150 | 914 | 5236 | 109 | 230 |
| 5560 | 914 | 4646 | 110 | 230 |
| 7730 1c | 914 | 6816 | 111 | 230 |
| 6020 | 914 | 5106 | 112 | 230 |
| 940 1c | 914 | 26 | 113 | 230 |
| 1090 2c | 914 | 176 | 114 | 230 |
| 550 | 914 | -364 | 114 | 231 |
| 6130 | 914 | 5216 | 115 | 231 |
| 7440 | 914 | 6526 | 116 | 231 |
| 102.7 | 914 | -811.3 | 116 | 232 |
| 43.23 | 914 | -870.77 | 116 | 233 |
| | | | | |
| 5560 | 6150 | Same Date | 116 | 233 |
| 7730 1c | 6150 | 1580 | 117 | 233 |
| 6020 | 6150 | -130 | 117 | 234 |
| 940 1c | 6150 | -5210 | 117 | 235 |
| 1090 2c | 6150 | -5060 | 117 | 236 |
| 550 | 6150 | -5600 | 117 | 237 |
| 6130 | 6150 | -20 | 117 | 238 |
| 7440 | 6150 | 1290 | 118 | 238 |
| 102.7 | 6150 | -6047.3 | 118 | 239 |
| 43.23 | 6150 | -6106.77 | 118 | 240 |
| | | | | |
| 7730 1c | 5560 | 2170 | 119 | 240 |
| 6020 | 5560 | 460 | 120 | 240 |
| 940 1c | 5560 | -4620 | 120 | 241 |
| 1090 2c | 5560 | -4470 | 120 | 242 |
| 550 | 5560 | -5010 | 120 | 243 |
| 6130 | 5560 | 570 | 121 | 243 |
| 7440 | 5560 | 1880 | 122 | 243 |
| 102.7 | 5560 | -5457.3 | 122 | 244 |
| 43.23 | 5560 | -5516.77 | 122 | 245 |

| | | | | |
|---|---|---|---|---|
| 6020 | 7730 1c | -1710 | 122 | 246 |
| 940 1c | 7730 1c | -6790 | 122 | 247 |
| 1090 2c | 7730 1c | -6640 | 122 | 248 |
| 550 | 7730 1c | -7180 | 122 | 249 |
| 6130 | 7730 1c | -1600 | 122 | 250 |
| 7440 | 7730 1c | -290 | 122 | 251 |
| 102.7 | 7730 1c | -7627.3 | 122 | 252 |
| 43.23 | 7730 1c | -7686.77 | 122 | 253 |
| | | | | |
| 940 1c | 6020 | -5080 | 122 | 254 |
| 1090 2c | 6020 | -4930 | 122 | 255 |
| 550 | 6020 | -5470 | 122 | 256 |
| 6130 | 6020 | 110 | 123 | 256 |
| 7440 | 6020 | 1420 | 124 | 256 |
| 102.7 | 6020 | -5917.3 | 124 | 257 |
| 43.23 | 6020 | -5976.77 | 124 | 258 |
| | | | | |
| 1090 2c | 940 1c | 150 | 125 | 258 |
| 550 | 940 1c | -390 | 125 | 259 |
| 6130 | 940 1c | 5190 | 126 | 259 |
| 7440 | 940 1c | 6500 | 127 | 259 |
| 102.7 | 940 1c | -837.3 | 127 | 260 |
| 43.23 | 940 1c | -896.77 | 127 | 261 |
| | | | | |
| 550 | 1090 2c | -540 | 127 | 262 |
| 6130 | 1090 2c | 5040 | 128 | 262 |
| 7440 | 1090 2c | 6350 | 129 | 262 |
| 102.7 | 1090 2c | -987.3 | 129 | 263 |
| 43.23 | 1090 2c | -1046.77 | 129 | 264 |
| | | | | |
| 6130 | 550 | 5580 | 130 | 264 |
| 7440 | 550 | 6890 | 131 | 264 |
| 102.7 | 550 | -447.3 | 131 | 265 |
| 43.23 | 550 | -506.77 | 131 | 266 |
| | | | | |
| 7440 | 6130 | 1310 | 132 | 266 |
| 102.7 | 6130 | -6027.3 | 132 | 267 |
| 43.23 | 6130 | -6086.77 | 132 | 268 |
| | | | | |
| 102.7 | 7440 | -7337.3 | 132 | 269 |
| 43.23 | 7440 | -7396.77 | 132 | 270 |
| | | | | |
| 43.23 | 102.7 | -59.47 | 132 | 271 |

S Statistic = 132 - 271 = -139

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 2/1/2017 | 2 |
| 3/1/2017 | 1 |
| 4/1/2017 | 1 |
| 5/1/2017 | 1 |
| 6/1/2017 | 1 |
| 7/1/2017 | 1 |

| | |
|---|---|
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 3/1/2022 | 1 |
| 3/1/2023 | 1 |
| 3/1/2024 | 1 |

There are 3 time periods with multiple data

---

A = 0
B = 54
C = 0
D = 0
E = 0
F = 6
a = 51156
b = 197316
c = 1624
Group Variance = 2839
Z-Score = -2.58998
Comparison Level at 95% confidence level = 1.65463 (upward trend)
-2.58998 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RW11-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 301000 | 368000 ML | -67000 | 0 | 1 |
| 288000 | 368000 ML | -80000 | 0 | 2 |
| 336000 | 368000 ML | -32000 | 0 | 3 |
| 201000 | 368000 ML | -167000 | 0 | 4 |
| 192000 | 368000 ML | -176000 | 0 | 5 |
| 147000 | 368000 ML | -221000 | 0 | 6 |
| 134000 | 368000 ML | -234000 | 0 | 7 |
| 111000 | 368000 ML | -257000 | 0 | 8 |
| 207000 | 368000 ML | -161000 | 0 | 9 |
| 197000 | 368000 ML | -171000 | 0 | 10 |
| 225000 ML | 368000 ML | -143000 | 0 | 11 |
| 215000 | 368000 ML | -153000 | 0 | 12 |
| 15700 | 368000 ML | -352300 | 0 | 13 |
| 174000 | 368000 ML | -194000 | 0 | 14 |
| 142000 2c | 368000 ML | -226000 | 0 | 15 |
| 137000 1c | 368000 ML | -231000 | 0 | 16 |
| 121000 M6 | 368000 ML | -247000 | 0 | 17 |
| 122000 M6 | 368000 ML | -246000 | 0 | 18 |
| 120000 | 368000 ML | -248000 | 0 | 19 |
| 173000 | 368000 ML | -195000 | 0 | 20 |
| 151000 | 368000 ML | -217000 | 0 | 21 |
| 128000 | 368000 ML | -240000 | 0 | 22 |
| 166000 | 368000 ML | -202000 | 0 | 23 |
| 188000 B | 368000 ML | -180000 | 0 | 24 |
| 141000 | 368000 ML | -227000 | 0 | 25 |
| 101800 | 368000 ML | -266200 | 0 | 26 |
| 264.3 | 368000 ML | -367736 | 0 | 27 |
| | | | | |
| 288000 | 301000 | -13000 | 0 | 28 |
| 336000 | 301000 | 35000 | 1 | 28 |
| 201000 | 301000 | -100000 | 1 | 29 |
| 192000 | 301000 | -109000 | 1 | 30 |
| 147000 | 301000 | -154000 | 1 | 31 |
| 134000 | 301000 | -167000 | 1 | 32 |
| 111000 | 301000 | -190000 | 1 | 33 |
| 207000 | 301000 | -94000 | 1 | 34 |
| 197000 | 301000 | -104000 | 1 | 35 |
| 225000 ML | 301000 | -76000 | 1 | 36 |
| 215000 | 301000 | -86000 | 1 | 37 |
| 15700 | 301000 | -285300 | 1 | 38 |
| 174000 | 301000 | -127000 | 1 | 39 |
| 142000 2c | 301000 | -159000 | 1 | 40 |
| 137000 1c | 301000 | -164000 | 1 | 41 |
| 121000 M6 | 301000 | -180000 | 1 | 42 |
| 122000 M6 | 301000 | -179000 | 1 | 43 |
| 120000 | 301000 | -181000 | 1 | 44 |
| 173000 | 301000 | -128000 | 1 | 45 |

| | | | | |
|---|---|---|---|---|
| 151000 | 301000 | -150000 | 1 | 46 |
| 128000 | 301000 | -173000 | 1 | 47 |
| 166000 | 301000 | -135000 | 1 | 48 |
| 188000 B | 301000 | -113000 | 1 | 49 |
| 141000 | 301000 | -160000 | 1 | 50 |
| 101800 | 301000 | -199200 | 1 | 51 |
| 264.3 | 301000 | -300736 | 1 | 52 |
| | | | | |
| 336000 | 288000 | 48000 | 2 | 52 |
| 201000 | 288000 | -87000 | 2 | 53 |
| 192000 | 288000 | -96000 | 2 | 54 |
| 147000 | 288000 | -141000 | 2 | 55 |
| 134000 | 288000 | -154000 | 2 | 56 |
| 111000 | 288000 | -177000 | 2 | 57 |
| 207000 | 288000 | -81000 | 2 | 58 |
| 197000 | 288000 | -91000 | 2 | 59 |
| 225000 ML | 288000 | -63000 | 2 | 60 |
| 215000 | 288000 | -73000 | 2 | 61 |
| 15700 | 288000 | -272300 | 2 | 62 |
| 174000 | 288000 | -114000 | 2 | 63 |
| 142000 2c | 288000 | -146000 | 2 | 64 |
| 137000 1c | 288000 | -151000 | 2 | 65 |
| 121000 M6 | 288000 | -167000 | 2 | 66 |
| 122000 M6 | 288000 | -166000 | 2 | 67 |
| 120000 | 288000 | -168000 | 2 | 68 |
| 173000 | 288000 | -115000 | 2 | 69 |
| 151000 | 288000 | -137000 | 2 | 70 |
| 128000 | 288000 | -160000 | 2 | 71 |
| 166000 | 288000 | -122000 | 2 | 72 |
| 188000 B | 288000 | -100000 | 2 | 73 |
| 141000 | 288000 | -147000 | 2 | 74 |
| 101800 | 288000 | -186200 | 2 | 75 |
| 264.3 | 288000 | -287736 | 2 | 76 |
| | | | | |
| 201000 | 336000 | -135000 | 2 | 77 |
| 192000 | 336000 | -144000 | 2 | 78 |
| 147000 | 336000 | -189000 | 2 | 79 |
| 134000 | 336000 | -202000 | 2 | 80 |
| 111000 | 336000 | -225000 | 2 | 81 |
| 207000 | 336000 | -129000 | 2 | 82 |
| 197000 | 336000 | -139000 | 2 | 83 |
| 225000 ML | 336000 | -111000 | 2 | 84 |
| 215000 | 336000 | -121000 | 2 | 85 |
| 15700 | 336000 | -320300 | 2 | 86 |
| 174000 | 336000 | -162000 | 2 | 87 |
| 142000 2c | 336000 | -194000 | 2 | 88 |
| 137000 1c | 336000 | -199000 | 2 | 89 |
| 121000 M6 | 336000 | -215000 | 2 | 90 |
| 122000 M6 | 336000 | -214000 | 2 | 91 |
| 120000 | 336000 | -216000 | 2 | 92 |
| 173000 | 336000 | -163000 | 2 | 93 |
| 151000 | 336000 | -185000 | 2 | 94 |
| 128000 | 336000 | -208000 | 2 | 95 |
| 166000 | 336000 | -170000 | 2 | 96 |
| 188000 B | 336000 | -148000 | 2 | 97 |
| 141000 | 336000 | -195000 | 2 | 98 |
| 101800 | 336000 | -234200 | 2 | 99 |

| | | | | |
|---|---|---|---|---|
| 264.3 | 336000 | -335736 | 2 | 100 |
| | | | | |
| 192000 | 201000 | -9000 | 2 | 101 |
| 147000 | 201000 | -54000 | 2 | 102 |
| 134000 | 201000 | -67000 | 2 | 103 |
| 111000 | 201000 | -90000 | 2 | 104 |
| 207000 | 201000 | 6000 | 3 | 104 |
| 197000 | 201000 | -4000 | 3 | 105 |
| 225000 ML | 201000 | 24000 | 4 | 105 |
| 215000 | 201000 | 14000 | 5 | 105 |
| 15700 | 201000 | -185300 | 5 | 106 |
| 174000 | 201000 | -27000 | 5 | 107 |
| 142000 2c | 201000 | -59000 | 5 | 108 |
| 137000 1c | 201000 | -64000 | 5 | 109 |
| 121000 M6 | 201000 | -80000 | 5 | 110 |
| 122000 M6 | 201000 | -79000 | 5 | 111 |
| 120000 | 201000 | -81000 | 5 | 112 |
| 173000 | 201000 | -28000 | 5 | 113 |
| 151000 | 201000 | -50000 | 5 | 114 |
| 128000 | 201000 | -73000 | 5 | 115 |
| 166000 | 201000 | -35000 | 5 | 116 |
| 188000 B | 201000 | -13000 | 5 | 117 |
| 141000 | 201000 | -60000 | 5 | 118 |
| 101800 | 201000 | -99200 | 5 | 119 |
| 264.3 | 201000 | -200736 | 5 | 120 |
| | | | | |
| 147000 | 192000 | -45000 | 5 | 121 |
| 134000 | 192000 | -58000 | 5 | 122 |
| 111000 | 192000 | -81000 | 5 | 123 |
| 207000 | 192000 | 15000 | 6 | 123 |
| 197000 | 192000 | 5000 | 7 | 123 |
| 225000 ML | 192000 | 33000 | 8 | 123 |
| 215000 | 192000 | 23000 | 9 | 123 |
| 15700 | 192000 | -176300 | 9 | 124 |
| 174000 | 192000 | -18000 | 9 | 125 |
| 142000 2c | 192000 | -50000 | 9 | 126 |
| 137000 1c | 192000 | -55000 | 9 | 127 |
| 121000 M6 | 192000 | -71000 | 9 | 128 |
| 122000 M6 | 192000 | -70000 | 9 | 129 |
| 120000 | 192000 | -72000 | 9 | 130 |
| 173000 | 192000 | -19000 | 9 | 131 |
| 151000 | 192000 | -41000 | 9 | 132 |
| 128000 | 192000 | -64000 | 9 | 133 |
| 166000 | 192000 | -26000 | 9 | 134 |
| 188000 B | 192000 | -4000 | 9 | 135 |
| 141000 | 192000 | -51000 | 9 | 136 |
| 101800 | 192000 | -90200 | 9 | 137 |
| 264.3 | 192000 | -191736 | 9 | 138 |
| | | | | |
| 134000 | 147000 | -13000 | 9 | 139 |
| 111000 | 147000 | -36000 | 9 | 140 |
| 207000 | 147000 | 60000 | 10 | 140 |
| 197000 | 147000 | 50000 | 11 | 140 |
| 225000 ML | 147000 | 78000 | 12 | 140 |
| 215000 | 147000 | 68000 | 13 | 140 |
| 15700 | 147000 | -131300 | 13 | 141 |
| 174000 | 147000 | 27000 | 14 | 141 |

| | | | | |
|---|---|---|---|---|
| 142000 2c | 147000 | -5000 | 14 | 142 |
| 137000 1c | 147000 | -10000 | 14 | 143 |
| 121000 M6 | 147000 | -26000 | 14 | 144 |
| 122000 M6 | 147000 | -25000 | 14 | 145 |
| 120000 | 147000 | -27000 | 14 | 146 |
| 173000 | 147000 | 26000 | 15 | 146 |
| 151000 | 147000 | 4000 | 16 | 146 |
| 128000 | 147000 | -19000 | 16 | 147 |
| 166000 | 147000 | 19000 | 17 | 147 |
| 188000 B | 147000 | 41000 | 18 | 147 |
| 141000 | 147000 | -6000 | 18 | 148 |
| 101800 | 147000 | -45200 | 18 | 149 |
| 264.3 | 147000 | -146736 | 18 | 150 |
| | | | | |
| 111000 | 134000 | -23000 | 18 | 151 |
| 207000 | 134000 | 73000 | 19 | 151 |
| 197000 | 134000 | 63000 | 20 | 151 |
| 225000 ML | 134000 | 91000 | 21 | 151 |
| 215000 | 134000 | 81000 | 22 | 151 |
| 15700 | 134000 | -118300 | 22 | 152 |
| 174000 | 134000 | 40000 | 23 | 152 |
| 142000 2c | 134000 | 8000 | 24 | 152 |
| 137000 1c | 134000 | 3000 | 25 | 152 |
| 121000 M6 | 134000 | -13000 | 25 | 153 |
| 122000 M6 | 134000 | -12000 | 25 | 154 |
| 120000 | 134000 | -14000 | 25 | 155 |
| 173000 | 134000 | 39000 | 26 | 155 |
| 151000 | 134000 | 17000 | 27 | 155 |
| 128000 | 134000 | -6000 | 27 | 156 |
| 166000 | 134000 | 32000 | 28 | 156 |
| 188000 B | 134000 | 54000 | 29 | 156 |
| 141000 | 134000 | 7000 | 30 | 156 |
| 101800 | 134000 | -32200 | 30 | 157 |
| 264.3 | 134000 | -133736 | 30 | 158 |
| | | | | |
| 207000 | 111000 | 96000 | 31 | 158 |
| 197000 | 111000 | 86000 | 32 | 158 |
| 225000 ML | 111000 | 114000 | 33 | 158 |
| 215000 | 111000 | 104000 | 34 | 158 |
| 15700 | 111000 | -95300 | 34 | 159 |
| 174000 | 111000 | 63000 | 35 | 159 |
| 142000 2c | 111000 | 31000 | 36 | 159 |
| 137000 1c | 111000 | 26000 | 37 | 159 |
| 121000 M6 | 111000 | 10000 | 38 | 159 |
| 122000 M6 | 111000 | 11000 | 39 | 159 |
| 120000 | 111000 | 9000 | 40 | 159 |
| 173000 | 111000 | 62000 | 41 | 159 |
| 151000 | 111000 | 40000 | 42 | 159 |
| 128000 | 111000 | 17000 | 43 | 159 |
| 166000 | 111000 | 55000 | 44 | 159 |
| 188000 B | 111000 | 77000 | 45 | 159 |
| 141000 | 111000 | 30000 | 46 | 159 |
| 101800 | 111000 | -9200 | 46 | 160 |
| 264.3 | 111000 | -110736 | 46 | 161 |
| | | | | |
| 197000 | 207000 | -10000 | 46 | 162 |
| 225000 ML | 207000 | 18000 | 47 | 162 |

| | | | | |
|---|---|---|---|---|
| 215000 | 207000 | 8000 | 48 | 162 |
| 15700 | 207000 | -191300 | 48 | 163 |
| 174000 | 207000 | -33000 | 48 | 164 |
| 142000 2c | 207000 | -65000 | 48 | 165 |
| 137000 1c | 207000 | -70000 | 48 | 166 |
| 121000 M6 | 207000 | -86000 | 48 | 167 |
| 122000 M6 | 207000 | -85000 | 48 | 168 |
| 120000 | 207000 | -87000 | 48 | 169 |
| 173000 | 207000 | -34000 | 48 | 170 |
| 151000 | 207000 | -56000 | 48 | 171 |
| 128000 | 207000 | -79000 | 48 | 172 |
| 166000 | 207000 | -41000 | 48 | 173 |
| 188000 B | 207000 | -19000 | 48 | 174 |
| 141000 | 207000 | -66000 | 48 | 175 |
| 101800 | 207000 | -105200 | 48 | 176 |
| 264.3 | 207000 | -206736 | 48 | 177 |
| | | | | |
| 225000 ML | 197000 | 28000 | 49 | 177 |
| 215000 | 197000 | 18000 | 50 | 177 |
| 15700 | 197000 | -181300 | 50 | 178 |
| 174000 | 197000 | -23000 | 50 | 179 |
| 142000 2c | 197000 | -55000 | 50 | 180 |
| 137000 1c | 197000 | -60000 | 50 | 181 |
| 121000 M6 | 197000 | -76000 | 50 | 182 |
| 122000 M6 | 197000 | -75000 | 50 | 183 |
| 120000 | 197000 | -77000 | 50 | 184 |
| 173000 | 197000 | -24000 | 50 | 185 |
| 151000 | 197000 | -46000 | 50 | 186 |
| 128000 | 197000 | -69000 | 50 | 187 |
| 166000 | 197000 | -31000 | 50 | 188 |
| 188000 B | 197000 | -9000 | 50 | 189 |
| 141000 | 197000 | -56000 | 50 | 190 |
| 101800 | 197000 | -95200 | 50 | 191 |
| 264.3 | 197000 | -196736 | 50 | 192 |
| | | | | |
| 215000 | 225000 ML | -10000 | 50 | 193 |
| 15700 | 225000 ML | -209300 | 50 | 194 |
| 174000 | 225000 ML | -51000 | 50 | 195 |
| 142000 2c | 225000 ML | -83000 | 50 | 196 |
| 137000 1c | 225000 ML | -88000 | 50 | 197 |
| 121000 M6 | 225000 ML | -104000 | 50 | 198 |
| 122000 M6 | 225000 ML | -103000 | 50 | 199 |
| 120000 | 225000 ML | -105000 | 50 | 200 |
| 173000 | 225000 ML | -52000 | 50 | 201 |
| 151000 | 225000 ML | -74000 | 50 | 202 |
| 128000 | 225000 ML | -97000 | 50 | 203 |
| 166000 | 225000 ML | -59000 | 50 | 204 |
| 188000 B | 225000 ML | -37000 | 50 | 205 |
| 141000 | 225000 ML | -84000 | 50 | 206 |
| 101800 | 225000 ML | -123200 | 50 | 207 |
| 264.3 | 225000 ML | -224736 | 50 | 208 |
| | | | | |
| 15700 | 215000 | -199300 | 50 | 209 |
| 174000 | 215000 | -41000 | 50 | 210 |
| 142000 2c | 215000 | -73000 | 50 | 211 |
| 137000 1c | 215000 | -78000 | 50 | 212 |
| 121000 M6 | 215000 | -94000 | 50 | 213 |

| | | | | |
|---|---|---|---|---|
| 122000 M6 | 215000 | -93000 | 50 | 214 |
| 120000 | 215000 | -95000 | 50 | 215 |
| 173000 | 215000 | -42000 | 50 | 216 |
| 151000 | 215000 | -64000 | 50 | 217 |
| 128000 | 215000 | -87000 | 50 | 218 |
| 166000 | 215000 | -49000 | 50 | 219 |
| 188000 B | 215000 | -27000 | 50 | 220 |
| 141000 | 215000 | -74000 | 50 | 221 |
| 101800 | 215000 | -113200 | 50 | 222 |
| 264.3 | 215000 | -214736 | 50 | 223 |
| | | | | |
| 174000 | 15700 | 158300 | 51 | 223 |
| 142000 2c | 15700 | 126300 | 52 | 223 |
| 137000 1c | 15700 | 121300 | 53 | 223 |
| 121000 M6 | 15700 | 105300 | 54 | 223 |
| 122000 M6 | 15700 | 106300 | 55 | 223 |
| 120000 | 15700 | 104300 | 56 | 223 |
| 173000 | 15700 | 157300 | 57 | 223 |
| 151000 | 15700 | 135300 | 58 | 223 |
| 128000 | 15700 | 112300 | 59 | 223 |
| 166000 | 15700 | 150300 | 60 | 223 |
| 188000 B | 15700 | 172300 | 61 | 223 |
| 141000 | 15700 | 125300 | 62 | 223 |
| 101800 | 15700 | 86100 | 63 | 223 |
| 264.3 | 15700 | -15435.7 | 63 | 224 |
| | | | | |
| 142000 2c | 174000 | -32000 | 63 | 225 |
| 137000 1c | 174000 | -37000 | 63 | 226 |
| 121000 M6 | 174000 | -53000 | 63 | 227 |
| 122000 M6 | 174000 | -52000 | 63 | 228 |
| 120000 | 174000 | -54000 | 63 | 229 |
| 173000 | 174000 | -1000 | 63 | 230 |
| 151000 | 174000 | -23000 | 63 | 231 |
| 128000 | 174000 | -46000 | 63 | 232 |
| 166000 | 174000 | -8000 | 63 | 233 |
| 188000 B | 174000 | 14000 | 64 | 233 |
| 141000 | 174000 | -33000 | 64 | 234 |
| 101800 | 174000 | -72200 | 64 | 235 |
| 264.3 | 174000 | -173736 | 64 | 236 |
| | | | | |
| 137000 1c | 142000 2c | Same Date | 64 | 236 |
| 121000 M6 | 142000 2c | -21000 | 64 | 237 |
| 122000 M6 | 142000 2c | -20000 | 64 | 238 |
| 120000 | 142000 2c | -22000 | 64 | 239 |
| 173000 | 142000 2c | 31000 | 65 | 239 |
| 151000 | 142000 2c | 9000 | 66 | 239 |
| 128000 | 142000 2c | -14000 | 66 | 240 |
| 166000 | 142000 2c | 24000 | 67 | 240 |
| 188000 B | 142000 2c | 46000 | 68 | 240 |
| 141000 | 142000 2c | -1000 | 68 | 241 |
| 101800 | 142000 2c | -40200 | 68 | 242 |
| 264.3 | 142000 2c | -141736 | 68 | 243 |
| | | | | |
| 121000 M6 | 137000 1c | -16000 | 68 | 244 |
| 122000 M6 | 137000 1c | -15000 | 68 | 245 |
| 120000 | 137000 1c | -17000 | 68 | 246 |
| 173000 | 137000 1c | 36000 | 69 | 246 |

| | | | | |
|---|---|---|---|---|
| 151000 | 137000 1c | 14000 | 70 | 246 |
| 128000 | 137000 1c | -9000 | 70 | 247 |
| 166000 | 137000 1c | 29000 | 71 | 247 |
| 188000 B | 137000 1c | 51000 | 72 | 247 |
| 141000 | 137000 1c | 4000 | 73 | 247 |
| 101800 | 137000 1c | -35200 | 73 | 248 |
| 264.3 | 137000 1c | -136736 | 73 | 249 |
| | | | | |
| 122000 M6 | 121000 M6 | Same Date | 73 | 249 |
| 120000 | 121000 M6 | -1000 | 73 | 250 |
| 173000 | 121000 M6 | 52000 | 74 | 250 |
| 151000 | 121000 M6 | 30000 | 75 | 250 |
| 128000 | 121000 M6 | 7000 | 76 | 250 |
| 166000 | 121000 M6 | 45000 | 77 | 250 |
| 188000 B | 121000 M6 | 67000 | 78 | 250 |
| 141000 | 121000 M6 | 20000 | 79 | 250 |
| 101800 | 121000 M6 | -19200 | 79 | 251 |
| 264.3 | 121000 M6 | -120736 | 79 | 252 |
| | | | | |
| 120000 | 122000 M6 | -2000 | 79 | 253 |
| 173000 | 122000 M6 | 51000 | 80 | 253 |
| 151000 | 122000 M6 | 29000 | 81 | 253 |
| 128000 | 122000 M6 | 6000 | 82 | 253 |
| 166000 | 122000 M6 | 44000 | 83 | 253 |
| 188000 B | 122000 M6 | 66000 | 84 | 253 |
| 141000 | 122000 M6 | 19000 | 85 | 253 |
| 101800 | 122000 M6 | -20200 | 85 | 254 |
| 264.3 | 122000 M6 | -121736 | 85 | 255 |
| | | | | |
| 173000 | 120000 | 53000 | 86 | 255 |
| 151000 | 120000 | 31000 | 87 | 255 |
| 128000 | 120000 | 8000 | 88 | 255 |
| 166000 | 120000 | 46000 | 89 | 255 |
| 188000 B | 120000 | 68000 | 90 | 255 |
| 141000 | 120000 | 21000 | 91 | 255 |
| 101800 | 120000 | -18200 | 91 | 256 |
| 264.3 | 120000 | -119736 | 91 | 257 |
| | | | | |
| 151000 | 173000 | -22000 | 91 | 258 |
| 128000 | 173000 | -45000 | 91 | 259 |
| 166000 | 173000 | -7000 | 91 | 260 |
| 188000 B | 173000 | 15000 | 92 | 260 |
| 141000 | 173000 | -32000 | 92 | 261 |
| 101800 | 173000 | -71200 | 92 | 262 |
| 264.3 | 173000 | -172736 | 92 | 263 |
| | | | | |
| 128000 | 151000 | -23000 | 92 | 264 |
| 166000 | 151000 | 15000 | 93 | 264 |
| 188000 B | 151000 | 37000 | 94 | 264 |
| 141000 | 151000 | -10000 | 94 | 265 |
| 101800 | 151000 | -49200 | 94 | 266 |
| 264.3 | 151000 | -150736 | 94 | 267 |
| | | | | |
| 166000 | 128000 | 38000 | 95 | 267 |
| 188000 B | 128000 | 60000 | 96 | 267 |
| 141000 | 128000 | 13000 | 97 | 267 |
| 101800 | 128000 | -26200 | 97 | 268 |

| | | | | |
|---|---|---|---|---|
| 264.3 | 128000 | -127736 | 97 | 269 |
| | | | | |
| 188000 B | 166000 | 22000 | 98 | 269 |
| 141000 | 166000 | -25000 | 98 | 270 |
| 101800 | 166000 | -64200 | 98 | 271 |
| 264.3 | 166000 | -165736 | 98 | 272 |
| | | | | |
| 141000 | 188000 B | -47000 | 98 | 273 |
| 101800 | 188000 B | -86200 | 98 | 274 |
| 264.3 | 188000 B | -187736 | 98 | 275 |
| | | | | |
| 101800 | 141000 | -39200 | 98 | 276 |
| 264.3 | 141000 | -140736 | 98 | 277 |
| | | | | |
| 264.3 | 101800 | -101536 | 98 | 278 |

S Statistic = 98 - 278 = -180

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 2/1/2017 | 1 |
| 3/1/2017 | 1 |
| 4/1/2017 | 1 |
| 5/1/2017 | 1 |
| 6/1/2017 | 1 |
| 7/1/2017 | 1 |
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 3/1/2022 | 1 |
| 3/1/2023 | 1 |
| 3/1/2024 | 1 |

There are 2 time periods with multiple data

A = 0
B = 36
C = 0
D = 0
E = 0
F = 4
a = 46116

b = 176904
c = 1512
Group Variance = 2560
Z-Score = -3.5378
Comparison Level at 95% confidence level = 1.65463 (upward trend)
-3.5378 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RW12-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 216000 | 249000 MH | -33000 | 0 | 1 |
| 188000 | 249000 MH | -61000 | 0 | 2 |
| 232000 | 249000 MH | -17000 | 0 | 3 |
| 226000 | 249000 MH | -23000 | 0 | 4 |
| 219000 | 249000 MH | -30000 | 0 | 5 |
| 156000 | 249000 MH | -93000 | 0 | 6 |
| 156000 | 249000 MH | -93000 | 0 | 7 |
| 150000 ML | 249000 MH | -99000 | 0 | 8 |
| 140000 | 249000 MH | -109000 | 0 | 9 |
| 157000 ML | 249000 MH | -92000 | 0 | 10 |
| 117000 | 249000 MH | -132000 | 0 | 11 |
| 103000 | 249000 MH | -146000 | 0 | 12 |
| 2410 | 249000 MH | -246590 | 0 | 13 |
| 14300 | 249000 MH | -234700 | 0 | 14 |
| 110000 | 249000 MH | -139000 | 0 | 15 |
| 111000 | 249000 MH | -138000 | 0 | 16 |
| 111000 M6 | 249000 MH | -138000 | 0 | 17 |
| 120000 | 249000 MH | -129000 | 0 | 18 |
| 104000 | 249000 MH | -145000 | 0 | 19 |
| 43500 M6 | 249000 MH | -205500 | 0 | 20 |
| 86400 | 249000 MH | -162600 | 0 | 21 |
| 81000 | 249000 MH | -168000 | 0 | 22 |
| 99550 | 249000 MH | -149450 | 0 | 23 |
| 28220 | 249000 MH | -220780 | 0 | 24 |
| 78100 | 249000 MH | -170900 | 0 | 25 |
| 1418 | 249000 MH | -247582 | 0 | 26 |
| 87040 | 249000 MH | -161960 | 0 | 27 |
| | | | | |
| 188000 | 216000 | -28000 | 0 | 28 |
| 232000 | 216000 | 16000 | 1 | 28 |
| 226000 | 216000 | 10000 | 2 | 28 |
| 219000 | 216000 | 3000 | 3 | 28 |
| 156000 | 216000 | -60000 | 3 | 29 |
| 156000 | 216000 | -60000 | 3 | 30 |
| 150000 ML | 216000 | -66000 | 3 | 31 |
| 140000 | 216000 | -76000 | 3 | 32 |
| 157000 ML | 216000 | -59000 | 3 | 33 |
| 117000 | 216000 | -99000 | 3 | 34 |
| 103000 | 216000 | -113000 | 3 | 35 |
| 2410 | 216000 | -213590 | 3 | 36 |
| 14300 | 216000 | -201700 | 3 | 37 |
| 110000 | 216000 | -106000 | 3 | 38 |
| 111000 | 216000 | -105000 | 3 | 39 |
| 111000 M6 | 216000 | -105000 | 3 | 40 |
| 120000 | 216000 | -96000 | 3 | 41 |
| 104000 | 216000 | -112000 | 3 | 42 |
| 43500 M6 | 216000 | -172500 | 3 | 43 |

| | | | | |
|---|---|---|---|---|
| 86400 | 216000 | -129600 | 3 | 44 |
| 81000 | 216000 | -135000 | 3 | 45 |
| 99550 | 216000 | -116450 | 3 | 46 |
| 28220 | 216000 | -187780 | 3 | 47 |
| 78100 | 216000 | -137900 | 3 | 48 |
| 1418 | 216000 | -214582 | 3 | 49 |
| 87040 | 216000 | -128960 | 3 | 50 |
| | | | | |
| 232000 | 188000 | 44000 | 4 | 50 |
| 226000 | 188000 | 38000 | 5 | 50 |
| 219000 | 188000 | 31000 | 6 | 50 |
| 156000 | 188000 | -32000 | 6 | 51 |
| 156000 | 188000 | -32000 | 6 | 52 |
| 150000 ML | 188000 | -38000 | 6 | 53 |
| 140000 | 188000 | -48000 | 6 | 54 |
| 157000 ML | 188000 | -31000 | 6 | 55 |
| 117000 | 188000 | -71000 | 6 | 56 |
| 103000 | 188000 | -85000 | 6 | 57 |
| 2410 | 188000 | -185590 | 6 | 58 |
| 14300 | 188000 | -173700 | 6 | 59 |
| 110000 | 188000 | -78000 | 6 | 60 |
| 111000 | 188000 | -77000 | 6 | 61 |
| 111000 M6 | 188000 | -77000 | 6 | 62 |
| 120000 | 188000 | -68000 | 6 | 63 |
| 104000 | 188000 | -84000 | 6 | 64 |
| 43500 M6 | 188000 | -144500 | 6 | 65 |
| 86400 | 188000 | -101600 | 6 | 66 |
| 81000 | 188000 | -107000 | 6 | 67 |
| 99550 | 188000 | -88450 | 6 | 68 |
| 28220 | 188000 | -159780 | 6 | 69 |
| 78100 | 188000 | -109900 | 6 | 70 |
| 1418 | 188000 | -186582 | 6 | 71 |
| 87040 | 188000 | -100960 | 6 | 72 |
| | | | | |
| 226000 | 232000 | -6000 | 6 | 73 |
| 219000 | 232000 | -13000 | 6 | 74 |
| 156000 | 232000 | -76000 | 6 | 75 |
| 156000 | 232000 | -76000 | 6 | 76 |
| 150000 ML | 232000 | -82000 | 6 | 77 |
| 140000 | 232000 | -92000 | 6 | 78 |
| 157000 ML | 232000 | -75000 | 6 | 79 |
| 117000 | 232000 | -115000 | 6 | 80 |
| 103000 | 232000 | -129000 | 6 | 81 |
| 2410 | 232000 | -229590 | 6 | 82 |
| 14300 | 232000 | -217700 | 6 | 83 |
| 110000 | 232000 | -122000 | 6 | 84 |
| 111000 | 232000 | -121000 | 6 | 85 |
| 111000 M6 | 232000 | -121000 | 6 | 86 |
| 120000 | 232000 | -112000 | 6 | 87 |
| 104000 | 232000 | -128000 | 6 | 88 |
| 43500 M6 | 232000 | -188500 | 6 | 89 |
| 86400 | 232000 | -145600 | 6 | 90 |
| 81000 | 232000 | -151000 | 6 | 91 |
| 99550 | 232000 | -132450 | 6 | 92 |
| 28220 | 232000 | -203780 | 6 | 93 |
| 78100 | 232000 | -153900 | 6 | 94 |
| 1418 | 232000 | -230582 | 6 | 95 |

| | | | | |
|---|---|---|---|---|
| 87040 | 232000 | -144960 | 6 | 96 |
| | | | | |
| 219000 | 226000 | -7000 | 6 | 97 |
| 156000 | 226000 | -70000 | 6 | 98 |
| 156000 | 226000 | -70000 | 6 | 99 |
| 150000 ML | 226000 | -76000 | 6 | 100 |
| 140000 | 226000 | -86000 | 6 | 101 |
| 157000 ML | 226000 | -69000 | 6 | 102 |
| 117000 | 226000 | -109000 | 6 | 103 |
| 103000 | 226000 | -123000 | 6 | 104 |
| 2410 | 226000 | -223590 | 6 | 105 |
| 14300 | 226000 | -211700 | 6 | 106 |
| 110000 | 226000 | -116000 | 6 | 107 |
| 111000 | 226000 | -115000 | 6 | 108 |
| 111000 M6 | 226000 | -115000 | 6 | 109 |
| 120000 | 226000 | -106000 | 6 | 110 |
| 104000 | 226000 | -122000 | 6 | 111 |
| 43500 M6 | 226000 | -182500 | 6 | 112 |
| 86400 | 226000 | -139600 | 6 | 113 |
| 81000 | 226000 | -145000 | 6 | 114 |
| 99550 | 226000 | -126450 | 6 | 115 |
| 28220 | 226000 | -197780 | 6 | 116 |
| 78100 | 226000 | -147900 | 6 | 117 |
| 1418 | 226000 | -224582 | 6 | 118 |
| 87040 | 226000 | -138960 | 6 | 119 |
| | | | | |
| 156000 | 219000 | -63000 | 6 | 120 |
| 156000 | 219000 | -63000 | 6 | 121 |
| 150000 ML | 219000 | -69000 | 6 | 122 |
| 140000 | 219000 | -79000 | 6 | 123 |
| 157000 ML | 219000 | -62000 | 6 | 124 |
| 117000 | 219000 | -102000 | 6 | 125 |
| 103000 | 219000 | -116000 | 6 | 126 |
| 2410 | 219000 | -216590 | 6 | 127 |
| 14300 | 219000 | -204700 | 6 | 128 |
| 110000 | 219000 | -109000 | 6 | 129 |
| 111000 | 219000 | -108000 | 6 | 130 |
| 111000 M6 | 219000 | -108000 | 6 | 131 |
| 120000 | 219000 | -99000 | 6 | 132 |
| 104000 | 219000 | -115000 | 6 | 133 |
| 43500 M6 | 219000 | -175500 | 6 | 134 |
| 86400 | 219000 | -132600 | 6 | 135 |
| 81000 | 219000 | -138000 | 6 | 136 |
| 99550 | 219000 | -119450 | 6 | 137 |
| 28220 | 219000 | -190780 | 6 | 138 |
| 78100 | 219000 | -140900 | 6 | 139 |
| 1418 | 219000 | -217582 | 6 | 140 |
| 87040 | 219000 | -131960 | 6 | 141 |
| | | | | |
| 156000 | 156000 | 0 | 6 | 141 |
| 150000 ML | 156000 | -6000 | 6 | 142 |
| 140000 | 156000 | -16000 | 6 | 143 |
| 157000 ML | 156000 | 1000 | 7 | 143 |
| 117000 | 156000 | -39000 | 7 | 144 |
| 103000 | 156000 | -53000 | 7 | 145 |
| 2410 | 156000 | -153590 | 7 | 146 |
| 14300 | 156000 | -141700 | 7 | 147 |

| | | | | |
|---|---|---|---|---|
| 110000 | 156000 | -46000 | 7 | 148 |
| 111000 | 156000 | -45000 | 7 | 149 |
| 111000 M6 | 156000 | -45000 | 7 | 150 |
| 120000 | 156000 | -36000 | 7 | 151 |
| 104000 | 156000 | -52000 | 7 | 152 |
| 43500 M6 | 156000 | -112500 | 7 | 153 |
| 86400 | 156000 | -69600 | 7 | 154 |
| 81000 | 156000 | -75000 | 7 | 155 |
| 99550 | 156000 | -56450 | 7 | 156 |
| 28220 | 156000 | -127780 | 7 | 157 |
| 78100 | 156000 | -77900 | 7 | 158 |
| 1418 | 156000 | -154582 | 7 | 159 |
| 87040 | 156000 | -68960 | 7 | 160 |
| | | | | |
| 150000 ML | 156000 | -6000 | 7 | 161 |
| 140000 | 156000 | -16000 | 7 | 162 |
| 157000 ML | 156000 | 1000 | 8 | 162 |
| 117000 | 156000 | -39000 | 8 | 163 |
| 103000 | 156000 | -53000 | 8 | 164 |
| 2410 | 156000 | -153590 | 8 | 165 |
| 14300 | 156000 | -141700 | 8 | 166 |
| 110000 | 156000 | -46000 | 8 | 167 |
| 111000 | 156000 | -45000 | 8 | 168 |
| 111000 M6 | 156000 | -45000 | 8 | 169 |
| 120000 | 156000 | -36000 | 8 | 170 |
| 104000 | 156000 | -52000 | 8 | 171 |
| 43500 M6 | 156000 | -112500 | 8 | 172 |
| 86400 | 156000 | -69600 | 8 | 173 |
| 81000 | 156000 | -75000 | 8 | 174 |
| 99550 | 156000 | -56450 | 8 | 175 |
| 28220 | 156000 | -127780 | 8 | 176 |
| 78100 | 156000 | -77900 | 8 | 177 |
| 1418 | 156000 | -154582 | 8 | 178 |
| 87040 | 156000 | -68960 | 8 | 179 |
| | | | | |
| 140000 | 150000 ML | -10000 | 8 | 180 |
| 157000 ML | 150000 ML | 7000 | 9 | 180 |
| 117000 | 150000 ML | -33000 | 9 | 181 |
| 103000 | 150000 ML | -47000 | 9 | 182 |
| 2410 | 150000 ML | -147590 | 9 | 183 |
| 14300 | 150000 ML | -135700 | 9 | 184 |
| 110000 | 150000 ML | -40000 | 9 | 185 |
| 111000 | 150000 ML | -39000 | 9 | 186 |
| 111000 M6 | 150000 ML | -39000 | 9 | 187 |
| 120000 | 150000 ML | -30000 | 9 | 188 |
| 104000 | 150000 ML | -46000 | 9 | 189 |
| 43500 M6 | 150000 ML | -106500 | 9 | 190 |
| 86400 | 150000 ML | -63600 | 9 | 191 |
| 81000 | 150000 ML | -69000 | 9 | 192 |
| 99550 | 150000 ML | -50450 | 9 | 193 |
| 28220 | 150000 ML | -121780 | 9 | 194 |
| 78100 | 150000 ML | -71900 | 9 | 195 |
| 1418 | 150000 ML | -148582 | 9 | 196 |
| 87040 | 150000 ML | -62960 | 9 | 197 |
| | | | | |
| 157000 ML | 140000 | 17000 | 10 | 197 |
| 117000 | 140000 | -23000 | 10 | 198 |

| | | | | |
|---|---|---|---|---|
| 103000 | 140000 | -37000 | 10 | 199 |
| 2410 | 140000 | -137590 | 10 | 200 |
| 14300 | 140000 | -125700 | 10 | 201 |
| 110000 | 140000 | -30000 | 10 | 202 |
| 111000 | 140000 | -29000 | 10 | 203 |
| 111000 M6 | 140000 | -29000 | 10 | 204 |
| 120000 | 140000 | -20000 | 10 | 205 |
| 104000 | 140000 | -36000 | 10 | 206 |
| 43500 M6 | 140000 | -96500 | 10 | 207 |
| 86400 | 140000 | -53600 | 10 | 208 |
| 81000 | 140000 | -59000 | 10 | 209 |
| 99550 | 140000 | -40450 | 10 | 210 |
| 28220 | 140000 | -111780 | 10 | 211 |
| 78100 | 140000 | -61900 | 10 | 212 |
| 1418 | 140000 | -138582 | 10 | 213 |
| 87040 | 140000 | -52960 | 10 | 214 |
| | | | | |
| 117000 | 157000 ML | -40000 | 10 | 215 |
| 103000 | 157000 ML | -54000 | 10 | 216 |
| 2410 | 157000 ML | -154590 | 10 | 217 |
| 14300 | 157000 ML | -142700 | 10 | 218 |
| 110000 | 157000 ML | -47000 | 10 | 219 |
| 111000 | 157000 ML | -46000 | 10 | 220 |
| 111000 M6 | 157000 ML | -46000 | 10 | 221 |
| 120000 | 157000 ML | -37000 | 10 | 222 |
| 104000 | 157000 ML | -53000 | 10 | 223 |
| 43500 M6 | 157000 ML | -113500 | 10 | 224 |
| 86400 | 157000 ML | -70600 | 10 | 225 |
| 81000 | 157000 ML | -76000 | 10 | 226 |
| 99550 | 157000 ML | -57450 | 10 | 227 |
| 28220 | 157000 ML | -128780 | 10 | 228 |
| 78100 | 157000 ML | -78900 | 10 | 229 |
| 1418 | 157000 ML | -155582 | 10 | 230 |
| 87040 | 157000 ML | -69960 | 10 | 231 |
| | | | | |
| 103000 | 117000 | -14000 | 10 | 232 |
| 2410 | 117000 | -114590 | 10 | 233 |
| 14300 | 117000 | -102700 | 10 | 234 |
| 110000 | 117000 | -7000 | 10 | 235 |
| 111000 | 117000 | -6000 | 10 | 236 |
| 111000 M6 | 117000 | -6000 | 10 | 237 |
| 120000 | 117000 | 3000 | 11 | 237 |
| 104000 | 117000 | -13000 | 11 | 238 |
| 43500 M6 | 117000 | -73500 | 11 | 239 |
| 86400 | 117000 | -30600 | 11 | 240 |
| 81000 | 117000 | -36000 | 11 | 241 |
| 99550 | 117000 | -17450 | 11 | 242 |
| 28220 | 117000 | -88780 | 11 | 243 |
| 78100 | 117000 | -38900 | 11 | 244 |
| 1418 | 117000 | -115582 | 11 | 245 |
| 87040 | 117000 | -29960 | 11 | 246 |
| | | | | |
| 2410 | 103000 | -100590 | 11 | 247 |
| 14300 | 103000 | -88700 | 11 | 248 |
| 110000 | 103000 | 7000 | 12 | 248 |
| 111000 | 103000 | 8000 | 13 | 248 |
| 111000 M6 | 103000 | 8000 | 14 | 248 |

