Groundwater & Environmental Services, Inc.

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February 14, 2025

Ms. Kathleen Thompson
Oil Control Program
Maryland Department of the Environment
1800 Washington Blvd, Suite 620
Baltimore, Maryland 21230

Re: Annual Remedial Evaluation – 2024
Carroll Independent Fuel Co. - Former Green Valley Citgo
11791 Fingerboard Road
Monrovia, Maryland
OCP Case #2005-0834-FR

Dear Ms. Thompson:

Groundwater & Environmental Services, Inc. (GES), on behalf of Carroll Independent Fuel Co. (CIFC), is pleased to submit the **Annual Remedial Evaluation - 2024** report for the Carroll/Former Green Valley Citgo facility (Site). Completion of an annual remedial evaluation for the Site was proposed in the *Revised Corrective Action Plan* submitted to the MDE on January 31, 2014 and approved by the Department on October 3, 2014.

In 2024, GES observed continued, declining trends of MTBE among monitoring and potable wells associated to the case. In addition, review of monitored natural attenuation (MNA) indicator parameters suggests that suitable aerobic and anaerobic conditions exist at the Site to support ongoing biodegradation processes.

On November 19, 2024, CIFC, MDE and GES gathered for an Administrative Consent Order (ACO) status meeting and discussed a path toward closure for the Site. During the meeting, GES presented a monitoring reduction plan which proposed a selection of currently active monitoring wells that could eventually be used to satisfy High-Risk Groundwater Use Area (HRGUA) requirements once the current MDE case for the Site was closed. The MDE requested that the monitoring reduction plan be reiterated with supporting rationale and submitted to the MDE for further review and comment. GES has taken the opportunity to present the proposed monitoring plan in this Annual Remedial Evaluation report for 2024.

In summary, the monitoring reduction plan proposes the following:

- The HRGUA network would be comprised of monitoring wells MW-1, MW-5, MW-13 and MW-17;
- The proposed HRGUA network would be sampled annually and should be implemented now, prior to case closure;
- Release of CIFC from GAC POET maintenance responsibilities for the 3994 Farm Lane potable supply well with sampling to occur at this residence on an annual frequency;
- Reduction of GVP supply system sampling to an annual frequency;
- Reduction of current monitoring report requirements from a quarterly to an annual frequency contingent upon approval of the proposed annual HRGUA monitoring program; and,
- Release from the requirement to submit an Annual Remedial Evaluation report moving forward.

GES, on behalf of CIFC looks forward to MDE's timely review and response to the monitoring reduction plan as provided in this report.

If you have any questions or would like additional information, please contact the undersigned at 800-220-3606, extension 3726, or Herb Meade at 410-261-5450.

Sincerely,

Pete Reichardt
Senior Project Manager

Enclosure

c: Jim Richmond – MDE (1 additional copy & eCopy)
Herb Meade – Carroll (e-copy)
Barry Glotfelty – Frederick County Health Department (CD)
Jennifer and Samir Andrawos – Timbercrest Limited Partnership (CD)
File – GES, MD (PSID# 1014970)

Carroll Independent Fuel Co.

Annual Remedial Evaluation – 2024

Former Green Valley Citgo Station
11791 Fingerboard Road, Monrovia, MD
MDE-OCP Case #2005-0834-FR

February 14, 2025

Annual Remedial Evaluation - 2024

Carroll Fuel – Former Green Valley Citgo
11791 Fingerboard Road
Monrovia, MD 21770

Prepared for:
Carroll Independent Fuel Co.
2700 Loch Raven Road
Baltimore, MD 21228

Prepared by:
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Date:
February 14, 2025

Pete Reichardt
Senior Project Manager

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Acronyms

BTEX	Benzene, Toluene, Ethylbenzene and Xylene
CIFC	Carroll Independent Fuel Co.
CoC	Constituents-of-Concern
DTW	Depth-to-Water
DO	Dissolved Oxygen
Ft. bgs	Feet below grade surface
GAC	Granular Activated Carbon
GES	Groundwater & Environmental Services, Inc.
GVP	Green Valley Plaza
HRGUA	High-Risk Groundwater Use Area
ISCO	In-Situ Chemical Oxidation
J	Estimated concentration
MNA	Monitored Natural Attenuation
Max.	Maximum
MDE- OCP	Maryland Department of the Environment - Oil Control Program
µg/L	Micrograms per Liter
mg/L	Milligrams per Liter
mV	Millivolts
MTBE	Methyl tert-butyl ether
MW	Monitoring Well
ORP	Oxidation Reduction Potential
POET	Point-of-Entry-Treatment
Redox	Oxidation-Reduction
UST	Underground Storage Tank
VOC	Volatile Organic Compound

1. Background and Purpose

Completion of an annual remedial evaluation for the Carroll Independent Fuel (CIFC) Former Green Valley Citgo (Site) was proposed in the *Revised Corrective Action Plan* submitted to the Maryland Department of the Environment Oil Control Program (MDE- OCP) on January 31, 2014 and approved by the Department on October 3, 2014. The purpose of the Annual Remedial Evaluation is as follows:

- to report on the analytical trends of constituents-of-concern (CoC), in particular, methyl tert-butyl ether (MTBE), among monitoring and potable wells related to the Site's active MDE-OCP case;
- to evaluate the effectiveness of the monitored natural attenuation (MNA) program now in effect at the Site, which has been the primary remedial mechanism since the completion of onsite In-Situ Chemical Oxidation activities (ISCO) in 2012;
- to evaluate the need for additional remedial measures;
- to evaluate the need to add or remove analytical constituents, as well as MNA indicator parameters from the monitoring program; and
- to evaluate the need to add or remove potable and/or monitoring wells from the current monitoring program, thereby providing a pathway to case closure.