| | | | | |
|---|---|---|---|---|
| 120000 | 103000 | 17000 | 15 | 248 |
| 104000 | 103000 | 1000 | 16 | 248 |
| 43500 M6 | 103000 | -59500 | 16 | 249 |
| 86400 | 103000 | -16600 | 16 | 250 |
| 81000 | 103000 | -22000 | 16 | 251 |
| 99550 | 103000 | -3450 | 16 | 252 |
| 28220 | 103000 | -74780 | 16 | 253 |
| 78100 | 103000 | -24900 | 16 | 254 |
| 1418 | 103000 | -101582 | 16 | 255 |
| 87040 | 103000 | -15960 | 16 | 256 |
| | | | | |
| 14300 | 2410 | 11890 | 17 | 256 |
| 110000 | 2410 | 107590 | 18 | 256 |
| 111000 | 2410 | 108590 | 19 | 256 |
| 111000 M6 | 2410 | 108590 | 20 | 256 |
| 120000 | 2410 | 117590 | 21 | 256 |
| 104000 | 2410 | 101590 | 22 | 256 |
| 43500 M6 | 2410 | 41090 | 23 | 256 |
| 86400 | 2410 | 83990 | 24 | 256 |
| 81000 | 2410 | 78590 | 25 | 256 |
| 99550 | 2410 | 97140 | 26 | 256 |
| 28220 | 2410 | 25810 | 27 | 256 |
| 78100 | 2410 | 75690 | 28 | 256 |
| 1418 | 2410 | -992 | 28 | 257 |
| 87040 | 2410 | 84630 | 29 | 257 |
| | | | | |
| 110000 | 14300 | 95700 | 30 | 257 |
| 111000 | 14300 | 96700 | 31 | 257 |
| 111000 M6 | 14300 | 96700 | 32 | 257 |
| 120000 | 14300 | 105700 | 33 | 257 |
| 104000 | 14300 | 89700 | 34 | 257 |
| 43500 M6 | 14300 | 29200 | 35 | 257 |
| 86400 | 14300 | 72100 | 36 | 257 |
| 81000 | 14300 | 66700 | 37 | 257 |
| 99550 | 14300 | 85250 | 38 | 257 |
| 28220 | 14300 | 13920 | 39 | 257 |
| 78100 | 14300 | 63800 | 40 | 257 |
| 1418 | 14300 | -12882 | 40 | 258 |
| 87040 | 14300 | 72740 | 41 | 258 |
| | | | | |
| 111000 | 110000 | Same Date | 41 | 258 |
| 111000 M6 | 110000 | 1000 | 42 | 258 |
| 120000 | 110000 | 10000 | 43 | 258 |
| 104000 | 110000 | -6000 | 43 | 259 |
| 43500 M6 | 110000 | -66500 | 43 | 260 |
| 86400 | 110000 | -23600 | 43 | 261 |
| 81000 | 110000 | -29000 | 43 | 262 |
| 99550 | 110000 | -10450 | 43 | 263 |
| 28220 | 110000 | -81780 | 43 | 264 |
| 78100 | 110000 | -31900 | 43 | 265 |
| 1418 | 110000 | -108582 | 43 | 266 |
| 87040 | 110000 | -22960 | 43 | 267 |
| | | | | |
| 111000 M6 | 111000 | 0 | 43 | 267 |
| 120000 | 111000 | 9000 | 44 | 267 |
| 104000 | 111000 | -7000 | 44 | 268 |
| 43500 M6 | 111000 | -67500 | 44 | 269 |

| | | | | |
|---|---|---|---|---|
| 86400 | 111000 | -24600 | 44 | 270 |
| 81000 | 111000 | -30000 | 44 | 271 |
| 99550 | 111000 | -11450 | 44 | 272 |
| 28220 | 111000 | -82780 | 44 | 273 |
| 78100 | 111000 | -32900 | 44 | 274 |
| 1418 | 111000 | -109582 | 44 | 275 |
| 87040 | 111000 | -23960 | 44 | 276 |
| | | | | |
| 120000 | 111000 M6 | Same Date | 44 | 276 |
| 104000 | 111000 M6 | -7000 | 44 | 277 |
| 43500 M6 | 111000 M6 | -67500 | 44 | 278 |
| 86400 | 111000 M6 | -24600 | 44 | 279 |
| 81000 | 111000 M6 | -30000 | 44 | 280 |
| 99550 | 111000 M6 | -11450 | 44 | 281 |
| 28220 | 111000 M6 | -82780 | 44 | 282 |
| 78100 | 111000 M6 | -32900 | 44 | 283 |
| 1418 | 111000 M6 | -109582 | 44 | 284 |
| 87040 | 111000 M6 | -23960 | 44 | 285 |
| | | | | |
| 104000 | 120000 | -16000 | 44 | 286 |
| 43500 M6 | 120000 | -76500 | 44 | 287 |
| 86400 | 120000 | -33600 | 44 | 288 |
| 81000 | 120000 | -39000 | 44 | 289 |
| 99550 | 120000 | -20450 | 44 | 290 |
| 28220 | 120000 | -91780 | 44 | 291 |
| 78100 | 120000 | -41900 | 44 | 292 |
| 1418 | 120000 | -118582 | 44 | 293 |
| 87040 | 120000 | -32960 | 44 | 294 |
| | | | | |
| 43500 M6 | 104000 | -60500 | 44 | 295 |
| 86400 | 104000 | -17600 | 44 | 296 |
| 81000 | 104000 | -23000 | 44 | 297 |
| 99550 | 104000 | -4450 | 44 | 298 |
| 28220 | 104000 | -75780 | 44 | 299 |
| 78100 | 104000 | -25900 | 44 | 300 |
| 1418 | 104000 | -102582 | 44 | 301 |
| 87040 | 104000 | -16960 | 44 | 302 |
| | | | | |
| 86400 | 43500 M6 | 42900 | 45 | 302 |
| 81000 | 43500 M6 | 37500 | 46 | 302 |
| 99550 | 43500 M6 | 56050 | 47 | 302 |
| 28220 | 43500 M6 | -15280 | 47 | 303 |
| 78100 | 43500 M6 | 34600 | 48 | 303 |
| 1418 | 43500 M6 | -42082 | 48 | 304 |
| 87040 | 43500 M6 | 43540 | 49 | 304 |
| | | | | |
| 81000 | 86400 | -5400 | 49 | 305 |
| 99550 | 86400 | 13150 | 50 | 305 |
| 28220 | 86400 | -58180 | 50 | 306 |
| 78100 | 86400 | -8300 | 50 | 307 |
| 1418 | 86400 | -84982 | 50 | 308 |
| 87040 | 86400 | 640 | 51 | 308 |
| | | | | |
| 99550 | 81000 | 18550 | 52 | 308 |
| 28220 | 81000 | -52780 | 52 | 309 |
| 78100 | 81000 | -2900 | 52 | 310 |
| 1418 | 81000 | -79582 | 52 | 311 |

| | | | | |
|---|---|---|---|---|
| 87040 | 81000 | 6040 | 53 | 311 |
| | | | | |
| 28220 | 99550 | -71330 | 53 | 312 |
| 78100 | 99550 | -21450 | 53 | 313 |
| 1418 | 99550 | -98132 | 53 | 314 |
| 87040 | 99550 | -12510 | 53 | 315 |
| | | | | |
| 78100 | 28220 | 49880 | 54 | 315 |
| 1418 | 28220 | -26802 | 54 | 316 |
| 87040 | 28220 | 58820 | 55 | 316 |
| | | | | |
| 1418 | 78100 | -76682 | 55 | 317 |
| 87040 | 78100 | 8940 | 56 | 317 |
| | | | | |
| 87040 | 1418 | 85622 | 57 | 317 |

S Statistic = 57 - 317 = -260

| Tied Group | Value | Members |
|---|---|---|
| 1 | 156000 | 2 |
| 2 | 111000 | 2 |

| Time Period | Observations |
|---|---|
| 2/1/2017 | 1 |
| 3/1/2017 | 1 |
| 4/1/2017 | 1 |
| 5/1/2017 | 1 |
| 6/1/2017 | 1 |
| 7/1/2017 | 1 |
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 6/1/2020 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 2 time periods with multiple data

A = 36
B = 36
C = 0
D = 0
E = 4

F = 4
a = 46116
b = 176904
c = 1512
Group Variance = 2558.01
Z-Score = -5.12093
Comparison Level at 95% confidence level = 1.65463 (upward trend)
-5.12093 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RW13-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 1160 | 308000 | -306840 | 0 | 1 |
| 204000 | 308000 | -104000 | 0 | 2 |
| 172000 | 308000 | -136000 | 0 | 3 |
| 237 | 308000 | -307763 | 0 | 4 |
| 8600 | 308000 | -299400 | 0 | 5 |
| 201000 | 308000 | -107000 | 0 | 6 |
| 274000 | 308000 | -34000 | 0 | 7 |
| 33.4 | 308000 | -307967 | 0 | 8 |
| 328000 | 308000 | 20000 | 1 | 8 |
| 321000 | 308000 | 13000 | 2 | 8 |
| 380 | 308000 | -307620 | 2 | 9 |
| 97.7 | 308000 | -307902 | 2 | 10 |
| 122 1c | 308000 | -307878 | 2 | 11 |
| 246000 | 308000 | -62000 | 2 | 12 |
| 250000 | 308000 | -58000 | 2 | 13 |
| 27 | 308000 | -307973 | 2 | 14 |
| 296000 ML | 308000 | -12000 | 2 | 15 |
| 19.8 1c | 308000 | -307980 | 2 | 16 |
| 363000 | 308000 | 55000 | 3 | 16 |
| 435000 | 308000 | 127000 | 4 | 16 |
| 479900 | 308000 | 171900 | 5 | 16 |
| 540700 | 308000 | 232700 | 6 | 16 |
| | | | | |
| 204000 | 1160 | 202840 | 7 | 16 |
| 172000 | 1160 | 170840 | 8 | 16 |
| 237 | 1160 | -923 | 8 | 17 |
| 8600 | 1160 | 7440 | 9 | 17 |
| 201000 | 1160 | 199840 | 10 | 17 |
| 274000 | 1160 | 272840 | 11 | 17 |
| 33.4 | 1160 | -1126.6 | 11 | 18 |
| 328000 | 1160 | 326840 | 12 | 18 |
| 321000 | 1160 | 319840 | 13 | 18 |
| 380 | 1160 | -780 | 13 | 19 |
| 97.7 | 1160 | -1062.3 | 13 | 20 |
| 122 1c | 1160 | -1038 | 13 | 21 |
| 246000 | 1160 | 244840 | 14 | 21 |
| 250000 | 1160 | 248840 | 15 | 21 |
| 27 | 1160 | -1133 | 15 | 22 |
| 296000 ML | 1160 | 294840 | 16 | 22 |
| 19.8 1c | 1160 | -1140.2 | 16 | 23 |
| 363000 | 1160 | 361840 | 17 | 23 |
| 435000 | 1160 | 433840 | 18 | 23 |
| 479900 | 1160 | 478740 | 19 | 23 |
| 540700 | 1160 | 539540 | 20 | 23 |
| | | | | |
| 172000 | 204000 | -32000 | 20 | 24 |
| 237 | 204000 | -203763 | 20 | 25 |

| | | | | |
|---|---|---|---|---|
| 8600 | 204000 | -195400 | 20 | 26 |
| 201000 | 204000 | -3000 | 20 | 27 |
| 274000 | 204000 | 70000 | 21 | 27 |
| 33.4 | 204000 | -203967 | 21 | 28 |
| 328000 | 204000 | 124000 | 22 | 28 |
| 321000 | 204000 | 117000 | 23 | 28 |
| 380 | 204000 | -203620 | 23 | 29 |
| 97.7 | 204000 | -203902 | 23 | 30 |
| 122 1c | 204000 | -203878 | 23 | 31 |
| 246000 | 204000 | 42000 | 24 | 31 |
| 250000 | 204000 | 46000 | 25 | 31 |
| 27 | 204000 | -203973 | 25 | 32 |
| 296000 ML | 204000 | 92000 | 26 | 32 |
| 19.8 1c | 204000 | -203980 | 26 | 33 |
| 363000 | 204000 | 159000 | 27 | 33 |
| 435000 | 204000 | 231000 | 28 | 33 |
| 479900 | 204000 | 275900 | 29 | 33 |
| 540700 | 204000 | 336700 | 30 | 33 |
| | | | | |
| 237 | 172000 | -171763 | 30 | 34 |
| 8600 | 172000 | -163400 | 30 | 35 |
| 201000 | 172000 | 29000 | 31 | 35 |
| 274000 | 172000 | 102000 | 32 | 35 |
| 33.4 | 172000 | -171967 | 32 | 36 |
| 328000 | 172000 | 156000 | 33 | 36 |
| 321000 | 172000 | 149000 | 34 | 36 |
| 380 | 172000 | -171620 | 34 | 37 |
| 97.7 | 172000 | -171902 | 34 | 38 |
| 122 1c | 172000 | -171878 | 34 | 39 |
| 246000 | 172000 | 74000 | 35 | 39 |
| 250000 | 172000 | 78000 | 36 | 39 |
| 27 | 172000 | -171973 | 36 | 40 |
| 296000 ML | 172000 | 124000 | 37 | 40 |
| 19.8 1c | 172000 | -171980 | 37 | 41 |
| 363000 | 172000 | 191000 | 38 | 41 |
| 435000 | 172000 | 263000 | 39 | 41 |
| 479900 | 172000 | 307900 | 40 | 41 |
| 540700 | 172000 | 368700 | 41 | 41 |
| | | | | |
| 8600 | 237 | 8363 | 42 | 41 |
| 201000 | 237 | 200763 | 43 | 41 |
| 274000 | 237 | 273763 | 44 | 41 |
| 33.4 | 237 | -203.6 | 44 | 42 |
| 328000 | 237 | 327763 | 45 | 42 |
| 321000 | 237 | 320763 | 46 | 42 |
| 380 | 237 | 143 | 47 | 42 |
| 97.7 | 237 | -139.3 | 47 | 43 |
| 122 1c | 237 | -115 | 47 | 44 |
| 246000 | 237 | 245763 | 48 | 44 |
| 250000 | 237 | 249763 | 49 | 44 |
| 27 | 237 | -210 | 49 | 45 |
| 296000 ML | 237 | 295763 | 50 | 45 |
| 19.8 1c | 237 | -217.2 | 50 | 46 |
| 363000 | 237 | 362763 | 51 | 46 |
| 435000 | 237 | 434763 | 52 | 46 |
| 479900 | 237 | 479663 | 53 | 46 |
| 540700 | 237 | 540463 | 54 | 46 |

| | | | | |
|---|---|---|---|---|
| 201000 | 8600 | 192400 | 55 | 46 |
| 274000 | 8600 | 265400 | 56 | 46 |
| 33.4 | 8600 | -8566.6 | 56 | 47 |
| 328000 | 8600 | 319400 | 57 | 47 |
| 321000 | 8600 | 312400 | 58 | 47 |
| 380 | 8600 | -8220 | 58 | 48 |
| 97.7 | 8600 | -8502.3 | 58 | 49 |
| 122 1c | 8600 | -8478 | 58 | 50 |
| 246000 | 8600 | 237400 | 59 | 50 |
| 250000 | 8600 | 241400 | 60 | 50 |
| 27 | 8600 | -8573 | 60 | 51 |
| 296000 ML | 8600 | 287400 | 61 | 51 |
| 19.8 1c | 8600 | -8580.2 | 61 | 52 |
| 363000 | 8600 | 354400 | 62 | 52 |
| 435000 | 8600 | 426400 | 63 | 52 |
| 479900 | 8600 | 471300 | 64 | 52 |
| 540700 | 8600 | 532100 | 65 | 52 |
| | | | | |
| 274000 | 201000 | 73000 | 66 | 52 |
| 33.4 | 201000 | -200967 | 66 | 53 |
| 328000 | 201000 | 127000 | 67 | 53 |
| 321000 | 201000 | 120000 | 68 | 53 |
| 380 | 201000 | -200620 | 68 | 54 |
| 97.7 | 201000 | -200902 | 68 | 55 |
| 122 1c | 201000 | -200878 | 68 | 56 |
| 246000 | 201000 | 45000 | 69 | 56 |
| 250000 | 201000 | 49000 | 70 | 56 |
| 27 | 201000 | -200973 | 70 | 57 |
| 296000 ML | 201000 | 95000 | 71 | 57 |
| 19.8 1c | 201000 | -200980 | 71 | 58 |
| 363000 | 201000 | 162000 | 72 | 58 |
| 435000 | 201000 | 234000 | 73 | 58 |
| 479900 | 201000 | 278900 | 74 | 58 |
| 540700 | 201000 | 339700 | 75 | 58 |
| | | | | |
| 33.4 | 274000 | -273967 | 75 | 59 |
| 328000 | 274000 | 54000 | 76 | 59 |
| 321000 | 274000 | 47000 | 77 | 59 |
| 380 | 274000 | -273620 | 77 | 60 |
| 97.7 | 274000 | -273902 | 77 | 61 |
| 122 1c | 274000 | -273878 | 77 | 62 |
| 246000 | 274000 | -28000 | 77 | 63 |
| 250000 | 274000 | -24000 | 77 | 64 |
| 27 | 274000 | -273973 | 77 | 65 |
| 296000 ML | 274000 | 22000 | 78 | 65 |
| 19.8 1c | 274000 | -273980 | 78 | 66 |
| 363000 | 274000 | 89000 | 79 | 66 |
| 435000 | 274000 | 161000 | 80 | 66 |
| 479900 | 274000 | 205900 | 81 | 66 |
| 540700 | 274000 | 266700 | 82 | 66 |
| | | | | |
| 328000 | 33.4 | 327967 | 83 | 66 |
| 321000 | 33.4 | 320967 | 84 | 66 |
| 380 | 33.4 | 346.6 | 85 | 66 |
| 97.7 | 33.4 | 64.3 | 86 | 66 |
| 122 1c | 33.4 | 88.6 | 87 | 66 |

| | | | | |
|---|---|---|---|---|
| 246000 | 33.4 | 245967 | 88 | 66 |
| 250000 | 33.4 | 249967 | 89 | 66 |
| 27 | 33.4 | -6.4 | 89 | 67 |
| 296000 ML | 33.4 | 295967 | 90 | 67 |
| 19.8 1c | 33.4 | -13.6 | 90 | 68 |
| 363000 | 33.4 | 362967 | 91 | 68 |
| 435000 | 33.4 | 434967 | 92 | 68 |
| 479900 | 33.4 | 479867 | 93 | 68 |
| 540700 | 33.4 | 540667 | 94 | 68 |
| | | | | |
| 321000 | 328000 | Same Date | 94 | 68 |
| 380 | 328000 | -327620 | 94 | 69 |
| 97.7 | 328000 | -327902 | 94 | 70 |
| 122 1c | 328000 | -327878 | 94 | 71 |
| 246000 | 328000 | -82000 | 94 | 72 |
| 250000 | 328000 | -78000 | 94 | 73 |
| 27 | 328000 | -327973 | 94 | 74 |
| 296000 ML | 328000 | -32000 | 94 | 75 |
| 19.8 1c | 328000 | -327980 | 94 | 76 |
| 363000 | 328000 | 35000 | 95 | 76 |
| 435000 | 328000 | 107000 | 96 | 76 |
| 479900 | 328000 | 151900 | 97 | 76 |
| 540700 | 328000 | 212700 | 98 | 76 |
| | | | | |
| 380 | 321000 | -320620 | 98 | 77 |
| 97.7 | 321000 | -320902 | 98 | 78 |
| 122 1c | 321000 | -320878 | 98 | 79 |
| 246000 | 321000 | -75000 | 98 | 80 |
| 250000 | 321000 | -71000 | 98 | 81 |
| 27 | 321000 | -320973 | 98 | 82 |
| 296000 ML | 321000 | -25000 | 98 | 83 |
| 19.8 1c | 321000 | -320980 | 98 | 84 |
| 363000 | 321000 | 42000 | 99 | 84 |
| 435000 | 321000 | 114000 | 100 | 84 |
| 479900 | 321000 | 158900 | 101 | 84 |
| 540700 | 321000 | 219700 | 102 | 84 |
| | | | | |
| 97.7 | 380 | Same Date | 102 | 84 |
| 122 1c | 380 | -258 | 102 | 85 |
| 246000 | 380 | 245620 | 103 | 85 |
| 250000 | 380 | 249620 | 104 | 85 |
| 27 | 380 | -353 | 104 | 86 |
| 296000 ML | 380 | 295620 | 105 | 86 |
| 19.8 1c | 380 | -360.2 | 105 | 87 |
| 363000 | 380 | 362620 | 106 | 87 |
| 435000 | 380 | 434620 | 107 | 87 |
| 479900 | 380 | 479520 | 108 | 87 |
| 540700 | 380 | 540320 | 109 | 87 |
| | | | | |
| 122 1c | 97.7 | 24.3 | 110 | 87 |
| 246000 | 97.7 | 245902 | 111 | 87 |
| 250000 | 97.7 | 249902 | 112 | 87 |
| 27 | 97.7 | -70.7 | 112 | 88 |
| 296000 ML | 97.7 | 295902 | 113 | 88 |
| 19.8 1c | 97.7 | -77.9 | 113 | 89 |
| 363000 | 97.7 | 362902 | 114 | 89 |
| 435000 | 97.7 | 434902 | 115 | 89 |

| | | | | |
|---|---|---|---|---|
| 479900 | 97.7 | 479802 | 116 | 89 |
| 540700 | 97.7 | 540602 | 117 | 89 |
| | | | | |
| 246000 | 122 1c | 245878 | 118 | 89 |
| 250000 | 122 1c | 249878 | 119 | 89 |
| 27 | 122 1c | -95 | 119 | 90 |
| 296000 ML | 122 1c | 295878 | 120 | 90 |
| 19.8 1c | 122 1c | -102.2 | 120 | 91 |
| 363000 | 122 1c | 362878 | 121 | 91 |
| 435000 | 122 1c | 434878 | 122 | 91 |
| 479900 | 122 1c | 479778 | 123 | 91 |
| 540700 | 122 1c | 540578 | 124 | 91 |
| | | | | |
| 250000 | 246000 | 4000 | 125 | 91 |
| 27 | 246000 | -245973 | 125 | 92 |
| 296000 ML | 246000 | 50000 | 126 | 92 |
| 19.8 1c | 246000 | -245980 | 126 | 93 |
| 363000 | 246000 | 117000 | 127 | 93 |
| 435000 | 246000 | 189000 | 128 | 93 |
| 479900 | 246000 | 233900 | 129 | 93 |
| 540700 | 246000 | 294700 | 130 | 93 |
| | | | | |
| 27 | 250000 | -249973 | 130 | 94 |
| 296000 ML | 250000 | 46000 | 131 | 94 |
| 19.8 1c | 250000 | -249980 | 131 | 95 |
| 363000 | 250000 | 113000 | 132 | 95 |
| 435000 | 250000 | 185000 | 133 | 95 |
| 479900 | 250000 | 229900 | 134 | 95 |
| 540700 | 250000 | 290700 | 135 | 95 |
| | | | | |
| 296000 ML | 27 | 295973 | 136 | 95 |
| 19.8 1c | 27 | -7.2 | 136 | 96 |
| 363000 | 27 | 362973 | 137 | 96 |
| 435000 | 27 | 434973 | 138 | 96 |
| 479900 | 27 | 479873 | 139 | 96 |
| 540700 | 27 | 540673 | 140 | 96 |
| | | | | |
| 19.8 1c | 296000 ML | -295980 | 140 | 97 |
| 363000 | 296000 ML | 67000 | 141 | 97 |
| 435000 | 296000 ML | 139000 | 142 | 97 |
| 479900 | 296000 ML | 183900 | 143 | 97 |
| 540700 | 296000 ML | 244700 | 144 | 97 |
| | | | | |
| 363000 | 19.8 1c | 362980 | 145 | 97 |
| 435000 | 19.8 1c | 434980 | 146 | 97 |
| 479900 | 19.8 1c | 479880 | 147 | 97 |
| 540700 | 19.8 1c | 540680 | 148 | 97 |
| | | | | |
| 435000 | 363000 | 72000 | 149 | 97 |
| 479900 | 363000 | 116900 | 150 | 97 |
| 540700 | 363000 | 177700 | 151 | 97 |
| | | | | |
| 479900 | 435000 | 44900 | 152 | 97 |
| 540700 | 435000 | 105700 | 153 | 97 |
| | | | | |
| 540700 | 479900 | 60800 | 154 | 97 |

S Statistic = 154 - 97 = 57

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 3/1/2022 | 1 |
| 3/1/2023 | 1 |
| 3/1/2024 | 1 |

There are 2 time periods with multiple data

A = 0
B = 36
C = 0
D = 0
E = 0
F = 4
a = 25806
b = 95634
c = 1012
Group Variance = 1431.67
Z-Score = 1.48002
Comparison Level at 95% confidence level = 1.65463 (upward trend)
1.48002 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RW15-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 71.1 | 3210 | -3138.9 | 0 | 1 |
| 295 | 3210 | -2915 | 0 | 2 |
| 825 | 3210 | -2385 | 0 | 3 |
| 1070 | 3210 | -2140 | 0 | 4 |
| 5540 | 3210 | 2330 | 1 | 4 |
| 252 | 3210 | -2958 | 1 | 5 |
| 18600 | 3210 | 15390 | 2 | 5 |
| 736 | 3210 | -2474 | 2 | 6 |
| 109000 | 3210 | 105790 | 3 | 6 |
| 110000 | 3210 | 106790 | 4 | 6 |
| 16500 | 3210 | 13290 | 5 | 6 |
| 16400 | 3210 | 13190 | 6 | 6 |
| 168000 | 3210 | 164790 | 7 | 6 |
| 179000 M6 | 3210 | 175790 | 8 | 6 |
| 17.9 | 3210 | -3192.1 | 8 | 7 |
| 5.8 J | 3210 | -3204.2 | 8 | 8 |
| 3210 1c | 3210 | 0 | 8 | 8 |
| 137 1c | 3210 | -3073 | 8 | 9 |
| 16400 | 3210 | 13190 | 9 | 9 |
| 49300 | 3210 | 46090 | 10 | 9 |
| 100800 | 3210 | 97590 | 11 | 9 |
| 31.51 | 3210 | -3178.49 | 11 | 10 |
| | | | | |
| 295 | 71.1 | 223.9 | 12 | 10 |
| 825 | 71.1 | 753.9 | 13 | 10 |
| 1070 | 71.1 | 998.9 | 14 | 10 |
| 5540 | 71.1 | 5468.9 | 15 | 10 |
| 252 | 71.1 | 180.9 | 16 | 10 |
| 18600 | 71.1 | 18528.9 | 17 | 10 |
| 736 | 71.1 | 664.9 | 18 | 10 |
| 109000 | 71.1 | 108929 | 19 | 10 |
| 110000 | 71.1 | 109929 | 20 | 10 |
| 16500 | 71.1 | 16428.9 | 21 | 10 |
| 16400 | 71.1 | 16328.9 | 22 | 10 |
| 168000 | 71.1 | 167929 | 23 | 10 |
| 179000 M6 | 71.1 | 178929 | 24 | 10 |
| 17.9 | 71.1 | -53.2 | 24 | 11 |
| 5.8 J | 71.1 | -65.3 | 24 | 12 |
| 3210 1c | 71.1 | 3138.9 | 25 | 12 |
| 137 1c | 71.1 | 65.9 | 26 | 12 |
| 16400 | 71.1 | 16328.9 | 27 | 12 |
| 49300 | 71.1 | 49228.9 | 28 | 12 |
| 100800 | 71.1 | 100729 | 29 | 12 |
| 31.51 | 71.1 | -39.59 | 29 | 13 |
| | | | | |
| 825 | 295 | 530 | 30 | 13 |
| 1070 | 295 | 775 | 31 | 13 |

| | | | | |
|---|---|---|---|---|
| 5540 | 295 | 5245 | 32 | 13 |
| 252 | 295 | -43 | 32 | 14 |
| 18600 | 295 | 18305 | 33 | 14 |
| 736 | 295 | 441 | 34 | 14 |
| 109000 | 295 | 108705 | 35 | 14 |
| 110000 | 295 | 109705 | 36 | 14 |
| 16500 | 295 | 16205 | 37 | 14 |
| 16400 | 295 | 16105 | 38 | 14 |
| 168000 | 295 | 167705 | 39 | 14 |
| 179000 M6 | 295 | 178705 | 40 | 14 |
| 17.9 | 295 | -277.1 | 40 | 15 |
| 5.8 J | 295 | -289.2 | 40 | 16 |
| 3210 1c | 295 | 2915 | 41 | 16 |
| 137 1c | 295 | -158 | 41 | 17 |
| 16400 | 295 | 16105 | 42 | 17 |
| 49300 | 295 | 49005 | 43 | 17 |
| 100800 | 295 | 100505 | 44 | 17 |
| 31.51 | 295 | -263.49 | 44 | 18 |
| | | | | |
| 1070 | 825 | 245 | 45 | 18 |
| 5540 | 825 | 4715 | 46 | 18 |
| 252 | 825 | -573 | 46 | 19 |
| 18600 | 825 | 17775 | 47 | 19 |
| 736 | 825 | -89 | 47 | 20 |
| 109000 | 825 | 108175 | 48 | 20 |
| 110000 | 825 | 109175 | 49 | 20 |
| 16500 | 825 | 15675 | 50 | 20 |
| 16400 | 825 | 15575 | 51 | 20 |
| 168000 | 825 | 167175 | 52 | 20 |
| 179000 M6 | 825 | 178175 | 53 | 20 |
| 17.9 | 825 | -807.1 | 53 | 21 |
| 5.8 J | 825 | -819.2 | 53 | 22 |
| 3210 1c | 825 | 2385 | 54 | 22 |
| 137 1c | 825 | -688 | 54 | 23 |
| 16400 | 825 | 15575 | 55 | 23 |
| 49300 | 825 | 48475 | 56 | 23 |
| 100800 | 825 | 99975 | 57 | 23 |
| 31.51 | 825 | -793.49 | 57 | 24 |
| | | | | |
| 5540 | 1070 | 4470 | 58 | 24 |
| 252 | 1070 | -818 | 58 | 25 |
| 18600 | 1070 | 17530 | 59 | 25 |
| 736 | 1070 | -334 | 59 | 26 |
| 109000 | 1070 | 107930 | 60 | 26 |
| 110000 | 1070 | 108930 | 61 | 26 |
| 16500 | 1070 | 15430 | 62 | 26 |
| 16400 | 1070 | 15330 | 63 | 26 |
| 168000 | 1070 | 166930 | 64 | 26 |
| 179000 M6 | 1070 | 177930 | 65 | 26 |
| 17.9 | 1070 | -1052.1 | 65 | 27 |
| 5.8 J | 1070 | -1064.2 | 65 | 28 |
| 3210 1c | 1070 | 2140 | 66 | 28 |
| 137 1c | 1070 | -933 | 66 | 29 |
| 16400 | 1070 | 15330 | 67 | 29 |
| 49300 | 1070 | 48230 | 68 | 29 |
| 100800 | 1070 | 99730 | 69 | 29 |
| 31.51 | 1070 | -1038.49 | 69 | 30 |

| | | | | |
|---|---|---|---|---|
| 252 | 5540 | -5288 | 69 | 31 |
| 18600 | 5540 | 13060 | 70 | 31 |
| 736 | 5540 | -4804 | 70 | 32 |
| 109000 | 5540 | 103460 | 71 | 32 |
| 110000 | 5540 | 104460 | 72 | 32 |
| 16500 | 5540 | 10960 | 73 | 32 |
| 16400 | 5540 | 10860 | 74 | 32 |
| 168000 | 5540 | 162460 | 75 | 32 |
| 179000 M6 | 5540 | 173460 | 76 | 32 |
| 17.9 | 5540 | -5522.1 | 76 | 33 |
| 5.8 J | 5540 | -5534.2 | 76 | 34 |
| 3210 1c | 5540 | -2330 | 76 | 35 |
| 137 1c | 5540 | -5403 | 76 | 36 |
| 16400 | 5540 | 10860 | 77 | 36 |
| 49300 | 5540 | 43760 | 78 | 36 |
| 100800 | 5540 | 95260 | 79 | 36 |
| 31.51 | 5540 | -5508.49 | 79 | 37 |
| | | | | |
| 18600 | 252 | 18348 | 80 | 37 |
| 736 | 252 | 484 | 81 | 37 |
| 109000 | 252 | 108748 | 82 | 37 |
| 110000 | 252 | 109748 | 83 | 37 |
| 16500 | 252 | 16248 | 84 | 37 |
| 16400 | 252 | 16148 | 85 | 37 |
| 168000 | 252 | 167748 | 86 | 37 |
| 179000 M6 | 252 | 178748 | 87 | 37 |
| 17.9 | 252 | -234.1 | 87 | 38 |
| 5.8 J | 252 | -246.2 | 87 | 39 |
| 3210 1c | 252 | 2958 | 88 | 39 |
| 137 1c | 252 | -115 | 88 | 40 |
| 16400 | 252 | 16148 | 89 | 40 |
| 49300 | 252 | 49048 | 90 | 40 |
| 100800 | 252 | 100548 | 91 | 40 |
| 31.51 | 252 | -220.49 | 91 | 41 |
| | | | | |
| 736 | 18600 | -17864 | 91 | 42 |
| 109000 | 18600 | 90400 | 92 | 42 |
| 110000 | 18600 | 91400 | 93 | 42 |
| 16500 | 18600 | -2100 | 93 | 43 |
| 16400 | 18600 | -2200 | 93 | 44 |
| 168000 | 18600 | 149400 | 94 | 44 |
| 179000 M6 | 18600 | 160400 | 95 | 44 |
| 17.9 | 18600 | -18582.1 | 95 | 45 |
| 5.8 J | 18600 | -18594.2 | 95 | 46 |
| 3210 1c | 18600 | -15390 | 95 | 47 |
| 137 1c | 18600 | -18463 | 95 | 48 |
| 16400 | 18600 | -2200 | 95 | 49 |
| 49300 | 18600 | 30700 | 96 | 49 |
| 100800 | 18600 | 82200 | 97 | 49 |
| 31.51 | 18600 | -18568.5 | 97 | 50 |
| | | | | |
| 109000 | 736 | 108264 | 98 | 50 |
| 110000 | 736 | 109264 | 99 | 50 |
| 16500 | 736 | 15764 | 100 | 50 |
| 16400 | 736 | 15664 | 101 | 50 |
| 168000 | 736 | 167264 | 102 | 50 |

| | | | | |
|---|---|---|---|---|
| 179000 M6 | 736 | 178264 | 103 | 50 |
| 17.9 | 736 | -718.1 | 103 | 51 |
| 5.8 J | 736 | -730.2 | 103 | 52 |
| 3210 1c | 736 | 2474 | 104 | 52 |
| 137 1c | 736 | -599 | 104 | 53 |
| 16400 | 736 | 15664 | 105 | 53 |
| 49300 | 736 | 48564 | 106 | 53 |
| 100800 | 736 | 100064 | 107 | 53 |
| 31.51 | 736 | -704.49 | 107 | 54 |
| | | | | |
| 110000 | 109000 | Same Date | 107 | 54 |
| 16500 | 109000 | -92500 | 107 | 55 |
| 16400 | 109000 | -92600 | 107 | 56 |
| 168000 | 109000 | 59000 | 108 | 56 |
| 179000 M6 | 109000 | 70000 | 109 | 56 |
| 17.9 | 109000 | -108982 | 109 | 57 |
| 5.8 J | 109000 | -108994 | 109 | 58 |
| 3210 1c | 109000 | -105790 | 109 | 59 |
| 137 1c | 109000 | -108863 | 109 | 60 |
| 16400 | 109000 | -92600 | 109 | 61 |
| 49300 | 109000 | -59700 | 109 | 62 |
| 100800 | 109000 | -8200 | 109 | 63 |
| 31.51 | 109000 | -108968 | 109 | 64 |
| | | | | |
| 16500 | 110000 | -93500 | 109 | 65 |
| 16400 | 110000 | -93600 | 109 | 66 |
| 168000 | 110000 | 58000 | 110 | 66 |
| 179000 M6 | 110000 | 69000 | 111 | 66 |
| 17.9 | 110000 | -109982 | 111 | 67 |
| 5.8 J | 110000 | -109994 | 111 | 68 |
| 3210 1c | 110000 | -106790 | 111 | 69 |
| 137 1c | 110000 | -109863 | 111 | 70 |
| 16400 | 110000 | -93600 | 111 | 71 |
| 49300 | 110000 | -60700 | 111 | 72 |
| 100800 | 110000 | -9200 | 111 | 73 |
| 31.51 | 110000 | -109968 | 111 | 74 |
| | | | | |
| 16400 | 16500 | Same Date | 111 | 74 |
| 168000 | 16500 | 151500 | 112 | 74 |
| 179000 M6 | 16500 | 162500 | 113 | 74 |
| 17.9 | 16500 | -16482.1 | 113 | 75 |
| 5.8 J | 16500 | -16494.2 | 113 | 76 |
| 3210 1c | 16500 | -13290 | 113 | 77 |
| 137 1c | 16500 | -16363 | 113 | 78 |
| 16400 | 16500 | -100 | 113 | 79 |
| 49300 | 16500 | 32800 | 114 | 79 |
| 100800 | 16500 | 84300 | 115 | 79 |
| 31.51 | 16500 | -16468.5 | 115 | 80 |
| | | | | |
| 168000 | 16400 | 151600 | 116 | 80 |
| 179000 M6 | 16400 | 162600 | 117 | 80 |
| 17.9 | 16400 | -16382.1 | 117 | 81 |
| 5.8 J | 16400 | -16394.2 | 117 | 82 |
| 3210 1c | 16400 | -13190 | 117 | 83 |
| 137 1c | 16400 | -16263 | 117 | 84 |
| 16400 | 16400 | 0 | 117 | 84 |
| 49300 | 16400 | 32900 | 118 | 84 |

| | | | | |
|---|---|---|---|---|
| 100800 | 16400 | 84400 | 119 | 84 |
| 31.51 | 16400 | -16368.5 | 119 | 85 |
| | | | | |
| 179000 M6 | 168000 | 11000 | 120 | 85 |
| 17.9 | 168000 | -167982 | 120 | 86 |
| 5.8 J | 168000 | -167994 | 120 | 87 |
| 3210 1c | 168000 | -164790 | 120 | 88 |
| 137 1c | 168000 | -167863 | 120 | 89 |
| 16400 | 168000 | -151600 | 120 | 90 |
| 49300 | 168000 | -118700 | 120 | 91 |
| 100800 | 168000 | -67200 | 120 | 92 |
| 31.51 | 168000 | -167968 | 120 | 93 |
| | | | | |
| 17.9 | 179000 M6 | -178982 | 120 | 94 |
| 5.8 J | 179000 M6 | -178994 | 120 | 95 |
| 3210 1c | 179000 M6 | -175790 | 120 | 96 |
| 137 1c | 179000 M6 | -178863 | 120 | 97 |
| 16400 | 179000 M6 | -162600 | 120 | 98 |
| 49300 | 179000 M6 | -129700 | 120 | 99 |
| 100800 | 179000 M6 | -78200 | 120 | 100 |
| 31.51 | 179000 M6 | -178968 | 120 | 101 |
| | | | | |
| 5.8 J | 17.9 | -12.1 | 120 | 102 |
| 3210 1c | 17.9 | 3192.1 | 121 | 102 |
| 137 1c | 17.9 | 119.1 | 122 | 102 |
| 16400 | 17.9 | 16382.1 | 123 | 102 |
| 49300 | 17.9 | 49282.1 | 124 | 102 |
| 100800 | 17.9 | 100782 | 125 | 102 |
| 31.51 | 17.9 | 13.61 | 126 | 102 |
| | | | | |
| 3210 1c | 5.8 J | 3204.2 | 127 | 102 |
| 137 1c | 5.8 J | 131.2 | 128 | 102 |
| 16400 | 5.8 J | 16394.2 | 129 | 102 |
| 49300 | 5.8 J | 49294.2 | 130 | 102 |
| 100800 | 5.8 J | 100794 | 131 | 102 |
| 31.51 | 5.8 J | 25.71 | 132 | 102 |
| | | | | |
| 137 1c | 3210 1c | -3073 | 132 | 103 |
| 16400 | 3210 1c | 13190 | 133 | 103 |
| 49300 | 3210 1c | 46090 | 134 | 103 |
| 100800 | 3210 1c | 97590 | 135 | 103 |
| 31.51 | 3210 1c | -3178.49 | 135 | 104 |
| | | | | |
| 16400 | 137 1c | 16263 | 136 | 104 |
| 49300 | 137 1c | 49163 | 137 | 104 |
| 100800 | 137 1c | 100663 | 138 | 104 |
| 31.51 | 137 1c | -105.49 | 138 | 105 |
| | | | | |
| 49300 | 16400 | 32900 | 139 | 105 |
| 100800 | 16400 | 84400 | 140 | 105 |
| 31.51 | 16400 | -16368.5 | 140 | 106 |
| | | | | |
| 100800 | 49300 | 51500 | 141 | 106 |
| 31.51 | 49300 | -49268.5 | 141 | 107 |
| | | | | |
| 31.51 | 100800 | -100768 | 141 | 108 |

S Statistic = 141 - 108 = 33

| Tied Group | Value | Members |
|---|---|---|
| 1 | 3210 | 2 |
| 2 | 16400 | 2 |

| Time Period | Observations |
|---|---|
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 3/1/2022 | 1 |
| 3/1/2023 | 1 |
| 3/1/2024 | 1 |