To avoid redundancy, please note that several tables and appendices referenced in this Annual Remedial Evaluation report are included in the **Fourth Quarter 2024 (4Q2024) Monitoring Report** for the Site, which will be submitted concurrently with this report.

2. Monitoring Since Active Remediation

An ISCO remediation system was in operation at the Site intermittently from September 14, 2011 through April 1, 2012. During ISCO system operation, significant reductions in constituent concentrations, including MTBE, were observed. While direct oxidation was likely the dominant factor for constituent reductions in groundwater within proximity of the injection wells, the constituent reductions occurring further downgradient from the ISCO wells were likely attributed to ongoing natural attenuation processes, including the stimulation of microorganisms through oxygen introduction by ISCO (biodegradation).

Since the ISCO system shutdown in 2012, petroleum constituent concentrations in groundwater have continued to reduce while measurable groundwater conditions at the Site have continued to demonstrate an environment suitable for both aerobic and anaerobic biodegradation processes. Because MTBE is the only volatile organic compound (VOC) that has been detected above any MDE Cleanup or Action Levels since 2009, MTBE is identified as the driving CoC for this MDE-OCP case, now in post-remedial monitoring status.

In Fourth Quarter 2017, the monitoring well network was reduced to nine (9) wells which now include: MW-7, MW-14D, MW-17, MW-18S-R, and MW-18D; sampled on a quarterly basis, and MW-1, MW-4, MW-5, MW-13; sampled on an annual basis.

3. MTBE Trends for Monitoring Wells

For monitoring performed in 2024, one (1) monitoring well exhibited an MTBE concentration above the corresponding MDE Action Level of 20 micrograms per liter (µg/L). Specifically, well MW-18S-R demonstrated an MTBE concentration of 29 µg/L on 11/12/2024.

An updated series of Mann-Kendall statistical analyses were completed to evaluate long-term MTBE trends for the nine (9) total monitoring wells currently comprising the Site monitoring well network. The results of the Mann-Kendall statistical analyses are attached as **Appendix A – Mann-Kendall Trend Analysis Graphs**.

In summary, the updated Mann-Kendall analyses demonstrate decreasing MTBE concentration trends, since ISCO remediation was last conducted in 2012 (i.e., the post-remedial period) with 99% or greater confidence for all active monitoring wells with the exception of monitoring well MW-18D, which demonstrated a no trend determination with a confidence factor of 52.8%. It is noted that over the last two years, MTBE at well MW-18D has ranged in concentration from non-detect (<0.08 µg/L) to 18 µg/L. Nonetheless, elevated detections of MTBE at bedrock well MW-18D, and at the companion shallow well MW-18S-R, appear localized and are not considered a risk factor to onsite or offsite potable supply wells, which, as will be demonstrated in the next section, continue to demonstrate decreasing, post-remedial analytical trends for MTBE.

In summary, the Mann-Kendall analyses support that MTBE concentrations at site monitoring wells have continued to stabilize and/or decline since the completion of ISCO remediation activities in 2012.

4. MTBE Trends for Potable Wells

Currently, the potable well monitoring program for the case consists of the following:

- quarterly sampling and maintenance of three (3) residential, granular-activated carbon (GAC) point-of-entry treatment (POET) located at 3990, 3992, and 3994 Farm Lane; and,
- quarterly “influent-only” sampling of the commercial GAC treatment system located at the Green Valley Plaza (GVP) shopping center.

An updated series of Mann-Kendall statistical analyses was completed to evaluate the post-remedial (>2012) influent MTBE trends for the three (3) remaining residential GAC systems, and the one (1) commercial GVP GAC system related the case. The results of the Mann-Kendall statistical analyses, for the influent concentrations of MTBE at these four supply wells, can be reviewed in the attached **Appendix A – Mann-Kendall Trend Analysis Graphs**.

In summary, the updated Mann-Kendall analyses demonstrate decreasing MTBE concentration trends, since ISCO remediation was last conducted in 2012, with a 99.7% or better confidence factor for the three (3) residential and one (1) commercial potable supply wells currently comprising the case.

5. Monitored Natural Attenuation Data Analysis

Natural attenuation relies upon physical, chemical and/or biological processes to reduce dissolved constituent concentrations in groundwater to acceptable levels. Physical attenuation processes would include dilution and dispersion of the constituents in groundwater. Because MTBE was generally phased-out from gasoline formulations in Maryland from 2005 to 2006, there is no known continuing source to contribute additional MTBE mass to the local groundwater system. The natural movement of groundwater, fed by recurrent precipitation at the surface, is gradually displacing and diluting residual MTBE in both monitoring and potable wells associated to the case. The declining trends of MTBE for all monitoring and potable wells (discussed in the previous section of this report) support that natural attenuation processes continue to be effective in reducing MTBE concentrations over time at the Site since the shutdown of the ISCO remediation system in 2012. Dilution and dispersion are considered the primary natural attenuation mechanisms responsible for continuing declines of MTBE among the active monitoring and potable wells associated to the case.