There are 2 time periods with multiple data

A = 36
B = 36
C = 0
D = 0
E = 4
F = 4
a = 25806
b = 95634
c = 1012
Group Variance = 1429.68
Z-Score = 0.846311
Comparison Level at 95% confidence level = 1.65463 (upward trend)
0.846311 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RW16-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 90300 | 86300 | 4000 | 1 | 0 |
| 314000 | 86300 | 227700 | 2 | 0 |
| 207000 | 86300 | 120700 | 3 | 0 |
| 20200 | 86300 | -66100 | 3 | 1 |
| 2000 | 86300 | -84300 | 3 | 2 |
| 441 | 86300 | -85859 | 3 | 3 |
| 19200 | 86300 | -67100 | 3 | 4 |
| 16200 | 86300 | -70100 | 3 | 5 |
| 11200 | 86300 | -75100 | 3 | 6 |
| 1230 | 86300 | -85070 | 3 | 7 |
| 320 | 86300 | -85980 | 3 | 8 |
| 4.7 J | 86300 | -86295.3 | 3 | 9 |
| 131 | 86300 | -86169 | 3 | 10 |
| 135 | 86300 | -86165 | 3 | 11 |
| 4.9 J | 86300 | -86295.1 | 3 | 12 |
| 13.1 | 86300 | -86286.9 | 3 | 13 |
| 460 | 86300 | -85840 | 3 | 14 |
| 16.2 | 86300 | -86283.8 | 3 | 15 |
| 7.3 J | 86300 | -86292.7 | 3 | 16 |
| 63.1 | 86300 | -86236.9 | 3 | 17 |
| 10.2 1c | 86300 | -86289.8 | 3 | 18 |
| 62.4 | 86300 | -86237.6 | 3 | 19 |
| 120 | 86300 | -86180 | 3 | 20 |
| ND<5 U | 86300 | -86295 | 3 | 21 |
| ND<5 U | 86300 | -86295 | 3 | 22 |
| | | | | |
| 314000 | 90300 | 223700 | 4 | 22 |
| 207000 | 90300 | 116700 | 5 | 22 |
| 20200 | 90300 | -70100 | 5 | 23 |
| 2000 | 90300 | -88300 | 5 | 24 |
| 441 | 90300 | -89859 | 5 | 25 |
| 19200 | 90300 | -71100 | 5 | 26 |
| 16200 | 90300 | -74100 | 5 | 27 |
| 11200 | 90300 | -79100 | 5 | 28 |
| 1230 | 90300 | -89070 | 5 | 29 |
| 320 | 90300 | -89980 | 5 | 30 |
| 4.7 J | 90300 | -90295.3 | 5 | 31 |
| 131 | 90300 | -90169 | 5 | 32 |
| 135 | 90300 | -90165 | 5 | 33 |
| 4.9 J | 90300 | -90295.1 | 5 | 34 |
| 13.1 | 90300 | -90286.9 | 5 | 35 |
| 460 | 90300 | -89840 | 5 | 36 |
| 16.2 | 90300 | -90283.8 | 5 | 37 |
| 7.3 J | 90300 | -90292.7 | 5 | 38 |
| 63.1 | 90300 | -90236.9 | 5 | 39 |
| 10.2 1c | 90300 | -90289.8 | 5 | 40 |
| 62.4 | 90300 | -90237.6 | 5 | 41 |

| | | | | |
|---|---|---|---|---|
| 120 | 90300 | -90180 | 5 | 42 |
| ND<5 U | 90300 | -90295 | 5 | 43 |
| ND<5 U | 90300 | -90295 | 5 | 44 |
| | | | | |
| 207000 | 314000 | -107000 | 5 | 45 |
| 20200 | 314000 | -293800 | 5 | 46 |
| 2000 | 314000 | -312000 | 5 | 47 |
| 441 | 314000 | -313559 | 5 | 48 |
| 19200 | 314000 | -294800 | 5 | 49 |
| 16200 | 314000 | -297800 | 5 | 50 |
| 11200 | 314000 | -302800 | 5 | 51 |
| 1230 | 314000 | -312770 | 5 | 52 |
| 320 | 314000 | -313680 | 5 | 53 |
| 4.7 J | 314000 | -313995 | 5 | 54 |
| 131 | 314000 | -313869 | 5 | 55 |
| 135 | 314000 | -313865 | 5 | 56 |
| 4.9 J | 314000 | -313995 | 5 | 57 |
| 13.1 | 314000 | -313987 | 5 | 58 |
| 460 | 314000 | -313540 | 5 | 59 |
| 16.2 | 314000 | -313984 | 5 | 60 |
| 7.3 J | 314000 | -313993 | 5 | 61 |
| 63.1 | 314000 | -313937 | 5 | 62 |
| 10.2 1c | 314000 | -313990 | 5 | 63 |
| 62.4 | 314000 | -313938 | 5 | 64 |
| 120 | 314000 | -313880 | 5 | 65 |
| ND<5 U | 314000 | -313995 | 5 | 66 |
| ND<5 U | 314000 | -313995 | 5 | 67 |
| | | | | |
| 20200 | 207000 | -186800 | 5 | 68 |
| 2000 | 207000 | -205000 | 5 | 69 |
| 441 | 207000 | -206559 | 5 | 70 |
| 19200 | 207000 | -187800 | 5 | 71 |
| 16200 | 207000 | -190800 | 5 | 72 |
| 11200 | 207000 | -195800 | 5 | 73 |
| 1230 | 207000 | -205770 | 5 | 74 |
| 320 | 207000 | -206680 | 5 | 75 |
| 4.7 J | 207000 | -206995 | 5 | 76 |
| 131 | 207000 | -206869 | 5 | 77 |
| 135 | 207000 | -206865 | 5 | 78 |
| 4.9 J | 207000 | -206995 | 5 | 79 |
| 13.1 | 207000 | -206987 | 5 | 80 |
| 460 | 207000 | -206540 | 5 | 81 |
| 16.2 | 207000 | -206984 | 5 | 82 |
| 7.3 J | 207000 | -206993 | 5 | 83 |
| 63.1 | 207000 | -206937 | 5 | 84 |
| 10.2 1c | 207000 | -206990 | 5 | 85 |
| 62.4 | 207000 | -206938 | 5 | 86 |
| 120 | 207000 | -206880 | 5 | 87 |
| ND<5 U | 207000 | -206995 | 5 | 88 |
| ND<5 U | 207000 | -206995 | 5 | 89 |
| | | | | |
| 2000 | 20200 | -18200 | 5 | 90 |
| 441 | 20200 | -19759 | 5 | 91 |
| 19200 | 20200 | -1000 | 5 | 92 |
| 16200 | 20200 | -4000 | 5 | 93 |
| 11200 | 20200 | -9000 | 5 | 94 |
| 1230 | 20200 | -18970 | 5 | 95 |

| | | | | |
|---|---|---|---|---|
| 320 | 20200 | -19880 | 5 | 96 |
| 4.7 J | 20200 | -20195.3 | 5 | 97 |
| 131 | 20200 | -20069 | 5 | 98 |
| 135 | 20200 | -20065 | 5 | 99 |
| 4.9 J | 20200 | -20195.1 | 5 | 100 |
| 13.1 | 20200 | -20186.9 | 5 | 101 |
| 460 | 20200 | -19740 | 5 | 102 |
| 16.2 | 20200 | -20183.8 | 5 | 103 |
| 7.3 J | 20200 | -20192.7 | 5 | 104 |
| 63.1 | 20200 | -20136.9 | 5 | 105 |
| 10.2 1c | 20200 | -20189.8 | 5 | 106 |
| 62.4 | 20200 | -20137.6 | 5 | 107 |
| 120 | 20200 | -20080 | 5 | 108 |
| ND<5 U | 20200 | -20195 | 5 | 109 |
| ND<5 U | 20200 | -20195 | 5 | 110 |
| | | | | |
| 441 | 2000 | -1559 | 5 | 111 |
| 19200 | 2000 | 17200 | 6 | 111 |
| 16200 | 2000 | 14200 | 7 | 111 |
| 11200 | 2000 | 9200 | 8 | 111 |
| 1230 | 2000 | -770 | 8 | 112 |
| 320 | 2000 | -1680 | 8 | 113 |
| 4.7 J | 2000 | -1995.3 | 8 | 114 |
| 131 | 2000 | -1869 | 8 | 115 |
| 135 | 2000 | -1865 | 8 | 116 |
| 4.9 J | 2000 | -1995.1 | 8 | 117 |
| 13.1 | 2000 | -1986.9 | 8 | 118 |
| 460 | 2000 | -1540 | 8 | 119 |
| 16.2 | 2000 | -1983.8 | 8 | 120 |
| 7.3 J | 2000 | -1992.7 | 8 | 121 |
| 63.1 | 2000 | -1936.9 | 8 | 122 |
| 10.2 1c | 2000 | -1989.8 | 8 | 123 |
| 62.4 | 2000 | -1937.6 | 8 | 124 |
| 120 | 2000 | -1880 | 8 | 125 |
| ND<5 U | 2000 | -1995 | 8 | 126 |
| ND<5 U | 2000 | -1995 | 8 | 127 |
| | | | | |
| 19200 | 441 | 18759 | 9 | 127 |
| 16200 | 441 | 15759 | 10 | 127 |
| 11200 | 441 | 10759 | 11 | 127 |
| 1230 | 441 | 789 | 12 | 127 |
| 320 | 441 | -121 | 12 | 128 |
| 4.7 J | 441 | -436.3 | 12 | 129 |
| 131 | 441 | -310 | 12 | 130 |
| 135 | 441 | -306 | 12 | 131 |
| 4.9 J | 441 | -436.1 | 12 | 132 |
| 13.1 | 441 | -427.9 | 12 | 133 |
| 460 | 441 | 19 | 13 | 133 |
| 16.2 | 441 | -424.8 | 13 | 134 |
| 7.3 J | 441 | -433.7 | 13 | 135 |
| 63.1 | 441 | -377.9 | 13 | 136 |
| 10.2 1c | 441 | -430.8 | 13 | 137 |
| 62.4 | 441 | -378.6 | 13 | 138 |
| 120 | 441 | -321 | 13 | 139 |
| ND<5 U | 441 | -436 | 13 | 140 |
| ND<5 U | 441 | -436 | 13 | 141 |

| | | | | |
|---|---|---|---|---|
| 16200 | 19200 | -3000 | 13 | 142 |
| 11200 | 19200 | -8000 | 13 | 143 |
| 1230 | 19200 | -17970 | 13 | 144 |
| 320 | 19200 | -18880 | 13 | 145 |
| 4.7 J | 19200 | -19195.3 | 13 | 146 |
| 131 | 19200 | -19069 | 13 | 147 |
| 135 | 19200 | -19065 | 13 | 148 |
| 4.9 J | 19200 | -19195.1 | 13 | 149 |
| 13.1 | 19200 | -19186.9 | 13 | 150 |
| 460 | 19200 | -18740 | 13 | 151 |
| 16.2 | 19200 | -19183.8 | 13 | 152 |
| 7.3 J | 19200 | -19192.7 | 13 | 153 |
| 63.1 | 19200 | -19136.9 | 13 | 154 |
| 10.2 1c | 19200 | -19189.8 | 13 | 155 |
| 62.4 | 19200 | -19137.6 | 13 | 156 |
| 120 | 19200 | -19080 | 13 | 157 |
| ND<5 U | 19200 | -19195 | 13 | 158 |
| ND<5 U | 19200 | -19195 | 13 | 159 |
| | | | | |
| 11200 | 16200 | -5000 | 13 | 160 |
| 1230 | 16200 | -14970 | 13 | 161 |
| 320 | 16200 | -15880 | 13 | 162 |
| 4.7 J | 16200 | -16195.3 | 13 | 163 |
| 131 | 16200 | -16069 | 13 | 164 |
| 135 | 16200 | -16065 | 13 | 165 |
| 4.9 J | 16200 | -16195.1 | 13 | 166 |
| 13.1 | 16200 | -16186.9 | 13 | 167 |
| 460 | 16200 | -15740 | 13 | 168 |
| 16.2 | 16200 | -16183.8 | 13 | 169 |
| 7.3 J | 16200 | -16192.7 | 13 | 170 |
| 63.1 | 16200 | -16136.9 | 13 | 171 |
| 10.2 1c | 16200 | -16189.8 | 13 | 172 |
| 62.4 | 16200 | -16137.6 | 13 | 173 |
| 120 | 16200 | -16080 | 13 | 174 |
| ND<5 U | 16200 | -16195 | 13 | 175 |
| ND<5 U | 16200 | -16195 | 13 | 176 |
| | | | | |
| 1230 | 11200 | -9970 | 13 | 177 |
| 320 | 11200 | -10880 | 13 | 178 |
| 4.7 J | 11200 | -11195.3 | 13 | 179 |
| 131 | 11200 | -11069 | 13 | 180 |
| 135 | 11200 | -11065 | 13 | 181 |
| 4.9 J | 11200 | -11195.1 | 13 | 182 |
| 13.1 | 11200 | -11186.9 | 13 | 183 |
| 460 | 11200 | -10740 | 13 | 184 |
| 16.2 | 11200 | -11183.8 | 13 | 185 |
| 7.3 J | 11200 | -11192.7 | 13 | 186 |
| 63.1 | 11200 | -11136.9 | 13 | 187 |
| 10.2 1c | 11200 | -11189.8 | 13 | 188 |
| 62.4 | 11200 | -11137.6 | 13 | 189 |
| 120 | 11200 | -11080 | 13 | 190 |
| ND<5 U | 11200 | -11195 | 13 | 191 |
| ND<5 U | 11200 | -11195 | 13 | 192 |
| | | | | |
| 320 | 1230 | -910 | 13 | 193 |
| 4.7 J | 1230 | -1225.3 | 13 | 194 |
| 131 | 1230 | -1099 | 13 | 195 |

| | | | | |
|---|---|---|---|---|
| 135 | 1230 | -1095 | 13 | 196 |
| 4.9 J | 1230 | -1225.1 | 13 | 197 |
| 13.1 | 1230 | -1216.9 | 13 | 198 |
| 460 | 1230 | -770 | 13 | 199 |
| 16.2 | 1230 | -1213.8 | 13 | 200 |
| 7.3 J | 1230 | -1222.7 | 13 | 201 |
| 63.1 | 1230 | -1166.9 | 13 | 202 |
| 10.2 1c | 1230 | -1219.8 | 13 | 203 |
| 62.4 | 1230 | -1167.6 | 13 | 204 |
| 120 | 1230 | -1110 | 13 | 205 |
| ND<5 U | 1230 | -1225 | 13 | 206 |
| ND<5 U | 1230 | -1225 | 13 | 207 |
| | | | | |
| 4.7 J | 320 | -315.3 | 13 | 208 |
| 131 | 320 | -189 | 13 | 209 |
| 135 | 320 | -185 | 13 | 210 |
| 4.9 J | 320 | -315.1 | 13 | 211 |
| 13.1 | 320 | -306.9 | 13 | 212 |
| 460 | 320 | 140 | 14 | 212 |
| 16.2 | 320 | -303.8 | 14 | 213 |
| 7.3 J | 320 | -312.7 | 14 | 214 |
| 63.1 | 320 | -256.9 | 14 | 215 |
| 10.2 1c | 320 | -309.8 | 14 | 216 |
| 62.4 | 320 | -257.6 | 14 | 217 |
| 120 | 320 | -200 | 14 | 218 |
| ND<5 U | 320 | -315 | 14 | 219 |
| ND<5 U | 320 | -315 | 14 | 220 |
| | | | | |
| 131 | 4.7 J | Same Date | 14 | 220 |
| 135 | 4.7 J | 130.3 | 15 | 220 |
| 4.9 J | 4.7 J | 0.2 | 16 | 220 |
| 13.1 | 4.7 J | 8.4 | 17 | 220 |
| 460 | 4.7 J | 455.3 | 18 | 220 |
| 16.2 | 4.7 J | 11.5 | 19 | 220 |
| 7.3 J | 4.7 J | 2.6 | 20 | 220 |
| 63.1 | 4.7 J | 58.4 | 21 | 220 |
| 10.2 1c | 4.7 J | 5.5 | 22 | 220 |
| 62.4 | 4.7 J | 57.7 | 23 | 220 |
| 120 | 4.7 J | 115.3 | 24 | 220 |
| ND<5 U | 4.7 J | 0.3 | 25 | 220 |
| ND<5 U | 4.7 J | 0.3 | 26 | 220 |
| | | | | |
| 135 | 131 | 4 | 27 | 220 |
| 4.9 J | 131 | -126.1 | 27 | 221 |
| 13.1 | 131 | -117.9 | 27 | 222 |
| 460 | 131 | 329 | 28 | 222 |
| 16.2 | 131 | -114.8 | 28 | 223 |
| 7.3 J | 131 | -123.7 | 28 | 224 |
| 63.1 | 131 | -67.9 | 28 | 225 |
| 10.2 1c | 131 | -120.8 | 28 | 226 |
| 62.4 | 131 | -68.6 | 28 | 227 |
| 120 | 131 | -11 | 28 | 228 |
| ND<5 U | 131 | -126 | 28 | 229 |
| ND<5 U | 131 | -126 | 28 | 230 |
| | | | | |
| 4.9 J | 135 | Same Date | 28 | 230 |
| 13.1 | 135 | -121.9 | 28 | 231 |

| | | | | |
|---|---|---|---|---|
| 460 | 135 | 325 | 29 | 231 |
| 16.2 | 135 | -118.8 | 29 | 232 |
| 7.3 J | 135 | -127.7 | 29 | 233 |
| 63.1 | 135 | -71.9 | 29 | 234 |
| 10.2 1c | 135 | -124.8 | 29 | 235 |
| 62.4 | 135 | -72.6 | 29 | 236 |
| 120 | 135 | -15 | 29 | 237 |
| ND<5 U | 135 | -130 | 29 | 238 |
| ND<5 U | 135 | -130 | 29 | 239 |
| | | | | |
| 13.1 | 4.9 J | 8.2 | 30 | 239 |
| 460 | 4.9 J | 455.1 | 31 | 239 |
| 16.2 | 4.9 J | 11.3 | 32 | 239 |
| 7.3 J | 4.9 J | 2.4 | 33 | 239 |
| 63.1 | 4.9 J | 58.2 | 34 | 239 |
| 10.2 1c | 4.9 J | 5.3 | 35 | 239 |
| 62.4 | 4.9 J | 57.5 | 36 | 239 |
| 120 | 4.9 J | 115.1 | 37 | 239 |
| ND<5 U | 4.9 J | 0.1 | 38 | 239 |
| ND<5 U | 4.9 J | 0.1 | 39 | 239 |
| | | | | |
| 460 | 13.1 | 446.9 | 40 | 239 |
| 16.2 | 13.1 | 3.1 | 41 | 239 |
| 7.3 J | 13.1 | -5.8 | 41 | 240 |
| 63.1 | 13.1 | 50 | 42 | 240 |
| 10.2 1c | 13.1 | -2.9 | 42 | 241 |
| 62.4 | 13.1 | 49.3 | 43 | 241 |
| 120 | 13.1 | 106.9 | 44 | 241 |
| ND<5 U | 13.1 | -8.1 | 44 | 242 |
| ND<5 U | 13.1 | -8.1 | 44 | 243 |
| | | | | |
| 16.2 | 460 | -443.8 | 44 | 244 |
| 7.3 J | 460 | -452.7 | 44 | 245 |
| 63.1 | 460 | -396.9 | 44 | 246 |
| 10.2 1c | 460 | -449.8 | 44 | 247 |
| 62.4 | 460 | -397.6 | 44 | 248 |
| 120 | 460 | -340 | 44 | 249 |
| ND<5 U | 460 | -455 | 44 | 250 |
| ND<5 U | 460 | -455 | 44 | 251 |
| | | | | |
| 7.3 J | 16.2 | -8.9 | 44 | 252 |
| 63.1 | 16.2 | 46.9 | 45 | 252 |
| 10.2 1c | 16.2 | -6 | 45 | 253 |
| 62.4 | 16.2 | 46.2 | 46 | 253 |
| 120 | 16.2 | 103.8 | 47 | 253 |
| ND<5 U | 16.2 | -11.2 | 47 | 254 |
| ND<5 U | 16.2 | -11.2 | 47 | 255 |
| | | | | |
| 63.1 | 7.3 J | 55.8 | 48 | 255 |
| 10.2 1c | 7.3 J | 2.9 | 49 | 255 |
| 62.4 | 7.3 J | 55.1 | 50 | 255 |
| 120 | 7.3 J | 112.7 | 51 | 255 |
| ND<5 U | 7.3 J | -2.3 | 51 | 256 |
| ND<5 U | 7.3 J | -2.3 | 51 | 257 |
| | | | | |
| 10.2 1c | 63.1 | -52.9 | 51 | 258 |
| 62.4 | 63.1 | -0.7 | 51 | 259 |

| | | | | |
|---|---|---|---|---|
| 120 | 63.1 | 56.9 | 52 | 259 |
| ND<5 U | 63.1 | -58.1 | 52 | 260 |
| ND<5 U | 63.1 | -58.1 | 52 | 261 |
| | | | | |
| 62.4 | 10.2 1c | 52.2 | 53 | 261 |
| 120 | 10.2 1c | 109.8 | 54 | 261 |
| ND<5 U | 10.2 1c | -5.2 | 54 | 262 |
| ND<5 U | 10.2 1c | -5.2 | 54 | 263 |
| | | | | |
| 120 | 62.4 | 57.6 | 55 | 263 |
| ND<5 U | 62.4 | -57.4 | 55 | 264 |
| ND<5 U | 62.4 | -57.4 | 55 | 265 |
| | | | | |
| ND<5 U | 120 | -115 | 55 | 266 |
| ND<5 U | 120 | -115 | 55 | 267 |
| | | | | |
| ND<5 U | ND<5 U | 0 | 55 | 267 |

S Statistic = 55 - 267 = -212

| Tied Group | Value | Members |
|---|---|---|
| 1 | 5 | 2 |

| Time Period | Observations |
|---|---|
| 2/1/2017 | 1 |
| 3/1/2017 | 1 |
| 4/1/2017 | 1 |
| 5/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 3/1/2022 | 1 |
| 3/1/2023 | 1 |
| 3/1/2024 | 1 |

There are 2 time periods with multiple data

A = 18
B = 36
C = 0
D = 0
E = 2
F = 4

a = 37050
b = 140400
c = 1300
Group Variance = 2055.34
Z-Score = -4.65415
Comparison Level at 95% confidence level = 1.65463 (upward trend)
-4.65415 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RW18-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 592000 | 728000 | -136000 | 0 | 1 |
| 633000 | 728000 | -95000 | 0 | 2 |
| 246000 | 728000 | -482000 | 0 | 3 |
| 694000 | 728000 | -34000 | 0 | 4 |
| 575000 | 728000 | -153000 | 0 | 5 |
| 290000 | 728000 | -438000 | 0 | 6 |
| 382000 MHML | 728000 | -346000 | 0 | 7 |
| 393000 | 728000 | -335000 | 0 | 8 |
| 323000 | 728000 | -405000 | 0 | 9 |
| 369000 | 728000 | -359000 | 0 | 10 |
| 370000 | 728000 | -358000 | 0 | 11 |
| 396000 | 728000 | -332000 | 0 | 12 |
| 330000 | 728000 | -398000 | 0 | 13 |
| 247000 | 728000 | -481000 | 0 | 14 |
| 846000 | 728000 | 118000 | 1 | 14 |
| 822000 | 728000 | 94000 | 2 | 14 |
| 279000 | 728000 | -449000 | 2 | 15 |
| 276000 | 728000 | -452000 | 2 | 16 |
| 640000 | 728000 | -88000 | 2 | 17 |
| 849000 | 728000 | 121000 | 3 | 17 |
| 545000 | 728000 | -183000 | 3 | 18 |
| 252000 | 728000 | -476000 | 3 | 19 |
| 753000 1c | 728000 | 25000 | 4 | 19 |
| 534000 1c | 728000 | -194000 | 4 | 20 |
| 4380 | 728000 | -723620 | 4 | 21 |
| 434000 | 728000 | -294000 | 4 | 22 |
| 406100 | 728000 | -321900 | 4 | 23 |
| 252600 | 728000 | -475400 | 4 | 24 |
| | | | | |
| 633000 | 592000 | 41000 | 5 | 24 |
| 246000 | 592000 | -346000 | 5 | 25 |
| 694000 | 592000 | 102000 | 6 | 25 |
| 575000 | 592000 | -17000 | 6 | 26 |
| 290000 | 592000 | -302000 | 6 | 27 |
| 382000 MHML | 592000 | -210000 | 6 | 28 |
| 393000 | 592000 | -199000 | 6 | 29 |
| 323000 | 592000 | -269000 | 6 | 30 |
| 369000 | 592000 | -223000 | 6 | 31 |
| 370000 | 592000 | -222000 | 6 | 32 |
| 396000 | 592000 | -196000 | 6 | 33 |
| 330000 | 592000 | -262000 | 6 | 34 |
| 247000 | 592000 | -345000 | 6 | 35 |
| 846000 | 592000 | 254000 | 7 | 35 |
| 822000 | 592000 | 230000 | 8 | 35 |
| 279000 | 592000 | -313000 | 8 | 36 |
| 276000 | 592000 | -316000 | 8 | 37 |
| 640000 | 592000 | 48000 | 9 | 37 |

| | | | | |
|---|---|---|---|---|
| 849000 | 592000 | 257000 | 10 | 37 |
| 545000 | 592000 | -47000 | 10 | 38 |
| 252000 | 592000 | -340000 | 10 | 39 |
| 753000 1c | 592000 | 161000 | 11 | 39 |
| 534000 1c | 592000 | -58000 | 11 | 40 |
| 4380 | 592000 | -587620 | 11 | 41 |
| 434000 | 592000 | -158000 | 11 | 42 |
| 406100 | 592000 | -185900 | 11 | 43 |
| 252600 | 592000 | -339400 | 11 | 44 |
| | | | | |
| 246000 | 633000 | -387000 | 11 | 45 |
| 694000 | 633000 | 61000 | 12 | 45 |
| 575000 | 633000 | -58000 | 12 | 46 |
| 290000 | 633000 | -343000 | 12 | 47 |
| 382000 MHML | 633000 | -251000 | 12 | 48 |
| 393000 | 633000 | -240000 | 12 | 49 |
| 323000 | 633000 | -310000 | 12 | 50 |
| 369000 | 633000 | -264000 | 12 | 51 |
| 370000 | 633000 | -263000 | 12 | 52 |
| 396000 | 633000 | -237000 | 12 | 53 |
| 330000 | 633000 | -303000 | 12 | 54 |
| 247000 | 633000 | -386000 | 12 | 55 |
| 846000 | 633000 | 213000 | 13 | 55 |
| 822000 | 633000 | 189000 | 14 | 55 |
| 279000 | 633000 | -354000 | 14 | 56 |
| 276000 | 633000 | -357000 | 14 | 57 |
| 640000 | 633000 | 7000 | 15 | 57 |
| 849000 | 633000 | 216000 | 16 | 57 |
| 545000 | 633000 | -88000 | 16 | 58 |
| 252000 | 633000 | -381000 | 16 | 59 |
| 753000 1c | 633000 | 120000 | 17 | 59 |
| 534000 1c | 633000 | -99000 | 17 | 60 |
| 4380 | 633000 | -628620 | 17 | 61 |
| 434000 | 633000 | -199000 | 17 | 62 |
| 406100 | 633000 | -226900 | 17 | 63 |
| 252600 | 633000 | -380400 | 17 | 64 |
| | | | | |
| 694000 | 246000 | 448000 | 18 | 64 |
| 575000 | 246000 | 329000 | 19 | 64 |
| 290000 | 246000 | 44000 | 20 | 64 |
| 382000 MHML | 246000 | 136000 | 21 | 64 |
| 393000 | 246000 | 147000 | 22 | 64 |
| 323000 | 246000 | 77000 | 23 | 64 |
| 369000 | 246000 | 123000 | 24 | 64 |
| 370000 | 246000 | 124000 | 25 | 64 |
| 396000 | 246000 | 150000 | 26 | 64 |
| 330000 | 246000 | 84000 | 27 | 64 |
| 247000 | 246000 | 1000 | 28 | 64 |
| 846000 | 246000 | 600000 | 29 | 64 |
| 822000 | 246000 | 576000 | 30 | 64 |
| 279000 | 246000 | 33000 | 31 | 64 |
| 276000 | 246000 | 30000 | 32 | 64 |
| 640000 | 246000 | 394000 | 33 | 64 |
| 849000 | 246000 | 603000 | 34 | 64 |
| 545000 | 246000 | 299000 | 35 | 64 |
| 252000 | 246000 | 6000 | 36 | 64 |
| 753000 1c | 246000 | 507000 | 37 | 64 |

| | | | | |
|---|---|---|---|---|
| 534000 1c | 246000 | 288000 | 38 | 64 |
| 4380 | 246000 | -241620 | 38 | 65 |
| 434000 | 246000 | 188000 | 39 | 65 |
| 406100 | 246000 | 160100 | 40 | 65 |
| 252600 | 246000 | 6600 | 41 | 65 |
| | | | | |
| 575000 | 694000 | -119000 | 41 | 66 |
| 290000 | 694000 | -404000 | 41 | 67 |
| 382000 MHML | 694000 | -312000 | 41 | 68 |
| 393000 | 694000 | -301000 | 41 | 69 |
| 323000 | 694000 | -371000 | 41 | 70 |
| 369000 | 694000 | -325000 | 41 | 71 |
| 370000 | 694000 | -324000 | 41 | 72 |
| 396000 | 694000 | -298000 | 41 | 73 |
| 330000 | 694000 | -364000 | 41 | 74 |
| 247000 | 694000 | -447000 | 41 | 75 |
| 846000 | 694000 | 152000 | 42 | 75 |
| 822000 | 694000 | 128000 | 43 | 75 |
| 279000 | 694000 | -415000 | 43 | 76 |
| 276000 | 694000 | -418000 | 43 | 77 |
| 640000 | 694000 | -54000 | 43 | 78 |
| 849000 | 694000 | 155000 | 44 | 78 |
| 545000 | 694000 | -149000 | 44 | 79 |
| 252000 | 694000 | -442000 | 44 | 80 |
| 753000 1c | 694000 | 59000 | 45 | 80 |
| 534000 1c | 694000 | -160000 | 45 | 81 |
| 4380 | 694000 | -689620 | 45 | 82 |
| 434000 | 694000 | -260000 | 45 | 83 |
| 406100 | 694000 | -287900 | 45 | 84 |
| 252600 | 694000 | -441400 | 45 | 85 |
| | | | | |
| 290000 | 575000 | -285000 | 45 | 86 |
| 382000 MHML | 575000 | -193000 | 45 | 87 |
| 393000 | 575000 | -182000 | 45 | 88 |
| 323000 | 575000 | -252000 | 45 | 89 |
| 369000 | 575000 | -206000 | 45 | 90 |
| 370000 | 575000 | -205000 | 45 | 91 |
| 396000 | 575000 | -179000 | 45 | 92 |
| 330000 | 575000 | -245000 | 45 | 93 |
| 247000 | 575000 | -328000 | 45 | 94 |
| 846000 | 575000 | 271000 | 46 | 94 |
| 822000 | 575000 | 247000 | 47 | 94 |
| 279000 | 575000 | -296000 | 47 | 95 |
| 276000 | 575000 | -299000 | 47 | 96 |
| 640000 | 575000 | 65000 | 48 | 96 |
| 849000 | 575000 | 274000 | 49 | 96 |
| 545000 | 575000 | -30000 | 49 | 97 |
| 252000 | 575000 | -323000 | 49 | 98 |
| 753000 1c | 575000 | 178000 | 50 | 98 |
| 534000 1c | 575000 | -41000 | 50 | 99 |
| 4380 | 575000 | -570620 | 50 | 100 |
| 434000 | 575000 | -141000 | 50 | 101 |
| 406100 | 575000 | -168900 | 50 | 102 |
| 252600 | 575000 | -322400 | 50 | 103 |
| | | | | |
| 382000 MHML | 290000 | 92000 | 51 | 103 |
| 393000 | 290000 | 103000 | 52 | 103 |

| | | | | |
|---|---|---|---|---|
| 323000 | 290000 | 33000 | 53 | 103 |
| 369000 | 290000 | 79000 | 54 | 103 |
| 370000 | 290000 | 80000 | 55 | 103 |
| 396000 | 290000 | 106000 | 56 | 103 |
| 330000 | 290000 | 40000 | 57 | 103 |
| 247000 | 290000 | -43000 | 57 | 104 |
| 846000 | 290000 | 556000 | 58 | 104 |
| 822000 | 290000 | 532000 | 59 | 104 |
| 279000 | 290000 | -11000 | 59 | 105 |
| 276000 | 290000 | -14000 | 59 | 106 |
| 640000 | 290000 | 350000 | 60 | 106 |
| 849000 | 290000 | 559000 | 61 | 106 |
| 545000 | 290000 | 255000 | 62 | 106 |
| 252000 | 290000 | -38000 | 62 | 107 |
| 753000 1c | 290000 | 463000 | 63 | 107 |
| 534000 1c | 290000 | 244000 | 64 | 107 |
| 4380 | 290000 | -285620 | 64 | 108 |
| 434000 | 290000 | 144000 | 65 | 108 |
| 406100 | 290000 | 116100 | 66 | 108 |
| 252600 | 290000 | -37400 | 66 | 109 |
| | | | | |
| 393000 | 382000 MHML | 11000 | 67 | 109 |
| 323000 | 382000 MHML | -59000 | 67 | 110 |
| 369000 | 382000 MHML | -13000 | 67 | 111 |
| 370000 | 382000 MHML | -12000 | 67 | 112 |
| 396000 | 382000 MHML | 14000 | 68 | 112 |
| 330000 | 382000 MHML | -52000 | 68 | 113 |
| 247000 | 382000 MHML | -135000 | 68 | 114 |
| 846000 | 382000 MHML | 464000 | 69 | 114 |
| 822000 | 382000 MHML | 440000 | 70 | 114 |
| 279000 | 382000 MHML | -103000 | 70 | 115 |
| 276000 | 382000 MHML | -106000 | 70 | 116 |
| 640000 | 382000 MHML | 258000 | 71 | 116 |
| 849000 | 382000 MHML | 467000 | 72 | 116 |
| 545000 | 382000 MHML | 163000 | 73 | 116 |
| 252000 | 382000 MHML | -130000 | 73 | 117 |
| 753000 1c | 382000 MHML | 371000 | 74 | 117 |
| 534000 1c | 382000 MHML | 152000 | 75 | 117 |
| 4380 | 382000 MHML | -377620 | 75 | 118 |
| 434000 | 382000 MHML | 52000 | 76 | 118 |
| 406100 | 382000 MHML | 24100 | 77 | 118 |
| 252600 | 382000 MHML | -129400 | 77 | 119 |
| | | | | |
| 323000 | 393000 | -70000 | 77 | 120 |
| 369000 | 393000 | -24000 | 77 | 121 |
| 370000 | 393000 | -23000 | 77 | 122 |
| 396000 | 393000 | 3000 | 78 | 122 |
| 330000 | 393000 | -63000 | 78 | 123 |
| 247000 | 393000 | -146000 | 78 | 124 |
| 846000 | 393000 | 453000 | 79 | 124 |
| 822000 | 393000 | 429000 | 80 | 124 |
| 279000 | 393000 | -114000 | 80 | 125 |
| 276000 | 393000 | -117000 | 80 | 126 |
| 640000 | 393000 | 247000 | 81 | 126 |
| 849000 | 393000 | 456000 | 82 | 126 |
| 545000 | 393000 | 152000 | 83 | 126 |
| 252000 | 393000 | -141000 | 83 | 127 |

| | | | | |
|---|---|---|---|---|
| 753000 1c | 393000 | 360000 | 84 | 127 |
| 534000 1c | 393000 | 141000 | 85 | 127 |
| 4380 | 393000 | -388620 | 85 | 128 |
| 434000 | 393000 | 41000 | 86 | 128 |
| 406100 | 393000 | 13100 | 87 | 128 |
| 252600 | 393000 | -140400 | 87 | 129 |
| | | | | |
| 369000 | 323000 | 46000 | 88 | 129 |
| 370000 | 323000 | 47000 | 89 | 129 |
| 396000 | 323000 | 73000 | 90 | 129 |
| 330000 | 323000 | 7000 | 91 | 129 |
| 247000 | 323000 | -76000 | 91 | 130 |
| 846000 | 323000 | 523000 | 92 | 130 |
| 822000 | 323000 | 499000 | 93 | 130 |
| 279000 | 323000 | -44000 | 93 | 131 |
| 276000 | 323000 | -47000 | 93 | 132 |
| 640000 | 323000 | 317000 | 94 | 132 |
| 849000 | 323000 | 526000 | 95 | 132 |
| 545000 | 323000 | 222000 | 96 | 132 |
| 252000 | 323000 | -71000 | 96 | 133 |
| 753000 1c | 323000 | 430000 | 97 | 133 |
| 534000 1c | 323000 | 211000 | 98 | 133 |
| 4380 | 323000 | -318620 | 98 | 134 |
| 434000 | 323000 | 111000 | 99 | 134 |
| 406100 | 323000 | 83100 | 100 | 134 |
| 252600 | 323000 | -70400 | 100 | 135 |
| | | | | |
| 370000 | 369000 | 1000 | 101 | 135 |
| 396000 | 369000 | 27000 | 102 | 135 |
| 330000 | 369000 | -39000 | 102 | 136 |
| 247000 | 369000 | -122000 | 102 | 137 |
| 846000 | 369000 | 477000 | 103 | 137 |
| 822000 | 369000 | 453000 | 104 | 137 |
| 279000 | 369000 | -90000 | 104 | 138 |
| 276000 | 369000 | -93000 | 104 | 139 |
| 640000 | 369000 | 271000 | 105 | 139 |
| 849000 | 369000 | 480000 | 106 | 139 |
| 545000 | 369000 | 176000 | 107 | 139 |
| 252000 | 369000 | -117000 | 107 | 140 |
| 753000 1c | 369000 | 384000 | 108 | 140 |
| 534000 1c | 369000 | 165000 | 109 | 140 |
| 4380 | 369000 | -364620 | 109 | 141 |
| 434000 | 369000 | 65000 | 110 | 141 |
| 406100 | 369000 | 37100 | 111 | 141 |
| 252600 | 369000 | -116400 | 111 | 142 |
| | | | | |
| 396000 | 370000 | 26000 | 112 | 142 |
| 330000 | 370000 | -40000 | 112 | 143 |
| 247000 | 370000 | -123000 | 112 | 144 |
| 846000 | 370000 | 476000 | 113 | 144 |
| 822000 | 370000 | 452000 | 114 | 144 |
| 279000 | 370000 | -91000 | 114 | 145 |
| 276000 | 370000 | -94000 | 114 | 146 |
| 640000 | 370000 | 270000 | 115 | 146 |
| 849000 | 370000 | 479000 | 116 | 146 |
| 545000 | 370000 | 175000 | 117 | 146 |
| 252000 | 370000 | -118000 | 117 | 147 |

| | | | | |
|---|---|---|---|---|
| 753000 1c | 370000 | 383000 | 118 | 147 |
| 534000 1c | 370000 | 164000 | 119 | 147 |
| 4380 | 370000 | -365620 | 119 | 148 |
| 434000 | 370000 | 64000 | 120 | 148 |
| 406100 | 370000 | 36100 | 121 | 148 |
| 252600 | 370000 | -117400 | 121 | 149 |
| | | | | |
| 330000 | 396000 | -66000 | 121 | 150 |
| 247000 | 396000 | -149000 | 121 | 151 |
| 846000 | 396000 | 450000 | 122 | 151 |
| 822000 | 396000 | 426000 | 123 | 151 |
| 279000 | 396000 | -117000 | 123 | 152 |
| 276000 | 396000 | -120000 | 123 | 153 |
| 640000 | 396000 | 244000 | 124 | 153 |
| 849000 | 396000 | 453000 | 125 | 153 |
| 545000 | 396000 | 149000 | 126 | 153 |
| 252000 | 396000 | -144000 | 126 | 154 |
| 753000 1c | 396000 | 357000 | 127 | 154 |
| 534000 1c | 396000 | 138000 | 128 | 154 |
| 4380 | 396000 | -391620 | 128 | 155 |
| 434000 | 396000 | 38000 | 129 | 155 |
| 406100 | 396000 | 10100 | 130 | 155 |
| 252600 | 396000 | -143400 | 130 | 156 |
| | | | | |
| 247000 | 330000 | -83000 | 130 | 157 |
| 846000 | 330000 | 516000 | 131 | 157 |
| 822000 | 330000 | 492000 | 132 | 157 |
| 279000 | 330000 | -51000 | 132 | 158 |
| 276000 | 330000 | -54000 | 132 | 159 |
| 640000 | 330000 | 310000 | 133 | 159 |
| 849000 | 330000 | 519000 | 134 | 159 |
| 545000 | 330000 | 215000 | 135 | 159 |
| 252000 | 330000 | -78000 | 135 | 160 |
| 753000 1c | 330000 | 423000 | 136 | 160 |
| 534000 1c | 330000 | 204000 | 137 | 160 |
| 4380 | 330000 | -325620 | 137 | 161 |
| 434000 | 330000 | 104000 | 138 | 161 |
| 406100 | 330000 | 76100 | 139 | 161 |
| 252600 | 330000 | -77400 | 139 | 162 |
| | | | | |
| 846000 | 247000 | 599000 | 140 | 162 |
| 822000 | 247000 | 575000 | 141 | 162 |
| 279000 | 247000 | 32000 | 142 | 162 |
| 276000 | 247000 | 29000 | 143 | 162 |
| 640000 | 247000 | 393000 | 144 | 162 |
| 849000 | 247000 | 602000 | 145 | 162 |
| 545000 | 247000 | 298000 | 146 | 162 |
| 252000 | 247000 | 5000 | 147 | 162 |
| 753000 1c | 247000 | 506000 | 148 | 162 |
| 534000 1c | 247000 | 287000 | 149 | 162 |
| 4380 | 247000 | -242620 | 149 | 163 |
| 434000 | 247000 | 187000 | 150 | 163 |
| 406100 | 247000 | 159100 | 151 | 163 |
| 252600 | 247000 | 5600 | 152 | 163 |
| | | | | |
| 822000 | 846000 | Same Date | 152 | 163 |
| 279000 | 846000 | -567000 | 152 | 164 |

| | | | | |
|---|---|---|---|---|
| 276000 | 846000 | -570000 | 152 | 165 |
| 640000 | 846000 | -206000 | 152 | 166 |
| 849000 | 846000 | 3000 | 153 | 166 |
| 545000 | 846000 | -301000 | 153 | 167 |
| 252000 | 846000 | -594000 | 153 | 168 |
| 753000 1c | 846000 | -93000 | 153 | 169 |
| 534000 1c | 846000 | -312000 | 153 | 170 |
| 4380 | 846000 | -841620 | 153 | 171 |
| 434000 | 846000 | -412000 | 153 | 172 |
| 406100 | 846000 | -439900 | 153 | 173 |
| 252600 | 846000 | -593400 | 153 | 174 |
| | | | | |
| 279000 | 822000 | -543000 | 153 | 175 |
| 276000 | 822000 | -546000 | 153 | 176 |
| 640000 | 822000 | -182000 | 153 | 177 |
| 849000 | 822000 | 27000 | 154 | 177 |
| 545000 | 822000 | -277000 | 154 | 178 |
| 252000 | 822000 | -570000 | 154 | 179 |
| 753000 1c | 822000 | -69000 | 154 | 180 |
| 534000 1c | 822000 | -288000 | 154 | 181 |
| 4380 | 822000 | -817620 | 154 | 182 |
| 434000 | 822000 | -388000 | 154 | 183 |
| 406100 | 822000 | -415900 | 154 | 184 |
| 252600 | 822000 | -569400 | 154 | 185 |
| | | | | |
| 276000 | 279000 | Same Date | 154 | 185 |
| 640000 | 279000 | 361000 | 155 | 185 |
| 849000 | 279000 | 570000 | 156 | 185 |
| 545000 | 279000 | 266000 | 157 | 185 |
| 252000 | 279000 | -27000 | 157 | 186 |
| 753000 1c | 279000 | 474000 | 158 | 186 |
| 534000 1c | 279000 | 255000 | 159 | 186 |
| 4380 | 279000 | -274620 | 159 | 187 |
| 434000 | 279000 | 155000 | 160 | 187 |
| 406100 | 279000 | 127100 | 161 | 187 |
| 252600 | 279000 | -26400 | 161 | 188 |
| | | | | |
| 640000 | 276000 | 364000 | 162 | 188 |
| 849000 | 276000 | 573000 | 163 | 188 |
| 545000 | 276000 | 269000 | 164 | 188 |
| 252000 | 276000 | -24000 | 164 | 189 |
| 753000 1c | 276000 | 477000 | 165 | 189 |
| 534000 1c | 276000 | 258000 | 166 | 189 |
| 4380 | 276000 | -271620 | 166 | 190 |
| 434000 | 276000 | 158000 | 167 | 190 |
| 406100 | 276000 | 130100 | 168 | 190 |
| 252600 | 276000 | -23400 | 168 | 191 |
| | | | | |
| 849000 | 640000 | 209000 | 169 | 191 |
| 545000 | 640000 | -95000 | 169 | 192 |
| 252000 | 640000 | -388000 | 169 | 193 |
| 753000 1c | 640000 | 113000 | 170 | 193 |
| 534000 1c | 640000 | -106000 | 170 | 194 |
| 4380 | 640000 | -635620 | 170 | 195 |
| 434000 | 640000 | -206000 | 170 | 196 |
| 406100 | 640000 | -233900 | 170 | 197 |
| 252600 | 640000 | -387400 | 170 | 198 |

| | | | | |
|---|---|---|---|---|
| 545000 | 849000 | -304000 | 170 | 199 |
| 252000 | 849000 | -597000 | 170 | 200 |
| 753000 1c | 849000 | -96000 | 170 | 201 |
| 534000 1c | 849000 | -315000 | 170 | 202 |
| 4380 | 849000 | -844620 | 170 | 203 |
| 434000 | 849000 | -415000 | 170 | 204 |
| 406100 | 849000 | -442900 | 170 | 205 |
| 252600 | 849000 | -596400 | 170 | 206 |
| | | | | |
| 252000 | 545000 | -293000 | 170 | 207 |
| 753000 1c | 545000 | 208000 | 171 | 207 |
| 534000 1c | 545000 | -11000 | 171 | 208 |
| 4380 | 545000 | -540620 | 171 | 209 |
| 434000 | 545000 | -111000 | 171 | 210 |
| 406100 | 545000 | -138900 | 171 | 211 |
| 252600 | 545000 | -292400 | 171 | 212 |
| | | | | |
| 753000 1c | 252000 | 501000 | 172 | 212 |
| 534000 1c | 252000 | 282000 | 173 | 212 |
| 4380 | 252000 | -247620 | 173 | 213 |
| 434000 | 252000 | 182000 | 174 | 213 |
| 406100 | 252000 | 154100 | 175 | 213 |
| 252600 | 252000 | 600 | 176 | 213 |
| | | | | |
| 534000 1c | 753000 1c | -219000 | 176 | 214 |
| 4380 | 753000 1c | -748620 | 176 | 215 |
| 434000 | 753000 1c | -319000 | 176 | 216 |
| 406100 | 753000 1c | -346900 | 176 | 217 |
| 252600 | 753000 1c | -500400 | 176 | 218 |
| | | | | |
| 4380 | 534000 1c | -529620 | 176 | 219 |
| 434000 | 534000 1c | -100000 | 176 | 220 |
| 406100 | 534000 1c | -127900 | 176 | 221 |
| 252600 | 534000 1c | -281400 | 176 | 222 |
| | | | | |
| 434000 | 4380 | 429620 | 177 | 222 |
| 406100 | 4380 | 401720 | 178 | 222 |
| 252600 | 4380 | 248220 | 179 | 222 |
| | | | | |
| 406100 | 434000 | -27900 | 179 | 223 |
| 252600 | 434000 | -181400 | 179 | 224 |
| | | | | |
| 252600 | 406100 | -153500 | 179 | 225 |

S Statistic = 179 - 225 = -46

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 2/1/2017 | 1 |
| 3/1/2017 | 1 |
| 4/1/2017 | 1 |
| 5/1/2017 | 1 |
| 6/1/2017 | 1 |
| 7/1/2017 | 1 |

| | |
|---|---|
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 3/1/2022 | 1 |
| 3/1/2023 | 1 |
| 3/1/2024 | 1 |