Another natural attenuation process, the microbial breakdown or biodegradation of MTBE, can also occur when groundwater conditions are suitable to support the appropriate bacterial colonies. As biodegradation can cause changes in groundwater chemistry, the collection of certain field parameters and analysis of select indicator constituents can assist in identifying the dominant (and supporting) biodegradation processes affecting contaminants in groundwater.

In the *Annual Remedial Evaluation - 2018* report, GES concluded that continued verification of improving water quality conditions at the Site and surrounding community could be achieved with the collection and analysis of VOCs only (including MTBE) in conjunction with the continued field measurements of groundwater quality parameters, such as oxidation-reduction potential (ORP) and dissolved oxygen (DO). For the 2018 Annual Remedial Evaluation report, GES recommended the suspension of sample analysis for nitrate, ferrous iron, and sulfate. The MDE-OCP approved this reduction request to the MNA monitoring program in correspondence dated December 6, 2019.

The chart below details the anticipated changes in groundwater chemistry during various stages of biodegradation from aerobic to highly anaerobic conditions.

Time →

← Distance from Source

	Aerobic Respiration	Nitrate Reduction	Manganese Reduction	Ferric Iron Reduction	Sulfate Reduction	Methan-ogenesis
	Aerobic	Anaerobic				
Electron Acceptor	O_2	NO_3^-	Mn^{4+}	Fe^{3+} (solid)	SO_4^{2-}	CO_2
Metabolic By-Product	CO_2	N_2, CO_2	Mn^{2+}	Fe^{2+} (dissolved)	H_2S	CH_4 (methane)
Expected Relationship with High BTEX	$O_2 \downarrow$	$NO_3^- \downarrow$	$Mn^{2+} \uparrow$	$Fe^{2+} \uparrow$	$SO_4^{2-} \downarrow$	$CH_4 \uparrow$

5.1 Dissolved Oxygen

During biodegradation, microbial populations in an aquifer can utilize hydrocarbons, including MTBE, as an energy source through oxidation-reduction (redox) reactions. These reactions often provide complete degradation of hydrocarbons to carbon dioxide and water, but require a terminal electron acceptor. Because oxygen is the most thermodynamically favored electron acceptor for these biodegradation reactions, dissolved oxygen (DO) concentrations in groundwater can indicate whether aerobic biodegradation is occurring as well as if a system is conducive to support aerobic biodegradation processes. A historical summary of field parameter measurements, including DO, is presented in **Table 2 - Historical Monitoring Well Field Parameters Data Summary** of the **4Q 2024 Monitoring Report**. Historical DO measurements in comparison to MTBE and water levels for a given monitoring well are presented in **Appendix D – Groundwater Well Monitoring Graphs** of the **4Q 2024 Monitoring Report.**

Review of the DO field measurements collected in 2024 from the nine (9) active monitoring wells in the network demonstrates the following:

- DO concentrations for wells MW-1, MW-4, MW-5, and MW-13 were measured once in Fourth Quarter 2024, as these wells are now sampled on an annual frequency. DO concentrations for the annual wells in the Fourth Quarter 2024 ranged from 6.08 to 8.82 milligrams per liter (mg/L), with an average DO concentration, at 7.49 mg/L.
- DO concentration for shallow well MW-7 ranged from 4.94 to 6.51 mg/L, measured during four quarterly events, with an average concentration of 5.90 mg/L.
- DO concentration for shallow well MW-17 ranged from 1.99 to 5.53 mg/L, measured during four quarterly events, with an average concentration of 3.95 mg/L.
- DO concentration for shallow well MW-18S-R ranged from 0.73 to 6.55 mg/L, measured during four quarterly events, with an average concentration of 4.34 mg/L.

- DO concentration for bedrock well MW-14D ranged from 0.20 to 0.78 mg/L, measured during four quarterly events, with an average concentration of 0.54 mg/L.
- DO concentration for bedrock well MW-18D ranged from 0.51 to 1.16 mg/L, measured during four quarterly events, with an average concentration of 0.88 mg/L.

In summary, shallow wells MW-1, MW-4, MW-5, MW-7, MW-13, MW-17, and MW-18S-R continue to demonstrate DO concentrations exceeding 2.0 mg/L on average, which is a suitable DO concentration to support aerobic biodegradation of petroleum-related constituents, including MTBE, at these particular wells.

Conversely, bedrock wells MW-14D and MW-18D continue to demonstrate DO concentrations approaching or falling below 1.0 mg/L which indicates an anaerobic water quality condition. Understandably, the bedrock aquifer consists of older groundwater that does not readily receive the recharge of oxygen-rich precipitation events that benefit the shallower-screened monitoring wells at the Site.

5.2 Oxidation Reduction Potential

Oxidation-Reduction Potential (ORP) is a measurement of electron activity and can be an indicator of the relative tendency of groundwater to accept or transfer electrons. ORP is used as an indicator parameter for biodegradation and can identify regions of a groundwater system that are under oxidizing (aerobic) or reducing (anaerobic) conditions. A summary of field parameter measurements, including ORP, is presented in **Table 2 – Historical Monitoring Well Field Parameters Data Summary** of the **4Q 2024 Monitoring Report**.

Review of the ORP field measurements collected in 2024 from the nine (9) active monitoring wells in the network demonstrates the following:

- ORP values for annual monitoring wells MW-1, MW-4, MW-5, and MW-13 were measured during the Fourth Quarter 2024 event. ORP values for the annual wells ranged from 203.1 to 232.5 millivolts (mV), with an average ORP value at 216.8 mV.
- ORP values for shallow well MW-7 ranged from 165.4 to 254.8 mV, measured during four quarterly events, with an average value of 214.5 mV.
- ORP values for shallow well MW-17 ranged from 141.0 to 231.1 mV, measured during four quarterly events, with an average value of 182.4 mV.
- ORP values for shallow well MW-18S-R ranged from 101.4 to 257.3 mV, measured during four quarterly events, with an average value of 192.0 mV.
- ORP values for bedrock well MW-14D ranged from -184.9 to -146.8 mV, measured during four quarterly events, with an average value of -165.2 mV.
- ORP values for bedrock well MW-18D ranged from -137.0 to 149.3 mV, measured during four quarterly events, with an average value of -18.2 mV.

In summary, ORP measurements obtained in 2024 from the seven (7) shallow wells and two (2) bedrock wells support the conclusions presented in the previous section of this report - that the shallow monitoring wells continue to exhibit conditions more conducive for aerobic biodegradation (positive ORP values) while the two bedrock wells demonstrated ORP values reflective of an anaerobic condition.

6. Annual Remedial Status Summary

Statistical review of MTBE concentrations, via Mann-Kendall analyses for both monitoring and potable supply wells associated to the Site, support the observation of stable and/or, declining MTBE trends.

Field parameter measurements and analytical results collected in 2024 among the nine (9) monitoring wells comprising the current network indicate that suitable aerobic and anaerobic conditions exist at the Site to support ongoing biodegradation processes. Declining constituent trends in potable and monitoring wells are anticipated to continue as biological activity, in conjunction with ongoing dilution and dispersion processes, continue to reduce concentrations of MTBE from the local Green Valley aquifer system.

7. Monitoring Reduction Plan

7.1 Proposed HRGUA Well Network

During an Administrative Consent Order (ACO) status meeting between MDE, CIFC and GES on November 19, 2024, GES presented a preliminary monitoring reduction plan for the Site which proposed a selection of currently active monitoring wells that could eventually be used to satisfy High-Risk Groundwater Use Area (HRGUA) requirements once the current MDE case for the Site was closed. As it is understood by GES and CIFC, the current case will remain open until further reductions to influent concentrations of MTBE at the three remaining off-site drinking water locations (3990, 3992, 3994 Farm Lane) are achieved to the satisfaction of the MDE.

In the interim, GES and CIFC feel it is now appropriate to select and implement an onsite HRGUA monitoring program, prior to case closure, given the strong evidence of declining MTBE concentrations and stable water quality conditions occurring at the Site which was demonstrated in this Annual Remedial Status Report for 2024, and from annual remedial reports submitted prior.

Therefore, GES is proposing that monitoring wells **MW-1, MW-5, MW-13, MW-17** be considered for the HRGUA monitoring network at the Site. Note this well list has been slightly modified from the well list presented during the November 19, 2024 meeting. A map of the proposed HRGUA monitoring well network is provided as **Figure 1**. Mann-Kendall analysis and time-series plots of MTBE concentration for all nine monitoring wells, three offsite potable supply wells and the onsite GVP supply well system are attached as **Appendix A – Mann-Kendall Trend Analysis**. Well specifications, including screen intervals for each monitoring well, can be reviewed in **Table 6** of the **Fourth Quarter 2024 Monitoring Report**.

The rationale for HRGUA monitoring well selection is as follows:

- Wells MW-1, MW-5 and MW-13 are positioned to serve a sentinel monitoring well function for future releases that could originate from either the fuel dispenser area or the underground storage tank (UST) field.
  - The screen intervals for **MW-1** and **MW-5** are similarly constructed at 40 to 61.5 feet below grade surface (ft. bgs) and 40 to 70 ft bgs, respectively, and provide representation of water quality occurring in the first water bearing zone beneath the Site (i.e., the water table).
    - Well MW-4 was not selected due to its frequent low-water condition which typically requires collection as a grab sample.
  - The screen interval for **MW-13**, at 49 to 84 ft. bgs, while deeper in comparison to MW-1 and MW-5, is considered in communication with the water table.
    - **MW-13,** being immediately adjacent and downgradient to the UST field has been highly responsive to dissolved constituent detections, including MTBE, over the duration of MDE case #2005-0834-FR.
    - MW-18S-R was not selected due to its proximity to MW-13 (redundant location) and that the well has demonstrated more variability in MTBE concentration over time, potential related to a sensitivity to fluctuating water levels.
    - MW-18D was not selected due to its historical purpose as a discretely screened bedrock well (120-130 ft bgs).
    - MW-7 was not selected as this well (screened 53 to 80 ft. bgs) has provided very consistent historical groundwater elevation and MTBE concentration values in comparison to proposed HRGUA well **MW-13**, and is therefore redundant.
- To represent the downgradient area near the property boundary, well **MW-17** is proposed.
    - **MW-17** has a broad screen interval (35 to 121 ft. bgs) and is considered well integrated with the water table zone. Well MW-17 has also been highly responsive to dissolved constituent detections, including MTBE, over the duration of MDE case #2005-0834-FR.
    - Well MW-14D was not selected, due to its proximity to MW-17 and its historical purpose as a discretely screened bedrock well (201-221 ft bgs).