There are 2 time periods with multiple data

---

A = 0
B = 36
C = 0
D = 0
E = 0
F = 4
a = 51156
b = 197316
c = 1624
Group Variance = 2840
Z-Score = -0.84441
Comparison Level at 95% confidence level = 1.65463 (upward trend)
-0.84441 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RW19-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 4.65e+006 | 5.9e+006 | -1.25e+006 | 0 | 1 |
| 7.01e+006 MH | 5.9e+006 | 1.11e+006 | 1 | 1 |
| 5.37e+006 ML | 5.9e+006 | -530000 | 1 | 2 |
| 6.72e+006 | 5.9e+006 | 820000 | 2 | 2 |
| 5.33e+006 | 5.9e+006 | -570000 | 2 | 3 |
| 3.36e+006 | 5.9e+006 | -2.54e+006 | 2 | 4 |
| 2.5e+006 | 5.9e+006 | -3.4e+006 | 2 | 5 |
| 3.67e+006 | 5.9e+006 | -2.23e+006 | 2 | 6 |
| 3.4e+006 | 5.9e+006 | -2.5e+006 | 2 | 7 |
| 3.97e+006 | 5.9e+006 | -1.93e+006 | 2 | 8 |
| 3.84e+006 ML | 5.9e+006 | -2.06e+006 | 2 | 9 |
| 4.19e+006 | 5.9e+006 | -1.71e+006 | 2 | 10 |
| 4.88e+006 | 5.9e+006 | -1.02e+006 | 2 | 11 |
| 5.88e+006 | 5.9e+006 | -20000 | 2 | 12 |
| 3.77e+006 | 5.9e+006 | -2.13e+006 | 2 | 13 |
| 3.66e+006 | 5.9e+006 | -2.24e+006 | 2 | 14 |
| 7.27e+006 | 5.9e+006 | 1.37e+006 | 3 | 14 |
| 7.28e+006 | 5.9e+006 | 1.38e+006 | 4 | 14 |
| 3.46e+006 | 5.9e+006 | -2.44e+006 | 4 | 15 |
| 5.69e+006 | 5.9e+006 | -210000 | 4 | 16 |
| 6.05e+006 ML | 5.9e+006 | 150000 | 5 | 16 |
| 6.45e+006 | 5.9e+006 | 550000 | 6 | 16 |
| 6.22e+006 | 5.9e+006 | 320000 | 7 | 16 |
| 3.93e+006 | 5.9e+006 | -1.97e+006 | 7 | 17 |
| 212000 MH | 5.9e+006 | -5.688e+006 | 7 | 18 |
| 3.09e+006 | 5.9e+006 | -2.81e+006 | 7 | 19 |
| 9.943 J | 5.9e+006 | -5.89999e+006 | 7 | 20 |
| 4.833e+006 | 5.9e+006 | -1.067e+006 | 7 | 21 |
| | | | | |
| 7.01e+006 MH | 4.65e+006 | 2.36e+006 | 8 | 21 |
| 5.37e+006 ML | 4.65e+006 | 720000 | 9 | 21 |
| 6.72e+006 | 4.65e+006 | 2.07e+006 | 10 | 21 |
| 5.33e+006 | 4.65e+006 | 680000 | 11 | 21 |
| 3.36e+006 | 4.65e+006 | -1.29e+006 | 11 | 22 |
| 2.5e+006 | 4.65e+006 | -2.15e+006 | 11 | 23 |
| 3.67e+006 | 4.65e+006 | -980000 | 11 | 24 |
| 3.4e+006 | 4.65e+006 | -1.25e+006 | 11 | 25 |
| 3.97e+006 | 4.65e+006 | -680000 | 11 | 26 |
| 3.84e+006 ML | 4.65e+006 | -810000 | 11 | 27 |
| 4.19e+006 | 4.65e+006 | -460000 | 11 | 28 |
| 4.88e+006 | 4.65e+006 | 230000 | 12 | 28 |
| 5.88e+006 | 4.65e+006 | 1.23e+006 | 13 | 28 |
| 3.77e+006 | 4.65e+006 | -880000 | 13 | 29 |
| 3.66e+006 | 4.65e+006 | -990000 | 13 | 30 |
| 7.27e+006 | 4.65e+006 | 2.62e+006 | 14 | 30 |
| 7.28e+006 | 4.65e+006 | 2.63e+006 | 15 | 30 |
| 3.46e+006 | 4.65e+006 | -1.19e+006 | 15 | 31 |

| | | | | |
|---|---|---|---|---|
| 5.69e+006 | 4.65e+006 | 1.04e+006 | 16 | 31 |
| 6.05e+006 ML | 4.65e+006 | 1.4e+006 | 17 | 31 |
| 6.45e+006 | 4.65e+006 | 1.8e+006 | 18 | 31 |
| 6.22e+006 | 4.65e+006 | 1.57e+006 | 19 | 31 |
| 3.93e+006 | 4.65e+006 | -720000 | 19 | 32 |
| 212000 MH | 4.65e+006 | -4.438e+006 | 19 | 33 |
| 3.09e+006 | 4.65e+006 | -1.56e+006 | 19 | 34 |
| 9.943 J | 4.65e+006 | -4.64999e+006 | 19 | 35 |
| 4.833e+006 | 4.65e+006 | 183000 | 20 | 35 |
| | | | | |
| 5.37e+006 ML | 7.01e+006 MH | -1.64e+006 | 20 | 36 |
| 6.72e+006 | 7.01e+006 MH | -290000 | 20 | 37 |
| 5.33e+006 | 7.01e+006 MH | -1.68e+006 | 20 | 38 |
| 3.36e+006 | 7.01e+006 MH | -3.65e+006 | 20 | 39 |
| 2.5e+006 | 7.01e+006 MH | -4.51e+006 | 20 | 40 |
| 3.67e+006 | 7.01e+006 MH | -3.34e+006 | 20 | 41 |
| 3.4e+006 | 7.01e+006 MH | -3.61e+006 | 20 | 42 |
| 3.97e+006 | 7.01e+006 MH | -3.04e+006 | 20 | 43 |
| 3.84e+006 ML | 7.01e+006 MH | -3.17e+006 | 20 | 44 |
| 4.19e+006 | 7.01e+006 MH | -2.82e+006 | 20 | 45 |
| 4.88e+006 | 7.01e+006 MH | -2.13e+006 | 20 | 46 |
| 5.88e+006 | 7.01e+006 MH | -1.13e+006 | 20 | 47 |
| 3.77e+006 | 7.01e+006 MH | -3.24e+006 | 20 | 48 |
| 3.66e+006 | 7.01e+006 MH | -3.35e+006 | 20 | 49 |
| 7.27e+006 | 7.01e+006 MH | 260000 | 21 | 49 |
| 7.28e+006 | 7.01e+006 MH | 270000 | 22 | 49 |
| 3.46e+006 | 7.01e+006 MH | -3.55e+006 | 22 | 50 |
| 5.69e+006 | 7.01e+006 MH | -1.32e+006 | 22 | 51 |
| 6.05e+006 ML | 7.01e+006 MH | -960000 | 22 | 52 |
| 6.45e+006 | 7.01e+006 MH | -560000 | 22 | 53 |
| 6.22e+006 | 7.01e+006 MH | -790000 | 22 | 54 |
| 3.93e+006 | 7.01e+006 MH | -3.08e+006 | 22 | 55 |
| 212000 MH | 7.01e+006 MH | -6.798e+006 | 22 | 56 |
| 3.09e+006 | 7.01e+006 MH | -3.92e+006 | 22 | 57 |
| 9.943 J | 7.01e+006 MH | -7.00999e+006 | 22 | 58 |
| 4.833e+006 | 7.01e+006 MH | -2.177e+006 | 22 | 59 |
| | | | | |
| 6.72e+006 | 5.37e+006 ML | 1.35e+006 | 23 | 59 |
| 5.33e+006 | 5.37e+006 ML | -40000 | 23 | 60 |
| 3.36e+006 | 5.37e+006 ML | -2.01e+006 | 23 | 61 |
| 2.5e+006 | 5.37e+006 ML | -2.87e+006 | 23 | 62 |
| 3.67e+006 | 5.37e+006 ML | -1.7e+006 | 23 | 63 |
| 3.4e+006 | 5.37e+006 ML | -1.97e+006 | 23 | 64 |
| 3.97e+006 | 5.37e+006 ML | -1.4e+006 | 23 | 65 |
| 3.84e+006 ML | 5.37e+006 ML | -1.53e+006 | 23 | 66 |
| 4.19e+006 | 5.37e+006 ML | -1.18e+006 | 23 | 67 |
| 4.88e+006 | 5.37e+006 ML | -490000 | 23 | 68 |
| 5.88e+006 | 5.37e+006 ML | 510000 | 24 | 68 |
| 3.77e+006 | 5.37e+006 ML | -1.6e+006 | 24 | 69 |
| 3.66e+006 | 5.37e+006 ML | -1.71e+006 | 24 | 70 |
| 7.27e+006 | 5.37e+006 ML | 1.9e+006 | 25 | 70 |
| 7.28e+006 | 5.37e+006 ML | 1.91e+006 | 26 | 70 |
| 3.46e+006 | 5.37e+006 ML | -1.91e+006 | 26 | 71 |
| 5.69e+006 | 5.37e+006 ML | 320000 | 27 | 71 |
| 6.05e+006 ML | 5.37e+006 ML | 680000 | 28 | 71 |
| 6.45e+006 | 5.37e+006 ML | 1.08e+006 | 29 | 71 |
| 6.22e+006 | 5.37e+006 ML | 850000 | 30 | 71 |

| | | | | |
|---|---|---|---|---|
| 3.93e+006 | 5.37e+006 ML | -1.44e+006 | 30 | 72 |
| 212000 MH | 5.37e+006 ML | -5.158e+006 | 30 | 73 |
| 3.09e+006 | 5.37e+006 ML | -2.28e+006 | 30 | 74 |
| 9.943 J | 5.37e+006 ML | -5.36999e+006 | 30 | 75 |
| 4.833e+006 | 5.37e+006 ML | -537000 | 30 | 76 |
| | | | | |
| 5.33e+006 | 6.72e+006 | -1.39e+006 | 30 | 77 |
| 3.36e+006 | 6.72e+006 | -3.36e+006 | 30 | 78 |
| 2.5e+006 | 6.72e+006 | -4.22e+006 | 30 | 79 |
| 3.67e+006 | 6.72e+006 | -3.05e+006 | 30 | 80 |
| 3.4e+006 | 6.72e+006 | -3.32e+006 | 30 | 81 |
| 3.97e+006 | 6.72e+006 | -2.75e+006 | 30 | 82 |
| 3.84e+006 ML | 6.72e+006 | -2.88e+006 | 30 | 83 |
| 4.19e+006 | 6.72e+006 | -2.53e+006 | 30 | 84 |
| 4.88e+006 | 6.72e+006 | -1.84e+006 | 30 | 85 |
| 5.88e+006 | 6.72e+006 | -840000 | 30 | 86 |
| 3.77e+006 | 6.72e+006 | -2.95e+006 | 30 | 87 |
| 3.66e+006 | 6.72e+006 | -3.06e+006 | 30 | 88 |
| 7.27e+006 | 6.72e+006 | 550000 | 31 | 88 |
| 7.28e+006 | 6.72e+006 | 560000 | 32 | 88 |
| 3.46e+006 | 6.72e+006 | -3.26e+006 | 32 | 89 |
| 5.69e+006 | 6.72e+006 | -1.03e+006 | 32 | 90 |
| 6.05e+006 ML | 6.72e+006 | -670000 | 32 | 91 |
| 6.45e+006 | 6.72e+006 | -270000 | 32 | 92 |
| 6.22e+006 | 6.72e+006 | -500000 | 32 | 93 |
| 3.93e+006 | 6.72e+006 | -2.79e+006 | 32 | 94 |
| 212000 MH | 6.72e+006 | -6.508e+006 | 32 | 95 |
| 3.09e+006 | 6.72e+006 | -3.63e+006 | 32 | 96 |
| 9.943 J | 6.72e+006 | -6.71999e+006 | 32 | 97 |
| 4.833e+006 | 6.72e+006 | -1.887e+006 | 32 | 98 |
| | | | | |
| 3.36e+006 | 5.33e+006 | -1.97e+006 | 32 | 99 |
| 2.5e+006 | 5.33e+006 | -2.83e+006 | 32 | 100 |
| 3.67e+006 | 5.33e+006 | -1.66e+006 | 32 | 101 |
| 3.4e+006 | 5.33e+006 | -1.93e+006 | 32 | 102 |
| 3.97e+006 | 5.33e+006 | -1.36e+006 | 32 | 103 |
| 3.84e+006 ML | 5.33e+006 | -1.49e+006 | 32 | 104 |
| 4.19e+006 | 5.33e+006 | -1.14e+006 | 32 | 105 |
| 4.88e+006 | 5.33e+006 | -450000 | 32 | 106 |
| 5.88e+006 | 5.33e+006 | 550000 | 33 | 106 |
| 3.77e+006 | 5.33e+006 | -1.56e+006 | 33 | 107 |
| 3.66e+006 | 5.33e+006 | -1.67e+006 | 33 | 108 |
| 7.27e+006 | 5.33e+006 | 1.94e+006 | 34 | 108 |
| 7.28e+006 | 5.33e+006 | 1.95e+006 | 35 | 108 |
| 3.46e+006 | 5.33e+006 | -1.87e+006 | 35 | 109 |
| 5.69e+006 | 5.33e+006 | 360000 | 36 | 109 |
| 6.05e+006 ML | 5.33e+006 | 720000 | 37 | 109 |
| 6.45e+006 | 5.33e+006 | 1.12e+006 | 38 | 109 |
| 6.22e+006 | 5.33e+006 | 890000 | 39 | 109 |
| 3.93e+006 | 5.33e+006 | -1.4e+006 | 39 | 110 |
| 212000 MH | 5.33e+006 | -5.118e+006 | 39 | 111 |
| 3.09e+006 | 5.33e+006 | -2.24e+006 | 39 | 112 |
| 9.943 J | 5.33e+006 | -5.32999e+006 | 39 | 113 |
| 4.833e+006 | 5.33e+006 | -497000 | 39 | 114 |
| | | | | |
| 2.5e+006 | 3.36e+006 | -860000 | 39 | 115 |
| 3.67e+006 | 3.36e+006 | 310000 | 40 | 115 |

| | | | | |
|---|---|---|---|---|
| 3.4e+006 | 3.36e+006 | 40000 | 41 | 115 |
| 3.97e+006 | 3.36e+006 | 610000 | 42 | 115 |
| 3.84e+006 ML | 3.36e+006 | 480000 | 43 | 115 |
| 4.19e+006 | 3.36e+006 | 830000 | 44 | 115 |
| 4.88e+006 | 3.36e+006 | 1.52e+006 | 45 | 115 |
| 5.88e+006 | 3.36e+006 | 2.52e+006 | 46 | 115 |
| 3.77e+006 | 3.36e+006 | 410000 | 47 | 115 |
| 3.66e+006 | 3.36e+006 | 300000 | 48 | 115 |
| 7.27e+006 | 3.36e+006 | 3.91e+006 | 49 | 115 |
| 7.28e+006 | 3.36e+006 | 3.92e+006 | 50 | 115 |
| 3.46e+006 | 3.36e+006 | 100000 | 51 | 115 |
| 5.69e+006 | 3.36e+006 | 2.33e+006 | 52 | 115 |
| 6.05e+006 ML | 3.36e+006 | 2.69e+006 | 53 | 115 |
| 6.45e+006 | 3.36e+006 | 3.09e+006 | 54 | 115 |
| 6.22e+006 | 3.36e+006 | 2.86e+006 | 55 | 115 |
| 3.93e+006 | 3.36e+006 | 570000 | 56 | 115 |
| 212000 MH | 3.36e+006 | -3.148e+006 | 56 | 116 |
| 3.09e+006 | 3.36e+006 | -270000 | 56 | 117 |
| 9.943 J | 3.36e+006 | -3.35999e+006 | 56 | 118 |
| 4.833e+006 | 3.36e+006 | 1.473e+006 | 57 | 118 |
| | | | | |
| 3.67e+006 | 2.5e+006 | 1.17e+006 | 58 | 118 |
| 3.4e+006 | 2.5e+006 | 900000 | 59 | 118 |
| 3.97e+006 | 2.5e+006 | 1.47e+006 | 60 | 118 |
| 3.84e+006 ML | 2.5e+006 | 1.34e+006 | 61 | 118 |
| 4.19e+006 | 2.5e+006 | 1.69e+006 | 62 | 118 |
| 4.88e+006 | 2.5e+006 | 2.38e+006 | 63 | 118 |
| 5.88e+006 | 2.5e+006 | 3.38e+006 | 64 | 118 |
| 3.77e+006 | 2.5e+006 | 1.27e+006 | 65 | 118 |
| 3.66e+006 | 2.5e+006 | 1.16e+006 | 66 | 118 |
| 7.27e+006 | 2.5e+006 | 4.77e+006 | 67 | 118 |
| 7.28e+006 | 2.5e+006 | 4.78e+006 | 68 | 118 |
| 3.46e+006 | 2.5e+006 | 960000 | 69 | 118 |
| 5.69e+006 | 2.5e+006 | 3.19e+006 | 70 | 118 |
| 6.05e+006 ML | 2.5e+006 | 3.55e+006 | 71 | 118 |
| 6.45e+006 | 2.5e+006 | 3.95e+006 | 72 | 118 |
| 6.22e+006 | 2.5e+006 | 3.72e+006 | 73 | 118 |
| 3.93e+006 | 2.5e+006 | 1.43e+006 | 74 | 118 |
| 212000 MH | 2.5e+006 | -2.288e+006 | 74 | 119 |
| 3.09e+006 | 2.5e+006 | 590000 | 75 | 119 |
| 9.943 J | 2.5e+006 | -2.49999e+006 | 75 | 120 |
| 4.833e+006 | 2.5e+006 | 2.333e+006 | 76 | 120 |
| | | | | |
| 3.4e+006 | 3.67e+006 | -270000 | 76 | 121 |
| 3.97e+006 | 3.67e+006 | 300000 | 77 | 121 |
| 3.84e+006 ML | 3.67e+006 | 170000 | 78 | 121 |
| 4.19e+006 | 3.67e+006 | 520000 | 79 | 121 |
| 4.88e+006 | 3.67e+006 | 1.21e+006 | 80 | 121 |
| 5.88e+006 | 3.67e+006 | 2.21e+006 | 81 | 121 |
| 3.77e+006 | 3.67e+006 | 100000 | 82 | 121 |
| 3.66e+006 | 3.67e+006 | -10000 | 82 | 122 |
| 7.27e+006 | 3.67e+006 | 3.6e+006 | 83 | 122 |
| 7.28e+006 | 3.67e+006 | 3.61e+006 | 84 | 122 |
| 3.46e+006 | 3.67e+006 | -210000 | 84 | 123 |
| 5.69e+006 | 3.67e+006 | 2.02e+006 | 85 | 123 |
| 6.05e+006 ML | 3.67e+006 | 2.38e+006 | 86 | 123 |
| 6.45e+006 | 3.67e+006 | 2.78e+006 | 87 | 123 |

| | | | | |
|---|---|---|---|---|
| 6.22e+006 | 3.67e+006 | 2.55e+006 | 88 | 123 |
| 3.93e+006 | 3.67e+006 | 260000 | 89 | 123 |
| 212000 MH | 3.67e+006 | -3.458e+006 | 89 | 124 |
| 3.09e+006 | 3.67e+006 | -580000 | 89 | 125 |
| 9.943 J | 3.67e+006 | -3.66999e+006 | 89 | 126 |
| 4.833e+006 | 3.67e+006 | 1.163e+006 | 90 | 126 |
| | | | | |
| 3.97e+006 | 3.4e+006 | 570000 | 91 | 126 |
| 3.84e+006 ML | 3.4e+006 | 440000 | 92 | 126 |
| 4.19e+006 | 3.4e+006 | 790000 | 93 | 126 |
| 4.88e+006 | 3.4e+006 | 1.48e+006 | 94 | 126 |
| 5.88e+006 | 3.4e+006 | 2.48e+006 | 95 | 126 |
| 3.77e+006 | 3.4e+006 | 370000 | 96 | 126 |
| 3.66e+006 | 3.4e+006 | 260000 | 97 | 126 |
| 7.27e+006 | 3.4e+006 | 3.87e+006 | 98 | 126 |
| 7.28e+006 | 3.4e+006 | 3.88e+006 | 99 | 126 |
| 3.46e+006 | 3.4e+006 | 60000 | 100 | 126 |
| 5.69e+006 | 3.4e+006 | 2.29e+006 | 101 | 126 |
| 6.05e+006 ML | 3.4e+006 | 2.65e+006 | 102 | 126 |
| 6.45e+006 | 3.4e+006 | 3.05e+006 | 103 | 126 |
| 6.22e+006 | 3.4e+006 | 2.82e+006 | 104 | 126 |
| 3.93e+006 | 3.4e+006 | 530000 | 105 | 126 |
| 212000 MH | 3.4e+006 | -3.188e+006 | 105 | 127 |
| 3.09e+006 | 3.4e+006 | -310000 | 105 | 128 |
| 9.943 J | 3.4e+006 | -3.39999e+006 | 105 | 129 |
| 4.833e+006 | 3.4e+006 | 1.433e+006 | 106 | 129 |
| | | | | |
| 3.84e+006 ML | 3.97e+006 | -130000 | 106 | 130 |
| 4.19e+006 | 3.97e+006 | 220000 | 107 | 130 |
| 4.88e+006 | 3.97e+006 | 910000 | 108 | 130 |
| 5.88e+006 | 3.97e+006 | 1.91e+006 | 109 | 130 |
| 3.77e+006 | 3.97e+006 | -200000 | 109 | 131 |
| 3.66e+006 | 3.97e+006 | -310000 | 109 | 132 |
| 7.27e+006 | 3.97e+006 | 3.3e+006 | 110 | 132 |
| 7.28e+006 | 3.97e+006 | 3.31e+006 | 111 | 132 |
| 3.46e+006 | 3.97e+006 | -510000 | 111 | 133 |
| 5.69e+006 | 3.97e+006 | 1.72e+006 | 112 | 133 |
| 6.05e+006 ML | 3.97e+006 | 2.08e+006 | 113 | 133 |
| 6.45e+006 | 3.97e+006 | 2.48e+006 | 114 | 133 |
| 6.22e+006 | 3.97e+006 | 2.25e+006 | 115 | 133 |
| 3.93e+006 | 3.97e+006 | -40000 | 115 | 134 |
| 212000 MH | 3.97e+006 | -3.758e+006 | 115 | 135 |
| 3.09e+006 | 3.97e+006 | -880000 | 115 | 136 |
| 9.943 J | 3.97e+006 | -3.96999e+006 | 115 | 137 |
| 4.833e+006 | 3.97e+006 | 863000 | 116 | 137 |
| | | | | |
| 4.19e+006 | 3.84e+006 ML | 350000 | 117 | 137 |
| 4.88e+006 | 3.84e+006 ML | 1.04e+006 | 118 | 137 |
| 5.88e+006 | 3.84e+006 ML | 2.04e+006 | 119 | 137 |
| 3.77e+006 | 3.84e+006 ML | -70000 | 119 | 138 |
| 3.66e+006 | 3.84e+006 ML | -180000 | 119 | 139 |
| 7.27e+006 | 3.84e+006 ML | 3.43e+006 | 120 | 139 |
| 7.28e+006 | 3.84e+006 ML | 3.44e+006 | 121 | 139 |
| 3.46e+006 | 3.84e+006 ML | -380000 | 121 | 140 |
| 5.69e+006 | 3.84e+006 ML | 1.85e+006 | 122 | 140 |
| 6.05e+006 ML | 3.84e+006 ML | 2.21e+006 | 123 | 140 |
| 6.45e+006 | 3.84e+006 ML | 2.61e+006 | 124 | 140 |

| | | | | |
|---|---|---|---|---|
| 6.22e+006 | 3.84e+006 ML | 2.38e+006 | 125 | 140 |
| 3.93e+006 | 3.84e+006 ML | 90000 | 126 | 140 |
| 212000 MH | 3.84e+006 ML | -3.628e+006 | 126 | 141 |
| 3.09e+006 | 3.84e+006 ML | -750000 | 126 | 142 |
| 9.943 J | 3.84e+006 ML | -3.83999e+006 | 126 | 143 |
| 4.833e+006 | 3.84e+006 ML | 993000 | 127 | 143 |
| | | | | |
| 4.88e+006 | 4.19e+006 | 690000 | 128 | 143 |
| 5.88e+006 | 4.19e+006 | 1.69e+006 | 129 | 143 |
| 3.77e+006 | 4.19e+006 | -420000 | 129 | 144 |
| 3.66e+006 | 4.19e+006 | -530000 | 129 | 145 |
| 7.27e+006 | 4.19e+006 | 3.08e+006 | 130 | 145 |
| 7.28e+006 | 4.19e+006 | 3.09e+006 | 131 | 145 |
| 3.46e+006 | 4.19e+006 | -730000 | 131 | 146 |
| 5.69e+006 | 4.19e+006 | 1.5e+006 | 132 | 146 |
| 6.05e+006 ML | 4.19e+006 | 1.86e+006 | 133 | 146 |
| 6.45e+006 | 4.19e+006 | 2.26e+006 | 134 | 146 |
| 6.22e+006 | 4.19e+006 | 2.03e+006 | 135 | 146 |
| 3.93e+006 | 4.19e+006 | -260000 | 135 | 147 |
| 212000 MH | 4.19e+006 | -3.978e+006 | 135 | 148 |
| 3.09e+006 | 4.19e+006 | -1.1e+006 | 135 | 149 |
| 9.943 J | 4.19e+006 | -4.18999e+006 | 135 | 150 |
| 4.833e+006 | 4.19e+006 | 643000 | 136 | 150 |
| | | | | |
| 5.88e+006 | 4.88e+006 | 1e+006 | 137 | 150 |
| 3.77e+006 | 4.88e+006 | -1.11e+006 | 137 | 151 |
| 3.66e+006 | 4.88e+006 | -1.22e+006 | 137 | 152 |
| 7.27e+006 | 4.88e+006 | 2.39e+006 | 138 | 152 |
| 7.28e+006 | 4.88e+006 | 2.4e+006 | 139 | 152 |
| 3.46e+006 | 4.88e+006 | -1.42e+006 | 139 | 153 |
| 5.69e+006 | 4.88e+006 | 810000 | 140 | 153 |
| 6.05e+006 ML | 4.88e+006 | 1.17e+006 | 141 | 153 |
| 6.45e+006 | 4.88e+006 | 1.57e+006 | 142 | 153 |
| 6.22e+006 | 4.88e+006 | 1.34e+006 | 143 | 153 |
| 3.93e+006 | 4.88e+006 | -950000 | 143 | 154 |
| 212000 MH | 4.88e+006 | -4.668e+006 | 143 | 155 |
| 3.09e+006 | 4.88e+006 | -1.79e+006 | 143 | 156 |
| 9.943 J | 4.88e+006 | -4.87999e+006 | 143 | 157 |
| 4.833e+006 | 4.88e+006 | -47000 | 143 | 158 |
| | | | | |
| 3.77e+006 | 5.88e+006 | -2.11e+006 | 143 | 159 |
| 3.66e+006 | 5.88e+006 | -2.22e+006 | 143 | 160 |
| 7.27e+006 | 5.88e+006 | 1.39e+006 | 144 | 160 |
| 7.28e+006 | 5.88e+006 | 1.4e+006 | 145 | 160 |
| 3.46e+006 | 5.88e+006 | -2.42e+006 | 145 | 161 |
| 5.69e+006 | 5.88e+006 | -190000 | 145 | 162 |
| 6.05e+006 ML | 5.88e+006 | 170000 | 146 | 162 |
| 6.45e+006 | 5.88e+006 | 570000 | 147 | 162 |
| 6.22e+006 | 5.88e+006 | 340000 | 148 | 162 |
| 3.93e+006 | 5.88e+006 | -1.95e+006 | 148 | 163 |
| 212000 MH | 5.88e+006 | -5.668e+006 | 148 | 164 |
| 3.09e+006 | 5.88e+006 | -2.79e+006 | 148 | 165 |
| 9.943 J | 5.88e+006 | -5.87999e+006 | 148 | 166 |
| 4.833e+006 | 5.88e+006 | -1.047e+006 | 148 | 167 |
| | | | | |
| 3.66e+006 | 3.77e+006 | Same Date | 148 | 167 |
| 7.27e+006 | 3.77e+006 | 3.5e+006 | 149 | 167 |

| | | | | |
|---|---|---|---|---|
| 7.28e+006 | 3.77e+006 | 3.51e+006 | 150 | 167 |
| 3.46e+006 | 3.77e+006 | -310000 | 150 | 168 |
| 5.69e+006 | 3.77e+006 | 1.92e+006 | 151 | 168 |
| 6.05e+006 ML | 3.77e+006 | 2.28e+006 | 152 | 168 |
| 6.45e+006 | 3.77e+006 | 2.68e+006 | 153 | 168 |
| 6.22e+006 | 3.77e+006 | 2.45e+006 | 154 | 168 |
| 3.93e+006 | 3.77e+006 | 160000 | 155 | 168 |
| 212000 MH | 3.77e+006 | -3.558e+006 | 155 | 169 |
| 3.09e+006 | 3.77e+006 | -680000 | 155 | 170 |
| 9.943 J | 3.77e+006 | -3.76999e+006 | 155 | 171 |
| 4.833e+006 | 3.77e+006 | 1.063e+006 | 156 | 171 |
| | | | | |
| 7.27e+006 | 3.66e+006 | 3.61e+006 | 157 | 171 |
| 7.28e+006 | 3.66e+006 | 3.62e+006 | 158 | 171 |
| 3.46e+006 | 3.66e+006 | -200000 | 158 | 172 |
| 5.69e+006 | 3.66e+006 | 2.03e+006 | 159 | 172 |
| 6.05e+006 ML | 3.66e+006 | 2.39e+006 | 160 | 172 |
| 6.45e+006 | 3.66e+006 | 2.79e+006 | 161 | 172 |
| 6.22e+006 | 3.66e+006 | 2.56e+006 | 162 | 172 |
| 3.93e+006 | 3.66e+006 | 270000 | 163 | 172 |
| 212000 MH | 3.66e+006 | -3.448e+006 | 163 | 173 |
| 3.09e+006 | 3.66e+006 | -570000 | 163 | 174 |
| 9.943 J | 3.66e+006 | -3.65999e+006 | 163 | 175 |
| 4.833e+006 | 3.66e+006 | 1.173e+006 | 164 | 175 |
| | | | | |
| 7.28e+006 | 7.27e+006 | Same Date | 164 | 175 |
| 3.46e+006 | 7.27e+006 | -3.81e+006 | 164 | 176 |
| 5.69e+006 | 7.27e+006 | -1.58e+006 | 164 | 177 |
| 6.05e+006 ML | 7.27e+006 | -1.22e+006 | 164 | 178 |
| 6.45e+006 | 7.27e+006 | -820000 | 164 | 179 |
| 6.22e+006 | 7.27e+006 | -1.05e+006 | 164 | 180 |
| 3.93e+006 | 7.27e+006 | -3.34e+006 | 164 | 181 |
| 212000 MH | 7.27e+006 | -7.058e+006 | 164 | 182 |
| 3.09e+006 | 7.27e+006 | -4.18e+006 | 164 | 183 |
| 9.943 J | 7.27e+006 | -7.26999e+006 | 164 | 184 |
| 4.833e+006 | 7.27e+006 | -2.437e+006 | 164 | 185 |
| | | | | |
| 3.46e+006 | 7.28e+006 | -3.82e+006 | 164 | 186 |
| 5.69e+006 | 7.28e+006 | -1.59e+006 | 164 | 187 |
| 6.05e+006 ML | 7.28e+006 | -1.23e+006 | 164 | 188 |
| 6.45e+006 | 7.28e+006 | -830000 | 164 | 189 |
| 6.22e+006 | 7.28e+006 | -1.06e+006 | 164 | 190 |
| 3.93e+006 | 7.28e+006 | -3.35e+006 | 164 | 191 |
| 212000 MH | 7.28e+006 | -7.068e+006 | 164 | 192 |
| 3.09e+006 | 7.28e+006 | -4.19e+006 | 164 | 193 |
| 9.943 J | 7.28e+006 | -7.27999e+006 | 164 | 194 |
| 4.833e+006 | 7.28e+006 | -2.447e+006 | 164 | 195 |
| | | | | |
| 5.69e+006 | 3.46e+006 | 2.23e+006 | 165 | 195 |
| 6.05e+006 ML | 3.46e+006 | 2.59e+006 | 166 | 195 |
| 6.45e+006 | 3.46e+006 | 2.99e+006 | 167 | 195 |
| 6.22e+006 | 3.46e+006 | 2.76e+006 | 168 | 195 |
| 3.93e+006 | 3.46e+006 | 470000 | 169 | 195 |
| 212000 MH | 3.46e+006 | -3.248e+006 | 169 | 196 |
| 3.09e+006 | 3.46e+006 | -370000 | 169 | 197 |
| 9.943 J | 3.46e+006 | -3.45999e+006 | 169 | 198 |
| 4.833e+006 | 3.46e+006 | 1.373e+006 | 170 | 198 |

| | | | | |
|---|---|---|---|---|
| 6.05e+006 ML | 5.69e+006 | 360000 | 171 | 198 |
| 6.45e+006 | 5.69e+006 | 760000 | 172 | 198 |
| 6.22e+006 | 5.69e+006 | 530000 | 173 | 198 |
| 3.93e+006 | 5.69e+006 | -1.76e+006 | 173 | 199 |
| 212000 MH | 5.69e+006 | -5.478e+006 | 173 | 200 |
| 3.09e+006 | 5.69e+006 | -2.6e+006 | 173 | 201 |
| 9.943 J | 5.69e+006 | -5.68999e+006 | 173 | 202 |
| 4.833e+006 | 5.69e+006 | -857000 | 173 | 203 |
| | | | | |
| 6.45e+006 | 6.05e+006 ML | 400000 | 174 | 203 |
| 6.22e+006 | 6.05e+006 ML | 170000 | 175 | 203 |
| 3.93e+006 | 6.05e+006 ML | -2.12e+006 | 175 | 204 |
| 212000 MH | 6.05e+006 ML | -5.838e+006 | 175 | 205 |
| 3.09e+006 | 6.05e+006 ML | -2.96e+006 | 175 | 206 |
| 9.943 J | 6.05e+006 ML | -6.04999e+006 | 175 | 207 |
| 4.833e+006 | 6.05e+006 ML | -1.217e+006 | 175 | 208 |
| | | | | |
| 6.22e+006 | 6.45e+006 | -230000 | 175 | 209 |
| 3.93e+006 | 6.45e+006 | -2.52e+006 | 175 | 210 |
| 212000 MH | 6.45e+006 | -6.238e+006 | 175 | 211 |
| 3.09e+006 | 6.45e+006 | -3.36e+006 | 175 | 212 |
| 9.943 J | 6.45e+006 | -6.44999e+006 | 175 | 213 |
| 4.833e+006 | 6.45e+006 | -1.617e+006 | 175 | 214 |
| | | | | |
| 3.93e+006 | 6.22e+006 | -2.29e+006 | 175 | 215 |
| 212000 MH | 6.22e+006 | -6.008e+006 | 175 | 216 |
| 3.09e+006 | 6.22e+006 | -3.13e+006 | 175 | 217 |
| 9.943 J | 6.22e+006 | -6.21999e+006 | 175 | 218 |
| 4.833e+006 | 6.22e+006 | -1.387e+006 | 175 | 219 |
| | | | | |
| 212000 MH | 3.93e+006 | -3.718e+006 | 175 | 220 |
| 3.09e+006 | 3.93e+006 | -840000 | 175 | 221 |
| 9.943 J | 3.93e+006 | -3.92999e+006 | 175 | 222 |
| 4.833e+006 | 3.93e+006 | 903000 | 176 | 222 |
| | | | | |
| 3.09e+006 | 212000 MH | 2.878e+006 | 177 | 222 |
| 9.943 J | 212000 MH | -211990 | 177 | 223 |
| 4.833e+006 | 212000 MH | 4.621e+006 | 178 | 223 |
| | | | | |
| 9.943 J | 3.09e+006 | -3.08999e+006 | 178 | 224 |
| 4.833e+006 | 3.09e+006 | 1.743e+006 | 179 | 224 |
| | | | | |
| 4.833e+006 | 9.943 J | 4.83299e+006 | 180 | 224 |

S Statistic = 180 - 224 = -44

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 2/1/2017 | 1 |
| 3/1/2017 | 1 |
| 4/1/2017 | 1 |
| 5/1/2017 | 1 |
| 6/1/2017 | 1 |
| 7/1/2017 | 1 |

| | |
|---|---|
| 8/1/2017 | 1 |
| 9/1/2017 | 1 |
| 10/1/2017 | 1 |
| 11/1/2017 | 1 |
| 12/1/2017 | 1 |
| 1/1/2018 | 1 |
| 4/1/2018 | 1 |
| 8/1/2018 | 1 |
| 10/1/2018 | 1 |
| 3/1/2019 | 2 |
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 3/1/2022 | 1 |
| 3/1/2023 | 1 |
| 3/1/2024 | 1 |

There are 2 time periods with multiple data

---

A = 0
B = 36
C = 0
D = 0
E = 0
F = 4
a = 51156
b = 197316
c = 1624
Group Variance = 2840
Z-Score = -0.806881
Comparison Level at 95% confidence level = 1.65463 (upward trend)
-0.806881 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RW21-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 630000 | 624000 | Same Date | 0 | 0 |
| 570000 1c | 624000 | -54000 | 0 | 1 |
| 539000 | 624000 | -85000 | 0 | 2 |
| 648000 | 624000 | 24000 | 1 | 2 |
| 470000 | 624000 | -154000 | 1 | 3 |
| 536000 ML3c | 624000 | -88000 | 1 | 4 |
| 4520 | 624000 | -619480 | 1 | 5 |
| 562000 | 624000 | -62000 | 1 | 6 |
| 527000 B | 624000 | -97000 | 1 | 7 |
| 5.07e+006 | 624000 | 4.446e+006 | 2 | 7 |
| 445600 | 624000 | -178400 | 2 | 8 |
| 348100 | 624000 | -275900 | 2 | 9 |
| | | | | |
| 570000 1c | 630000 | -60000 | 2 | 10 |
| 539000 | 630000 | -91000 | 2 | 11 |
| 648000 | 630000 | 18000 | 3 | 11 |
| 470000 | 630000 | -160000 | 3 | 12 |
| 536000 ML3c | 630000 | -94000 | 3 | 13 |
| 4520 | 630000 | -625480 | 3 | 14 |
| 562000 | 630000 | -68000 | 3 | 15 |
| 527000 B | 630000 | -103000 | 3 | 16 |
| 5.07e+006 | 630000 | 4.44e+006 | 4 | 16 |
| 445600 | 630000 | -184400 | 4 | 17 |
| 348100 | 630000 | -281900 | 4 | 18 |
| | | | | |
| 539000 | 570000 1c | -31000 | 4 | 19 |
| 648000 | 570000 1c | 78000 | 5 | 19 |
| 470000 | 570000 1c | -100000 | 5 | 20 |
| 536000 ML3c | 570000 1c | -34000 | 5 | 21 |
| 4520 | 570000 1c | -565480 | 5 | 22 |
| 562000 | 570000 1c | -8000 | 5 | 23 |
| 527000 B | 570000 1c | -43000 | 5 | 24 |
| 5.07e+006 | 570000 1c | 4.5e+006 | 6 | 24 |
| 445600 | 570000 1c | -124400 | 6 | 25 |
| 348100 | 570000 1c | -221900 | 6 | 26 |
| | | | | |
| 648000 | 539000 | 109000 | 7 | 26 |
| 470000 | 539000 | -69000 | 7 | 27 |
| 536000 ML3c | 539000 | -3000 | 7 | 28 |
| 4520 | 539000 | -534480 | 7 | 29 |
| 562000 | 539000 | 23000 | 8 | 29 |
| 527000 B | 539000 | -12000 | 8 | 30 |
| 5.07e+006 | 539000 | 4.531e+006 | 9 | 30 |
| 445600 | 539000 | -93400 | 9 | 31 |
| 348100 | 539000 | -190900 | 9 | 32 |
| | | | | |
| 470000 | 648000 | -178000 | 9 | 33 |

| | | | | |
|---|---|---|---|---|
| 536000 ML3c | 648000 | -112000 | 9 | 34 |
| 4520 | 648000 | -643480 | 9 | 35 |
| 562000 | 648000 | -86000 | 9 | 36 |
| 527000 B | 648000 | -121000 | 9 | 37 |
| 5.07e+006 | 648000 | 4.422e+006 | 10 | 37 |
| 445600 | 648000 | -202400 | 10 | 38 |
| 348100 | 648000 | -299900 | 10 | 39 |
| | | | | |
| 536000 ML3c | 470000 | 66000 | 11 | 39 |
| 4520 | 470000 | -465480 | 11 | 40 |
| 562000 | 470000 | 92000 | 12 | 40 |
| 527000 B | 470000 | 57000 | 13 | 40 |
| 5.07e+006 | 470000 | 4.6e+006 | 14 | 40 |
| 445600 | 470000 | -24400 | 14 | 41 |
| 348100 | 470000 | -121900 | 14 | 42 |
| | | | | |
| 4520 | 536000 ML3c | -531480 | 14 | 43 |
| 562000 | 536000 ML3c | 26000 | 15 | 43 |
| 527000 B | 536000 ML3c | -9000 | 15 | 44 |
| 5.07e+006 | 536000 ML3c | 4.534e+006 | 16 | 44 |
| 445600 | 536000 ML3c | -90400 | 16 | 45 |
| 348100 | 536000 ML3c | -187900 | 16 | 46 |
| | | | | |
| 562000 | 4520 | Same Date | 16 | 46 |
| 527000 B | 4520 | 522480 | 17 | 46 |
| 5.07e+006 | 4520 | 5.06548e+006 | 18 | 46 |
| 445600 | 4520 | 441080 | 19 | 46 |
| 348100 | 4520 | 343580 | 20 | 46 |
| | | | | |
| 527000 B | 562000 | -35000 | 20 | 47 |
| 5.07e+006 | 562000 | 4.508e+006 | 21 | 47 |
| 445600 | 562000 | -116400 | 21 | 48 |
| 348100 | 562000 | -213900 | 21 | 49 |
| | | | | |
| 5.07e+006 | 527000 B | 4.543e+006 | 22 | 49 |
| 445600 | 527000 B | -81400 | 22 | 50 |
| 348100 | 527000 B | -178900 | 22 | 51 |
| | | | | |
| 445600 | 5.07e+006 | -4.6244e+006 | 22 | 52 |
| 348100 | 5.07e+006 | -4.7219e+006 | 22 | 53 |
| | | | | |
| 348100 | 445600 | -97500 | 22 | 54 |

S Statistic = 22 - 54 = -32

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 2 |
| 6/1/2021 | 1 |

3/1/2022 1
3/1/2023 1
3/1/2024 1
There are 2 time periods with multiple data

---

A = 0
B = 36
C = 0
D = 0
E = 0
F = 4
a = 4836
b = 15444
c = 312
Group Variance = 266.667
Z-Score = -1.89835
Comparison Level at 95% confidence level = 1.65463 (upward trend)
-1.89835 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RW22R-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 3900 | 3900 | Same Date | 0 | 0 |
| 3940 | 3900 | Same Date | 0 | 0 |
| 3940 | 3900 | Same Date | 0 | 0 |
| 3900 | 3900 | Same Date | 0 | 0 |
| 3900 | 3900 | Same Date | 0 | 0 |
| 3940 | 3900 | Same Date | 0 | 0 |
| 3940 | 3900 | Same Date | 0 | 0 |
| 1030 2c | 3900 | Same Date | 0 | 0 |
| 1750 1c3c | 3900 | Same Date | 0 | 0 |
| 983 | 3900 | -2917 | 0 | 1 |
| 3000 | 3900 | -900 | 0 | 2 |
| 1810 | 3900 | -2090 | 0 | 3 |
| 4350 | 3900 | 450 | 1 | 3 |
| 5340 | 3900 | 1440 | 2 | 3 |
| 7730 | 3900 | 3830 | 3 | 3 |
| 9800 | 3900 | 5900 | 4 | 3 |
| 21700 | 3900 | 17800 | 5 | 3 |
| 38920 | 3900 | 35020 | 6 | 3 |
| 38920 | 3900 | 35020 | 7 | 3 |
| 68800 | 3900 | 64900 | 8 | 3 |
| 87290 | 3900 | 83390 | 9 | 3 |
| 82310 | 3900 | 78410 | 10 | 3 |
| 109100 | 3900 | 105200 | 11 | 3 |
| | | | | |
| 3940 | 3900 | Same Date | 11 | 3 |
| 3940 | 3900 | Same Date | 11 | 3 |
| 3900 | 3900 | Same Date | 11 | 3 |
| 3900 | 3900 | Same Date | 11 | 3 |
| 3940 | 3900 | Same Date | 11 | 3 |
| 3940 | 3900 | Same Date | 11 | 3 |
| 1030 2c | 3900 | Same Date | 11 | 3 |
| 1750 1c3c | 3900 | Same Date | 11 | 3 |
| 983 | 3900 | -2917 | 11 | 4 |
| 3000 | 3900 | -900 | 11 | 5 |
| 1810 | 3900 | -2090 | 11 | 6 |
| 4350 | 3900 | 450 | 12 | 6 |
| 5340 | 3900 | 1440 | 13 | 6 |
| 7730 | 3900 | 3830 | 14 | 6 |
| 9800 | 3900 | 5900 | 15 | 6 |
| 21700 | 3900 | 17800 | 16 | 6 |
| 38920 | 3900 | 35020 | 17 | 6 |
| 38920 | 3900 | 35020 | 18 | 6 |
| 68800 | 3900 | 64900 | 19 | 6 |
| 87290 | 3900 | 83390 | 20 | 6 |
| 82310 | 3900 | 78410 | 21 | 6 |
| 109100 | 3900 | 105200 | 22 | 6 |

| | | | | |
|---|---|---|---|---|
| 3940 | 3940 | Same Date | 22 | 6 |
| 3900 | 3940 | Same Date | 22 | 6 |
| 3900 | 3940 | Same Date | 22 | 6 |
| 3940 | 3940 | Same Date | 22 | 6 |
| 3940 | 3940 | Same Date | 22 | 6 |
| 1030 2c | 3940 | Same Date | 22 | 6 |
| 1750 1c3c | 3940 | Same Date | 22 | 6 |
| 983 | 3940 | -2957 | 22 | 7 |
| 3000 | 3940 | -940 | 22 | 8 |
| 1810 | 3940 | -2130 | 22 | 9 |
| 4350 | 3940 | 410 | 23 | 9 |
| 5340 | 3940 | 1400 | 24 | 9 |
| 7730 | 3940 | 3790 | 25 | 9 |
| 9800 | 3940 | 5860 | 26 | 9 |
| 21700 | 3940 | 17760 | 27 | 9 |
| 38920 | 3940 | 34980 | 28 | 9 |
| 38920 | 3940 | 34980 | 29 | 9 |
| 68800 | 3940 | 64860 | 30 | 9 |
| 87290 | 3940 | 83350 | 31 | 9 |
| 82310 | 3940 | 78370 | 32 | 9 |
| 109100 | 3940 | 105160 | 33 | 9 |
| | | | | |
| 3900 | 3940 | Same Date | 33 | 9 |
| 3900 | 3940 | Same Date | 33 | 9 |
| 3940 | 3940 | Same Date | 33 | 9 |
| 3940 | 3940 | Same Date | 33 | 9 |
| 1030 2c | 3940 | Same Date | 33 | 9 |
| 1750 1c3c | 3940 | Same Date | 33 | 9 |
| 983 | 3940 | -2957 | 33 | 10 |
| 3000 | 3940 | -940 | 33 | 11 |
| 1810 | 3940 | -2130 | 33 | 12 |
| 4350 | 3940 | 410 | 34 | 12 |
| 5340 | 3940 | 1400 | 35 | 12 |
| 7730 | 3940 | 3790 | 36 | 12 |
| 9800 | 3940 | 5860 | 37 | 12 |
| 21700 | 3940 | 17760 | 38 | 12 |
| 38920 | 3940 | 34980 | 39 | 12 |
| 38920 | 3940 | 34980 | 40 | 12 |
| 68800 | 3940 | 64860 | 41 | 12 |
| 87290 | 3940 | 83350 | 42 | 12 |
| 82310 | 3940 | 78370 | 43 | 12 |
| 109100 | 3940 | 105160 | 44 | 12 |
| | | | | |
| 3900 | 3900 | Same Date | 44 | 12 |
| 3940 | 3900 | Same Date | 44 | 12 |
| 3940 | 3900 | Same Date | 44 | 12 |
| 1030 2c | 3900 | Same Date | 44 | 12 |
| 1750 1c3c | 3900 | Same Date | 44 | 12 |
| 983 | 3900 | -2917 | 44 | 13 |
| 3000 | 3900 | -900 | 44 | 14 |
| 1810 | 3900 | -2090 | 44 | 15 |
| 4350 | 3900 | 450 | 45 | 15 |
| 5340 | 3900 | 1440 | 46 | 15 |
| 7730 | 3900 | 3830 | 47 | 15 |
| 9800 | 3900 | 5900 | 48 | 15 |
| 21700 | 3900 | 17800 | 49 | 15 |
| 38920 | 3900 | 35020 | 50 | 15 |

| | | | | |
|---|---|---|---|---|
| 38920 | 3900 | 35020 | 51 | 15 |
| 68800 | 3900 | 64900 | 52 | 15 |
| 87290 | 3900 | 83390 | 53 | 15 |
| 82310 | 3900 | 78410 | 54 | 15 |
| 109100 | 3900 | 105200 | 55 | 15 |
| | | | | |
| 3940 | 3900 | Same Date | 55 | 15 |
| 3940 | 3900 | Same Date | 55 | 15 |
| 1030 2c | 3900 | Same Date | 55 | 15 |
| 1750 1c3c | 3900 | Same Date | 55 | 15 |
| 983 | 3900 | -2917 | 55 | 16 |
| 3000 | 3900 | -900 | 55 | 17 |
| 1810 | 3900 | -2090 | 55 | 18 |
| 4350 | 3900 | 450 | 56 | 18 |
| 5340 | 3900 | 1440 | 57 | 18 |
| 7730 | 3900 | 3830 | 58 | 18 |
| 9800 | 3900 | 5900 | 59 | 18 |
| 21700 | 3900 | 17800 | 60 | 18 |
| 38920 | 3900 | 35020 | 61 | 18 |
| 38920 | 3900 | 35020 | 62 | 18 |
| 68800 | 3900 | 64900 | 63 | 18 |
| 87290 | 3900 | 83390 | 64 | 18 |
| 82310 | 3900 | 78410 | 65 | 18 |
| 109100 | 3900 | 105200 | 66 | 18 |
| | | | | |
| 3940 | 3940 | Same Date | 66 | 18 |
| 1030 2c | 3940 | Same Date | 66 | 18 |
| 1750 1c3c | 3940 | Same Date | 66 | 18 |
| 983 | 3940 | -2957 | 66 | 19 |
| 3000 | 3940 | -940 | 66 | 20 |
| 1810 | 3940 | -2130 | 66 | 21 |
| 4350 | 3940 | 410 | 67 | 21 |
| 5340 | 3940 | 1400 | 68 | 21 |
| 7730 | 3940 | 3790 | 69 | 21 |
| 9800 | 3940 | 5860 | 70 | 21 |
| 21700 | 3940 | 17760 | 71 | 21 |
| 38920 | 3940 | 34980 | 72 | 21 |
| 38920 | 3940 | 34980 | 73 | 21 |
| 68800 | 3940 | 64860 | 74 | 21 |
| 87290 | 3940 | 83350 | 75 | 21 |
| 82310 | 3940 | 78370 | 76 | 21 |
| 109100 | 3940 | 105160 | 77 | 21 |
| | | | | |
| 1030 2c | 3940 | Same Date | 77 | 21 |
| 1750 1c3c | 3940 | Same Date | 77 | 21 |
| 983 | 3940 | -2957 | 77 | 22 |
| 3000 | 3940 | -940 | 77 | 23 |
| 1810 | 3940 | -2130 | 77 | 24 |
| 4350 | 3940 | 410 | 78 | 24 |
| 5340 | 3940 | 1400 | 79 | 24 |
| 7730 | 3940 | 3790 | 80 | 24 |
| 9800 | 3940 | 5860 | 81 | 24 |
| 21700 | 3940 | 17760 | 82 | 24 |
| 38920 | 3940 | 34980 | 83 | 24 |
| 38920 | 3940 | 34980 | 84 | 24 |
| 68800 | 3940 | 64860 | 85 | 24 |
| 87290 | 3940 | 83350 | 86 | 24 |