From the list of proposed HRGUA wells, three (3) of the (4) four wells including **MW-1, MW-5 and MW-13** are currently sampled on an annual frequency as established with MDE correspondence dated October 17, 2017. The fourth proposed HRGUA well, **MW-17**, is currently sampled quarterly. Review of MTBE detection history for **MW-17** (**Appendix A**) indicates that:

- Quarterly MTBE concentrations have remained at or below 1.1 µg/L since May 2021;
- There is a decreasing trend in MTBE concentration over time with a very high confidence factor (99.9%); and,

- Current MTBE concentration is 0.40 µg/L (Nov. 2024) and shows very little variability from event-to-event.

With these considerations, GES feels it appropriate that well **MW-17** should now be sampled on an annual frequency.

It is acknowledged that the six UST field observational pipes (TF-3, 4, 5, 6, 7, 8) would also be required for inspection and gauging during an annual HRGUA monitoring event. It is also acknowledged that collection of an influent sample from the onsite **GVP supply well system** would be required during future HRGUA sampling events.

Once an agreement between CIFC and MDE, regarding a revised monitoring well network, is reached, CIFC will then begin planning for the abandonment of those remaining monitoring wells which were not selected for the pending HRGUA monitoring network.

7.2 Recommended Sample Period for Proposed HRGUA Network

During the November 19, 2024 ACO status meeting, the MDE requested that GES provide a recommendation regarding the most appropriate time-of-year to sample the monitoring wells at the Site on an annual basis. GES reviewed both the minimum and maximum depth-to-water measurements and MTBE concentrations for each proposed HRGUA well, per quarter for a given year, and tallied the results. The table below presents the quarter with the most min. and max "counts" over a particular well's monitoring history.

Table A – Min. and Max Quarter Tally Results – DTW and MTBE

	MW-1	MW-5	MW-13	MW-17
Min. DTW (GW High)	2Q	2Q	2Q	1Q & 2Q (tied)
Max DTW (GW Low)	4Q	4Q	4Q	4Q
Min MTBE	2Q	Hist. ND	3Q & 4Q (tied)	4Q
Max MTBE	4Q	Hist. ND	4Q	3Q

GW = Groundwater
DTW = Depth-to-Water
Hist ND = Historically Non-Detect

Review of the table above indicates minimum depth-to-water (DTW) measurements (high GW elevations) were typically recorded during the 2Q of a given year, with maximum DTW measurements (low GW elevations) recorded during the 4Q of a given year, among the four proposed HRGUA wells. However, review of maximum historical DTW measurements for each well indicate that none of the four proposed wells has ever been measured at or near a "dry" condition since installation.

For MTBE, the tally of quarters with minimum and maximum concentration values for a given year was more variable among the three wells with historical detections, with both maximum and minimum MTBE values occurring during 2Q, 3Q and 4Q.

In summary, GES would recommend that future annual HRGUA sampling occur during the late 3Q to early 4Q period. Concerns of a seasonal "dry" condition, for any of the proposed four wells, are minimal. A third consideration is that the 1Q is typically the most difficult season to conduct field sampling.

7.3 Potable Supply Well Reduction Request

The three remaining offsite residential potable supply locations for the case include 3990, 3992 and 3994 Farm Lane. All three offsite potable locations are currently treated with GAC POET systems and are monitored on a quarterly basis. As reported in **Section 4,** and as demonstrated in **Appendix A**, all three offsite supply well locations are exhibiting declining MTBE trends with very little variability from quarter-to-quarter. The last tested influent MTBE concentrations for 3990, 3992 and 3994 Farm Lane were 13 µg/L, 6.9 µg/L and 1.8 µg/L, respectively. Because the **3994 Farm Lane** location is approaching an MTBE influent concentration of 1.0 µg/L, GES feels it appropriate for MDE to release CIFC from further maintenance requirements for the 3994 Farm Lane GAC POET system. CIFC is currently proposing to sample the 3994 Farm Lane residence as an influent-only collection, on an annual frequency.

Regarding the onsite **GVP supply well system**, the influent-only port is currently sampled semi-annually per MDE directive correspondence dated January 18, 2023. Review of MTBE detection history for the GVP influent location (**Appendix A**) indicates that:

- MTBE concentrations have remained at or below 1.0 µg/L since Jan. 2020;
- There is a decreasing trend in MTBE concentration over time with a very high confidence factor (99.7%); and,
- Current MTBE concentration is 0.25 J µg/L (Nov. 2024) and shows very little variability from event-to-event.