| | | | | |
|---|---|---|---|---|
| 82310 | 3940 | 78370 | 87 | 24 |
| 109100 | 3940 | 105160 | 88 | 24 |
| | | | | |
| 1750 1c3c | 1030 2c | Same Date | 88 | 24 |
| 983 | 1030 2c | -47 | 88 | 25 |
| 3000 | 1030 2c | 1970 | 89 | 25 |
| 1810 | 1030 2c | 780 | 90 | 25 |
| 4350 | 1030 2c | 3320 | 91 | 25 |
| 5340 | 1030 2c | 4310 | 92 | 25 |
| 7730 | 1030 2c | 6700 | 93 | 25 |
| 9800 | 1030 2c | 8770 | 94 | 25 |
| 21700 | 1030 2c | 20670 | 95 | 25 |
| 38920 | 1030 2c | 37890 | 96 | 25 |
| 38920 | 1030 2c | 37890 | 97 | 25 |
| 68800 | 1030 2c | 67770 | 98 | 25 |
| 87290 | 1030 2c | 86260 | 99 | 25 |
| 82310 | 1030 2c | 81280 | 100 | 25 |
| 109100 | 1030 2c | 108070 | 101 | 25 |
| | | | | |
| 983 | 1750 1c3c | -767 | 101 | 26 |
| 3000 | 1750 1c3c | 1250 | 102 | 26 |
| 1810 | 1750 1c3c | 60 | 103 | 26 |
| 4350 | 1750 1c3c | 2600 | 104 | 26 |
| 5340 | 1750 1c3c | 3590 | 105 | 26 |
| 7730 | 1750 1c3c | 5980 | 106 | 26 |
| 9800 | 1750 1c3c | 8050 | 107 | 26 |
| 21700 | 1750 1c3c | 19950 | 108 | 26 |
| 38920 | 1750 1c3c | 37170 | 109 | 26 |
| 38920 | 1750 1c3c | 37170 | 110 | 26 |
| 68800 | 1750 1c3c | 67050 | 111 | 26 |
| 87290 | 1750 1c3c | 85540 | 112 | 26 |
| 82310 | 1750 1c3c | 80560 | 113 | 26 |
| 109100 | 1750 1c3c | 107350 | 114 | 26 |
| | | | | |
| 3000 | 983 | 2017 | 115 | 26 |
| 1810 | 983 | 827 | 116 | 26 |
| 4350 | 983 | 3367 | 117 | 26 |
| 5340 | 983 | 4357 | 118 | 26 |
| 7730 | 983 | 6747 | 119 | 26 |
| 9800 | 983 | 8817 | 120 | 26 |
| 21700 | 983 | 20717 | 121 | 26 |
| 38920 | 983 | 37937 | 122 | 26 |
| 38920 | 983 | 37937 | 123 | 26 |
| 68800 | 983 | 67817 | 124 | 26 |
| 87290 | 983 | 86307 | 125 | 26 |
| 82310 | 983 | 81327 | 126 | 26 |
| 109100 | 983 | 108117 | 127 | 26 |
| | | | | |
| 1810 | 3000 | -1190 | 127 | 27 |
| 4350 | 3000 | 1350 | 128 | 27 |
| 5340 | 3000 | 2340 | 129 | 27 |
| 7730 | 3000 | 4730 | 130 | 27 |
| 9800 | 3000 | 6800 | 131 | 27 |
| 21700 | 3000 | 18700 | 132 | 27 |
| 38920 | 3000 | 35920 | 133 | 27 |
| 38920 | 3000 | 35920 | 134 | 27 |
| 68800 | 3000 | 65800 | 135 | 27 |

| | | | | |
|---|---|---|---|---|
| 87290 | 3000 | 84290 | 136 | 27 |
| 82310 | 3000 | 79310 | 137 | 27 |
| 109100 | 3000 | 106100 | 138 | 27 |
| | | | | |
| 4350 | 1810 | 2540 | 139 | 27 |
| 5340 | 1810 | 3530 | 140 | 27 |
| 7730 | 1810 | 5920 | 141 | 27 |
| 9800 | 1810 | 7990 | 142 | 27 |
| 21700 | 1810 | 19890 | 143 | 27 |
| 38920 | 1810 | 37110 | 144 | 27 |
| 38920 | 1810 | 37110 | 145 | 27 |
| 68800 | 1810 | 66990 | 146 | 27 |
| 87290 | 1810 | 85480 | 147 | 27 |
| 82310 | 1810 | 80500 | 148 | 27 |
| 109100 | 1810 | 107290 | 149 | 27 |
| | | | | |
| 5340 | 4350 | 990 | 150 | 27 |
| 7730 | 4350 | 3380 | 151 | 27 |
| 9800 | 4350 | 5450 | 152 | 27 |
| 21700 | 4350 | 17350 | 153 | 27 |
| 38920 | 4350 | 34570 | 154 | 27 |
| 38920 | 4350 | 34570 | 155 | 27 |
| 68800 | 4350 | 64450 | 156 | 27 |
| 87290 | 4350 | 82940 | 157 | 27 |
| 82310 | 4350 | 77960 | 158 | 27 |
| 109100 | 4350 | 104750 | 159 | 27 |
| | | | | |
| 7730 | 5340 | 2390 | 160 | 27 |
| 9800 | 5340 | 4460 | 161 | 27 |
| 21700 | 5340 | 16360 | 162 | 27 |
| 38920 | 5340 | 33580 | 163 | 27 |
| 38920 | 5340 | 33580 | 164 | 27 |
| 68800 | 5340 | 63460 | 165 | 27 |
| 87290 | 5340 | 81950 | 166 | 27 |
| 82310 | 5340 | 76970 | 167 | 27 |
| 109100 | 5340 | 103760 | 168 | 27 |
| | | | | |
| 9800 | 7730 | 2070 | 169 | 27 |
| 21700 | 7730 | 13970 | 170 | 27 |
| 38920 | 7730 | 31190 | 171 | 27 |
| 38920 | 7730 | 31190 | 172 | 27 |
| 68800 | 7730 | 61070 | 173 | 27 |
| 87290 | 7730 | 79560 | 174 | 27 |
| 82310 | 7730 | 74580 | 175 | 27 |
| 109100 | 7730 | 101370 | 176 | 27 |
| | | | | |
| 21700 | 9800 | 11900 | 177 | 27 |
| 38920 | 9800 | 29120 | 178 | 27 |
| 38920 | 9800 | 29120 | 179 | 27 |
| 68800 | 9800 | 59000 | 180 | 27 |
| 87290 | 9800 | 77490 | 181 | 27 |
| 82310 | 9800 | 72510 | 182 | 27 |
| 109100 | 9800 | 99300 | 183 | 27 |
| | | | | |
| 38920 | 21700 | 17220 | 184 | 27 |
| 38920 | 21700 | 17220 | 185 | 27 |
| 68800 | 21700 | 47100 | 186 | 27 |

| | | | | |
|---|---|---|---|---|
| 87290 | 21700 | 65590 | 187 | 27 |
| 82310 | 21700 | 60610 | 188 | 27 |
| 109100 | 21700 | 87400 | 189 | 27 |
| | | | | |
| 38920 | 38920 | Same Date | 189 | 27 |
| 68800 | 38920 | 29880 | 190 | 27 |
| 87290 | 38920 | 48370 | 191 | 27 |
| 82310 | 38920 | 43390 | 192 | 27 |
| 109100 | 38920 | 70180 | 193 | 27 |
| | | | | |
| 68800 | 38920 | 29880 | 194 | 27 |
| 87290 | 38920 | 48370 | 195 | 27 |
| 82310 | 38920 | 43390 | 196 | 27 |
| 109100 | 38920 | 70180 | 197 | 27 |
| | | | | |
| 87290 | 68800 | 18490 | 198 | 27 |
| 82310 | 68800 | 13510 | 199 | 27 |
| 109100 | 68800 | 40300 | 200 | 27 |
| | | | | |
| 82310 | 87290 | -4980 | 200 | 28 |
| 109100 | 87290 | 21810 | 201 | 28 |
| | | | | |
| 109100 | 82310 | 26790 | 202 | 28 |

S Statistic = 202 - 28 = 174

| Tied Group | Value | Members |
|---|---|---|
| 1 | 3900 | 4 |
| 2 | 3940 | 4 |
| 3 | 38920 | 2 |

| Time Period | Observations |
|---|---|
| 5/1/2019 | 10 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 2 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 2 time periods with multiple data

A = 330
B = 2268
C = 48
D = 720
E = 26
F = 92
a = 29256
b = 109296

c = 1104
Group Variance = 1483.48
Z-Score = 4.49164
Comparison Level at 95% confidence level = 1.65463 (upward trend)
**4.49164 > 1.65463 indicating an upward trend**

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RW23-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 109000 | 112000 M6 | Same Date | 0 | 0 |
| 125000 | 112000 M6 | 13000 | 1 | 0 |
| 111000 | 112000 M6 | -1000 | 1 | 1 |
| 100000 | 112000 M6 | -12000 | 1 | 2 |
| 116000 | 112000 M6 | 4000 | 2 | 2 |
| 105000 2c | 112000 M6 | -7000 | 2 | 3 |
| 95600 | 112000 M6 | -16400 | 2 | 4 |
| 124000 | 112000 M6 | 12000 | 3 | 4 |
| 110000 | 112000 M6 | -2000 | 3 | 5 |
| 85000 | 112000 M6 | -27000 | 3 | 6 |
| 113200 | 112000 M6 | 1200 | 4 | 6 |
| 114900 | 112000 M6 | 2900 | 5 | 6 |
| 135500 | 112000 M6 | 23500 | 6 | 6 |
| 139800 | 112000 M6 | 27800 | 7 | 6 |
| 144200 | 112000 M6 | 32200 | 8 | 6 |
| | | | | |
| 125000 | 109000 | 16000 | 9 | 6 |
| 111000 | 109000 | 2000 | 10 | 6 |
| 100000 | 109000 | -9000 | 10 | 7 |
| 116000 | 109000 | 7000 | 11 | 7 |
| 105000 2c | 109000 | -4000 | 11 | 8 |
| 95600 | 109000 | -13400 | 11 | 9 |
| 124000 | 109000 | 15000 | 12 | 9 |
| 110000 | 109000 | 1000 | 13 | 9 |
| 85000 | 109000 | -24000 | 13 | 10 |
| 113200 | 109000 | 4200 | 14 | 10 |
| 114900 | 109000 | 5900 | 15 | 10 |
| 135500 | 109000 | 26500 | 16 | 10 |
| 139800 | 109000 | 30800 | 17 | 10 |
| 144200 | 109000 | 35200 | 18 | 10 |
| | | | | |
| 111000 | 125000 | -14000 | 18 | 11 |
| 100000 | 125000 | -25000 | 18 | 12 |
| 116000 | 125000 | -9000 | 18 | 13 |
| 105000 2c | 125000 | -20000 | 18 | 14 |
| 95600 | 125000 | -29400 | 18 | 15 |
| 124000 | 125000 | -1000 | 18 | 16 |
| 110000 | 125000 | -15000 | 18 | 17 |
| 85000 | 125000 | -40000 | 18 | 18 |
| 113200 | 125000 | -11800 | 18 | 19 |
| 114900 | 125000 | -10100 | 18 | 20 |
| 135500 | 125000 | 10500 | 19 | 20 |
| 139800 | 125000 | 14800 | 20 | 20 |
| 144200 | 125000 | 19200 | 21 | 20 |
| | | | | |
| 100000 | 111000 | -11000 | 21 | 21 |
| 116000 | 111000 | 5000 | 22 | 21 |

| | | | | |
|---|---|---|---|---|
| 105000 2c | 111000 | -6000 | 22 | 22 |
| 95600 | 111000 | -15400 | 22 | 23 |
| 124000 | 111000 | 13000 | 23 | 23 |
| 110000 | 111000 | -1000 | 23 | 24 |
| 85000 | 111000 | -26000 | 23 | 25 |
| 113200 | 111000 | 2200 | 24 | 25 |
| 114900 | 111000 | 3900 | 25 | 25 |
| 135500 | 111000 | 24500 | 26 | 25 |
| 139800 | 111000 | 28800 | 27 | 25 |
| 144200 | 111000 | 33200 | 28 | 25 |
| | | | | |
| 116000 | 100000 | 16000 | 29 | 25 |
| 105000 2c | 100000 | 5000 | 30 | 25 |
| 95600 | 100000 | -4400 | 30 | 26 |
| 124000 | 100000 | 24000 | 31 | 26 |
| 110000 | 100000 | 10000 | 32 | 26 |
| 85000 | 100000 | -15000 | 32 | 27 |
| 113200 | 100000 | 13200 | 33 | 27 |
| 114900 | 100000 | 14900 | 34 | 27 |
| 135500 | 100000 | 35500 | 35 | 27 |
| 139800 | 100000 | 39800 | 36 | 27 |
| 144200 | 100000 | 44200 | 37 | 27 |
| | | | | |
| 105000 2c | 116000 | -11000 | 37 | 28 |
| 95600 | 116000 | -20400 | 37 | 29 |
| 124000 | 116000 | 8000 | 38 | 29 |
| 110000 | 116000 | -6000 | 38 | 30 |
| 85000 | 116000 | -31000 | 38 | 31 |
| 113200 | 116000 | -2800 | 38 | 32 |
| 114900 | 116000 | -1100 | 38 | 33 |
| 135500 | 116000 | 19500 | 39 | 33 |
| 139800 | 116000 | 23800 | 40 | 33 |
| 144200 | 116000 | 28200 | 41 | 33 |
| | | | | |
| 95600 | 105000 2c | -9400 | 41 | 34 |
| 124000 | 105000 2c | 19000 | 42 | 34 |
| 110000 | 105000 2c | 5000 | 43 | 34 |
| 85000 | 105000 2c | -20000 | 43 | 35 |
| 113200 | 105000 2c | 8200 | 44 | 35 |
| 114900 | 105000 2c | 9900 | 45 | 35 |
| 135500 | 105000 2c | 30500 | 46 | 35 |
| 139800 | 105000 2c | 34800 | 47 | 35 |
| 144200 | 105000 2c | 39200 | 48 | 35 |
| | | | | |
| 124000 | 95600 | 28400 | 49 | 35 |
| 110000 | 95600 | 14400 | 50 | 35 |
| 85000 | 95600 | -10600 | 50 | 36 |
| 113200 | 95600 | 17600 | 51 | 36 |
| 114900 | 95600 | 19300 | 52 | 36 |
| 135500 | 95600 | 39900 | 53 | 36 |
| 139800 | 95600 | 44200 | 54 | 36 |
| 144200 | 95600 | 48600 | 55 | 36 |
| | | | | |
| 110000 | 124000 | -14000 | 55 | 37 |
| 85000 | 124000 | -39000 | 55 | 38 |
| 113200 | 124000 | -10800 | 55 | 39 |
| 114900 | 124000 | -9100 | 55 | 40 |

| | | | | |
|---|---|---|---|---|
| 135500 | 124000 | 11500 | 56 | 40 |
| 139800 | 124000 | 15800 | 57 | 40 |
| 144200 | 124000 | 20200 | 58 | 40 |
| | | | | |
| 85000 | 110000 | -25000 | 58 | 41 |
| 113200 | 110000 | 3200 | 59 | 41 |
| 114900 | 110000 | 4900 | 60 | 41 |
| 135500 | 110000 | 25500 | 61 | 41 |
| 139800 | 110000 | 29800 | 62 | 41 |
| 144200 | 110000 | 34200 | 63 | 41 |
| | | | | |
| 113200 | 85000 | 28200 | 64 | 41 |
| 114900 | 85000 | 29900 | 65 | 41 |
| 135500 | 85000 | 50500 | 66 | 41 |
| 139800 | 85000 | 54800 | 67 | 41 |
| 144200 | 85000 | 59200 | 68 | 41 |
| | | | | |
| 114900 | 113200 | 1700 | 69 | 41 |
| 135500 | 113200 | 22300 | 70 | 41 |
| 139800 | 113200 | 26600 | 71 | 41 |
| 144200 | 113200 | 31000 | 72 | 41 |
| | | | | |
| 135500 | 114900 | 20600 | 73 | 41 |
| 139800 | 114900 | 24900 | 74 | 41 |
| 144200 | 114900 | 29300 | 75 | 41 |
| | | | | |
| 139800 | 135500 | 4300 | 76 | 41 |
| 144200 | 135500 | 8700 | 77 | 41 |
| | | | | |
| 144200 | 139800 | 4400 | 78 | 41 |

S Statistic = 78 - 41 = 37

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 0
B = 18
C = 0

D = 0
E = 0
F = 2
a = 8880
b = 30240
c = 480
Group Variance = 492.333
Z-Score = 1.62246
Comparison Level at 95% confidence level = 1.65463 (upward trend)
1.62246 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RW24-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 695000 | 650000 | Same Date | 0 | 0 |
| 635000 | 650000 | -15000 | 0 | 1 |
| 538000 | 650000 | -112000 | 0 | 2 |
| 466000 | 650000 | -184000 | 0 | 3 |
| 378000 | 650000 | -272000 | 0 | 4 |
| 364000 | 650000 | -286000 | 0 | 5 |
| 258000 1c | 650000 | -392000 | 0 | 6 |
| 292000 B | 650000 | -358000 | 0 | 7 |
| 263000 | 650000 | -387000 | 0 | 8 |
| 294700 | 650000 | -355300 | 0 | 9 |
| 651300 | 650000 | 1300 | 1 | 9 |
| | | | | |
| 635000 | 695000 | -60000 | 1 | 10 |
| 538000 | 695000 | -157000 | 1 | 11 |
| 466000 | 695000 | -229000 | 1 | 12 |
| 378000 | 695000 | -317000 | 1 | 13 |
| 364000 | 695000 | -331000 | 1 | 14 |
| 258000 1c | 695000 | -437000 | 1 | 15 |
| 292000 B | 695000 | -403000 | 1 | 16 |
| 263000 | 695000 | -432000 | 1 | 17 |
| 294700 | 695000 | -400300 | 1 | 18 |
| 651300 | 695000 | -43700 | 1 | 19 |
| | | | | |
| 538000 | 635000 | -97000 | 1 | 20 |
| 466000 | 635000 | -169000 | 1 | 21 |
| 378000 | 635000 | -257000 | 1 | 22 |
| 364000 | 635000 | -271000 | 1 | 23 |
| 258000 1c | 635000 | -377000 | 1 | 24 |
| 292000 B | 635000 | -343000 | 1 | 25 |
| 263000 | 635000 | -372000 | 1 | 26 |
| 294700 | 635000 | -340300 | 1 | 27 |
| 651300 | 635000 | 16300 | 2 | 27 |
| | | | | |
| 466000 | 538000 | -72000 | 2 | 28 |
| 378000 | 538000 | -160000 | 2 | 29 |
| 364000 | 538000 | -174000 | 2 | 30 |
| 258000 1c | 538000 | -280000 | 2 | 31 |
| 292000 B | 538000 | -246000 | 2 | 32 |
| 263000 | 538000 | -275000 | 2 | 33 |
| 294700 | 538000 | -243300 | 2 | 34 |
| 651300 | 538000 | 113300 | 3 | 34 |
| | | | | |
| 378000 | 466000 | -88000 | 3 | 35 |
| 364000 | 466000 | -102000 | 3 | 36 |
| 258000 1c | 466000 | -208000 | 3 | 37 |
| 292000 B | 466000 | -174000 | 3 | 38 |
| 263000 | 466000 | -203000 | 3 | 39 |

| | | | | |
|---|---|---|---|---|
| 294700 | 466000 | -171300 | 3 | 40 |
| 651300 | 466000 | 185300 | 4 | 40 |
| | | | | |
| 364000 | 378000 | -14000 | 4 | 41 |
| 258000 1c | 378000 | -120000 | 4 | 42 |
| 292000 B | 378000 | -86000 | 4 | 43 |
| 263000 | 378000 | -115000 | 4 | 44 |
| 294700 | 378000 | -83300 | 4 | 45 |
| 651300 | 378000 | 273300 | 5 | 45 |
| | | | | |
| 258000 1c | 364000 | -106000 | 5 | 46 |
| 292000 B | 364000 | -72000 | 5 | 47 |
| 263000 | 364000 | -101000 | 5 | 48 |
| 294700 | 364000 | -69300 | 5 | 49 |
| 651300 | 364000 | 287300 | 6 | 49 |
| | | | | |
| 292000 B | 258000 1c | 34000 | 7 | 49 |
| 263000 | 258000 1c | 5000 | 8 | 49 |
| 294700 | 258000 1c | 36700 | 9 | 49 |
| 651300 | 258000 1c | 393300 | 10 | 49 |
| | | | | |
| 263000 | 292000 B | -29000 | 10 | 50 |
| 294700 | 292000 B | 2700 | 11 | 50 |
| 651300 | 292000 B | 359300 | 12 | 50 |
| | | | | |
| 294700 | 263000 | 31700 | 13 | 50 |
| 651300 | 263000 | 388300 | 14 | 50 |
| | | | | |
| 651300 | 294700 | 356600 | 15 | 50 |

S Statistic = 15 - 50 = -35

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 3/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 0
B = 18
C = 0
D = 0
E = 0
F = 2
a = 3828
b = 11880

c = 264
Group Variance = 211.667
Z-Score = -2.33697
Comparison Level at 95% confidence level = 1.65463 (upward trend)
-2.33697 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RW25-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 413000 | 421000 | Same Date | 0 | 0 |
| 7000 | 421000 | -414000 | 0 | 1 |
| 462000 | 421000 | 41000 | 1 | 1 |
| 355000 | 421000 | -66000 | 1 | 2 |
| 443000 | 421000 | 22000 | 2 | 2 |
| 477000 | 421000 | 56000 | 3 | 2 |
| 445000 1c | 421000 | 24000 | 4 | 2 |
| 338000 | 421000 | -83000 | 4 | 3 |
| 376000 | 421000 | -45000 | 4 | 4 |
| 419800 | 421000 | -1200 | 4 | 5 |
| 773300 | 421000 | 352300 | 5 | 5 |
| 7000 | 413000 | -406000 | 5 | 6 |
| 462000 | 413000 | 49000 | 6 | 6 |
| 355000 | 413000 | -58000 | 6 | 7 |
| 443000 | 413000 | 30000 | 7 | 7 |
| 477000 | 413000 | 64000 | 8 | 7 |
| 445000 1c | 413000 | 32000 | 9 | 7 |
| 338000 | 413000 | -75000 | 9 | 8 |
| 376000 | 413000 | -37000 | 9 | 9 |
| 419800 | 413000 | 6800 | 10 | 9 |
| 773300 | 413000 | 360300 | 11 | 9 |
| 462000 | 7000 | 455000 | 12 | 9 |
| 355000 | 7000 | 348000 | 13 | 9 |
| 443000 | 7000 | 436000 | 14 | 9 |
| 477000 | 7000 | 470000 | 15 | 9 |
| 445000 1c | 7000 | 438000 | 16 | 9 |
| 338000 | 7000 | 331000 | 17 | 9 |
| 376000 | 7000 | 369000 | 18 | 9 |
| 419800 | 7000 | 412800 | 19 | 9 |
| 773300 | 7000 | 766300 | 20 | 9 |
| 355000 | 462000 | -107000 | 20 | 10 |
| 443000 | 462000 | -19000 | 20 | 11 |
| 477000 | 462000 | 15000 | 21 | 11 |
| 445000 1c | 462000 | -17000 | 21 | 12 |
| 338000 | 462000 | -124000 | 21 | 13 |
| 376000 | 462000 | -86000 | 21 | 14 |
| 419800 | 462000 | -42200 | 21 | 15 |
| 773300 | 462000 | 311300 | 22 | 15 |
| 443000 | 355000 | 88000 | 23 | 15 |
| 477000 | 355000 | 122000 | 24 | 15 |
| 445000 1c | 355000 | 90000 | 25 | 15 |
| 338000 | 355000 | -17000 | 25 | 16 |
| 376000 | 355000 | 21000 | 26 | 16 |

| | | | | |
|---|---|---|---|---|
| 419800 | 355000 | 64800 | 27 | 16 |
| 773300 | 355000 | 418300 | 28 | 16 |
| | | | | |
| 477000 | 443000 | 34000 | 29 | 16 |
| 445000 1c | 443000 | 2000 | 30 | 16 |
| 338000 | 443000 | -105000 | 30 | 17 |
| 376000 | 443000 | -67000 | 30 | 18 |
| 419800 | 443000 | -23200 | 30 | 19 |
| 773300 | 443000 | 330300 | 31 | 19 |
| | | | | |
| 445000 1c | 477000 | -32000 | 31 | 20 |
| 338000 | 477000 | -139000 | 31 | 21 |
| 376000 | 477000 | -101000 | 31 | 22 |
| 419800 | 477000 | -57200 | 31 | 23 |
| 773300 | 477000 | 296300 | 32 | 23 |
| | | | | |
| 338000 | 445000 1c | -107000 | 32 | 24 |
| 376000 | 445000 1c | -69000 | 32 | 25 |
| 419800 | 445000 1c | -25200 | 32 | 26 |
| 773300 | 445000 1c | 328300 | 33 | 26 |
| | | | | |
| 376000 | 338000 | 38000 | 34 | 26 |
| 419800 | 338000 | 81800 | 35 | 26 |
| 773300 | 338000 | 435300 | 36 | 26 |
| | | | | |
| 419800 | 376000 | 43800 | 37 | 26 |
| 773300 | 376000 | 397300 | 38 | 26 |
| | | | | |
| 773300 | 419800 | 353500 | 39 | 26 |

S Statistic = 39 - 26 = 13

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 3/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 0
B = 18
C = 0
D = 0
E = 0
F = 2
a = 3828
b = 11880

c = 264
Group Variance = 211.667
Z-Score = 0.824812
Comparison Level at 95% confidence level = 1.65463 (upward trend)
0.824812 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RWA-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 355000 M6 | 355000 M6 | Same Date | 0 | 0 |
| 363000 M6 | 355000 M6 | Same Date | 0 | 0 |
| 363000 M6 | 355000 M6 | Same Date | 0 | 0 |
| 375000 | 355000 M6 | Same Date | 0 | 0 |
| 391000 1c2c | 355000 M6 | Same Date | 0 | 0 |
| 355000 M6 | 355000 M6 | Same Date | 0 | 0 |
| 355000 M6 | 355000 M6 | Same Date | 0 | 0 |
| 363000 M6 | 355000 M6 | Same Date | 0 | 0 |
| 363000 M6 | 355000 M6 | Same Date | 0 | 0 |
| 349000 | 355000 M6 | -6000 | 0 | 1 |
| 396000 | 355000 M6 | 41000 | 1 | 1 |
| 521000 | 355000 M6 | 166000 | 2 | 1 |
| 441000 | 355000 M6 | 86000 | 3 | 1 |
| 452000 | 355000 M6 | 97000 | 4 | 1 |
| 406000 MHML1c | 355000 M6 | 51000 | 5 | 1 |
| 468000 | 355000 M6 | 113000 | 6 | 1 |
| 328000 | 355000 M6 | -27000 | 6 | 2 |
| 415000 | 355000 M6 | 60000 | 7 | 2 |
| 340500 | 355000 M6 | -14500 | 7 | 3 |
| 309600 | 355000 M6 | -45400 | 7 | 4 |
| 341900 | 355000 M6 | -13100 | 7 | 5 |
| 379700 | 355000 M6 | 24700 | 8 | 5 |
| 337700 | 355000 M6 | -17300 | 8 | 6 |
| 363000 M6 | 355000 M6 | Same Date | 8 | 6 |
| 363000 M6 | 355000 M6 | Same Date | 8 | 6 |
| 375000 | 355000 M6 | Same Date | 8 | 6 |
| 391000 1c2c | 355000 M6 | Same Date | 8 | 6 |
| 355000 M6 | 355000 M6 | Same Date | 8 | 6 |
| 355000 M6 | 355000 M6 | Same Date | 8 | 6 |
| 363000 M6 | 355000 M6 | Same Date | 8 | 6 |
| 363000 M6 | 355000 M6 | Same Date | 8 | 6 |
| 349000 | 355000 M6 | -6000 | 8 | 7 |
| 396000 | 355000 M6 | 41000 | 9 | 7 |
| 521000 | 355000 M6 | 166000 | 10 | 7 |
| 441000 | 355000 M6 | 86000 | 11 | 7 |
| 452000 | 355000 M6 | 97000 | 12 | 7 |
| 406000 MHML1c | 355000 M6 | 51000 | 13 | 7 |
| 468000 | 355000 M6 | 113000 | 14 | 7 |
| 328000 | 355000 M6 | -27000 | 14 | 8 |
| 415000 | 355000 M6 | 60000 | 15 | 8 |
| 340500 | 355000 M6 | -14500 | 15 | 9 |
| 309600 | 355000 M6 | -45400 | 15 | 10 |
| 341900 | 355000 M6 | -13100 | 15 | 11 |
| 379700 | 355000 M6 | 24700 | 16 | 11 |
| 337700 | 355000 M6 | -17300 | 16 | 12 |

| | | | | |
|---|---|---|---|---|
| 363000 M6 | 363000 M6 | Same Date | 16 | 12 |
| 375000 | 363000 M6 | Same Date | 16 | 12 |
| 391000 1c2c | 363000 M6 | Same Date | 16 | 12 |
| 355000 M6 | 363000 M6 | Same Date | 16 | 12 |
| 355000 M6 | 363000 M6 | Same Date | 16 | 12 |
| 363000 M6 | 363000 M6 | Same Date | 16 | 12 |
| 363000 M6 | 363000 M6 | Same Date | 16 | 12 |
| 349000 | 363000 M6 | -14000 | 16 | 13 |
| 396000 | 363000 M6 | 33000 | 17 | 13 |
| 521000 | 363000 M6 | 158000 | 18 | 13 |
| 441000 | 363000 M6 | 78000 | 19 | 13 |
| 452000 | 363000 M6 | 89000 | 20 | 13 |
| 406000 MHML1c | 363000 M6 | 43000 | 21 | 13 |
| 468000 | 363000 M6 | 105000 | 22 | 13 |
| 328000 | 363000 M6 | -35000 | 22 | 14 |
| 415000 | 363000 M6 | 52000 | 23 | 14 |
| 340500 | 363000 M6 | -22500 | 23 | 15 |
| 309600 | 363000 M6 | -53400 | 23 | 16 |
| 341900 | 363000 M6 | -21100 | 23 | 17 |
| 379700 | 363000 M6 | 16700 | 24 | 17 |
| 337700 | 363000 M6 | -25300 | 24 | 18 |
| | | | | |
| 375000 | 363000 M6 | Same Date | 24 | 18 |
| 391000 1c2c | 363000 M6 | Same Date | 24 | 18 |
| 355000 M6 | 363000 M6 | Same Date | 24 | 18 |
| 355000 M6 | 363000 M6 | Same Date | 24 | 18 |
| 363000 M6 | 363000 M6 | Same Date | 24 | 18 |
| 363000 M6 | 363000 M6 | Same Date | 24 | 18 |
| 349000 | 363000 M6 | -14000 | 24 | 19 |
| 396000 | 363000 M6 | 33000 | 25 | 19 |
| 521000 | 363000 M6 | 158000 | 26 | 19 |
| 441000 | 363000 M6 | 78000 | 27 | 19 |
| 452000 | 363000 M6 | 89000 | 28 | 19 |
| 406000 MHML1c | 363000 M6 | 43000 | 29 | 19 |
| 468000 | 363000 M6 | 105000 | 30 | 19 |
| 328000 | 363000 M6 | -35000 | 30 | 20 |
| 415000 | 363000 M6 | 52000 | 31 | 20 |
| 340500 | 363000 M6 | -22500 | 31 | 21 |
| 309600 | 363000 M6 | -53400 | 31 | 22 |
| 341900 | 363000 M6 | -21100 | 31 | 23 |
| 379700 | 363000 M6 | 16700 | 32 | 23 |
| 337700 | 363000 M6 | -25300 | 32 | 24 |
| | | | | |
| 391000 1c2c | 375000 | Same Date | 32 | 24 |
| 355000 M6 | 375000 | Same Date | 32 | 24 |
| 355000 M6 | 375000 | Same Date | 32 | 24 |
| 363000 M6 | 375000 | Same Date | 32 | 24 |
| 363000 M6 | 375000 | Same Date | 32 | 24 |
| 349000 | 375000 | -26000 | 32 | 25 |
| 396000 | 375000 | 21000 | 33 | 25 |
| 521000 | 375000 | 146000 | 34 | 25 |
| 441000 | 375000 | 66000 | 35 | 25 |
| 452000 | 375000 | 77000 | 36 | 25 |
| 406000 MHML1c | 375000 | 31000 | 37 | 25 |
| 468000 | 375000 | 93000 | 38 | 25 |
| 328000 | 375000 | -47000 | 38 | 26 |
| 415000 | 375000 | 40000 | 39 | 26 |

| | | | | |
|---|---|---|---|---|
| 340500 | 375000 | -34500 | 39 | 27 |
| 309600 | 375000 | -65400 | 39 | 28 |
| 341900 | 375000 | -33100 | 39 | 29 |
| 379700 | 375000 | 4700 | 40 | 29 |
| 337700 | 375000 | -37300 | 40 | 30 |
| | | | | |
| 355000 M6 | 391000 1c2c | Same Date | 40 | 30 |
| 355000 M6 | 391000 1c2c | Same Date | 40 | 30 |
| 363000 M6 | 391000 1c2c | Same Date | 40 | 30 |
| 363000 M6 | 391000 1c2c | Same Date | 40 | 30 |
| 349000 | 391000 1c2c | -42000 | 40 | 31 |
| 396000 | 391000 1c2c | 5000 | 41 | 31 |
| 521000 | 391000 1c2c | 130000 | 42 | 31 |
| 441000 | 391000 1c2c | 50000 | 43 | 31 |
| 452000 | 391000 1c2c | 61000 | 44 | 31 |
| 406000 MHML1c | 391000 1c2c | 15000 | 45 | 31 |
| 468000 | 391000 1c2c | 77000 | 46 | 31 |
| 328000 | 391000 1c2c | -63000 | 46 | 32 |
| 415000 | 391000 1c2c | 24000 | 47 | 32 |
| 340500 | 391000 1c2c | -50500 | 47 | 33 |
| 309600 | 391000 1c2c | -81400 | 47 | 34 |
| 341900 | 391000 1c2c | -49100 | 47 | 35 |
| 379700 | 391000 1c2c | -11300 | 47 | 36 |
| 337700 | 391000 1c2c | -53300 | 47 | 37 |
| | | | | |
| 355000 M6 | 355000 M6 | Same Date | 47 | 37 |
| 363000 M6 | 355000 M6 | Same Date | 47 | 37 |
| 363000 M6 | 355000 M6 | Same Date | 47 | 37 |
| 349000 | 355000 M6 | -6000 | 47 | 38 |
| 396000 | 355000 M6 | 41000 | 48 | 38 |
| 521000 | 355000 M6 | 166000 | 49 | 38 |
| 441000 | 355000 M6 | 86000 | 50 | 38 |
| 452000 | 355000 M6 | 97000 | 51 | 38 |
| 406000 MHML1c | 355000 M6 | 51000 | 52 | 38 |
| 468000 | 355000 M6 | 113000 | 53 | 38 |
| 328000 | 355000 M6 | -27000 | 53 | 39 |
| 415000 | 355000 M6 | 60000 | 54 | 39 |
| 340500 | 355000 M6 | -14500 | 54 | 40 |
| 309600 | 355000 M6 | -45400 | 54 | 41 |
| 341900 | 355000 M6 | -13100 | 54 | 42 |
| 379700 | 355000 M6 | 24700 | 55 | 42 |
| 337700 | 355000 M6 | -17300 | 55 | 43 |
| | | | | |
| 363000 M6 | 355000 M6 | Same Date | 55 | 43 |
| 363000 M6 | 355000 M6 | Same Date | 55 | 43 |
| 349000 | 355000 M6 | -6000 | 55 | 44 |
| 396000 | 355000 M6 | 41000 | 56 | 44 |
| 521000 | 355000 M6 | 166000 | 57 | 44 |
| 441000 | 355000 M6 | 86000 | 58 | 44 |
| 452000 | 355000 M6 | 97000 | 59 | 44 |
| 406000 MHML1c | 355000 M6 | 51000 | 60 | 44 |
| 468000 | 355000 M6 | 113000 | 61 | 44 |
| 328000 | 355000 M6 | -27000 | 61 | 45 |
| 415000 | 355000 M6 | 60000 | 62 | 45 |
| 340500 | 355000 M6 | -14500 | 62 | 46 |
| 309600 | 355000 M6 | -45400 | 62 | 47 |
| 341900 | 355000 M6 | -13100 | 62 | 48 |

| | | | | |
|---|---|---|---|---|
| 379700 | 355000 M6 | 24700 | 63 | 48 |
| 337700 | 355000 M6 | -17300 | 63 | 49 |
| | | | | |
| 363000 M6 | 363000 M6 | Same Date | 63 | 49 |
| 349000 | 363000 M6 | -14000 | 63 | 50 |
| 396000 | 363000 M6 | 33000 | 64 | 50 |
| 521000 | 363000 M6 | 158000 | 65 | 50 |
| 441000 | 363000 M6 | 78000 | 66 | 50 |
| 452000 | 363000 M6 | 89000 | 67 | 50 |
| 406000 MHML1c | 363000 M6 | 43000 | 68 | 50 |
| 468000 | 363000 M6 | 105000 | 69 | 50 |
| 328000 | 363000 M6 | -35000 | 69 | 51 |
| 415000 | 363000 M6 | 52000 | 70 | 51 |
| 340500 | 363000 M6 | -22500 | 70 | 52 |
| 309600 | 363000 M6 | -53400 | 70 | 53 |
| 341900 | 363000 M6 | -21100 | 70 | 54 |
| 379700 | 363000 M6 | 16700 | 71 | 54 |
| 337700 | 363000 M6 | -25300 | 71 | 55 |
| | | | | |
| 349000 | 363000 M6 | -14000 | 71 | 56 |
| 396000 | 363000 M6 | 33000 | 72 | 56 |
| 521000 | 363000 M6 | 158000 | 73 | 56 |
| 441000 | 363000 M6 | 78000 | 74 | 56 |
| 452000 | 363000 M6 | 89000 | 75 | 56 |
| 406000 MHML1c | 363000 M6 | 43000 | 76 | 56 |
| 468000 | 363000 M6 | 105000 | 77 | 56 |
| 328000 | 363000 M6 | -35000 | 77 | 57 |
| 415000 | 363000 M6 | 52000 | 78 | 57 |
| 340500 | 363000 M6 | -22500 | 78 | 58 |
| 309600 | 363000 M6 | -53400 | 78 | 59 |
| 341900 | 363000 M6 | -21100 | 78 | 60 |
| 379700 | 363000 M6 | 16700 | 79 | 60 |
| 337700 | 363000 M6 | -25300 | 79 | 61 |
| | | | | |
| 396000 | 349000 | 47000 | 80 | 61 |
| 521000 | 349000 | 172000 | 81 | 61 |
| 441000 | 349000 | 92000 | 82 | 61 |
| 452000 | 349000 | 103000 | 83 | 61 |
| 406000 MHML1c | 349000 | 57000 | 84 | 61 |
| 468000 | 349000 | 119000 | 85 | 61 |
| 328000 | 349000 | -21000 | 85 | 62 |
| 415000 | 349000 | 66000 | 86 | 62 |
| 340500 | 349000 | -8500 | 86 | 63 |
| 309600 | 349000 | -39400 | 86 | 64 |
| 341900 | 349000 | -7100 | 86 | 65 |
| 379700 | 349000 | 30700 | 87 | 65 |
| 337700 | 349000 | -11300 | 87 | 66 |
| | | | | |
| 521000 | 396000 | 125000 | 88 | 66 |
| 441000 | 396000 | 45000 | 89 | 66 |
| 452000 | 396000 | 56000 | 90 | 66 |
| 406000 MHML1c | 396000 | 10000 | 91 | 66 |
| 468000 | 396000 | 72000 | 92 | 66 |
| 328000 | 396000 | -68000 | 92 | 67 |
| 415000 | 396000 | 19000 | 93 | 67 |
| 340500 | 396000 | -55500 | 93 | 68 |
| 309600 | 396000 | -86400 | 93 | 69 |

| | | | | |
|---|---|---|---|---|
| 341900 | 396000 | -54100 | 93 | 70 |
| 379700 | 396000 | -16300 | 93 | 71 |
| 337700 | 396000 | -58300 | 93 | 72 |
| | | | | |
| 441000 | 521000 | -80000 | 93 | 73 |
| 452000 | 521000 | -69000 | 93 | 74 |
| 406000 MHML1c | 521000 | -115000 | 93 | 75 |
| 468000 | 521000 | -53000 | 93 | 76 |
| 328000 | 521000 | -193000 | 93 | 77 |
| 415000 | 521000 | -106000 | 93 | 78 |
| 340500 | 521000 | -180500 | 93 | 79 |
| 309600 | 521000 | -211400 | 93 | 80 |
| 341900 | 521000 | -179100 | 93 | 81 |
| 379700 | 521000 | -141300 | 93 | 82 |
| 337700 | 521000 | -183300 | 93 | 83 |
| | | | | |
| 452000 | 441000 | 11000 | 94 | 83 |
| 406000 MHML1c | 441000 | -35000 | 94 | 84 |
| 468000 | 441000 | 27000 | 95 | 84 |
| 328000 | 441000 | -113000 | 95 | 85 |
| 415000 | 441000 | -26000 | 95 | 86 |
| 340500 | 441000 | -100500 | 95 | 87 |
| 309600 | 441000 | -131400 | 95 | 88 |
| 341900 | 441000 | -99100 | 95 | 89 |
| 379700 | 441000 | -61300 | 95 | 90 |
| 337700 | 441000 | -103300 | 95 | 91 |
| | | | | |
| 406000 MHML1c | 452000 | -46000 | 95 | 92 |
| 468000 | 452000 | 16000 | 96 | 92 |
| 328000 | 452000 | -124000 | 96 | 93 |
| 415000 | 452000 | -37000 | 96 | 94 |
| 340500 | 452000 | -111500 | 96 | 95 |
| 309600 | 452000 | -142400 | 96 | 96 |
| 341900 | 452000 | -110100 | 96 | 97 |
| 379700 | 452000 | -72300 | 96 | 98 |
| 337700 | 452000 | -114300 | 96 | 99 |
| | | | | |
| 468000 | 406000 MHML1c | 62000 | 97 | 99 |
| 328000 | 406000 MHML1c | -78000 | 97 | 100 |
| 415000 | 406000 MHML1c | 9000 | 98 | 100 |
| 340500 | 406000 MHML1c | -65500 | 98 | 101 |
| 309600 | 406000 MHML1c | -96400 | 98 | 102 |
| 341900 | 406000 MHML1c | -64100 | 98 | 103 |
| 379700 | 406000 MHML1c | -26300 | 98 | 104 |
| 337700 | 406000 MHML1c | -68300 | 98 | 105 |
| | | | | |
| 328000 | 468000 | -140000 | 98 | 106 |
| 415000 | 468000 | -53000 | 98 | 107 |
| 340500 | 468000 | -127500 | 98 | 108 |
| 309600 | 468000 | -158400 | 98 | 109 |
| 341900 | 468000 | -126100 | 98 | 110 |
| 379700 | 468000 | -88300 | 98 | 111 |
| 337700 | 468000 | -130300 | 98 | 112 |
| | | | | |
| 415000 | 328000 | 87000 | 99 | 112 |
| 340500 | 328000 | 12500 | 100 | 112 |
| 309600 | 328000 | -18400 | 100 | 113 |

| | | | | |
|---|---|---|---|---|
| 341900 | 328000 | 13900 | 101 | 113 |
| 379700 | 328000 | 51700 | 102 | 113 |
| 337700 | 328000 | 9700 | 103 | 113 |
| | | | | |
| 340500 | 415000 | -74500 | 103 | 114 |
| 309600 | 415000 | -105400 | 103 | 115 |
| 341900 | 415000 | -73100 | 103 | 116 |
| 379700 | 415000 | -35300 | 103 | 117 |
| 337700 | 415000 | -77300 | 103 | 118 |
| | | | | |
| 309600 | 340500 | -30900 | 103 | 119 |
| 341900 | 340500 | 1400 | 104 | 119 |
| 379700 | 340500 | 39200 | 105 | 119 |
| 337700 | 340500 | -2800 | 105 | 120 |
| | | | | |
| 341900 | 309600 | 32300 | 106 | 120 |
| 379700 | 309600 | 70100 | 107 | 120 |
| 337700 | 309600 | 28100 | 108 | 120 |
| | | | | |
| 379700 | 341900 | 37800 | 109 | 120 |
| 337700 | 341900 | -4200 | 109 | 121 |
| | | | | |
| 337700 | 379700 | -42000 | 109 | 122 |

S Statistic = 109 - 122 = -13

| Tied Group | Value | Members |
|---|---|---|
| 1 | 355000 | 4 |
| 2 | 363000 | 4 |

| Time Period | Observations |
|---|---|
| 5/1/2019 | 10 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 312
B = 2250
C = 48
D = 720
E = 24
F = 90
a = 29256
b = 109296

c = 1104
Group Variance = 1485.27
Z-Score = -0.311371
Comparison Level at 95% confidence level = 1.65463 (upward trend)
-0.311371 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RWB-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 18.4 | 17.6 1c2c | Same Date | 0 | 0 |
| 9.7 J | 17.6 1c2c | Same Date | 0 | 0 |
| 9.7 J | 17.6 1c2c | Same Date | 0 | 0 |
| 19.5 | 17.6 1c2c | Same Date | 0 | 0 |
| 19.5 | 17.6 1c2c | Same Date | 0 | 0 |
| 9.7 J | 17.6 1c2c | Same Date | 0 | 0 |
| 9.7 J | 17.6 1c2c | Same Date | 0 | 0 |
| 19.5 | 17.6 1c2c | Same Date | 0 | 0 |
| 19.5 | 17.6 1c2c | Same Date | 0 | 0 |
| 29.2 | 17.6 1c2c | 11.6 | 1 | 0 |
| 47.8 | 17.6 1c2c | 30.2 | 2 | 0 |
| 8.9 J | 17.6 1c2c | -8.7 | 2 | 1 |
| 8.4 J | 17.6 1c2c | -9.2 | 2 | 2 |
| 15.2 1c | 17.6 1c2c | -2.4 | 2 | 3 |
| 13.5 1c | 17.6 1c2c | -4.1 | 2 | 4 |
| 13.6 | 17.6 1c2c | -4 | 2 | 5 |
| 19.1 J | 17.6 1c2c | 1.5 | 3 | 5 |
| 16.7 J | 17.6 1c2c | -0.9 | 3 | 6 |
| 18.9 | 17.6 1c2c | 1.3 | 4 | 6 |
| 17.14 | 17.6 1c2c | -0.46 | 4 | 7 |
| 19.29 | 17.6 1c2c | 1.69 | 5 | 7 |
| 20.29 | 17.6 1c2c | 2.69 | 6 | 7 |
| 14.63 | 17.6 1c2c | -2.97 | 6 | 8 |
| | | | | |
| 9.7 J | 18.4 | Same Date | 6 | 8 |
| 9.7 J | 18.4 | Same Date | 6 | 8 |
| 19.5 | 18.4 | Same Date | 6 | 8 |
| 19.5 | 18.4 | Same Date | 6 | 8 |
| 9.7 J | 18.4 | Same Date | 6 | 8 |
| 9.7 J | 18.4 | Same Date | 6 | 8 |
| 19.5 | 18.4 | Same Date | 6 | 8 |
| 19.5 | 18.4 | Same Date | 6 | 8 |
| 29.2 | 18.4 | 10.8 | 7 | 8 |
| 47.8 | 18.4 | 29.4 | 8 | 8 |
| 8.9 J | 18.4 | -9.5 | 8 | 9 |
| 8.4 J | 18.4 | -10 | 8 | 10 |
| 15.2 1c | 18.4 | -3.2 | 8 | 11 |
| 13.5 1c | 18.4 | -4.9 | 8 | 12 |
| 13.6 | 18.4 | -4.8 | 8 | 13 |
| 19.1 J | 18.4 | 0.7 | 9 | 13 |
| 16.7 J | 18.4 | -1.7 | 9 | 14 |
| 18.9 | 18.4 | 0.5 | 10 | 14 |
| 17.14 | 18.4 | -1.26 | 10 | 15 |
| 19.29 | 18.4 | 0.89 | 11 | 15 |
| 20.29 | 18.4 | 1.89 | 12 | 15 |
| 14.63 | 18.4 | -3.77 | 12 | 16 |

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|---|---|---|---|---|
| 9.7 J | 9.7 J | Same Date | 12 | 16 |
| 19.5 | 9.7 J | Same Date | 12 | 16 |
| 19.5 | 9.7 J | Same Date | 12 | 16 |
| 9.7 J | 9.7 J | Same Date | 12 | 16 |
| 9.7 J | 9.7 J | Same Date | 12 | 16 |
| 19.5 | 9.7 J | Same Date | 12 | 16 |
| 19.5 | 9.7 J | Same Date | 12 | 16 |
| 29.2 | 9.7 J | 19.5 | 13 | 16 |
| 47.8 | 9.7 J | 38.1 | 14 | 16 |
| 8.9 J | 9.7 J | -0.8 | 14 | 17 |
| 8.4 J | 9.7 J | -1.3 | 14 | 18 |
| 15.2 1c | 9.7 J | 5.5 | 15 | 18 |
| 13.5 1c | 9.7 J | 3.8 | 16 | 18 |
| 13.6 | 9.7 J | 3.9 | 17 | 18 |
| 19.1 J | 9.7 J | 9.4 | 18 | 18 |
| 16.7 J | 9.7 J | 7 | 19 | 18 |
| 18.9 | 9.7 J | 9.2 | 20 | 18 |
| 17.14 | 9.7 J | 7.44 | 21 | 18 |
| 19.29 | 9.7 J | 9.59 | 22 | 18 |
| 20.29 | 9.7 J | 10.59 | 23 | 18 |
| 14.63 | 9.7 J | 4.93 | 24 | 18 |
| | | | | |
| 19.5 | 9.7 J | Same Date | 24 | 18 |
| 19.5 | 9.7 J | Same Date | 24 | 18 |
| 9.7 J | 9.7 J | Same Date | 24 | 18 |
| 9.7 J | 9.7 J | Same Date | 24 | 18 |
| 19.5 | 9.7 J | Same Date | 24 | 18 |
| 19.5 | 9.7 J | Same Date | 24 | 18 |
| 29.2 | 9.7 J | 19.5 | 25 | 18 |
| 47.8 | 9.7 J | 38.1 | 26 | 18 |
| 8.9 J | 9.7 J | -0.8 | 26 | 19 |
| 8.4 J | 9.7 J | -1.3 | 26 | 20 |
| 15.2 1c | 9.7 J | 5.5 | 27 | 20 |
| 13.5 1c | 9.7 J | 3.8 | 28 | 20 |
| 13.6 | 9.7 J | 3.9 | 29 | 20 |
| 19.1 J | 9.7 J | 9.4 | 30 | 20 |
| 16.7 J | 9.7 J | 7 | 31 | 20 |
| 18.9 | 9.7 J | 9.2 | 32 | 20 |
| 17.14 | 9.7 J | 7.44 | 33 | 20 |
| 19.29 | 9.7 J | 9.59 | 34 | 20 |
| 20.29 | 9.7 J | 10.59 | 35 | 20 |
| 14.63 | 9.7 J | 4.93 | 36 | 20 |
| | | | | |
| 19.5 | 19.5 | Same Date | 36 | 20 |
| 9.7 J | 19.5 | Same Date | 36 | 20 |
| 9.7 J | 19.5 | Same Date | 36 | 20 |
| 19.5 | 19.5 | Same Date | 36 | 20 |
| 19.5 | 19.5 | Same Date | 36 | 20 |
| 29.2 | 19.5 | 9.7 | 37 | 20 |
| 47.8 | 19.5 | 28.3 | 38 | 20 |
| 8.9 J | 19.5 | -10.6 | 38 | 21 |
| 8.4 J | 19.5 | -11.1 | 38 | 22 |
| 15.2 1c | 19.5 | -4.3 | 38 | 23 |
| 13.5 1c | 19.5 | -6 | 38 | 24 |
| 13.6 | 19.5 | -5.9 | 38 | 25 |
| 19.1 J | 19.5 | -0.4 | 38 | 26 |
| 16.7 J | 19.5 | -2.8 | 38 | 27 |

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|---|---|---|---|---|
| 18.9 | 19.5 | -0.6 | 38 | 28 |
| 17.14 | 19.5 | -2.36 | 38 | 29 |
| 19.29 | 19.5 | -0.21 | 38 | 30 |
| 20.29 | 19.5 | 0.79 | 39 | 30 |
| 14.63 | 19.5 | -4.87 | 39 | 31 |
| | | | | |
| 9.7 J | 19.5 | Same Date | 39 | 31 |
| 9.7 J | 19.5 | Same Date | 39 | 31 |
| 19.5 | 19.5 | Same Date | 39 | 31 |
| 19.5 | 19.5 | Same Date | 39 | 31 |
| 29.2 | 19.5 | 9.7 | 40 | 31 |
| 47.8 | 19.5 | 28.3 | 41 | 31 |
| 8.9 J | 19.5 | -10.6 | 41 | 32 |
| 8.4 J | 19.5 | -11.1 | 41 | 33 |
| 15.2 1c | 19.5 | -4.3 | 41 | 34 |
| 13.5 1c | 19.5 | -6 | 41 | 35 |
| 13.6 | 19.5 | -5.9 | 41 | 36 |
| 19.1 J | 19.5 | -0.4 | 41 | 37 |
| 16.7 J | 19.5 | -2.8 | 41 | 38 |
| 18.9 | 19.5 | -0.6 | 41 | 39 |
| 17.14 | 19.5 | -2.36 | 41 | 40 |
| 19.29 | 19.5 | -0.21 | 41 | 41 |
| 20.29 | 19.5 | 0.79 | 42 | 41 |
| 14.63 | 19.5 | -4.87 | 42 | 42 |
| | | | | |
| 9.7 J | 9.7 J | Same Date | 42 | 42 |
| 19.5 | 9.7 J | Same Date | 42 | 42 |
| 19.5 | 9.7 J | Same Date | 42 | 42 |
| 29.2 | 9.7 J | 19.5 | 43 | 42 |
| 47.8 | 9.7 J | 38.1 | 44 | 42 |
| 8.9 J | 9.7 J | -0.8 | 44 | 43 |
| 8.4 J | 9.7 J | -1.3 | 44 | 44 |
| 15.2 1c | 9.7 J | 5.5 | 45 | 44 |
| 13.5 1c | 9.7 J | 3.8 | 46 | 44 |
| 13.6 | 9.7 J | 3.9 | 47 | 44 |
| 19.1 J | 9.7 J | 9.4 | 48 | 44 |
| 16.7 J | 9.7 J | 7 | 49 | 44 |
| 18.9 | 9.7 J | 9.2 | 50 | 44 |
| 17.14 | 9.7 J | 7.44 | 51 | 44 |
| 19.29 | 9.7 J | 9.59 | 52 | 44 |
| 20.29 | 9.7 J | 10.59 | 53 | 44 |
| 14.63 | 9.7 J | 4.93 | 54 | 44 |
| | | | | |
| 19.5 | 9.7 J | Same Date | 54 | 44 |
| 19.5 | 9.7 J | Same Date | 54 | 44 |
| 29.2 | 9.7 J | 19.5 | 55 | 44 |
| 47.8 | 9.7 J | 38.1 | 56 | 44 |
| 8.9 J | 9.7 J | -0.8 | 56 | 45 |
| 8.4 J | 9.7 J | -1.3 | 56 | 46 |
| 15.2 1c | 9.7 J | 5.5 | 57 | 46 |
| 13.5 1c | 9.7 J | 3.8 | 58 | 46 |
| 13.6 | 9.7 J | 3.9 | 59 | 46 |
| 19.1 J | 9.7 J | 9.4 | 60 | 46 |
| 16.7 J | 9.7 J | 7 | 61 | 46 |
| 18.9 | 9.7 J | 9.2 | 62 | 46 |
| 17.14 | 9.7 J | 7.44 | 63 | 46 |
| 19.29 | 9.7 J | 9.59 | 64 | 46 |

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|---|---|---|---|---|
| 20.29 | 9.7 J | 10.59 | 65 | 46 |
| 14.63 | 9.7 J | 4.93 | 66 | 46 |
| | | | | |
| 19.5 | 19.5 | Same Date | 66 | 46 |
| 29.2 | 19.5 | 9.7 | 67 | 46 |
| 47.8 | 19.5 | 28.3 | 68 | 46 |
| 8.9 J | 19.5 | -10.6 | 68 | 47 |
| 8.4 J | 19.5 | -11.1 | 68 | 48 |
| 15.2 1c | 19.5 | -4.3 | 68 | 49 |
| 13.5 1c | 19.5 | -6 | 68 | 50 |
| 13.6 | 19.5 | -5.9 | 68 | 51 |
| 19.1 J | 19.5 | -0.4 | 68 | 52 |
| 16.7 J | 19.5 | -2.8 | 68 | 53 |
| 18.9 | 19.5 | -0.6 | 68 | 54 |
| 17.14 | 19.5 | -2.36 | 68 | 55 |
| 19.29 | 19.5 | -0.21 | 68 | 56 |
| 20.29 | 19.5 | 0.79 | 69 | 56 |
| 14.63 | 19.5 | -4.87 | 69 | 57 |
| | | | | |
| 29.2 | 19.5 | 9.7 | 70 | 57 |
| 47.8 | 19.5 | 28.3 | 71 | 57 |
| 8.9 J | 19.5 | -10.6 | 71 | 58 |
| 8.4 J | 19.5 | -11.1 | 71 | 59 |
| 15.2 1c | 19.5 | -4.3 | 71 | 60 |
| 13.5 1c | 19.5 | -6 | 71 | 61 |
| 13.6 | 19.5 | -5.9 | 71 | 62 |
| 19.1 J | 19.5 | -0.4 | 71 | 63 |
| 16.7 J | 19.5 | -2.8 | 71 | 64 |
| 18.9 | 19.5 | -0.6 | 71 | 65 |
| 17.14 | 19.5 | -2.36 | 71 | 66 |
| 19.29 | 19.5 | -0.21 | 71 | 67 |
| 20.29 | 19.5 | 0.79 | 72 | 67 |
| 14.63 | 19.5 | -4.87 | 72 | 68 |
| | | | | |
| 47.8 | 29.2 | 18.6 | 73 | 68 |
| 8.9 J | 29.2 | -20.3 | 73 | 69 |
| 8.4 J | 29.2 | -20.8 | 73 | 70 |
| 15.2 1c | 29.2 | -14 | 73 | 71 |
| 13.5 1c | 29.2 | -15.7 | 73 | 72 |
| 13.6 | 29.2 | -15.6 | 73 | 73 |
| 19.1 J | 29.2 | -10.1 | 73 | 74 |
| 16.7 J | 29.2 | -12.5 | 73 | 75 |
| 18.9 | 29.2 | -10.3 | 73 | 76 |
| 17.14 | 29.2 | -12.06 | 73 | 77 |
| 19.29 | 29.2 | -9.91 | 73 | 78 |
| 20.29 | 29.2 | -8.91 | 73 | 79 |
| 14.63 | 29.2 | -14.57 | 73 | 80 |
| | | | | |
| 8.9 J | 47.8 | -38.9 | 73 | 81 |
| 8.4 J | 47.8 | -39.4 | 73 | 82 |
| 15.2 1c | 47.8 | -32.6 | 73 | 83 |
| 13.5 1c | 47.8 | -34.3 | 73 | 84 |
| 13.6 | 47.8 | -34.2 | 73 | 85 |
| 19.1 J | 47.8 | -28.7 | 73 | 86 |
| 16.7 J | 47.8 | -31.1 | 73 | 87 |
| 18.9 | 47.8 | -28.9 | 73 | 88 |
| 17.14 | 47.8 | -30.66 | 73 | 89 |

| | | | | |
|---|---|---|---|---|
| 19.29 | 47.8 | -28.51 | 73 | 90 |
| 20.29 | 47.8 | -27.51 | 73 | 91 |
| 14.63 | 47.8 | -33.17 | 73 | 92 |
| | | | | |
| 8.4 J | 8.9 J | -0.5 | 73 | 93 |
| 15.2 1c | 8.9 J | 6.3 | 74 | 93 |
| 13.5 1c | 8.9 J | 4.6 | 75 | 93 |
| 13.6 | 8.9 J | 4.7 | 76 | 93 |
| 19.1 J | 8.9 J | 10.2 | 77 | 93 |
| 16.7 J | 8.9 J | 7.8 | 78 | 93 |
| 18.9 | 8.9 J | 10 | 79 | 93 |
| 17.14 | 8.9 J | 8.24 | 80 | 93 |
| 19.29 | 8.9 J | 10.39 | 81 | 93 |
| 20.29 | 8.9 J | 11.39 | 82 | 93 |
| 14.63 | 8.9 J | 5.73 | 83 | 93 |
| | | | | |
| 15.2 1c | 8.4 J | 6.8 | 84 | 93 |
| 13.5 1c | 8.4 J | 5.1 | 85 | 93 |
| 13.6 | 8.4 J | 5.2 | 86 | 93 |
| 19.1 J | 8.4 J | 10.7 | 87 | 93 |
| 16.7 J | 8.4 J | 8.3 | 88 | 93 |
| 18.9 | 8.4 J | 10.5 | 89 | 93 |
| 17.14 | 8.4 J | 8.74 | 90 | 93 |
| 19.29 | 8.4 J | 10.89 | 91 | 93 |
| 20.29 | 8.4 J | 11.89 | 92 | 93 |
| 14.63 | 8.4 J | 6.23 | 93 | 93 |
| | | | | |
| 13.5 1c | 15.2 1c | -1.7 | 93 | 94 |
| 13.6 | 15.2 1c | -1.6 | 93 | 95 |
| 19.1 J | 15.2 1c | 3.9 | 94 | 95 |
| 16.7 J | 15.2 1c | 1.5 | 95 | 95 |
| 18.9 | 15.2 1c | 3.7 | 96 | 95 |
| 17.14 | 15.2 1c | 1.94 | 97 | 95 |
| 19.29 | 15.2 1c | 4.09 | 98 | 95 |
| 20.29 | 15.2 1c | 5.09 | 99 | 95 |
| 14.63 | 15.2 1c | -0.57 | 99 | 96 |
| | | | | |
| 13.6 | 13.5 1c | 0.1 | 100 | 96 |
| 19.1 J | 13.5 1c | 5.6 | 101 | 96 |
| 16.7 J | 13.5 1c | 3.2 | 102 | 96 |
| 18.9 | 13.5 1c | 5.4 | 103 | 96 |
| 17.14 | 13.5 1c | 3.64 | 104 | 96 |
| 19.29 | 13.5 1c | 5.79 | 105 | 96 |
| 20.29 | 13.5 1c | 6.79 | 106 | 96 |
| 14.63 | 13.5 1c | 1.13 | 107 | 96 |
| | | | | |
| 19.1 J | 13.6 | 5.5 | 108 | 96 |
| 16.7 J | 13.6 | 3.1 | 109 | 96 |
| 18.9 | 13.6 | 5.3 | 110 | 96 |
| 17.14 | 13.6 | 3.54 | 111 | 96 |
| 19.29 | 13.6 | 5.69 | 112 | 96 |
| 20.29 | 13.6 | 6.69 | 113 | 96 |
| 14.63 | 13.6 | 1.03 | 114 | 96 |
| | | | | |
| 16.7 J | 19.1 J | -2.4 | 114 | 97 |
| 18.9 | 19.1 J | -0.2 | 114 | 98 |
| 17.14 | 19.1 J | -1.96 | 114 | 99 |

| | | | | |
|---|---|---|---|---|
| 19.29 | 19.1 J | 0.19 | 115 | 99 |
| 20.29 | 19.1 J | 1.19 | 116 | 99 |
| 14.63 | 19.1 J | -4.47 | 116 | 100 |
| | | | | |
| 18.9 | 16.7 J | 2.2 | 117 | 100 |
| 17.14 | 16.7 J | 0.44 | 118 | 100 |
| 19.29 | 16.7 J | 2.59 | 119 | 100 |
| 20.29 | 16.7 J | 3.59 | 120 | 100 |
| 14.63 | 16.7 J | -2.07 | 120 | 101 |
| | | | | |
| 17.14 | 18.9 | -1.76 | 120 | 102 |
| 19.29 | 18.9 | 0.39 | 121 | 102 |
| 20.29 | 18.9 | 1.39 | 122 | 102 |
| 14.63 | 18.9 | -4.27 | 122 | 103 |
| | | | | |
| 19.29 | 17.14 | 2.15 | 123 | 103 |
| 20.29 | 17.14 | 3.15 | 124 | 103 |
| 14.63 | 17.14 | -2.51 | 124 | 104 |
| | | | | |
| 20.29 | 19.29 | 1 | 125 | 104 |
| 14.63 | 19.29 | -4.66 | 125 | 105 |
| | | | | |
| 14.63 | 20.29 | -5.66 | 125 | 106 |

S Statistic = 125 - 106 = 19

| Tied Group | Value | Members |
|---|---|---|
| 1 | 9.7 | 4 |
| 2 | 19.5 | 4 |

| Time Period | Observations |
|---|---|
| 5/1/2019 | 10 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 312
B = 2250
C = 48
D = 720
E = 24
F = 90
a = 29256
b = 109296

c = 1104
Group Variance = 1485.27
Z-Score = 0.467056
Comparison Level at 95% confidence level = 1.65463 (upward trend)
0.467056 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RWD-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 37700 1c3c | 36200 M62c | Same Date | 0 | 0 |
| 41900 | 36200 M62c | 5700 | 1 | 0 |
| 52600 | 36200 M62c | 16400 | 2 | 0 |
| 50400 | 36200 M62c | 14200 | 3 | 0 |
| 59300 | 36200 M62c | 23100 | 4 | 0 |
| 69300 1c | 36200 M62c | 33100 | 5 | 0 |
| 64200 1c | 36200 M62c | 28000 | 6 | 0 |
| 81900 | 36200 M62c | 45700 | 7 | 0 |
| 53400 | 36200 M62c | 17200 | 8 | 0 |
| 47200 | 36200 M62c | 11000 | 9 | 0 |
| 49020 | 36200 M62c | 12820 | 10 | 0 |
| 49020 | 36200 M62c | 12820 | 11 | 0 |
| 46840 | 36200 M62c | 10640 | 12 | 0 |
| 47480 | 36200 M62c | 11280 | 13 | 0 |
| 73990 | 36200 M62c | 37790 | 14 | 0 |
| 93910 | 36200 M62c | 57710 | 15 | 0 |
| | | | | |
| 41900 | 37700 1c3c | 4200 | 16 | 0 |
| 52600 | 37700 1c3c | 14900 | 17 | 0 |
| 50400 | 37700 1c3c | 12700 | 18 | 0 |
| 59300 | 37700 1c3c | 21600 | 19 | 0 |
| 69300 1c | 37700 1c3c | 31600 | 20 | 0 |
| 64200 1c | 37700 1c3c | 26500 | 21 | 0 |
| 81900 | 37700 1c3c | 44200 | 22 | 0 |
| 53400 | 37700 1c3c | 15700 | 23 | 0 |
| 47200 | 37700 1c3c | 9500 | 24 | 0 |
| 49020 | 37700 1c3c | 11320 | 25 | 0 |
| 49020 | 37700 1c3c | 11320 | 26 | 0 |
| 46840 | 37700 1c3c | 9140 | 27 | 0 |
| 47480 | 37700 1c3c | 9780 | 28 | 0 |
| 73990 | 37700 1c3c | 36290 | 29 | 0 |
| 93910 | 37700 1c3c | 56210 | 30 | 0 |
| | | | | |
| 52600 | 41900 | 10700 | 31 | 0 |
| 50400 | 41900 | 8500 | 32 | 0 |
| 59300 | 41900 | 17400 | 33 | 0 |
| 69300 1c | 41900 | 27400 | 34 | 0 |
| 64200 1c | 41900 | 22300 | 35 | 0 |
| 81900 | 41900 | 40000 | 36 | 0 |
| 53400 | 41900 | 11500 | 37 | 0 |
| 47200 | 41900 | 5300 | 38 | 0 |
| 49020 | 41900 | 7120 | 39 | 0 |
| 49020 | 41900 | 7120 | 40 | 0 |
| 46840 | 41900 | 4940 | 41 | 0 |
| 47480 | 41900 | 5580 | 42 | 0 |
| 73990 | 41900 | 32090 | 43 | 0 |
| 93910 | 41900 | 52010 | 44 | 0 |

| | | | | |
|---|---|---|---|---|
| 50400 | 52600 | -2200 | 44 | 1 |
| 59300 | 52600 | 6700 | 45 | 1 |
| 69300 1c | 52600 | 16700 | 46 | 1 |
| 64200 1c | 52600 | 11600 | 47 | 1 |
| 81900 | 52600 | 29300 | 48 | 1 |
| 53400 | 52600 | 800 | 49 | 1 |
| 47200 | 52600 | -5400 | 49 | 2 |
| 49020 | 52600 | -3580 | 49 | 3 |
| 49020 | 52600 | -3580 | 49 | 4 |
| 46840 | 52600 | -5760 | 49 | 5 |
| 47480 | 52600 | -5120 | 49 | 6 |
| 73990 | 52600 | 21390 | 50 | 6 |
| 93910 | 52600 | 41310 | 51 | 6 |
| | | | | |
| 59300 | 50400 | 8900 | 52 | 6 |
| 69300 1c | 50400 | 18900 | 53 | 6 |
| 64200 1c | 50400 | 13800 | 54 | 6 |
| 81900 | 50400 | 31500 | 55 | 6 |
| 53400 | 50400 | 3000 | 56 | 6 |
| 47200 | 50400 | -3200 | 56 | 7 |
| 49020 | 50400 | -1380 | 56 | 8 |
| 49020 | 50400 | -1380 | 56 | 9 |
| 46840 | 50400 | -3560 | 56 | 10 |
| 47480 | 50400 | -2920 | 56 | 11 |
| 73990 | 50400 | 23590 | 57 | 11 |
| 93910 | 50400 | 43510 | 58 | 11 |
| | | | | |
| 69300 1c | 59300 | 10000 | 59 | 11 |
| 64200 1c | 59300 | 4900 | 60 | 11 |
| 81900 | 59300 | 22600 | 61 | 11 |
| 53400 | 59300 | -5900 | 61 | 12 |
| 47200 | 59300 | -12100 | 61 | 13 |
| 49020 | 59300 | -10280 | 61 | 14 |
| 49020 | 59300 | -10280 | 61 | 15 |
| 46840 | 59300 | -12460 | 61 | 16 |
| 47480 | 59300 | -11820 | 61 | 17 |
| 73990 | 59300 | 14690 | 62 | 17 |
| 93910 | 59300 | 34610 | 63 | 17 |
| | | | | |
| 64200 1c | 69300 1c | -5100 | 63 | 18 |
| 81900 | 69300 1c | 12600 | 64 | 18 |
| 53400 | 69300 1c | -15900 | 64 | 19 |
| 47200 | 69300 1c | -22100 | 64 | 20 |
| 49020 | 69300 1c | -20280 | 64 | 21 |
| 49020 | 69300 1c | -20280 | 64 | 22 |
| 46840 | 69300 1c | -22460 | 64 | 23 |
| 47480 | 69300 1c | -21820 | 64 | 24 |
| 73990 | 69300 1c | 4690 | 65 | 24 |
| 93910 | 69300 1c | 24610 | 66 | 24 |
| | | | | |
| 81900 | 64200 1c | 17700 | 67 | 24 |
| 53400 | 64200 1c | -10800 | 67 | 25 |
| 47200 | 64200 1c | -17000 | 67 | 26 |
| 49020 | 64200 1c | -15180 | 67 | 27 |
| 49020 | 64200 1c | -15180 | 67 | 28 |
| 46840 | 64200 1c | -17360 | 67 | 29 |

| | | | | |
|---|---|---|---|---|
| 47480 | 64200 1c | -16720 | 67 | 30 |
| 73990 | 64200 1c | 9790 | 68 | 30 |
| 93910 | 64200 1c | 29710 | 69 | 30 |
| | | | | |
| 53400 | 81900 | -28500 | 69 | 31 |
| 47200 | 81900 | -34700 | 69 | 32 |
| 49020 | 81900 | -32880 | 69 | 33 |
| 49020 | 81900 | -32880 | 69 | 34 |
| 46840 | 81900 | -35060 | 69 | 35 |
| 47480 | 81900 | -34420 | 69 | 36 |
| 73990 | 81900 | -7910 | 69 | 37 |
| 93910 | 81900 | 12010 | 70 | 37 |
| | | | | |
| 47200 | 53400 | -6200 | 70 | 38 |
| 49020 | 53400 | -4380 | 70 | 39 |
| 49020 | 53400 | -4380 | 70 | 40 |
| 46840 | 53400 | -6560 | 70 | 41 |
| 47480 | 53400 | -5920 | 70 | 42 |
| 73990 | 53400 | 20590 | 71 | 42 |
| 93910 | 53400 | 40510 | 72 | 42 |
| | | | | |
| 49020 | 47200 | 1820 | 73 | 42 |
| 49020 | 47200 | 1820 | 74 | 42 |
| 46840 | 47200 | -360 | 74 | 43 |
| 47480 | 47200 | 280 | 75 | 43 |
| 73990 | 47200 | 26790 | 76 | 43 |
| 93910 | 47200 | 46710 | 77 | 43 |
| | | | | |
| 49020 | 49020 | Same Date | 77 | 43 |
| 46840 | 49020 | -2180 | 77 | 44 |
| 47480 | 49020 | -1540 | 77 | 45 |
| 73990 | 49020 | 24970 | 78 | 45 |
| 93910 | 49020 | 44890 | 79 | 45 |
| | | | | |
| 46840 | 49020 | -2180 | 79 | 46 |
| 47480 | 49020 | -1540 | 79 | 47 |
| 73990 | 49020 | 24970 | 80 | 47 |
| 93910 | 49020 | 44890 | 81 | 47 |
| | | | | |
| 47480 | 46840 | 640 | 82 | 47 |
| 73990 | 46840 | 27150 | 83 | 47 |
| 93910 | 46840 | 47070 | 84 | 47 |
| | | | | |
| 73990 | 47480 | 26510 | 85 | 47 |
| 93910 | 47480 | 46430 | 86 | 47 |
| | | | | |
| 93910 | 73990 | 19920 | 87 | 47 |

S Statistic = 87 - 47 = 40

| Tied Group | Value | Members |
|---|---|---|
| 1 | 49020 | 2 |

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |

| | |
|---|---|
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 2 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 2 time periods with multiple data

---

A = 18
B = 36
C = 0
D = 0
E = 2
F = 4
a = 10608
b = 36720
c = 544
Group Variance = 586.348
Z-Score = 1.6106
Comparison Level at 95% confidence level = 1.65463 (upward trend)
1.6106 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RWE-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 121000 M61c3c | 112000 2c | Same Date | 0 | 0 |
| 109000 | 112000 2c | -3000 | 0 | 1 |
| 118000 | 112000 2c | 6000 | 1 | 1 |
| 102000 ML | 112000 2c | -10000 | 1 | 2 |
| 114000 ML | 112000 2c | 2000 | 2 | 2 |
| 110000 1c | 112000 2c | -2000 | 2 | 3 |
| 80800 1c | 112000 2c | -31200 | 2 | 4 |
| 102000 | 112000 2c | -10000 | 2 | 5 |
| 68000 | 112000 2c | -44000 | 2 | 6 |
| 62700 | 112000 2c | -49300 | 2 | 7 |
| 58890 | 112000 2c | -53110 | 2 | 8 |
| 58890 | 112000 2c | -53110 | 2 | 9 |
| 53380 | 112000 2c | -58620 | 2 | 10 |
| 61680 | 112000 2c | -50320 | 2 | 11 |
| 67550 | 112000 2c | -44450 | 2 | 12 |
| 70970 | 112000 2c | -41030 | 2 | 13 |
| | | | | |
| 109000 | 121000 M61c3c | -12000 | 2 | 14 |
| 118000 | 121000 M61c3c | -3000 | 2 | 15 |
| 102000 ML | 121000 M61c3c | -19000 | 2 | 16 |
| 114000 ML | 121000 M61c3c | -7000 | 2 | 17 |
| 110000 1c | 121000 M61c3c | -11000 | 2 | 18 |
| 80800 1c | 121000 M61c3c | -40200 | 2 | 19 |
| 102000 | 121000 M61c3c | -19000 | 2 | 20 |
| 68000 | 121000 M61c3c | -53000 | 2 | 21 |
| 62700 | 121000 M61c3c | -58300 | 2 | 22 |
| 58890 | 121000 M61c3c | -62110 | 2 | 23 |
| 58890 | 121000 M61c3c | -62110 | 2 | 24 |
| 53380 | 121000 M61c3c | -67620 | 2 | 25 |
| 61680 | 121000 M61c3c | -59320 | 2 | 26 |
| 67550 | 121000 M61c3c | -53450 | 2 | 27 |
| 70970 | 121000 M61c3c | -50030 | 2 | 28 |
| | | | | |
| 118000 | 109000 | 9000 | 3 | 28 |
| 102000 ML | 109000 | -7000 | 3 | 29 |
| 114000 ML | 109000 | 5000 | 4 | 29 |
| 110000 1c | 109000 | 1000 | 5 | 29 |
| 80800 1c | 109000 | -28200 | 5 | 30 |
| 102000 | 109000 | -7000 | 5 | 31 |
| 68000 | 109000 | -41000 | 5 | 32 |
| 62700 | 109000 | -46300 | 5 | 33 |
| 58890 | 109000 | -50110 | 5 | 34 |
| 58890 | 109000 | -50110 | 5 | 35 |
| 53380 | 109000 | -55620 | 5 | 36 |
| 61680 | 109000 | -47320 | 5 | 37 |
| 67550 | 109000 | -41450 | 5 | 38 |
| 70970 | 109000 | -38030 | 5 | 39 |

| | | | | |
|---|---|---|---|---|
| 102000 ML | 118000 | -16000 | 5 | 40 |
| 114000 ML | 118000 | -4000 | 5 | 41 |
| 110000 1c | 118000 | -8000 | 5 | 42 |
| 80800 1c | 118000 | -37200 | 5 | 43 |
| 102000 | 118000 | -16000 | 5 | 44 |
| 68000 | 118000 | -50000 | 5 | 45 |
| 62700 | 118000 | -55300 | 5 | 46 |
| 58890 | 118000 | -59110 | 5 | 47 |
| 58890 | 118000 | -59110 | 5 | 48 |
| 53380 | 118000 | -64620 | 5 | 49 |
| 61680 | 118000 | -56320 | 5 | 50 |
| 67550 | 118000 | -50450 | 5 | 51 |
| 70970 | 118000 | -47030 | 5 | 52 |
| | | | | |
| 114000 ML | 102000 ML | 12000 | 6 | 52 |
| 110000 1c | 102000 ML | 8000 | 7 | 52 |
| 80800 1c | 102000 ML | -21200 | 7 | 53 |
| 102000 | 102000 ML | 0 | 7 | 53 |
| 68000 | 102000 ML | -34000 | 7 | 54 |
| 62700 | 102000 ML | -39300 | 7 | 55 |
| 58890 | 102000 ML | -43110 | 7 | 56 |
| 58890 | 102000 ML | -43110 | 7 | 57 |
| 53380 | 102000 ML | -48620 | 7 | 58 |
| 61680 | 102000 ML | -40320 | 7 | 59 |
| 67550 | 102000 ML | -34450 | 7 | 60 |
| 70970 | 102000 ML | -31030 | 7 | 61 |
| | | | | |
| 110000 1c | 114000 ML | -4000 | 7 | 62 |
| 80800 1c | 114000 ML | -33200 | 7 | 63 |
| 102000 | 114000 ML | -12000 | 7 | 64 |
| 68000 | 114000 ML | -46000 | 7 | 65 |
| 62700 | 114000 ML | -51300 | 7 | 66 |
| 58890 | 114000 ML | -55110 | 7 | 67 |
| 58890 | 114000 ML | -55110 | 7 | 68 |
| 53380 | 114000 ML | -60620 | 7 | 69 |
| 61680 | 114000 ML | -52320 | 7 | 70 |
| 67550 | 114000 ML | -46450 | 7 | 71 |
| 70970 | 114000 ML | -43030 | 7 | 72 |
| | | | | |
| 80800 1c | 110000 1c | -29200 | 7 | 73 |
| 102000 | 110000 1c | -8000 | 7 | 74 |
| 68000 | 110000 1c | -42000 | 7 | 75 |
| 62700 | 110000 1c | -47300 | 7 | 76 |
| 58890 | 110000 1c | -51110 | 7 | 77 |
| 58890 | 110000 1c | -51110 | 7 | 78 |
| 53380 | 110000 1c | -56620 | 7 | 79 |
| 61680 | 110000 1c | -48320 | 7 | 80 |
| 67550 | 110000 1c | -42450 | 7 | 81 |
| 70970 | 110000 1c | -39030 | 7 | 82 |
| | | | | |
| 102000 | 80800 1c | 21200 | 8 | 82 |
| 68000 | 80800 1c | -12800 | 8 | 83 |
| 62700 | 80800 1c | -18100 | 8 | 84 |
| 58890 | 80800 1c | -21910 | 8 | 85 |
| 58890 | 80800 1c | -21910 | 8 | 86 |
| 53380 | 80800 1c | -27420 | 8 | 87 |

| | | | | |
|---|---|---|---|---|
| 61680 | 80800 1c | -19120 | 8 | 88 |
| 67550 | 80800 1c | -13250 | 8 | 89 |
| 70970 | 80800 1c | -9830 | 8 | 90 |
| | | | | |
| 68000 | 102000 | -34000 | 8 | 91 |
| 62700 | 102000 | -39300 | 8 | 92 |
| 58890 | 102000 | -43110 | 8 | 93 |
| 58890 | 102000 | -43110 | 8 | 94 |
| 53380 | 102000 | -48620 | 8 | 95 |
| 61680 | 102000 | -40320 | 8 | 96 |
| 67550 | 102000 | -34450 | 8 | 97 |
| 70970 | 102000 | -31030 | 8 | 98 |
| | | | | |
| 62700 | 68000 | -5300 | 8 | 99 |
| 58890 | 68000 | -9110 | 8 | 100 |
| 58890 | 68000 | -9110 | 8 | 101 |
| 53380 | 68000 | -14620 | 8 | 102 |
| 61680 | 68000 | -6320 | 8 | 103 |
| 67550 | 68000 | -450 | 8 | 104 |
| 70970 | 68000 | 2970 | 9 | 104 |
| | | | | |
| 58890 | 62700 | -3810 | 9 | 105 |
| 58890 | 62700 | -3810 | 9 | 106 |
| 53380 | 62700 | -9320 | 9 | 107 |
| 61680 | 62700 | -1020 | 9 | 108 |
| 67550 | 62700 | 4850 | 10 | 108 |
| 70970 | 62700 | 8270 | 11 | 108 |
| | | | | |
| 58890 | 58890 | Same Date | 11 | 108 |
| 53380 | 58890 | -5510 | 11 | 109 |
| 61680 | 58890 | 2790 | 12 | 109 |
| 67550 | 58890 | 8660 | 13 | 109 |
| 70970 | 58890 | 12080 | 14 | 109 |
| | | | | |
| 53380 | 58890 | -5510 | 14 | 110 |
| 61680 | 58890 | 2790 | 15 | 110 |
| 67550 | 58890 | 8660 | 16 | 110 |
| 70970 | 58890 | 12080 | 17 | 110 |
| | | | | |
| 61680 | 53380 | 8300 | 18 | 110 |
| 67550 | 53380 | 14170 | 19 | 110 |
| 70970 | 53380 | 17590 | 20 | 110 |
| | | | | |
| 67550 | 61680 | 5870 | 21 | 110 |
| 70970 | 61680 | 9290 | 22 | 110 |
| | | | | |
| 70970 | 67550 | 3420 | 23 | 110 |

S Statistic = 23 - 110 = -87

| Tied Group | Value | Members |
|---|---|---|
| 1 | 102000 | 2 |
| 2 | 58890 | 2 |

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |

| | |
|---|---|
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 2 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 2 time periods with multiple data

---

A = 36
B = 36
C = 0
D = 0
E = 4
F = 4
a = 10608
b = 36720
c = 544
Group Variance = 585.363
Z-Score = -3.55456
Comparison Level at 95% confidence level = 1.65463 (upward trend)
-3.55456 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RWF-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 41900 M6 | 40700 | Same Date | 0 | 0 |
| 42300 M6 | 40700 | 1600 | 1 | 0 |
| 58800 | 40700 | 18100 | 2 | 0 |
| 90400 | 40700 | 49700 | 3 | 0 |
| 108000 | 40700 | 67300 | 4 | 0 |
| 134000 1c | 40700 | 93300 | 5 | 0 |
| 110000 1c | 40700 | 69300 | 6 | 0 |
| 133000 B | 40700 | 92300 | 7 | 0 |
| 82500 | 40700 | 41800 | 8 | 0 |
| 86800 | 40700 | 46100 | 9 | 0 |
| 89070 | 40700 | 48370 | 10 | 0 |
| 70650 | 40700 | 29950 | 11 | 0 |
| 72380 | 40700 | 31680 | 12 | 0 |
| 58150 | 40700 | 17450 | 13 | 0 |
| 71140 | 40700 | 30440 | 14 | 0 |
| | | | | |
| 42300 M6 | 41900 M6 | 400 | 15 | 0 |
| 58800 | 41900 M6 | 16900 | 16 | 0 |
| 90400 | 41900 M6 | 48500 | 17 | 0 |
| 108000 | 41900 M6 | 66100 | 18 | 0 |
| 134000 1c | 41900 M6 | 92100 | 19 | 0 |
| 110000 1c | 41900 M6 | 68100 | 20 | 0 |
| 133000 B | 41900 M6 | 91100 | 21 | 0 |
| 82500 | 41900 M6 | 40600 | 22 | 0 |
| 86800 | 41900 M6 | 44900 | 23 | 0 |
| 89070 | 41900 M6 | 47170 | 24 | 0 |
| 70650 | 41900 M6 | 28750 | 25 | 0 |
| 72380 | 41900 M6 | 30480 | 26 | 0 |
| 58150 | 41900 M6 | 16250 | 27 | 0 |
| 71140 | 41900 M6 | 29240 | 28 | 0 |
| | | | | |
| 58800 | 42300 M6 | 16500 | 29 | 0 |
| 90400 | 42300 M6 | 48100 | 30 | 0 |
| 108000 | 42300 M6 | 65700 | 31 | 0 |
| 134000 1c | 42300 M6 | 91700 | 32 | 0 |
| 110000 1c | 42300 M6 | 67700 | 33 | 0 |
| 133000 B | 42300 M6 | 90700 | 34 | 0 |
| 82500 | 42300 M6 | 40200 | 35 | 0 |
| 86800 | 42300 M6 | 44500 | 36 | 0 |
| 89070 | 42300 M6 | 46770 | 37 | 0 |
| 70650 | 42300 M6 | 28350 | 38 | 0 |
| 72380 | 42300 M6 | 30080 | 39 | 0 |
| 58150 | 42300 M6 | 15850 | 40 | 0 |
| 71140 | 42300 M6 | 28840 | 41 | 0 |
| | | | | |
| 90400 | 58800 | 31600 | 42 | 0 |
| 108000 | 58800 | 49200 | 43 | 0 |

| | | | | |
|---|---|---|---|---|
| 134000 1c | 58800 | 75200 | 44 | 0 |
| 110000 1c | 58800 | 51200 | 45 | 0 |
| 133000 B | 58800 | 74200 | 46 | 0 |
| 82500 | 58800 | 23700 | 47 | 0 |
| 86800 | 58800 | 28000 | 48 | 0 |
| 89070 | 58800 | 30270 | 49 | 0 |
| 70650 | 58800 | 11850 | 50 | 0 |
| 72380 | 58800 | 13580 | 51 | 0 |
| 58150 | 58800 | -650 | 51 | 1 |
| 71140 | 58800 | 12340 | 52 | 1 |
| | | | | |
| 108000 | 90400 | 17600 | 53 | 1 |
| 134000 1c | 90400 | 43600 | 54 | 1 |
| 110000 1c | 90400 | 19600 | 55 | 1 |
| 133000 B | 90400 | 42600 | 56 | 1 |
| 82500 | 90400 | -7900 | 56 | 2 |
| 86800 | 90400 | -3600 | 56 | 3 |
| 89070 | 90400 | -1330 | 56 | 4 |
| 70650 | 90400 | -19750 | 56 | 5 |
| 72380 | 90400 | -18020 | 56 | 6 |
| 58150 | 90400 | -32250 | 56 | 7 |
| 71140 | 90400 | -19260 | 56 | 8 |
| | | | | |
| 134000 1c | 108000 | 26000 | 57 | 8 |
| 110000 1c | 108000 | 2000 | 58 | 8 |
| 133000 B | 108000 | 25000 | 59 | 8 |
| 82500 | 108000 | -25500 | 59 | 9 |
| 86800 | 108000 | -21200 | 59 | 10 |
| 89070 | 108000 | -18930 | 59 | 11 |
| 70650 | 108000 | -37350 | 59 | 12 |
| 72380 | 108000 | -35620 | 59 | 13 |
| 58150 | 108000 | -49850 | 59 | 14 |
| 71140 | 108000 | -36860 | 59 | 15 |
| | | | | |
| 110000 1c | 134000 1c | -24000 | 59 | 16 |
| 133000 B | 134000 1c | -1000 | 59 | 17 |
| 82500 | 134000 1c | -51500 | 59 | 18 |
| 86800 | 134000 1c | -47200 | 59 | 19 |
| 89070 | 134000 1c | -44930 | 59 | 20 |
| 70650 | 134000 1c | -63350 | 59 | 21 |
| 72380 | 134000 1c | -61620 | 59 | 22 |
| 58150 | 134000 1c | -75850 | 59 | 23 |
| 71140 | 134000 1c | -62860 | 59 | 24 |
| | | | | |
| 133000 B | 110000 1c | 23000 | 60 | 24 |
| 82500 | 110000 1c | -27500 | 60 | 25 |
| 86800 | 110000 1c | -23200 | 60 | 26 |
| 89070 | 110000 1c | -20930 | 60 | 27 |
| 70650 | 110000 1c | -39350 | 60 | 28 |
| 72380 | 110000 1c | -37620 | 60 | 29 |
| 58150 | 110000 1c | -51850 | 60 | 30 |
| 71140 | 110000 1c | -38860 | 60 | 31 |
| | | | | |
| 82500 | 133000 B | -50500 | 60 | 32 |
| 86800 | 133000 B | -46200 | 60 | 33 |
| 89070 | 133000 B | -43930 | 60 | 34 |
| 70650 | 133000 B | -62350 | 60 | 35 |

| | | | | |
|---|---|---|---|---|
| 72380 | 133000 B | -60620 | 60 | 36 |
| 58150 | 133000 B | -74850 | 60 | 37 |
| 71140 | 133000 B | -61860 | 60 | 38 |
| | | | | |
| 86800 | 82500 | 4300 | 61 | 38 |
| 89070 | 82500 | 6570 | 62 | 38 |
| 70650 | 82500 | -11850 | 62 | 39 |
| 72380 | 82500 | -10120 | 62 | 40 |
| 58150 | 82500 | -24350 | 62 | 41 |
| 71140 | 82500 | -11360 | 62 | 42 |
| | | | | |
| 89070 | 86800 | 2270 | 63 | 42 |
| 70650 | 86800 | -16150 | 63 | 43 |
| 72380 | 86800 | -14420 | 63 | 44 |
| 58150 | 86800 | -28650 | 63 | 45 |
| 71140 | 86800 | -15660 | 63 | 46 |
| | | | | |
| 70650 | 89070 | -18420 | 63 | 47 |
| 72380 | 89070 | -16690 | 63 | 48 |
| 58150 | 89070 | -30920 | 63 | 49 |
| 71140 | 89070 | -17930 | 63 | 50 |
| | | | | |
| 72380 | 70650 | 1730 | 64 | 50 |
| 58150 | 70650 | -12500 | 64 | 51 |
| 71140 | 70650 | 490 | 65 | 51 |
| | | | | |
| 58150 | 72380 | -14230 | 65 | 52 |
| 71140 | 72380 | -1240 | 65 | 53 |
| | | | | |
| 71140 | 58150 | 12990 | 66 | 53 |