Because CIFC is responsible for influent-only testing on the **GVP supply well system**, and in consideration of the stability and declining trends (now approaching the limits of detectability), GES requests that the MDE reduce the GVP supply well sampling to an annual frequency.

As diagnostic and maintenance requirements for the 3990 and 3992 Farm Lane GAC POET systems are likely to remain in place into the near future, it is anticipated that these two residences will continue to be sampled by CIFC on a quarterly basis until otherwise advised. The MDE would continue to be copied on all residential supply well sampling result letters.

7.4 Reporting Reduction Request

GES recommends that the submission of groundwater monitoring reports for the case should reduce from a quarterly to an annual reporting requirement which would correspond to the annual sampling frequency now proposed for the HRGUA network that CIFC wishes to implement.

GES also requests that the requirement for the submission of a separate Annual Remedial Evaluation Report be removed. With consideration that dissolved petroleum-related constituents in groundwater, particularly MTBE, have greatly diminished at the Site, and that onsite water quality conditions have been stable for quite some time, the annual remedial report is no longer necessary. Individual monitoring well and potable supply well trend graphs that were typically provided in past Annual Remedial Status Reports (included as **Appendix A** to this report) would now be included with the annual HRGUA monitoring report.

Figures

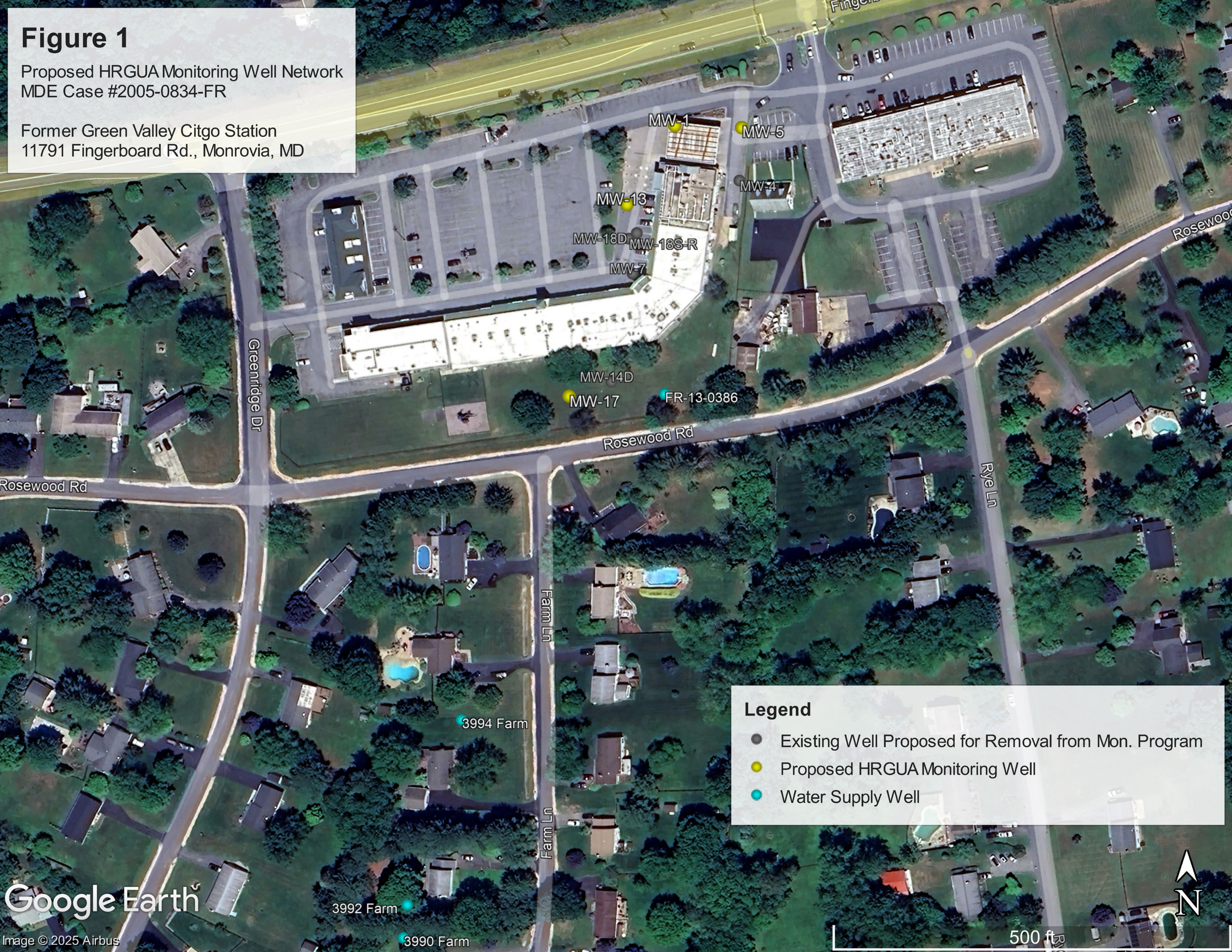


Figure 1

Proposed HRGUA Monitoring Well Network
MDE Case #2005-0834-FR

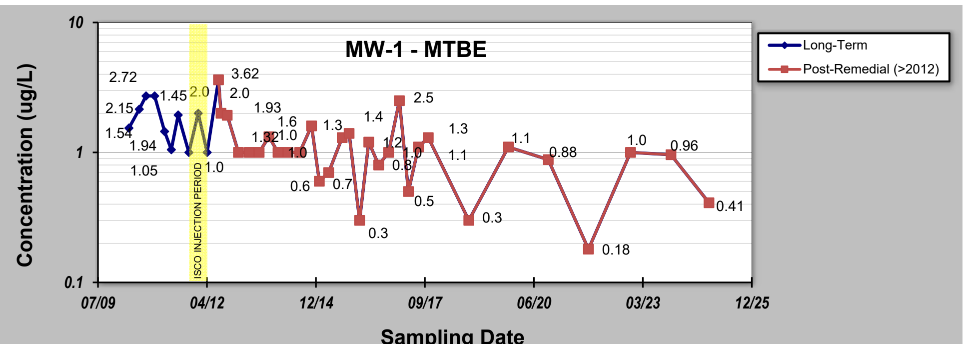