S Statistic = 66 - 53 = 13

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 0
B = 18
C = 0

D = 0
E = 0
F = 2
a = 8880
b = 30240
c = 480
Group Variance = 492.333
Z-Score = 0.540819
Comparison Level at 95% confidence level = 1.65463 (upward trend)
0.540819 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RWG-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 357 1c3c | 332 2c | Same Date | 0 | 0 |
| 291 | 332 2c | -41 | 0 | 1 |
| 362 | 332 2c | 30 | 1 | 1 |
| 411 | 332 2c | 79 | 2 | 1 |
| 465 | 332 2c | 133 | 3 | 1 |
| 545 1c | 332 2c | 213 | 4 | 1 |
| 522 1c | 332 2c | 190 | 5 | 1 |
| 319 | 332 2c | -13 | 5 | 2 |
| 1090 | 332 2c | 758 | 6 | 2 |
| 1872 | 332 2c | 1540 | 7 | 2 |
| 2787 | 332 2c | 2455 | 8 | 2 |
| | | | | |
| 291 | 357 1c3c | -66 | 8 | 3 |
| 362 | 357 1c3c | 5 | 9 | 3 |
| 411 | 357 1c3c | 54 | 10 | 3 |
| 465 | 357 1c3c | 108 | 11 | 3 |
| 545 1c | 357 1c3c | 188 | 12 | 3 |
| 522 1c | 357 1c3c | 165 | 13 | 3 |
| 319 | 357 1c3c | -38 | 13 | 4 |
| 1090 | 357 1c3c | 733 | 14 | 4 |
| 1872 | 357 1c3c | 1515 | 15 | 4 |
| 2787 | 357 1c3c | 2430 | 16 | 4 |
| | | | | |
| 362 | 291 | 71 | 17 | 4 |
| 411 | 291 | 120 | 18 | 4 |
| 465 | 291 | 174 | 19 | 4 |
| 545 1c | 291 | 254 | 20 | 4 |
| 522 1c | 291 | 231 | 21 | 4 |
| 319 | 291 | 28 | 22 | 4 |
| 1090 | 291 | 799 | 23 | 4 |
| 1872 | 291 | 1581 | 24 | 4 |
| 2787 | 291 | 2496 | 25 | 4 |
| | | | | |
| 411 | 362 | 49 | 26 | 4 |
| 465 | 362 | 103 | 27 | 4 |
| 545 1c | 362 | 183 | 28 | 4 |
| 522 1c | 362 | 160 | 29 | 4 |
| 319 | 362 | -43 | 29 | 5 |
| 1090 | 362 | 728 | 30 | 5 |
| 1872 | 362 | 1510 | 31 | 5 |
| 2787 | 362 | 2425 | 32 | 5 |
| | | | | |
| 465 | 411 | 54 | 33 | 5 |
| 545 1c | 411 | 134 | 34 | 5 |
| 522 1c | 411 | 111 | 35 | 5 |
| 319 | 411 | -92 | 35 | 6 |
| 1090 | 411 | 679 | 36 | 6 |

| | | | | |
|---|---|---|---|---|
| 1872 | 411 | 1461 | 37 | 6 |
| 2787 | 411 | 2376 | 38 | 6 |
| | | | | |
| 545 1c | 465 | 80 | 39 | 6 |
| 522 1c | 465 | 57 | 40 | 6 |
| 319 | 465 | -146 | 40 | 7 |
| 1090 | 465 | 625 | 41 | 7 |
| 1872 | 465 | 1407 | 42 | 7 |
| 2787 | 465 | 2322 | 43 | 7 |
| | | | | |
| 522 1c | 545 1c | -23 | 43 | 8 |
| 319 | 545 1c | -226 | 43 | 9 |
| 1090 | 545 1c | 545 | 44 | 9 |
| 1872 | 545 1c | 1327 | 45 | 9 |
| 2787 | 545 1c | 2242 | 46 | 9 |
| | | | | |
| 319 | 522 1c | -203 | 46 | 10 |
| 1090 | 522 1c | 568 | 47 | 10 |
| 1872 | 522 1c | 1350 | 48 | 10 |
| 2787 | 522 1c | 2265 | 49 | 10 |
| | | | | |
| 1090 | 319 | 771 | 50 | 10 |
| 1872 | 319 | 1553 | 51 | 10 |
| 2787 | 319 | 2468 | 52 | 10 |
| | | | | |
| 1872 | 1090 | 782 | 53 | 10 |
| 2787 | 1090 | 1697 | 54 | 10 |
| | | | | |
| 2787 | 1872 | 915 | 55 | 10 |

S Statistic = 55 - 10 = 45

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 11/1/2021 | 1 |
| 3/1/2022 | 1 |
| 3/1/2023 | 1 |
| 3/1/2024 | 1 |

There are 1 time periods with multiple data

A = 0
B = 18
C = 0
D = 0
E = 0
F = 2
a = 3828
b = 11880

c = 264
Group Variance = 211.667
Z-Score = 3.02431
Comparison Level at 95% confidence level = 1.65463 (upward trend)
**3.02431 > 1.65463 indicating an upward trend**

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RWH-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 226000 | 234000 | Same Date | 0 | 0 |
| 378000 1c | 234000 | 144000 | 1 | 0 |
| 502000 | 234000 | 268000 | 2 | 0 |
| 406000 | 234000 | 172000 | 3 | 0 |
| 474000 M6 | 234000 | 240000 | 4 | 0 |
| 477000 | 234000 | 243000 | 5 | 0 |
| 618000 | 234000 | 384000 | 6 | 0 |
| 578000 | 234000 | 344000 | 7 | 0 |
| 388000 | 234000 | 154000 | 8 | 0 |
| 287000 EM1 | 234000 | 53000 | 9 | 0 |
| 328000 | 234000 | 94000 | 10 | 0 |
| 430500 | 234000 | 196500 | 11 | 0 |
| 397700 | 234000 | 163700 | 12 | 0 |
| 494000 | 234000 | 260000 | 13 | 0 |
| 638300 | 234000 | 404300 | 14 | 0 |
| | | | | |
| 378000 1c | 226000 | 152000 | 15 | 0 |
| 502000 | 226000 | 276000 | 16 | 0 |
| 406000 | 226000 | 180000 | 17 | 0 |
| 474000 M6 | 226000 | 248000 | 18 | 0 |
| 477000 | 226000 | 251000 | 19 | 0 |
| 618000 | 226000 | 392000 | 20 | 0 |
| 578000 | 226000 | 352000 | 21 | 0 |
| 388000 | 226000 | 162000 | 22 | 0 |
| 287000 EM1 | 226000 | 61000 | 23 | 0 |
| 328000 | 226000 | 102000 | 24 | 0 |
| 430500 | 226000 | 204500 | 25 | 0 |
| 397700 | 226000 | 171700 | 26 | 0 |
| 494000 | 226000 | 268000 | 27 | 0 |
| 638300 | 226000 | 412300 | 28 | 0 |
| | | | | |
| 502000 | 378000 1c | 124000 | 29 | 0 |
| 406000 | 378000 1c | 28000 | 30 | 0 |
| 474000 M6 | 378000 1c | 96000 | 31 | 0 |
| 477000 | 378000 1c | 99000 | 32 | 0 |
| 618000 | 378000 1c | 240000 | 33 | 0 |
| 578000 | 378000 1c | 200000 | 34 | 0 |
| 388000 | 378000 1c | 10000 | 35 | 0 |
| 287000 EM1 | 378000 1c | -91000 | 35 | 1 |
| 328000 | 378000 1c | -50000 | 35 | 2 |
| 430500 | 378000 1c | 52500 | 36 | 2 |
| 397700 | 378000 1c | 19700 | 37 | 2 |
| 494000 | 378000 1c | 116000 | 38 | 2 |
| 638300 | 378000 1c | 260300 | 39 | 2 |
| | | | | |
| 406000 | 502000 | -96000 | 39 | 3 |
| 474000 M6 | 502000 | -28000 | 39 | 4 |

| | | | | |
|---|---|---|---|---|
| 477000 | 502000 | -25000 | 39 | 5 |
| 618000 | 502000 | 116000 | 40 | 5 |
| 578000 | 502000 | 76000 | 41 | 5 |
| 388000 | 502000 | -114000 | 41 | 6 |
| 287000 EM1 | 502000 | -215000 | 41 | 7 |
| 328000 | 502000 | -174000 | 41 | 8 |
| 430500 | 502000 | -71500 | 41 | 9 |
| 397700 | 502000 | -104300 | 41 | 10 |
| 494000 | 502000 | -8000 | 41 | 11 |
| 638300 | 502000 | 136300 | 42 | 11 |
| | | | | |
| 474000 M6 | 406000 | 68000 | 43 | 11 |
| 477000 | 406000 | 71000 | 44 | 11 |
| 618000 | 406000 | 212000 | 45 | 11 |
| 578000 | 406000 | 172000 | 46 | 11 |
| 388000 | 406000 | -18000 | 46 | 12 |
| 287000 EM1 | 406000 | -119000 | 46 | 13 |
| 328000 | 406000 | -78000 | 46 | 14 |
| 430500 | 406000 | 24500 | 47 | 14 |
| 397700 | 406000 | -8300 | 47 | 15 |
| 494000 | 406000 | 88000 | 48 | 15 |
| 638300 | 406000 | 232300 | 49 | 15 |
| | | | | |
| 477000 | 474000 M6 | 3000 | 50 | 15 |
| 618000 | 474000 M6 | 144000 | 51 | 15 |
| 578000 | 474000 M6 | 104000 | 52 | 15 |
| 388000 | 474000 M6 | -86000 | 52 | 16 |
| 287000 EM1 | 474000 M6 | -187000 | 52 | 17 |
| 328000 | 474000 M6 | -146000 | 52 | 18 |
| 430500 | 474000 M6 | -43500 | 52 | 19 |
| 397700 | 474000 M6 | -76300 | 52 | 20 |
| 494000 | 474000 M6 | 20000 | 53 | 20 |
| 638300 | 474000 M6 | 164300 | 54 | 20 |
| | | | | |
| 618000 | 477000 | 141000 | 55 | 20 |
| 578000 | 477000 | 101000 | 56 | 20 |
| 388000 | 477000 | -89000 | 56 | 21 |
| 287000 EM1 | 477000 | -190000 | 56 | 22 |
| 328000 | 477000 | -149000 | 56 | 23 |
| 430500 | 477000 | -46500 | 56 | 24 |
| 397700 | 477000 | -79300 | 56 | 25 |
| 494000 | 477000 | 17000 | 57 | 25 |
| 638300 | 477000 | 161300 | 58 | 25 |
| | | | | |
| 578000 | 618000 | -40000 | 58 | 26 |
| 388000 | 618000 | -230000 | 58 | 27 |
| 287000 EM1 | 618000 | -331000 | 58 | 28 |
| 328000 | 618000 | -290000 | 58 | 29 |
| 430500 | 618000 | -187500 | 58 | 30 |
| 397700 | 618000 | -220300 | 58 | 31 |
| 494000 | 618000 | -124000 | 58 | 32 |
| 638300 | 618000 | 20300 | 59 | 32 |
| | | | | |
| 388000 | 578000 | -190000 | 59 | 33 |
| 287000 EM1 | 578000 | -291000 | 59 | 34 |
| 328000 | 578000 | -250000 | 59 | 35 |
| 430500 | 578000 | -147500 | 59 | 36 |

| | | | | |
|---|---|---|---|---|
| 397700 | 578000 | -180300 | 59 | 37 |
| 494000 | 578000 | -84000 | 59 | 38 |
| 638300 | 578000 | 60300 | 60 | 38 |
| | | | | |
| 287000 EM1 | 388000 | -101000 | 60 | 39 |
| 328000 | 388000 | -60000 | 60 | 40 |
| 430500 | 388000 | 42500 | 61 | 40 |
| 397700 | 388000 | 9700 | 62 | 40 |
| 494000 | 388000 | 106000 | 63 | 40 |
| 638300 | 388000 | 250300 | 64 | 40 |
| | | | | |
| 328000 | 287000 EM1 | 41000 | 65 | 40 |
| 430500 | 287000 EM1 | 143500 | 66 | 40 |
| 397700 | 287000 EM1 | 110700 | 67 | 40 |
| 494000 | 287000 EM1 | 207000 | 68 | 40 |
| 638300 | 287000 EM1 | 351300 | 69 | 40 |
| | | | | |
| 430500 | 328000 | 102500 | 70 | 40 |
| 397700 | 328000 | 69700 | 71 | 40 |
| 494000 | 328000 | 166000 | 72 | 40 |
| 638300 | 328000 | 310300 | 73 | 40 |
| | | | | |
| 397700 | 430500 | -32800 | 73 | 41 |
| 494000 | 430500 | 63500 | 74 | 41 |
| 638300 | 430500 | 207800 | 75 | 41 |
| | | | | |
| 494000 | 397700 | 96300 | 76 | 41 |
| 638300 | 397700 | 240600 | 77 | 41 |
| | | | | |
| 638300 | 494000 | 144300 | 78 | 41 |

S Statistic = 78 - 41 = 37

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 0
B = 18
C = 0

D = 0
E = 0
F = 2
a = 8880
b = 30240
c = 480
Group Variance = 492.333
Z-Score = 1.62246
Comparison Level at 95% confidence level = 1.65463 (upward trend)
1.62246 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RWI-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 652000 | 632000 | Same Date | 0 | 0 |
| 519000 1c | 632000 | -113000 | 0 | 1 |
| 544000 | 632000 | -88000 | 0 | 2 |
| 875000 | 632000 | 243000 | 1 | 2 |
| 775000 | 632000 | 143000 | 2 | 2 |
| 542000 ML | 632000 | -90000 | 2 | 3 |
| 424000 P6 | 632000 | -208000 | 2 | 4 |
| 557800 | 632000 | -74200 | 2 | 5 |
| 563700 | 632000 | -68300 | 2 | 6 |
| | | | | |
| 519000 1c | 652000 | -133000 | 2 | 7 |
| 544000 | 652000 | -108000 | 2 | 8 |
| 875000 | 652000 | 223000 | 3 | 8 |
| 775000 | 652000 | 123000 | 4 | 8 |
| 542000 ML | 652000 | -110000 | 4 | 9 |
| 424000 P6 | 652000 | -228000 | 4 | 10 |
| 557800 | 652000 | -94200 | 4 | 11 |
| 563700 | 652000 | -88300 | 4 | 12 |
| | | | | |
| 544000 | 519000 1c | 25000 | 5 | 12 |
| 875000 | 519000 1c | 356000 | 6 | 12 |
| 775000 | 519000 1c | 256000 | 7 | 12 |
| 542000 ML | 519000 1c | 23000 | 8 | 12 |
| 424000 P6 | 519000 1c | -95000 | 8 | 13 |
| 557800 | 519000 1c | 38800 | 9 | 13 |
| 563700 | 519000 1c | 44700 | 10 | 13 |
| | | | | |
| 875000 | 544000 | 331000 | 11 | 13 |
| 775000 | 544000 | 231000 | 12 | 13 |
| 542000 ML | 544000 | -2000 | 12 | 14 |
| 424000 P6 | 544000 | -120000 | 12 | 15 |
| 557800 | 544000 | 13800 | 13 | 15 |
| 563700 | 544000 | 19700 | 14 | 15 |
| | | | | |
| 775000 | 875000 | -100000 | 14 | 16 |
| 542000 ML | 875000 | -333000 | 14 | 17 |
| 424000 P6 | 875000 | -451000 | 14 | 18 |
| 557800 | 875000 | -317200 | 14 | 19 |
| 563700 | 875000 | -311300 | 14 | 20 |
| | | | | |
| 542000 ML | 775000 | -233000 | 14 | 21 |
| 424000 P6 | 775000 | -351000 | 14 | 22 |
| 557800 | 775000 | -217200 | 14 | 23 |
| 563700 | 775000 | -211300 | 14 | 24 |
| | | | | |
| 424000 P6 | 542000 ML | -118000 | 14 | 25 |
| 557800 | 542000 ML | 15800 | 15 | 25 |

| | | | | |
|---|---|---|---|---|
| 563700 | 542000 ML | 21700 | 16 | 25 |
| 557800 | 424000 P6 | 133800 | 17 | 25 |
| 563700 | 424000 P6 | 139700 | 18 | 25 |
| 563700 | 557800 | 5900 | 19 | 25 |

S Statistic = 19 - 25 = -6

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 6/1/2021 | 1 |
| 3/1/2022 | 1 |
| 3/1/2023 | 1 |
| 3/1/2024 | 1 |

There are 1 time periods with multiple data

A = 0
B = 18
C = 0
D = 0
E = 0
F = 2
a = 2250
b = 6480
c = 180
Group Variance = 124
Z-Score = -0.449013
Comparison Level at 95% confidence level = 1.65463 (upward trend)
-0.449013 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RWJ-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 3080 | 1580 1c | Same Date | 0 | 0 |
| 270 BM1 | 1580 1c | Same Date | 0 | 0 |
| 2150 1c | 1580 1c | 570 | 1 | 0 |
| 3140 | 1580 1c | 1560 | 2 | 0 |
| 3430 | 1580 1c | 1850 | 3 | 0 |
| 805 | 1580 1c | -775 | 3 | 1 |
| 744 | 1580 1c | -836 | 3 | 2 |
| 1060 | 1580 1c | -520 | 3 | 3 |
| 1990 | 1580 1c | 410 | 4 | 3 |
| 2840 | 1580 1c | 1260 | 5 | 3 |
| 6330 | 1580 1c | 4750 | 6 | 3 |
| 1325 | 1580 1c | -255 | 6 | 4 |
| 5894 | 1580 1c | 4314 | 7 | 4 |
| 6992 | 1580 1c | 5412 | 8 | 4 |
| 7502 | 1580 1c | 5922 | 9 | 4 |
| 3130 | 1580 1c | 1550 | 10 | 4 |
| | | | | |
| 270 BM1 | 3080 | Same Date | 10 | 4 |
| 2150 1c | 3080 | -930 | 10 | 5 |
| 3140 | 3080 | 60 | 11 | 5 |
| 3430 | 3080 | 350 | 12 | 5 |
| 805 | 3080 | -2275 | 12 | 6 |
| 744 | 3080 | -2336 | 12 | 7 |
| 1060 | 3080 | -2020 | 12 | 8 |
| 1990 | 3080 | -1090 | 12 | 9 |
| 2840 | 3080 | -240 | 12 | 10 |
| 6330 | 3080 | 3250 | 13 | 10 |
| 1325 | 3080 | -1755 | 13 | 11 |
| 5894 | 3080 | 2814 | 14 | 11 |
| 6992 | 3080 | 3912 | 15 | 11 |
| 7502 | 3080 | 4422 | 16 | 11 |
| 3130 | 3080 | 50 | 17 | 11 |
| | | | | |
| 2150 1c | 270 BM1 | 1880 | 18 | 11 |
| 3140 | 270 BM1 | 2870 | 19 | 11 |
| 3430 | 270 BM1 | 3160 | 20 | 11 |
| 805 | 270 BM1 | 535 | 21 | 11 |
| 744 | 270 BM1 | 474 | 22 | 11 |
| 1060 | 270 BM1 | 790 | 23 | 11 |
| 1990 | 270 BM1 | 1720 | 24 | 11 |
| 2840 | 270 BM1 | 2570 | 25 | 11 |
| 6330 | 270 BM1 | 6060 | 26 | 11 |
| 1325 | 270 BM1 | 1055 | 27 | 11 |
| 5894 | 270 BM1 | 5624 | 28 | 11 |
| 6992 | 270 BM1 | 6722 | 29 | 11 |
| 7502 | 270 BM1 | 7232 | 30 | 11 |
| 3130 | 270 BM1 | 2860 | 31 | 11 |

| | | | | |
|---|---|---|---|---|
| 3140 | 2150 1c | 990 | 32 | 11 |
| 3430 | 2150 1c | 1280 | 33 | 11 |
| 805 | 2150 1c | -1345 | 33 | 12 |
| 744 | 2150 1c | -1406 | 33 | 13 |
| 1060 | 2150 1c | -1090 | 33 | 14 |
| 1990 | 2150 1c | -160 | 33 | 15 |
| 2840 | 2150 1c | 690 | 34 | 15 |
| 6330 | 2150 1c | 4180 | 35 | 15 |
| 1325 | 2150 1c | -825 | 35 | 16 |
| 5894 | 2150 1c | 3744 | 36 | 16 |
| 6992 | 2150 1c | 4842 | 37 | 16 |
| 7502 | 2150 1c | 5352 | 38 | 16 |
| 3130 | 2150 1c | 980 | 39 | 16 |
| | | | | |
| 3430 | 3140 | 290 | 40 | 16 |
| 805 | 3140 | -2335 | 40 | 17 |
| 744 | 3140 | -2396 | 40 | 18 |
| 1060 | 3140 | -2080 | 40 | 19 |
| 1990 | 3140 | -1150 | 40 | 20 |
| 2840 | 3140 | -300 | 40 | 21 |
| 6330 | 3140 | 3190 | 41 | 21 |
| 1325 | 3140 | -1815 | 41 | 22 |
| 5894 | 3140 | 2754 | 42 | 22 |
| 6992 | 3140 | 3852 | 43 | 22 |
| 7502 | 3140 | 4362 | 44 | 22 |
| 3130 | 3140 | -10 | 44 | 23 |
| | | | | |
| 805 | 3430 | -2625 | 44 | 24 |
| 744 | 3430 | -2686 | 44 | 25 |
| 1060 | 3430 | -2370 | 44 | 26 |
| 1990 | 3430 | -1440 | 44 | 27 |
| 2840 | 3430 | -590 | 44 | 28 |
| 6330 | 3430 | 2900 | 45 | 28 |
| 1325 | 3430 | -2105 | 45 | 29 |
| 5894 | 3430 | 2464 | 46 | 29 |
| 6992 | 3430 | 3562 | 47 | 29 |
| 7502 | 3430 | 4072 | 48 | 29 |
| 3130 | 3430 | -300 | 48 | 30 |
| | | | | |
| 744 | 805 | -61 | 48 | 31 |
| 1060 | 805 | 255 | 49 | 31 |
| 1990 | 805 | 1185 | 50 | 31 |
| 2840 | 805 | 2035 | 51 | 31 |
| 6330 | 805 | 5525 | 52 | 31 |
| 1325 | 805 | 520 | 53 | 31 |
| 5894 | 805 | 5089 | 54 | 31 |
| 6992 | 805 | 6187 | 55 | 31 |
| 7502 | 805 | 6697 | 56 | 31 |
| 3130 | 805 | 2325 | 57 | 31 |
| | | | | |
| 1060 | 744 | 316 | 58 | 31 |
| 1990 | 744 | 1246 | 59 | 31 |
| 2840 | 744 | 2096 | 60 | 31 |
| 6330 | 744 | 5586 | 61 | 31 |
| 1325 | 744 | 581 | 62 | 31 |
| 5894 | 744 | 5150 | 63 | 31 |

| | | | | |
|---|---|---|---|---|
| 6992 | 744 | 6248 | 64 | 31 |
| 7502 | 744 | 6758 | 65 | 31 |
| 3130 | 744 | 2386 | 66 | 31 |
| | | | | |
| 1990 | 1060 | 930 | 67 | 31 |
| 2840 | 1060 | 1780 | 68 | 31 |
| 6330 | 1060 | 5270 | 69 | 31 |
| 1325 | 1060 | 265 | 70 | 31 |
| 5894 | 1060 | 4834 | 71 | 31 |
| 6992 | 1060 | 5932 | 72 | 31 |
| 7502 | 1060 | 6442 | 73 | 31 |
| 3130 | 1060 | 2070 | 74 | 31 |
| | | | | |
| 2840 | 1990 | 850 | 75 | 31 |
| 6330 | 1990 | 4340 | 76 | 31 |
| 1325 | 1990 | -665 | 76 | 32 |
| 5894 | 1990 | 3904 | 77 | 32 |
| 6992 | 1990 | 5002 | 78 | 32 |
| 7502 | 1990 | 5512 | 79 | 32 |
| 3130 | 1990 | 1140 | 80 | 32 |
| | | | | |
| 6330 | 2840 | 3490 | 81 | 32 |
| 1325 | 2840 | -1515 | 81 | 33 |
| 5894 | 2840 | 3054 | 82 | 33 |
| 6992 | 2840 | 4152 | 83 | 33 |
| 7502 | 2840 | 4662 | 84 | 33 |
| 3130 | 2840 | 290 | 85 | 33 |
| | | | | |
| 1325 | 6330 | -5005 | 85 | 34 |
| 5894 | 6330 | -436 | 85 | 35 |
| 6992 | 6330 | 662 | 86 | 35 |
| 7502 | 6330 | 1172 | 87 | 35 |
| 3130 | 6330 | -3200 | 87 | 36 |
| | | | | |
| 5894 | 1325 | 4569 | 88 | 36 |
| 6992 | 1325 | 5667 | 89 | 36 |
| 7502 | 1325 | 6177 | 90 | 36 |
| 3130 | 1325 | 1805 | 91 | 36 |
| | | | | |
| 6992 | 5894 | 1098 | 92 | 36 |
| 7502 | 5894 | 1608 | 93 | 36 |
| 3130 | 5894 | -2764 | 93 | 37 |
| | | | | |
| 7502 | 6992 | 510 | 94 | 37 |
| 3130 | 6992 | -3862 | 94 | 38 |
| | | | | |
| 3130 | 7502 | -4372 | 94 | 39 |

S Statistic = 94 - 39 = 55

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 5/1/2019 | 3 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |

| | |
|---|---|
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

---

A = 0
B = 66
C = 0
D = 6
E = 0
F = 6
a = 10608
b = 36720
c = 544
Group Variance = 585.667
Z-Score = 2.23135
Comparison Level at 95% confidence level = 1.65463 (upward trend)
**2.23135 > 1.65463 indicating an upward trend**

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RWK-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 21300 | 21100 1c | Same Date | 0 | 0 |
| 25100 1c | 21100 1c | 4000 | 1 | 0 |
| 21600 | 21100 1c | 500 | 2 | 0 |
| 30300 | 21100 1c | 9200 | 3 | 0 |
| 21400 | 21100 1c | 300 | 4 | 0 |
| 36800 | 21100 1c | 15700 | 5 | 0 |
| 26500 | 21100 1c | 5400 | 6 | 0 |
| 34600 | 21100 1c | 13500 | 7 | 0 |
| 23700 | 21100 1c | 2600 | 8 | 0 |
| 19600 | 21100 1c | -1500 | 8 | 1 |
| 16940 | 21100 1c | -4160 | 8 | 2 |
| 15630 | 21100 1c | -5470 | 8 | 3 |
| 22520 | 21100 1c | 1420 | 9 | 3 |
| 38260 | 21100 1c | 17160 | 10 | 3 |
| 35070 | 21100 1c | 13970 | 11 | 3 |
| | | | | |
| 25100 1c | 21300 | 3800 | 12 | 3 |
| 21600 | 21300 | 300 | 13 | 3 |
| 30300 | 21300 | 9000 | 14 | 3 |
| 21400 | 21300 | 100 | 15 | 3 |
| 36800 | 21300 | 15500 | 16 | 3 |
| 26500 | 21300 | 5200 | 17 | 3 |
| 34600 | 21300 | 13300 | 18 | 3 |
| 23700 | 21300 | 2400 | 19 | 3 |
| 19600 | 21300 | -1700 | 19 | 4 |
| 16940 | 21300 | -4360 | 19 | 5 |
| 15630 | 21300 | -5670 | 19 | 6 |
| 22520 | 21300 | 1220 | 20 | 6 |
| 38260 | 21300 | 16960 | 21 | 6 |
| 35070 | 21300 | 13770 | 22 | 6 |
| | | | | |
| 21600 | 25100 1c | -3500 | 22 | 7 |
| 30300 | 25100 1c | 5200 | 23 | 7 |
| 21400 | 25100 1c | -3700 | 23 | 8 |
| 36800 | 25100 1c | 11700 | 24 | 8 |
| 26500 | 25100 1c | 1400 | 25 | 8 |
| 34600 | 25100 1c | 9500 | 26 | 8 |
| 23700 | 25100 1c | -1400 | 26 | 9 |
| 19600 | 25100 1c | -5500 | 26 | 10 |
| 16940 | 25100 1c | -8160 | 26 | 11 |
| 15630 | 25100 1c | -9470 | 26 | 12 |
| 22520 | 25100 1c | -2580 | 26 | 13 |
| 38260 | 25100 1c | 13160 | 27 | 13 |
| 35070 | 25100 1c | 9970 | 28 | 13 |
| | | | | |
| 30300 | 21600 | 8700 | 29 | 13 |
| 21400 | 21600 | -200 | 29 | 14 |

| | | | | |
|---|---|---|---|---|
| 36800 | 21600 | 15200 | 30 | 14 |
| 26500 | 21600 | 4900 | 31 | 14 |
| 34600 | 21600 | 13000 | 32 | 14 |
| 23700 | 21600 | 2100 | 33 | 14 |
| 19600 | 21600 | -2000 | 33 | 15 |
| 16940 | 21600 | -4660 | 33 | 16 |
| 15630 | 21600 | -5970 | 33 | 17 |
| 22520 | 21600 | 920 | 34 | 17 |
| 38260 | 21600 | 16660 | 35 | 17 |
| 35070 | 21600 | 13470 | 36 | 17 |
| | | | | |
| 21400 | 30300 | -8900 | 36 | 18 |
| 36800 | 30300 | 6500 | 37 | 18 |
| 26500 | 30300 | -3800 | 37 | 19 |
| 34600 | 30300 | 4300 | 38 | 19 |
| 23700 | 30300 | -6600 | 38 | 20 |
| 19600 | 30300 | -10700 | 38 | 21 |
| 16940 | 30300 | -13360 | 38 | 22 |
| 15630 | 30300 | -14670 | 38 | 23 |
| 22520 | 30300 | -7780 | 38 | 24 |
| 38260 | 30300 | 7960 | 39 | 24 |
| 35070 | 30300 | 4770 | 40 | 24 |
| | | | | |
| 36800 | 21400 | 15400 | 41 | 24 |
| 26500 | 21400 | 5100 | 42 | 24 |
| 34600 | 21400 | 13200 | 43 | 24 |
| 23700 | 21400 | 2300 | 44 | 24 |
| 19600 | 21400 | -1800 | 44 | 25 |
| 16940 | 21400 | -4460 | 44 | 26 |
| 15630 | 21400 | -5770 | 44 | 27 |
| 22520 | 21400 | 1120 | 45 | 27 |
| 38260 | 21400 | 16860 | 46 | 27 |
| 35070 | 21400 | 13670 | 47 | 27 |
| | | | | |
| 26500 | 36800 | -10300 | 47 | 28 |
| 34600 | 36800 | -2200 | 47 | 29 |
| 23700 | 36800 | -13100 | 47 | 30 |
| 19600 | 36800 | -17200 | 47 | 31 |
| 16940 | 36800 | -19860 | 47 | 32 |
| 15630 | 36800 | -21170 | 47 | 33 |
| 22520 | 36800 | -14280 | 47 | 34 |
| 38260 | 36800 | 1460 | 48 | 34 |
| 35070 | 36800 | -1730 | 48 | 35 |
| | | | | |
| 34600 | 26500 | 8100 | 49 | 35 |
| 23700 | 26500 | -2800 | 49 | 36 |
| 19600 | 26500 | -6900 | 49 | 37 |
| 16940 | 26500 | -9560 | 49 | 38 |
| 15630 | 26500 | -10870 | 49 | 39 |
| 22520 | 26500 | -3980 | 49 | 40 |
| 38260 | 26500 | 11760 | 50 | 40 |
| 35070 | 26500 | 8570 | 51 | 40 |
| | | | | |
| 23700 | 34600 | -10900 | 51 | 41 |
| 19600 | 34600 | -15000 | 51 | 42 |
| 16940 | 34600 | -17660 | 51 | 43 |
| 15630 | 34600 | -18970 | 51 | 44 |

| | | | | |
|---|---|---|---|---|
| 22520 | 34600 | -12080 | 51 | 45 |
| 38260 | 34600 | 3660 | 52 | 45 |
| 35070 | 34600 | 470 | 53 | 45 |
| | | | | |
| 19600 | 23700 | -4100 | 53 | 46 |
| 16940 | 23700 | -6760 | 53 | 47 |
| 15630 | 23700 | -8070 | 53 | 48 |
| 22520 | 23700 | -1180 | 53 | 49 |
| 38260 | 23700 | 14560 | 54 | 49 |
| 35070 | 23700 | 11370 | 55 | 49 |
| | | | | |
| 16940 | 19600 | -2660 | 55 | 50 |
| 15630 | 19600 | -3970 | 55 | 51 |
| 22520 | 19600 | 2920 | 56 | 51 |
| 38260 | 19600 | 18660 | 57 | 51 |
| 35070 | 19600 | 15470 | 58 | 51 |
| | | | | |
| 15630 | 16940 | -1310 | 58 | 52 |
| 22520 | 16940 | 5580 | 59 | 52 |
| 38260 | 16940 | 21320 | 60 | 52 |
| 35070 | 16940 | 18130 | 61 | 52 |
| | | | | |
| 22520 | 15630 | 6890 | 62 | 52 |
| 38260 | 15630 | 22630 | 63 | 52 |
| 35070 | 15630 | 19440 | 64 | 52 |
| | | | | |
| 38260 | 22520 | 15740 | 65 | 52 |
| 35070 | 22520 | 12550 | 66 | 52 |
| | | | | |
| 35070 | 38260 | -3190 | 66 | 53 |

S Statistic = 66 - 53 = 13

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 0
B = 18
C = 0

D = 0
E = 0
F = 2
a = 8880
b = 30240
c = 480
Group Variance = 492.333
Z-Score = 0.540819
Comparison Level at 95% confidence level = 1.65463 (upward trend)
0.540819 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RWL-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 163000 | 169000 M6 | Same Date | 0 | 0 |
| 142000 1c | 169000 M6 | -27000 | 0 | 1 |
| 124000 | 169000 M6 | -45000 | 0 | 2 |
| 121000 | 169000 M6 | -48000 | 0 | 3 |
| 96300 | 169000 M6 | -72700 | 0 | 4 |
| 116000 2c | 169000 M6 | -53000 | 0 | 5 |
| 126000 | 169000 M6 | -43000 | 0 | 6 |
| 110000 | 169000 M6 | -59000 | 0 | 7 |
| 97000 | 169000 M6 | -72000 | 0 | 8 |
| 75200 | 169000 M6 | -93800 | 0 | 9 |
| 79440 | 169000 M6 | -89560 | 0 | 10 |
| 76850 | 169000 M6 | -92150 | 0 | 11 |
| 88270 | 169000 M6 | -80730 | 0 | 12 |
| 47080 | 169000 M6 | -121920 | 0 | 13 |
| 101000 | 169000 M6 | -68000 | 0 | 14 |
| | | | | |
| 142000 1c | 163000 | -21000 | 0 | 15 |
| 124000 | 163000 | -39000 | 0 | 16 |
| 121000 | 163000 | -42000 | 0 | 17 |
| 96300 | 163000 | -66700 | 0 | 18 |
| 116000 2c | 163000 | -47000 | 0 | 19 |
| 126000 | 163000 | -37000 | 0 | 20 |
| 110000 | 163000 | -53000 | 0 | 21 |
| 97000 | 163000 | -66000 | 0 | 22 |
| 75200 | 163000 | -87800 | 0 | 23 |
| 79440 | 163000 | -83560 | 0 | 24 |
| 76850 | 163000 | -86150 | 0 | 25 |
| 88270 | 163000 | -74730 | 0 | 26 |
| 47080 | 163000 | -115920 | 0 | 27 |
| 101000 | 163000 | -62000 | 0 | 28 |
| | | | | |
| 124000 | 142000 1c | -18000 | 0 | 29 |
| 121000 | 142000 1c | -21000 | 0 | 30 |
| 96300 | 142000 1c | -45700 | 0 | 31 |
| 116000 2c | 142000 1c | -26000 | 0 | 32 |
| 126000 | 142000 1c | -16000 | 0 | 33 |
| 110000 | 142000 1c | -32000 | 0 | 34 |
| 97000 | 142000 1c | -45000 | 0 | 35 |
| 75200 | 142000 1c | -66800 | 0 | 36 |
| 79440 | 142000 1c | -62560 | 0 | 37 |
| 76850 | 142000 1c | -65150 | 0 | 38 |
| 88270 | 142000 1c | -53730 | 0 | 39 |
| 47080 | 142000 1c | -94920 | 0 | 40 |
| 101000 | 142000 1c | -41000 | 0 | 41 |
| | | | | |
| 121000 | 124000 | -3000 | 0 | 42 |
| 96300 | 124000 | -27700 | 0 | 43 |

| | | | | |
|---|---|---|---|---|
| 116000 2c | 124000 | -8000 | 0 | 44 |
| 126000 | 124000 | 2000 | 1 | 44 |
| 110000 | 124000 | -14000 | 1 | 45 |
| 97000 | 124000 | -27000 | 1 | 46 |
| 75200 | 124000 | -48800 | 1 | 47 |
| 79440 | 124000 | -44560 | 1 | 48 |
| 76850 | 124000 | -47150 | 1 | 49 |
| 88270 | 124000 | -35730 | 1 | 50 |
| 47080 | 124000 | -76920 | 1 | 51 |
| 101000 | 124000 | -23000 | 1 | 52 |
| | | | | |
| 96300 | 121000 | -24700 | 1 | 53 |
| 116000 2c | 121000 | -5000 | 1 | 54 |
| 126000 | 121000 | 5000 | 2 | 54 |
| 110000 | 121000 | -11000 | 2 | 55 |
| 97000 | 121000 | -24000 | 2 | 56 |
| 75200 | 121000 | -45800 | 2 | 57 |
| 79440 | 121000 | -41560 | 2 | 58 |
| 76850 | 121000 | -44150 | 2 | 59 |
| 88270 | 121000 | -32730 | 2 | 60 |
| 47080 | 121000 | -73920 | 2 | 61 |
| 101000 | 121000 | -20000 | 2 | 62 |
| | | | | |
| 116000 2c | 96300 | 19700 | 3 | 62 |
| 126000 | 96300 | 29700 | 4 | 62 |
| 110000 | 96300 | 13700 | 5 | 62 |
| 97000 | 96300 | 700 | 6 | 62 |
| 75200 | 96300 | -21100 | 6 | 63 |
| 79440 | 96300 | -16860 | 6 | 64 |
| 76850 | 96300 | -19450 | 6 | 65 |
| 88270 | 96300 | -8030 | 6 | 66 |
| 47080 | 96300 | -49220 | 6 | 67 |
| 101000 | 96300 | 4700 | 7 | 67 |
| | | | | |
| 126000 | 116000 2c | 10000 | 8 | 67 |
| 110000 | 116000 2c | -6000 | 8 | 68 |
| 97000 | 116000 2c | -19000 | 8 | 69 |
| 75200 | 116000 2c | -40800 | 8 | 70 |
| 79440 | 116000 2c | -36560 | 8 | 71 |
| 76850 | 116000 2c | -39150 | 8 | 72 |
| 88270 | 116000 2c | -27730 | 8 | 73 |
| 47080 | 116000 2c | -68920 | 8 | 74 |
| 101000 | 116000 2c | -15000 | 8 | 75 |
| | | | | |
| 110000 | 126000 | -16000 | 8 | 76 |
| 97000 | 126000 | -29000 | 8 | 77 |
| 75200 | 126000 | -50800 | 8 | 78 |
| 79440 | 126000 | -46560 | 8 | 79 |
| 76850 | 126000 | -49150 | 8 | 80 |
| 88270 | 126000 | -37730 | 8 | 81 |
| 47080 | 126000 | -78920 | 8 | 82 |
| 101000 | 126000 | -25000 | 8 | 83 |
| | | | | |
| 97000 | 110000 | -13000 | 8 | 84 |
| 75200 | 110000 | -34800 | 8 | 85 |
| 79440 | 110000 | -30560 | 8 | 86 |
| 76850 | 110000 | -33150 | 8 | 87 |

| | | | | |
|---|---|---|---|---|
| 88270 | 110000 | -21730 | 8 | 88 |
| 47080 | 110000 | -62920 | 8 | 89 |
| 101000 | 110000 | -9000 | 8 | 90 |
| | | | | |
| 75200 | 97000 | -21800 | 8 | 91 |
| 79440 | 97000 | -17560 | 8 | 92 |
| 76850 | 97000 | -20150 | 8 | 93 |
| 88270 | 97000 | -8730 | 8 | 94 |
| 47080 | 97000 | -49920 | 8 | 95 |
| 101000 | 97000 | 4000 | 9 | 95 |
| | | | | |
| 79440 | 75200 | 4240 | 10 | 95 |
| 76850 | 75200 | 1650 | 11 | 95 |
| 88270 | 75200 | 13070 | 12 | 95 |
| 47080 | 75200 | -28120 | 12 | 96 |
| 101000 | 75200 | 25800 | 13 | 96 |
| | | | | |
| 76850 | 79440 | -2590 | 13 | 97 |
| 88270 | 79440 | 8830 | 14 | 97 |
| 47080 | 79440 | -32360 | 14 | 98 |
| 101000 | 79440 | 21560 | 15 | 98 |
| | | | | |
| 88270 | 76850 | 11420 | 16 | 98 |
| 47080 | 76850 | -29770 | 16 | 99 |
| 101000 | 76850 | 24150 | 17 | 99 |
| | | | | |
| 47080 | 88270 | -41190 | 17 | 100 |
| 101000 | 88270 | 12730 | 18 | 100 |
| | | | | |
| 101000 | 47080 | 53920 | 19 | 100 |

S Statistic = 19 - 100 = -81

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 0
B = 18
C = 0

D = 0
E = 0
F = 2
a = 8880
b = 30240
c = 480
Group Variance = 492.333
Z-Score = -3.60546
Comparison Level at 95% confidence level = 1.65463 (upward trend)
-3.60546 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RWM-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 165000 | 162000 | Same Date | 0 | 0 |
| 159000 | 162000 | -3000 | 0 | 1 |
| 152000 M61c | 162000 | -10000 | 0 | 2 |
| 139000 | 162000 | -23000 | 0 | 3 |
| 128000 | 162000 | -34000 | 0 | 4 |
| 138000 2c | 162000 | -24000 | 0 | 5 |
| 125000 | 162000 | -37000 | 0 | 6 |
| 150000 | 162000 | -12000 | 0 | 7 |
| 94900 | 162000 | -67100 | 0 | 8 |
| 98340 | 162000 | -63660 | 0 | 9 |
| 84760 | 162000 | -77240 | 0 | 10 |
| | | | | |
| 159000 | 165000 | -6000 | 0 | 11 |
| 152000 M61c | 165000 | -13000 | 0 | 12 |
| 139000 | 165000 | -26000 | 0 | 13 |
| 128000 | 165000 | -37000 | 0 | 14 |
| 138000 2c | 165000 | -27000 | 0 | 15 |
| 125000 | 165000 | -40000 | 0 | 16 |
| 150000 | 165000 | -15000 | 0 | 17 |
| 94900 | 165000 | -70100 | 0 | 18 |
| 98340 | 165000 | -66660 | 0 | 19 |
| 84760 | 165000 | -80240 | 0 | 20 |
| | | | | |
| 152000 M61c | 159000 | -7000 | 0 | 21 |
| 139000 | 159000 | -20000 | 0 | 22 |
| 128000 | 159000 | -31000 | 0 | 23 |
| 138000 2c | 159000 | -21000 | 0 | 24 |
| 125000 | 159000 | -34000 | 0 | 25 |
| 150000 | 159000 | -9000 | 0 | 26 |
| 94900 | 159000 | -64100 | 0 | 27 |
| 98340 | 159000 | -60660 | 0 | 28 |
| 84760 | 159000 | -74240 | 0 | 29 |
| | | | | |
| 139000 | 152000 M61c | -13000 | 0 | 30 |
| 128000 | 152000 M61c | -24000 | 0 | 31 |
| 138000 2c | 152000 M61c | -14000 | 0 | 32 |
| 125000 | 152000 M61c | -27000 | 0 | 33 |
| 150000 | 152000 M61c | -2000 | 0 | 34 |
| 94900 | 152000 M61c | -57100 | 0 | 35 |
| 98340 | 152000 M61c | -53660 | 0 | 36 |
| 84760 | 152000 M61c | -67240 | 0 | 37 |
| | | | | |
| 128000 | 139000 | -11000 | 0 | 38 |
| 138000 2c | 139000 | -1000 | 0 | 39 |
| 125000 | 139000 | -14000 | 0 | 40 |
| 150000 | 139000 | 11000 | 1 | 40 |
| 94900 | 139000 | -44100 | 1 | 41 |

| | | | | |
|---|---|---|---|---|
| 98340 | 139000 | -40660 | 1 | 42 |
| 84760 | 139000 | -54240 | 1 | 43 |
| | | | | |
| 138000 2c | 128000 | 10000 | 2 | 43 |
| 125000 | 128000 | -3000 | 2 | 44 |
| 150000 | 128000 | 22000 | 3 | 44 |
| 94900 | 128000 | -33100 | 3 | 45 |
| 98340 | 128000 | -29660 | 3 | 46 |
| 84760 | 128000 | -43240 | 3 | 47 |
| | | | | |
| 125000 | 138000 2c | -13000 | 3 | 48 |
| 150000 | 138000 2c | 12000 | 4 | 48 |
| 94900 | 138000 2c | -43100 | 4 | 49 |
| 98340 | 138000 2c | -39660 | 4 | 50 |
| 84760 | 138000 2c | -53240 | 4 | 51 |
| | | | | |
| 150000 | 125000 | 25000 | 5 | 51 |
| 94900 | 125000 | -30100 | 5 | 52 |
| 98340 | 125000 | -26660 | 5 | 53 |
| 84760 | 125000 | -40240 | 5 | 54 |
| | | | | |
| 94900 | 150000 | -55100 | 5 | 55 |
| 98340 | 150000 | -51660 | 5 | 56 |
| 84760 | 150000 | -65240 | 5 | 57 |
| | | | | |
| 98340 | 94900 | 3440 | 6 | 57 |
| 84760 | 94900 | -10140 | 6 | 58 |
| | | | | |
| 84760 | 98340 | -13580 | 6 | 59 |

S Statistic = 6 - 59 = -53

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 3/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 0
B = 18
C = 0
D = 0
E = 0
F = 2
a = 3828
b = 11880

c = 264
Group Variance = 211.667
Z-Score = -3.57419
Comparison Level at 95% confidence level = 1.65463 (upward trend)
-3.57419 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RWO-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 249000 M62c3c | 243000 M61c4c | Same Date | 0 | 0 |
| 214000 1c | 243000 M61c4c | -29000 | 0 | 1 |
| 204000 | 243000 M61c4c | -39000 | 0 | 2 |
| 202000 | 243000 M61c4c | -41000 | 0 | 3 |
| 223000 | 243000 M61c4c | -20000 | 0 | 4 |
| 204000 3c | 243000 M61c4c | -39000 | 0 | 5 |
| 155000 | 243000 M61c4c | -88000 | 0 | 6 |
| 208000 | 243000 M61c4c | -35000 | 0 | 7 |
| ND<100 U | 243000 M61c4c | -242900 | 0 | 8 |
| 1380 | 243000 M61c4c | -241620 | 0 | 9 |
| 114000 | 243000 M61c4c | -129000 | 0 | 10 |
| 180000 | 243000 M61c4c | -63000 | 0 | 11 |
| 149200 | 243000 M61c4c | -93800 | 0 | 12 |
| 182300 | 243000 M61c4c | -60700 | 0 | 13 |
| 147600 | 243000 M61c4c | -95400 | 0 | 14 |
| 318800 | 243000 M61c4c | 75800 | 1 | 14 |
| | | | | |
| 214000 1c | 249000 M62c3c | -35000 | 1 | 15 |
| 204000 | 249000 M62c3c | -45000 | 1 | 16 |
| 202000 | 249000 M62c3c | -47000 | 1 | 17 |
| 223000 | 249000 M62c3c | -26000 | 1 | 18 |
| 204000 3c | 249000 M62c3c | -45000 | 1 | 19 |
| 155000 | 249000 M62c3c | -94000 | 1 | 20 |
| 208000 | 249000 M62c3c | -41000 | 1 | 21 |
| ND<100 U | 249000 M62c3c | -248900 | 1 | 22 |
| 1380 | 249000 M62c3c | -247620 | 1 | 23 |
| 114000 | 249000 M62c3c | -135000 | 1 | 24 |
| 180000 | 249000 M62c3c | -69000 | 1 | 25 |
| 149200 | 249000 M62c3c | -99800 | 1 | 26 |
| 182300 | 249000 M62c3c | -66700 | 1 | 27 |
| 147600 | 249000 M62c3c | -101400 | 1 | 28 |
| 318800 | 249000 M62c3c | 69800 | 2 | 28 |
| | | | | |
| 204000 | 214000 1c | -10000 | 2 | 29 |
| 202000 | 214000 1c | -12000 | 2 | 30 |
| 223000 | 214000 1c | 9000 | 3 | 30 |
| 204000 3c | 214000 1c | -10000 | 3 | 31 |
| 155000 | 214000 1c | -59000 | 3 | 32 |
| 208000 | 214000 1c | -6000 | 3 | 33 |
| ND<100 U | 214000 1c | -213900 | 3 | 34 |
| 1380 | 214000 1c | -212620 | 3 | 35 |
| 114000 | 214000 1c | -100000 | 3 | 36 |
| 180000 | 214000 1c | -34000 | 3 | 37 |
| 149200 | 214000 1c | -64800 | 3 | 38 |
| 182300 | 214000 1c | -31700 | 3 | 39 |
| 147600 | 214000 1c | -66400 | 3 | 40 |
| 318800 | 214000 1c | 104800 | 4 | 40 |

| | | | | |
|---|---|---|---|---|
| 202000 | 204000 | -2000 | 4 | 41 |
| 223000 | 204000 | 19000 | 5 | 41 |
| 204000 3c | 204000 | 0 | 5 | 41 |
| 155000 | 204000 | -49000 | 5 | 42 |
| 208000 | 204000 | 4000 | 6 | 42 |
| ND<100 U | 204000 | -203900 | 6 | 43 |
| 1380 | 204000 | -202620 | 6 | 44 |
| 114000 | 204000 | -90000 | 6 | 45 |
| 180000 | 204000 | -24000 | 6 | 46 |
| 149200 | 204000 | -54800 | 6 | 47 |
| 182300 | 204000 | -21700 | 6 | 48 |
| 147600 | 204000 | -56400 | 6 | 49 |
| 318800 | 204000 | 114800 | 7 | 49 |
| | | | | |
| 223000 | 202000 | 21000 | 8 | 49 |
| 204000 3c | 202000 | 2000 | 9 | 49 |
| 155000 | 202000 | -47000 | 9 | 50 |
| 208000 | 202000 | 6000 | 10 | 50 |
| ND<100 U | 202000 | -201900 | 10 | 51 |
| 1380 | 202000 | -200620 | 10 | 52 |
| 114000 | 202000 | -88000 | 10 | 53 |
| 180000 | 202000 | -22000 | 10 | 54 |
| 149200 | 202000 | -52800 | 10 | 55 |
| 182300 | 202000 | -19700 | 10 | 56 |
| 147600 | 202000 | -54400 | 10 | 57 |
| 318800 | 202000 | 116800 | 11 | 57 |
| | | | | |
| 204000 3c | 223000 | -19000 | 11 | 58 |
| 155000 | 223000 | -68000 | 11 | 59 |
| 208000 | 223000 | -15000 | 11 | 60 |
| ND<100 U | 223000 | -222900 | 11 | 61 |
| 1380 | 223000 | -221620 | 11 | 62 |
| 114000 | 223000 | -109000 | 11 | 63 |
| 180000 | 223000 | -43000 | 11 | 64 |
| 149200 | 223000 | -73800 | 11 | 65 |
| 182300 | 223000 | -40700 | 11 | 66 |
| 147600 | 223000 | -75400 | 11 | 67 |
| 318800 | 223000 | 95800 | 12 | 67 |
| | | | | |
| 155000 | 204000 3c | -49000 | 12 | 68 |
| 208000 | 204000 3c | 4000 | 13 | 68 |
| ND<100 U | 204000 3c | -203900 | 13 | 69 |
| 1380 | 204000 3c | -202620 | 13 | 70 |
| 114000 | 204000 3c | -90000 | 13 | 71 |
| 180000 | 204000 3c | -24000 | 13 | 72 |
| 149200 | 204000 3c | -54800 | 13 | 73 |
| 182300 | 204000 3c | -21700 | 13 | 74 |
| 147600 | 204000 3c | -56400 | 13 | 75 |
| 318800 | 204000 3c | 114800 | 14 | 75 |
| | | | | |
| 208000 | 155000 | 53000 | 15 | 75 |
| ND<100 U | 155000 | -154900 | 15 | 76 |
| 1380 | 155000 | -153620 | 15 | 77 |
| 114000 | 155000 | -41000 | 15 | 78 |
| 180000 | 155000 | 25000 | 16 | 78 |
| 149200 | 155000 | -5800 | 16 | 79 |

| | | | | |
|---|---|---|---|---|
| 182300 | 155000 | 27300 | 17 | 79 |
| 147600 | 155000 | -7400 | 17 | 80 |
| 318800 | 155000 | 163800 | 18 | 80 |
| | | | | |
| ND<100 U | 208000 | -207900 | 18 | 81 |
| 1380 | 208000 | -206620 | 18 | 82 |
| 114000 | 208000 | -94000 | 18 | 83 |
| 180000 | 208000 | -28000 | 18 | 84 |
| 149200 | 208000 | -58800 | 18 | 85 |
| 182300 | 208000 | -25700 | 18 | 86 |
| 147600 | 208000 | -60400 | 18 | 87 |
| 318800 | 208000 | 110800 | 19 | 87 |
| | | | | |
| 1380 | ND<100 U | 1280 | 20 | 87 |
| 114000 | ND<100 U | 113900 | 21 | 87 |
| 180000 | ND<100 U | 179900 | 22 | 87 |
| 149200 | ND<100 U | 149100 | 23 | 87 |
| 182300 | ND<100 U | 182200 | 24 | 87 |
| 147600 | ND<100 U | 147500 | 25 | 87 |
| 318800 | ND<100 U | 318700 | 26 | 87 |
| | | | | |
| 114000 | 1380 | 112620 | 27 | 87 |
| 180000 | 1380 | 178620 | 28 | 87 |
| 149200 | 1380 | 147820 | 29 | 87 |
| 182300 | 1380 | 180920 | 30 | 87 |
| 147600 | 1380 | 146220 | 31 | 87 |
| 318800 | 1380 | 317420 | 32 | 87 |
| | | | | |
| 180000 | 114000 | 66000 | 33 | 87 |
| 149200 | 114000 | 35200 | 34 | 87 |
| 182300 | 114000 | 68300 | 35 | 87 |
| 147600 | 114000 | 33600 | 36 | 87 |
| 318800 | 114000 | 204800 | 37 | 87 |
| | | | | |
| 149200 | 180000 | -30800 | 37 | 88 |
| 182300 | 180000 | 2300 | 38 | 88 |
| 147600 | 180000 | -32400 | 38 | 89 |
| 318800 | 180000 | 138800 | 39 | 89 |
| | | | | |
| 182300 | 149200 | 33100 | 40 | 89 |
| 147600 | 149200 | -1600 | 40 | 90 |
| 318800 | 149200 | 169600 | 41 | 90 |
| | | | | |
| 147600 | 182300 | -34700 | 41 | 91 |
| 318800 | 182300 | 136500 | 42 | 91 |
| | | | | |
| 318800 | 147600 | 171200 | 43 | 91 |

S Statistic = 43 - 91 = -48

| Tied Group | Value | Members |
|---|---|---|
| 1 | 204000 | 2 |

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |

| | |
|---|---|
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 11/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

---

A = 18
B = 18
C = 0
D = 0
E = 2
F = 2
a = 10608
b = 36720
c = 544
Group Variance = 587.341
Z-Score = -1.93933
Comparison Level at 95% confidence level = 1.65463 (upward trend)
-1.93933 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RWP-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 3.21e+006 | 2.97e+006 | Same Date | 0 | 0 |
| 3.57e+006 1c | 2.97e+006 | 600000 | 1 | 0 |
| 3.88e+006 | 2.97e+006 | 910000 | 2 | 0 |
| 3.86e+006 | 2.97e+006 | 890000 | 3 | 0 |
| 3.16e+006 | 2.97e+006 | 190000 | 4 | 0 |
| 3.81e+006 | 2.97e+006 | 840000 | 5 | 0 |
| 3.52e+006 MH | 2.97e+006 | 550000 | 6 | 0 |
| 3.99e+006 | 2.97e+006 | 1.02e+006 | 7 | 0 |
| 526 | 2.97e+006 | -2.96947e+006 | 7 | 1 |
| 2.53e+006 | 2.97e+006 | -440000 | 7 | 2 |
| 2.709e+006 | 2.97e+006 | -261000 | 7 | 3 |
| 72.01 | 2.97e+006 | -2.96993e+006 | 7 | 4 |
| 3.118e+006 | 2.97e+006 | 148000 | 8 | 4 |
| 2.706e+006 | 2.97e+006 | -264000 | 8 | 5 |
| 3.227e+006 | 2.97e+006 | 257000 | 9 | 5 |
| | | | | |
| 3.57e+006 1c | 3.21e+006 | 360000 | 10 | 5 |
| 3.88e+006 | 3.21e+006 | 670000 | 11 | 5 |
| 3.86e+006 | 3.21e+006 | 650000 | 12 | 5 |
| 3.16e+006 | 3.21e+006 | -50000 | 12 | 6 |
| 3.81e+006 | 3.21e+006 | 600000 | 13 | 6 |
| 3.52e+006 MH | 3.21e+006 | 310000 | 14 | 6 |
| 3.99e+006 | 3.21e+006 | 780000 | 15 | 6 |
| 526 | 3.21e+006 | -3.20947e+006 | 15 | 7 |
| 2.53e+006 | 3.21e+006 | -680000 | 15 | 8 |
| 2.709e+006 | 3.21e+006 | -501000 | 15 | 9 |
| 72.01 | 3.21e+006 | -3.20993e+006 | 15 | 10 |
| 3.118e+006 | 3.21e+006 | -92000 | 15 | 11 |
| 2.706e+006 | 3.21e+006 | -504000 | 15 | 12 |
| 3.227e+006 | 3.21e+006 | 17000 | 16 | 12 |
| | | | | |
| 3.88e+006 | 3.57e+006 1c | 310000 | 17 | 12 |
| 3.86e+006 | 3.57e+006 1c | 290000 | 18 | 12 |
| 3.16e+006 | 3.57e+006 1c | -410000 | 18 | 13 |
| 3.81e+006 | 3.57e+006 1c | 240000 | 19 | 13 |
| 3.52e+006 MH | 3.57e+006 1c | -50000 | 19 | 14 |
| 3.99e+006 | 3.57e+006 1c | 420000 | 20 | 14 |
| 526 | 3.57e+006 1c | -3.56947e+006 | 20 | 15 |
| 2.53e+006 | 3.57e+006 1c | -1.04e+006 | 20 | 16 |
| 2.709e+006 | 3.57e+006 1c | -861000 | 20 | 17 |
| 72.01 | 3.57e+006 1c | -3.56993e+006 | 20 | 18 |
| 3.118e+006 | 3.57e+006 1c | -452000 | 20 | 19 |
| 2.706e+006 | 3.57e+006 1c | -864000 | 20 | 20 |
| 3.227e+006 | 3.57e+006 1c | -343000 | 20 | 21 |
| | | | | |
| 3.86e+006 | 3.88e+006 | -20000 | 20 | 22 |
| 3.16e+006 | 3.88e+006 | -720000 | 20 | 23 |

| | | | | |
|---|---|---|---|---|
| 3.81e+006 | 3.88e+006 | -70000 | 20 | 24 |
| 3.52e+006 MH | 3.88e+006 | -360000 | 20 | 25 |
| 3.99e+006 | 3.88e+006 | 110000 | 21 | 25 |
| 526 | 3.88e+006 | -3.87947e+006 | 21 | 26 |
| 2.53e+006 | 3.88e+006 | -1.35e+006 | 21 | 27 |
| 2.709e+006 | 3.88e+006 | -1.171e+006 | 21 | 28 |
| 72.01 | 3.88e+006 | -3.87993e+006 | 21 | 29 |
| 3.118e+006 | 3.88e+006 | -762000 | 21 | 30 |
| 2.706e+006 | 3.88e+006 | -1.174e+006 | 21 | 31 |
| 3.227e+006 | 3.88e+006 | -653000 | 21 | 32 |
| | | | | |
| 3.16e+006 | 3.86e+006 | -700000 | 21 | 33 |
| 3.81e+006 | 3.86e+006 | -50000 | 21 | 34 |
| 3.52e+006 MH | 3.86e+006 | -340000 | 21 | 35 |
| 3.99e+006 | 3.86e+006 | 130000 | 22 | 35 |
| 526 | 3.86e+006 | -3.85947e+006 | 22 | 36 |
| 2.53e+006 | 3.86e+006 | -1.33e+006 | 22 | 37 |
| 2.709e+006 | 3.86e+006 | -1.151e+006 | 22 | 38 |
| 72.01 | 3.86e+006 | -3.85993e+006 | 22 | 39 |
| 3.118e+006 | 3.86e+006 | -742000 | 22 | 40 |
| 2.706e+006 | 3.86e+006 | -1.154e+006 | 22 | 41 |
| 3.227e+006 | 3.86e+006 | -633000 | 22 | 42 |
| | | | | |
| 3.81e+006 | 3.16e+006 | 650000 | 23 | 42 |
| 3.52e+006 MH | 3.16e+006 | 360000 | 24 | 42 |
| 3.99e+006 | 3.16e+006 | 830000 | 25 | 42 |
| 526 | 3.16e+006 | -3.15947e+006 | 25 | 43 |
| 2.53e+006 | 3.16e+006 | -630000 | 25 | 44 |
| 2.709e+006 | 3.16e+006 | -451000 | 25 | 45 |
| 72.01 | 3.16e+006 | -3.15993e+006 | 25 | 46 |
| 3.118e+006 | 3.16e+006 | -42000 | 25 | 47 |
| 2.706e+006 | 3.16e+006 | -454000 | 25 | 48 |
| 3.227e+006 | 3.16e+006 | 67000 | 26 | 48 |
| | | | | |
| 3.52e+006 MH | 3.81e+006 | -290000 | 26 | 49 |
| 3.99e+006 | 3.81e+006 | 180000 | 27 | 49 |
| 526 | 3.81e+006 | -3.80947e+006 | 27 | 50 |
| 2.53e+006 | 3.81e+006 | -1.28e+006 | 27 | 51 |
| 2.709e+006 | 3.81e+006 | -1.101e+006 | 27 | 52 |
| 72.01 | 3.81e+006 | -3.80993e+006 | 27 | 53 |
| 3.118e+006 | 3.81e+006 | -692000 | 27 | 54 |
| 2.706e+006 | 3.81e+006 | -1.104e+006 | 27 | 55 |
| 3.227e+006 | 3.81e+006 | -583000 | 27 | 56 |
| | | | | |
| 3.99e+006 | 3.52e+006 MH | 470000 | 28 | 56 |
| 526 | 3.52e+006 MH | -3.51947e+006 | 28 | 57 |
| 2.53e+006 | 3.52e+006 MH | -990000 | 28 | 58 |
| 2.709e+006 | 3.52e+006 MH | -811000 | 28 | 59 |
| 72.01 | 3.52e+006 MH | -3.51993e+006 | 28 | 60 |
| 3.118e+006 | 3.52e+006 MH | -402000 | 28 | 61 |
| 2.706e+006 | 3.52e+006 MH | -814000 | 28 | 62 |
| 3.227e+006 | 3.52e+006 MH | -293000 | 28 | 63 |
| | | | | |
| 526 | 3.99e+006 | -3.98947e+006 | 28 | 64 |
| 2.53e+006 | 3.99e+006 | -1.46e+006 | 28 | 65 |
| 2.709e+006 | 3.99e+006 | -1.281e+006 | 28 | 66 |
| 72.01 | 3.99e+006 | -3.98993e+006 | 28 | 67 |

| | | | | |
|---|---|---|---|---|
| 3.118e+006 | 3.99e+006 | -872000 | 28 | 68 |
| 2.706e+006 | 3.99e+006 | -1.284e+006 | 28 | 69 |
| 3.227e+006 | 3.99e+006 | -763000 | 28 | 70 |
| | | | | |
| 2.53e+006 | 526 | 2.52947e+006 | 29 | 70 |
| 2.709e+006 | 526 | 2.70847e+006 | 30 | 70 |
| 72.01 | 526 | -453.99 | 30 | 71 |
| 3.118e+006 | 526 | 3.11747e+006 | 31 | 71 |
| 2.706e+006 | 526 | 2.70547e+006 | 32 | 71 |
| 3.227e+006 | 526 | 3.22647e+006 | 33 | 71 |
| | | | | |
| 2.709e+006 | 2.53e+006 | 179000 | 34 | 71 |
| 72.01 | 2.53e+006 | -2.52993e+006 | 34 | 72 |
| 3.118e+006 | 2.53e+006 | 588000 | 35 | 72 |
| 2.706e+006 | 2.53e+006 | 176000 | 36 | 72 |
| 3.227e+006 | 2.53e+006 | 697000 | 37 | 72 |
| | | | | |
| 72.01 | 2.709e+006 | -2.70893e+006 | 37 | 73 |
| 3.118e+006 | 2.709e+006 | 409000 | 38 | 73 |
| 2.706e+006 | 2.709e+006 | -3000 | 38 | 74 |
| 3.227e+006 | 2.709e+006 | 518000 | 39 | 74 |
| | | | | |
| 3.118e+006 | 72.01 | 3.11793e+006 | 40 | 74 |
| 2.706e+006 | 72.01 | 2.70593e+006 | 41 | 74 |
| 3.227e+006 | 72.01 | 3.22693e+006 | 42 | 74 |
| | | | | |
| 2.706e+006 | 3.118e+006 | -412000 | 42 | 75 |
| 3.227e+006 | 3.118e+006 | 109000 | 43 | 75 |
| | | | | |
| 3.227e+006 | 2.706e+006 | 521000 | 44 | 75 |

S Statistic = 44 - 75 = -31

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 11/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 0
B = 18
C = 0

D = 0
E = 0
F = 2
a = 8880
b = 30240
c = 480
Group Variance = 492.333
Z-Score = -1.35205
Comparison Level at 95% confidence level = 1.65463 (upward trend)
-1.35205 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RWQ-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 339000 | 357000 | Same Date | 0 | 0 |
| 270000 1c | 357000 | -87000 | 0 | 1 |
| 258000 | 357000 | -99000 | 0 | 2 |
| 312000 | 357000 | -45000 | 0 | 3 |
| 255000 | 357000 | -102000 | 0 | 4 |
| 280000 3c | 357000 | -77000 | 0 | 5 |
| 257000 | 357000 | -100000 | 0 | 6 |
| 286000 | 357000 | -71000 | 0 | 7 |
| 256000 | 357000 | -101000 | 0 | 8 |
| 221000 | 357000 | -136000 | 0 | 9 |
| 216500 | 357000 | -140500 | 0 | 10 |
| 19.07 | 357000 | -356981 | 0 | 11 |
| 292800 | 357000 | -64200 | 0 | 12 |
| 316200 | 357000 | -40800 | 0 | 13 |
| 315500 | 357000 | -41500 | 0 | 14 |
| | | | | |
| 270000 1c | 339000 | -69000 | 0 | 15 |
| 258000 | 339000 | -81000 | 0 | 16 |
| 312000 | 339000 | -27000 | 0 | 17 |
| 255000 | 339000 | -84000 | 0 | 18 |
| 280000 3c | 339000 | -59000 | 0 | 19 |
| 257000 | 339000 | -82000 | 0 | 20 |
| 286000 | 339000 | -53000 | 0 | 21 |
| 256000 | 339000 | -83000 | 0 | 22 |
| 221000 | 339000 | -118000 | 0 | 23 |
| 216500 | 339000 | -122500 | 0 | 24 |
| 19.07 | 339000 | -338981 | 0 | 25 |
| 292800 | 339000 | -46200 | 0 | 26 |
| 316200 | 339000 | -22800 | 0 | 27 |
| 315500 | 339000 | -23500 | 0 | 28 |
| | | | | |
| 258000 | 270000 1c | -12000 | 0 | 29 |
| 312000 | 270000 1c | 42000 | 1 | 29 |
| 255000 | 270000 1c | -15000 | 1 | 30 |
| 280000 3c | 270000 1c | 10000 | 2 | 30 |
| 257000 | 270000 1c | -13000 | 2 | 31 |
| 286000 | 270000 1c | 16000 | 3 | 31 |
| 256000 | 270000 1c | -14000 | 3 | 32 |
| 221000 | 270000 1c | -49000 | 3 | 33 |
| 216500 | 270000 1c | -53500 | 3 | 34 |
| 19.07 | 270000 1c | -269981 | 3 | 35 |
| 292800 | 270000 1c | 22800 | 4 | 35 |
| 316200 | 270000 1c | 46200 | 5 | 35 |
| 315500 | 270000 1c | 45500 | 6 | 35 |
| | | | | |
| 312000 | 258000 | 54000 | 7 | 35 |
| 255000 | 258000 | -3000 | 7 | 36 |

| | | | | |
|---|---|---|---|---|
| 280000 3c | 258000 | 22000 | 8 | 36 |
| 257000 | 258000 | -1000 | 8 | 37 |
| 286000 | 258000 | 28000 | 9 | 37 |
| 256000 | 258000 | -2000 | 9 | 38 |
| 221000 | 258000 | -37000 | 9 | 39 |
| 216500 | 258000 | -41500 | 9 | 40 |
| 19.07 | 258000 | -257981 | 9 | 41 |
| 292800 | 258000 | 34800 | 10 | 41 |
| 316200 | 258000 | 58200 | 11 | 41 |
| 315500 | 258000 | 57500 | 12 | 41 |
| | | | | |
| 255000 | 312000 | -57000 | 12 | 42 |
| 280000 3c | 312000 | -32000 | 12 | 43 |
| 257000 | 312000 | -55000 | 12 | 44 |
| 286000 | 312000 | -26000 | 12 | 45 |
| 256000 | 312000 | -56000 | 12 | 46 |
| 221000 | 312000 | -91000 | 12 | 47 |
| 216500 | 312000 | -95500 | 12 | 48 |
| 19.07 | 312000 | -311981 | 12 | 49 |
| 292800 | 312000 | -19200 | 12 | 50 |
| 316200 | 312000 | 4200 | 13 | 50 |
| 315500 | 312000 | 3500 | 14 | 50 |
| | | | | |
| 280000 3c | 255000 | 25000 | 15 | 50 |
| 257000 | 255000 | 2000 | 16 | 50 |
| 286000 | 255000 | 31000 | 17 | 50 |
| 256000 | 255000 | 1000 | 18 | 50 |
| 221000 | 255000 | -34000 | 18 | 51 |
| 216500 | 255000 | -38500 | 18 | 52 |
| 19.07 | 255000 | -254981 | 18 | 53 |
| 292800 | 255000 | 37800 | 19 | 53 |
| 316200 | 255000 | 61200 | 20 | 53 |
| 315500 | 255000 | 60500 | 21 | 53 |
| | | | | |
| 257000 | 280000 3c | -23000 | 21 | 54 |
| 286000 | 280000 3c | 6000 | 22 | 54 |
| 256000 | 280000 3c | -24000 | 22 | 55 |
| 221000 | 280000 3c | -59000 | 22 | 56 |
| 216500 | 280000 3c | -63500 | 22 | 57 |
| 19.07 | 280000 3c | -279981 | 22 | 58 |
| 292800 | 280000 3c | 12800 | 23 | 58 |
| 316200 | 280000 3c | 36200 | 24 | 58 |
| 315500 | 280000 3c | 35500 | 25 | 58 |
| | | | | |
| 286000 | 257000 | 29000 | 26 | 58 |
| 256000 | 257000 | -1000 | 26 | 59 |
| 221000 | 257000 | -36000 | 26 | 60 |
| 216500 | 257000 | -40500 | 26 | 61 |
| 19.07 | 257000 | -256981 | 26 | 62 |
| 292800 | 257000 | 35800 | 27 | 62 |
| 316200 | 257000 | 59200 | 28 | 62 |
| 315500 | 257000 | 58500 | 29 | 62 |
| | | | | |
| 256000 | 286000 | -30000 | 29 | 63 |
| 221000 | 286000 | -65000 | 29 | 64 |
| 216500 | 286000 | -69500 | 29 | 65 |
| 19.07 | 286000 | -285981 | 29 | 66 |

| | | | | |
|---|---|---|---|---|
| 292800 | 286000 | 6800 | 30 | 66 |
| 316200 | 286000 | 30200 | 31 | 66 |
| 315500 | 286000 | 29500 | 32 | 66 |
| | | | | |
| 221000 | 256000 | -35000 | 32 | 67 |
| 216500 | 256000 | -39500 | 32 | 68 |
| 19.07 | 256000 | -255981 | 32 | 69 |
| 292800 | 256000 | 36800 | 33 | 69 |
| 316200 | 256000 | 60200 | 34 | 69 |
| 315500 | 256000 | 59500 | 35 | 69 |
| | | | | |
| 216500 | 221000 | -4500 | 35 | 70 |
| 19.07 | 221000 | -220981 | 35 | 71 |
| 292800 | 221000 | 71800 | 36 | 71 |
| 316200 | 221000 | 95200 | 37 | 71 |
| 315500 | 221000 | 94500 | 38 | 71 |
| | | | | |
| 19.07 | 216500 | -216481 | 38 | 72 |
| 292800 | 216500 | 76300 | 39 | 72 |
| 316200 | 216500 | 99700 | 40 | 72 |
| 315500 | 216500 | 99000 | 41 | 72 |
| | | | | |
| 292800 | 19.07 | 292781 | 42 | 72 |
| 316200 | 19.07 | 316181 | 43 | 72 |
| 315500 | 19.07 | 315481 | 44 | 72 |
| | | | | |
| 316200 | 292800 | 23400 | 45 | 72 |
| 315500 | 292800 | 22700 | 46 | 72 |
| | | | | |
| 315500 | 316200 | -700 | 46 | 73 |

S Statistic = 46 - 73 = -27

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 0
B = 18
C = 0

D = 0
E = 0
F = 2
a = 8880
b = 30240
c = 480
Group Variance = 492.333
Z-Score = -1.17177
Comparison Level at 95% confidence level = 1.65463 (upward trend)
-1.17177 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RWR-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 2.66e+006 1c4c | 2.56e+006 2c | Same Date | 0 | 0 |
| 3.62e+006 1c | 2.56e+006 2c | 1.06e+006 | 1 | 0 |
| 4.05e+006 | 2.56e+006 2c | 1.49e+006 | 2 | 0 |
| 814000 | 2.56e+006 2c | -1.746e+006 | 2 | 1 |
| 2.53e+006 | 2.56e+006 2c | -30000 | 2 | 2 |
| 1.83e+006 | 2.56e+006 2c | -730000 | 2 | 3 |
| 996000 1c | 2.56e+006 2c | -1.564e+006 | 2 | 4 |
| 1.4e+006 | 2.56e+006 2c | -1.16e+006 | 2 | 5 |
| 48000 | 2.56e+006 2c | -2.512e+006 | 2 | 6 |
| 599000 | 2.56e+006 2c | -1.961e+006 | 2 | 7 |
| 912000 | 2.56e+006 2c | -1.648e+006 | 2 | 8 |
| 2.677e+006 | 2.56e+006 2c | 117000 | 3 | 8 |
| 2.476e+006 | 2.56e+006 2c | -84000 | 3 | 9 |
| 2.73e+006 | 2.56e+006 2c | 170000 | 4 | 9 |
| 4.833e+006 | 2.56e+006 2c | 2.273e+006 | 5 | 9 |
| | | | | |
| 3.62e+006 1c | 2.66e+006 1c4c | 960000 | 6 | 9 |
| 4.05e+006 | 2.66e+006 1c4c | 1.39e+006 | 7 | 9 |
| 814000 | 2.66e+006 1c4c | -1.846e+006 | 7 | 10 |
| 2.53e+006 | 2.66e+006 1c4c | -130000 | 7 | 11 |
| 1.83e+006 | 2.66e+006 1c4c | -830000 | 7 | 12 |
| 996000 1c | 2.66e+006 1c4c | -1.664e+006 | 7 | 13 |
| 1.4e+006 | 2.66e+006 1c4c | -1.26e+006 | 7 | 14 |
| 48000 | 2.66e+006 1c4c | -2.612e+006 | 7 | 15 |
| 599000 | 2.66e+006 1c4c | -2.061e+006 | 7 | 16 |
| 912000 | 2.66e+006 1c4c | -1.748e+006 | 7 | 17 |
| 2.677e+006 | 2.66e+006 1c4c | 17000 | 8 | 17 |
| 2.476e+006 | 2.66e+006 1c4c | -184000 | 8 | 18 |
| 2.73e+006 | 2.66e+006 1c4c | 70000 | 9 | 18 |
| 4.833e+006 | 2.66e+006 1c4c | 2.173e+006 | 10 | 18 |
| | | | | |
| 4.05e+006 | 3.62e+006 1c | 430000 | 11 | 18 |
| 814000 | 3.62e+006 1c | -2.806e+006 | 11 | 19 |
| 2.53e+006 | 3.62e+006 1c | -1.09e+006 | 11 | 20 |
| 1.83e+006 | 3.62e+006 1c | -1.79e+006 | 11 | 21 |
| 996000 1c | 3.62e+006 1c | -2.624e+006 | 11 | 22 |
| 1.4e+006 | 3.62e+006 1c | -2.22e+006 | 11 | 23 |
| 48000 | 3.62e+006 1c | -3.572e+006 | 11 | 24 |
| 599000 | 3.62e+006 1c | -3.021e+006 | 11 | 25 |
| 912000 | 3.62e+006 1c | -2.708e+006 | 11 | 26 |
| 2.677e+006 | 3.62e+006 1c | -943000 | 11 | 27 |
| 2.476e+006 | 3.62e+006 1c | -1.144e+006 | 11 | 28 |
| 2.73e+006 | 3.62e+006 1c | -890000 | 11 | 29 |
| 4.833e+006 | 3.62e+006 1c | 1.213e+006 | 12 | 29 |
| | | | | |
| 814000 | 4.05e+006 | -3.236e+006 | 12 | 30 |
| 2.53e+006 | 4.05e+006 | -1.52e+006 | 12 | 31 |

| | | | | |
|---|---|---|---|---|
| 1.83e+006 | 4.05e+006 | -2.22e+006 | 12 | 32 |
| 996000 1c | 4.05e+006 | -3.054e+006 | 12 | 33 |
| 1.4e+006 | 4.05e+006 | -2.65e+006 | 12 | 34 |
| 48000 | 4.05e+006 | -4.002e+006 | 12 | 35 |
| 599000 | 4.05e+006 | -3.451e+006 | 12 | 36 |
| 912000 | 4.05e+006 | -3.138e+006 | 12 | 37 |
| 2.677e+006 | 4.05e+006 | -1.373e+006 | 12 | 38 |
| 2.476e+006 | 4.05e+006 | -1.574e+006 | 12 | 39 |
| 2.73e+006 | 4.05e+006 | -1.32e+006 | 12 | 40 |
| 4.833e+006 | 4.05e+006 | 783000 | 13 | 40 |
| | | | | |
| 2.53e+006 | 814000 | 1.716e+006 | 14 | 40 |
| 1.83e+006 | 814000 | 1.016e+006 | 15 | 40 |
| 996000 1c | 814000 | 182000 | 16 | 40 |
| 1.4e+006 | 814000 | 586000 | 17 | 40 |
| 48000 | 814000 | -766000 | 17 | 41 |
| 599000 | 814000 | -215000 | 17 | 42 |
| 912000 | 814000 | 98000 | 18 | 42 |
| 2.677e+006 | 814000 | 1.863e+006 | 19 | 42 |
| 2.476e+006 | 814000 | 1.662e+006 | 20 | 42 |
| 2.73e+006 | 814000 | 1.916e+006 | 21 | 42 |
| 4.833e+006 | 814000 | 4.019e+006 | 22 | 42 |
| | | | | |
| 1.83e+006 | 2.53e+006 | -700000 | 22 | 43 |
| 996000 1c | 2.53e+006 | -1.534e+006 | 22 | 44 |
| 1.4e+006 | 2.53e+006 | -1.13e+006 | 22 | 45 |
| 48000 | 2.53e+006 | -2.482e+006 | 22 | 46 |
| 599000 | 2.53e+006 | -1.931e+006 | 22 | 47 |
| 912000 | 2.53e+006 | -1.618e+006 | 22 | 48 |
| 2.677e+006 | 2.53e+006 | 147000 | 23 | 48 |
| 2.476e+006 | 2.53e+006 | -54000 | 23 | 49 |
| 2.73e+006 | 2.53e+006 | 200000 | 24 | 49 |
| 4.833e+006 | 2.53e+006 | 2.303e+006 | 25 | 49 |
| | | | | |
| 996000 1c | 1.83e+006 | -834000 | 25 | 50 |
| 1.4e+006 | 1.83e+006 | -430000 | 25 | 51 |
| 48000 | 1.83e+006 | -1.782e+006 | 25 | 52 |
| 599000 | 1.83e+006 | -1.231e+006 | 25 | 53 |
| 912000 | 1.83e+006 | -918000 | 25 | 54 |
| 2.677e+006 | 1.83e+006 | 847000 | 26 | 54 |
| 2.476e+006 | 1.83e+006 | 646000 | 27 | 54 |
| 2.73e+006 | 1.83e+006 | 900000 | 28 | 54 |
| 4.833e+006 | 1.83e+006 | 3.003e+006 | 29 | 54 |
| | | | | |
| 1.4e+006 | 996000 1c | 404000 | 30 | 54 |
| 48000 | 996000 1c | -948000 | 30 | 55 |
| 599000 | 996000 1c | -397000 | 30 | 56 |
| 912000 | 996000 1c | -84000 | 30 | 57 |
| 2.677e+006 | 996000 1c | 1.681e+006 | 31 | 57 |
| 2.476e+006 | 996000 1c | 1.48e+006 | 32 | 57 |
| 2.73e+006 | 996000 1c | 1.734e+006 | 33 | 57 |
| 4.833e+006 | 996000 1c | 3.837e+006 | 34 | 57 |
| | | | | |
| 48000 | 1.4e+006 | -1.352e+006 | 34 | 58 |
| 599000 | 1.4e+006 | -801000 | 34 | 59 |
| 912000 | 1.4e+006 | -488000 | 34 | 60 |
| 2.677e+006 | 1.4e+006 | 1.277e+006 | 35 | 60 |

| | | | | |
|---|---|---|---|---|
| 2.476e+006 | 1.4e+006 | 1.076e+006 | 36 | 60 |
| 2.73e+006 | 1.4e+006 | 1.33e+006 | 37 | 60 |
| 4.833e+006 | 1.4e+006 | 3.433e+006 | 38 | 60 |
| | | | | |
| 599000 | 48000 | 551000 | 39 | 60 |
| 912000 | 48000 | 864000 | 40 | 60 |
| 2.677e+006 | 48000 | 2.629e+006 | 41 | 60 |
| 2.476e+006 | 48000 | 2.428e+006 | 42 | 60 |
| 2.73e+006 | 48000 | 2.682e+006 | 43 | 60 |
| 4.833e+006 | 48000 | 4.785e+006 | 44 | 60 |
| | | | | |
| 912000 | 599000 | 313000 | 45 | 60 |
| 2.677e+006 | 599000 | 2.078e+006 | 46 | 60 |
| 2.476e+006 | 599000 | 1.877e+006 | 47 | 60 |
| 2.73e+006 | 599000 | 2.131e+006 | 48 | 60 |
| 4.833e+006 | 599000 | 4.234e+006 | 49 | 60 |
| | | | | |
| 2.677e+006 | 912000 | 1.765e+006 | 50 | 60 |
| 2.476e+006 | 912000 | 1.564e+006 | 51 | 60 |
| 2.73e+006 | 912000 | 1.818e+006 | 52 | 60 |
| 4.833e+006 | 912000 | 3.921e+006 | 53 | 60 |
| | | | | |
| 2.476e+006 | 2.677e+006 | -201000 | 53 | 61 |
| 2.73e+006 | 2.677e+006 | 53000 | 54 | 61 |
| 4.833e+006 | 2.677e+006 | 2.156e+006 | 55 | 61 |
| | | | | |
| 2.73e+006 | 2.476e+006 | 254000 | 56 | 61 |
| 4.833e+006 | 2.476e+006 | 2.357e+006 | 57 | 61 |
| | | | | |
| 4.833e+006 | 2.73e+006 | 2.103e+006 | 58 | 61 |

S Statistic = 58 - 61 = -3

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 0
B = 18
C = 0

D = 0
E = 0
F = 2
a = 8880
b = 30240
c = 480
Group Variance = 492.333
Z-Score = -0.0901364
Comparison Level at 95% confidence level = 1.65463 (upward trend)
-0.0901364 <= 1.65463 indicating no evidence of an upward trend

## Mann-Kendall Trend Analysis

### Parameter: Zinc

### Location: RWS-MWI

**Original Data (Not Transformed)**

**Non-Detects Replaced with 1/2 DL**

95% Confidence Level

| Xj | Xk | Xj - Xk | Positives | Negatives |
|---|---|---|---|---|
| 843000 | 797000 | Same Date | 0 | 0 |
| 1.04e+006 1c | 797000 | 243000 | 1 | 0 |
| 946000 | 797000 | 149000 | 2 | 0 |
| 1.07e+006 | 797000 | 273000 | 3 | 0 |
| 74300 | 797000 | -722700 | 3 | 1 |
| 760000 | 797000 | -37000 | 3 | 2 |
| 919000 | 797000 | 122000 | 4 | 2 |
| 858000 | 797000 | 61000 | 5 | 2 |
| 649000 | 797000 | -148000 | 5 | 3 |
| 633000 | 797000 | -164000 | 5 | 4 |
| 228900 | 797000 | -568100 | 5 | 5 |
| 759700 | 797000 | -37300 | 5 | 6 |
| 773700 | 797000 | -23300 | 5 | 7 |
| 767800 | 797000 | -29200 | 5 | 8 |
| 742600 | 797000 | -54400 | 5 | 9 |
| | | | | |
| 1.04e+006 1c | 843000 | 197000 | 6 | 9 |
| 946000 | 843000 | 103000 | 7 | 9 |
| 1.07e+006 | 843000 | 227000 | 8 | 9 |
| 74300 | 843000 | -768700 | 8 | 10 |
| 760000 | 843000 | -83000 | 8 | 11 |
| 919000 | 843000 | 76000 | 9 | 11 |
| 858000 | 843000 | 15000 | 10 | 11 |
| 649000 | 843000 | -194000 | 10 | 12 |
| 633000 | 843000 | -210000 | 10 | 13 |
| 228900 | 843000 | -614100 | 10 | 14 |
| 759700 | 843000 | -83300 | 10 | 15 |
| 773700 | 843000 | -69300 | 10 | 16 |
| 767800 | 843000 | -75200 | 10 | 17 |
| 742600 | 843000 | -100400 | 10 | 18 |
| | | | | |
| 946000 | 1.04e+006 1c | -94000 | 10 | 19 |
| 1.07e+006 | 1.04e+006 1c | 30000 | 11 | 19 |
| 74300 | 1.04e+006 1c | -965700 | 11 | 20 |
| 760000 | 1.04e+006 1c | -280000 | 11 | 21 |
| 919000 | 1.04e+006 1c | -121000 | 11 | 22 |
| 858000 | 1.04e+006 1c | -182000 | 11 | 23 |
| 649000 | 1.04e+006 1c | -391000 | 11 | 24 |
| 633000 | 1.04e+006 1c | -407000 | 11 | 25 |
| 228900 | 1.04e+006 1c | -811100 | 11 | 26 |
| 759700 | 1.04e+006 1c | -280300 | 11 | 27 |
| 773700 | 1.04e+006 1c | -266300 | 11 | 28 |
| 767800 | 1.04e+006 1c | -272200 | 11 | 29 |
| 742600 | 1.04e+006 1c | -297400 | 11 | 30 |
| | | | | |
| 1.07e+006 | 946000 | 124000 | 12 | 30 |
| 74300 | 946000 | -871700 | 12 | 31 |

| | | | | |
|---|---|---|---|---|
| 760000 | 946000 | -186000 | 12 | 32 |
| 919000 | 946000 | -27000 | 12 | 33 |
| 858000 | 946000 | -88000 | 12 | 34 |
| 649000 | 946000 | -297000 | 12 | 35 |
| 633000 | 946000 | -313000 | 12 | 36 |
| 228900 | 946000 | -717100 | 12 | 37 |
| 759700 | 946000 | -186300 | 12 | 38 |
| 773700 | 946000 | -172300 | 12 | 39 |
| 767800 | 946000 | -178200 | 12 | 40 |
| 742600 | 946000 | -203400 | 12 | 41 |
| | | | | |
| 74300 | 1.07e+006 | -995700 | 12 | 42 |
| 760000 | 1.07e+006 | -310000 | 12 | 43 |
| 919000 | 1.07e+006 | -151000 | 12 | 44 |
| 858000 | 1.07e+006 | -212000 | 12 | 45 |
| 649000 | 1.07e+006 | -421000 | 12 | 46 |
| 633000 | 1.07e+006 | -437000 | 12 | 47 |
| 228900 | 1.07e+006 | -841100 | 12 | 48 |
| 759700 | 1.07e+006 | -310300 | 12 | 49 |
| 773700 | 1.07e+006 | -296300 | 12 | 50 |
| 767800 | 1.07e+006 | -302200 | 12 | 51 |
| 742600 | 1.07e+006 | -327400 | 12 | 52 |
| | | | | |
| 760000 | 74300 | 685700 | 13 | 52 |
| 919000 | 74300 | 844700 | 14 | 52 |
| 858000 | 74300 | 783700 | 15 | 52 |
| 649000 | 74300 | 574700 | 16 | 52 |
| 633000 | 74300 | 558700 | 17 | 52 |
| 228900 | 74300 | 154600 | 18 | 52 |
| 759700 | 74300 | 685400 | 19 | 52 |
| 773700 | 74300 | 699400 | 20 | 52 |
| 767800 | 74300 | 693500 | 21 | 52 |
| 742600 | 74300 | 668300 | 22 | 52 |
| | | | | |
| 919000 | 760000 | 159000 | 23 | 52 |
| 858000 | 760000 | 98000 | 24 | 52 |
| 649000 | 760000 | -111000 | 24 | 53 |
| 633000 | 760000 | -127000 | 24 | 54 |
| 228900 | 760000 | -531100 | 24 | 55 |
| 759700 | 760000 | -300 | 24 | 56 |
| 773700 | 760000 | 13700 | 25 | 56 |
| 767800 | 760000 | 7800 | 26 | 56 |
| 742600 | 760000 | -17400 | 26 | 57 |
| | | | | |
| 858000 | 919000 | -61000 | 26 | 58 |
| 649000 | 919000 | -270000 | 26 | 59 |
| 633000 | 919000 | -286000 | 26 | 60 |
| 228900 | 919000 | -690100 | 26 | 61 |
| 759700 | 919000 | -159300 | 26 | 62 |
| 773700 | 919000 | -145300 | 26 | 63 |
| 767800 | 919000 | -151200 | 26 | 64 |
| 742600 | 919000 | -176400 | 26 | 65 |
| | | | | |
| 649000 | 858000 | -209000 | 26 | 66 |
| 633000 | 858000 | -225000 | 26 | 67 |
| 228900 | 858000 | -629100 | 26 | 68 |
| 759700 | 858000 | -98300 | 26 | 69 |

| | | | | |
|---|---|---|---|---|
| 773700 | 858000 | -84300 | 26 | 70 |
| 767800 | 858000 | -90200 | 26 | 71 |
| 742600 | 858000 | -115400 | 26 | 72 |
| | | | | |
| 633000 | 649000 | -16000 | 26 | 73 |
| 228900 | 649000 | -420100 | 26 | 74 |
| 759700 | 649000 | 110700 | 27 | 74 |
| 773700 | 649000 | 124700 | 28 | 74 |
| 767800 | 649000 | 118800 | 29 | 74 |
| 742600 | 649000 | 93600 | 30 | 74 |
| | | | | |
| 228900 | 633000 | -404100 | 30 | 75 |
| 759700 | 633000 | 126700 | 31 | 75 |
| 773700 | 633000 | 140700 | 32 | 75 |
| 767800 | 633000 | 134800 | 33 | 75 |
| 742600 | 633000 | 109600 | 34 | 75 |
| | | | | |
| 759700 | 228900 | 530800 | 35 | 75 |
| 773700 | 228900 | 544800 | 36 | 75 |
| 767800 | 228900 | 538900 | 37 | 75 |
| 742600 | 228900 | 513700 | 38 | 75 |
| | | | | |
| 773700 | 759700 | 14000 | 39 | 75 |
| 767800 | 759700 | 8100 | 40 | 75 |
| 742600 | 759700 | -17100 | 40 | 76 |
| | | | | |
| 767800 | 773700 | -5900 | 40 | 77 |
| 742600 | 773700 | -31100 | 40 | 78 |
| | | | | |
| 742600 | 767800 | -25200 | 40 | 79 |

S Statistic = 40 - 79 = -39

| Tied Group | Value | Members |
|---|---|---|

| Time Period | Observations |
|---|---|
| 5/1/2019 | 2 |
| 9/1/2019 | 1 |
| 12/1/2019 | 1 |
| 3/1/2020 | 1 |
| 6/1/2020 | 1 |
| 9/1/2020 | 1 |
| 11/1/2020 | 1 |
| 6/1/2021 | 1 |
| 10/1/2021 | 1 |
| 3/1/2022 | 1 |
| 9/1/2022 | 1 |
| 3/1/2023 | 1 |
| 9/1/2023 | 1 |
| 3/1/2024 | 1 |
| 9/1/2024 | 1 |

There are 1 time periods with multiple data

A = 0
B = 18
C = 0

D = 0
E = 0
F = 2
a = 8880
b = 30240
c = 480
Group Variance = 492.333
Z-Score = -1.71259
Comparison Level at 95% confidence level = 1.65463 (upward trend)
-1.71259 <= 1.65463 indicating no evidence of an upward trend