Former Green Valley Citgo Station
11791 Fingerboard Rd., Monrovia, MD

Appendix A – Mann-Kendall Trend Analysis Graphs

GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	4-Feb-25	**Job ID:**	MW-1
Facility Name:	Monrovia BP / Former Green Valley Citgo	**Constituent:**	Methyl tert-Butyl Ether
Conducted By:	P. Reichardt	**Concentration Units:**	ug/L

	Sampling Point ID:	Long-Term	Post-Remedial (>2012)					
Sampling Event	**Sampling Date**	**METHYL TERT-BUTYL ETHER CONCENTRATION (ug/L)**						
1	16-Apr-10	1.54						
2	20-Jul-10	2.15						
3	20-Sep-10	2.72						
4	8-Dec-10	2.72						
5	9-Mar-11	1.45						
6	10-May-11	1.05						
7	12-Jul-11	1.94						
8	18-Oct-11	1.0		ND				
9	12-Jan-12	2.0		ND				
10	3-Apr-12	1.0		ND				
11	16-Jul-12	3.62	3.62					
12	8-Aug-12	2.0	2.0	ND				
13	4-Oct-12	1.93	1.93					
14	15-Jan-13	1.0	1.0	ND				
15	24-Apr-13	1.0	1.0	ND				
16	24-Jul-13	1.0	1.0	ND				
17	22-Oct-13	1.32	1.32					
18	13-Jan-14	1.0	1.0	ND				
19	15-Apr-14	1.0	1.0	ND				
20	31-Jul-14	1.0	1.0	ND				
21	17-Nov-14	1.6	1.6					
22	27-Jan-15	0.6	0.6					
23	23-Apr-15	0.7	0.7					
24	25-Aug-15	1.3	1.3					
25	27-Oct-15	1.4	1.4					
26	1-Feb-16	0.3	0.3	J				
27	25-Apr-16	1.2	1.2					
28	25-Jul-16	0.8	0.8					
29	24-Oct-16	1.0	1.0					
30	31-Jan-17	2.5	2.5					
31	24-Apr-17	0.5	0.5					
32	25-Jul-17	1.1	1.1					
33	23-Oct-17	1.3	1.3					
34	30-Oct-18	0.3	0.3	J				
35	28-Oct-19	1.1	1.1					
36	28-Oct-20	0.88	0.88					
37	1-Nov-21	0.18	0.18	J				
38	22-Nov-22	1.0	1.0					
39	28-Nov-23	0.96	0.96					
40	11-Nov-24	0.41	0.41	J				
	Coefficient of Variation:	0.56	0.61					
	Mann-Kendall Statistic (S):	-338	-148					
	Confidence Factor:	>99.9%	99.6%					
	Concentration Trend:	Decreasing	Decreasing					



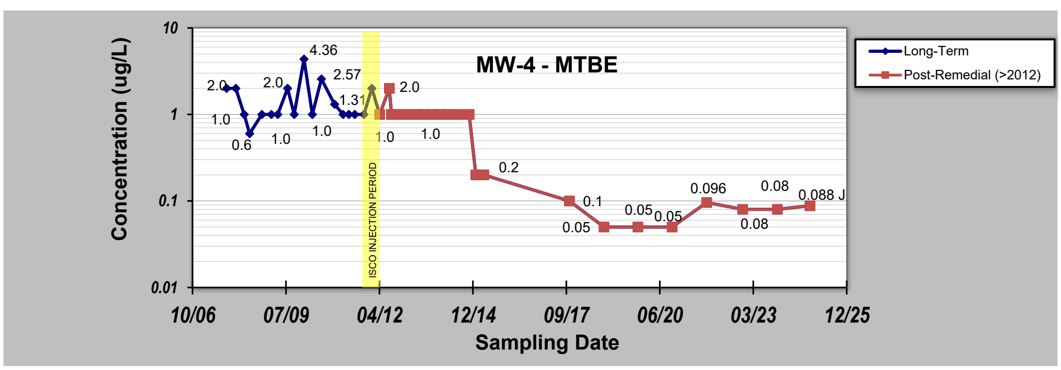
Notes:

1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	4-Feb-25	**Job ID:**	MW-4
Facility Name:	Monrovia BP / Former Green Valley Citgo	**Constituent:**	Methyl tert-Butyl Ether
Conducted By:	P. Reichardt	**Concentration Units:**	ug/L

Sampling Event	Sampling Date	METHYL TERT-BUTYL ETHER CONCENTRATION (ug/L)						
Sampling Point ID:		Long-Term	Post-Remedial (>2012)					
1	10-Oct-07	2.0						
2	16-Jan-08	2.0						
3	15-Apr-08	1.0						
4	12-Jun-08	0.6						
5	21-Oct-08	1.0						
6	30-Jan-09	1.0		ND				
7	9-Apr-09	1.0		ND				
8	23-Jul-09	2.0		ND				
9	2-Oct-09	1.0		ND				
10	15-Jan-10	4.36						
11	14-Apr-10	1.0		ND				
12	20-Jul-10	2.57						
13	8-Dec-10	1.31						
14	9-Mar-11	1.0		ND				
15	10-May-11	1.0		ND				
16	12-Jul-11	1.0		ND				
17	18-Oct-11	1.0		ND				
18	11-Jan-12	2.0		ND				
19	3-Apr-12	1.0	1.0	ND				
20	16-Jul-12	2.0	2.0	ND				
21	8-Aug-12	1.0	1.0	ND				
22	3-Oct-12	1.0	1.0	ND				
23	16-Jan-13	1.0	1.0	ND				
24	24-Apr-13	1.0	1.0	ND				
25	23-Jul-13	1.0	1.0	ND				
26	22-Oct-13	1.0	1.0	ND				
27	15-Jan-14	1.0	1.0	ND				
28	15-Apr-14	1.0	1.0	ND				
29	28-Jul-14	1.0	1.0	ND				
30	17-Nov-14	1.0	1.0	ND				
31	28-Jan-15	0.2	0.2	J				
32	23-Apr-15	0.2	0.2	J				
33	25-Oct-17	0.1	0.1	J				
34	30-Oct-18	0.05	0.05	ND				
35	28-Oct-19	0.05	0.05	ND				
36	28-Oct-20	0.05	0.05	ND				
37	2-Nov-21	0.096	0.096	J				
38	22-Nov-22	0.08	0.08	ND				
39	28-Nov-23	0.08	0.08	ND				
40	11-Nov-24	0.088	0.088	J				
Coefficient of Variation:		0.82	0.86					
Mann-Kendall Statistic (S):		-375	-141					
Confidence Factor:		>99.9%	>99.9%					
Concentration Trend:		Decreasing	Decreasing					



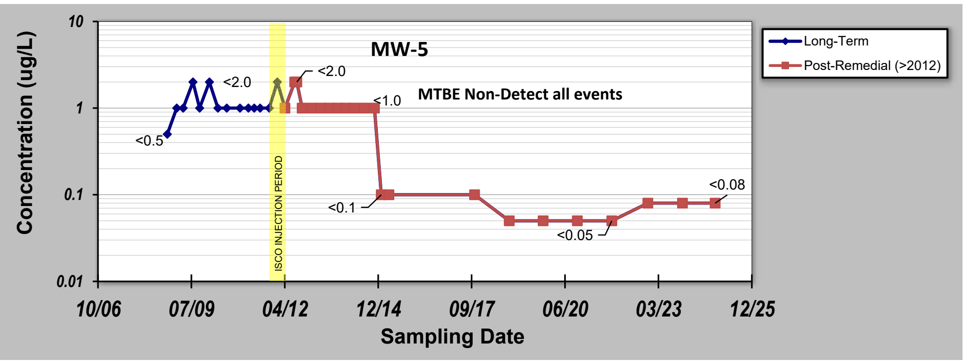
Notes:

1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	4-Feb-25	Job ID:	MW-5
Facility Name:	Monrovia BP / Former Green Valley Citgo	Constituent:	Methyl tert-Butyl Ether
Conducted By:	P. Reichardt	Concentration Units:	ug/L

Sampling Event	Sampling Date	METHYL TERT-BUTYL ETHER CONCENTRATION (ug/L)						
	Sampling Point ID:	Long-Term	Post-Remedial (>2012)					
1	21-Oct-08	0.5		ND				
2	30-Jan-09	1.0		ND				
3	9-Apr-09	1.0		ND				
4	23-Jul-09	2.0		ND				
5	2-Oct-09	1.0		ND				
6	15-Jan-10	2.0		ND				
7	16-Apr-10	1.0		ND				
8	20-Jul-10	1.0		ND				
9	8-Dec-10	1.0		ND				
10	9-Mar-11	1.0		ND				
11	10-May-11	1.0		ND				
12	12-Jul-11	1.0		ND				
13	18-Oct-11	1.0		ND				
14	12-Jan-12	2.0		ND				
15	3-Apr-12	1.0	1.0	ND				
16	16-Jul-12	2.0	2.0	ND				
17	8-Aug-12	2.0	2.0	ND				
18	4-Oct-12	1.0	1.0	ND				
19	15-Jan-13	1.0	1.0	ND				
20	24-Apr-13	1.0	1.0	ND				
21	24-Jul-13	1.0	1.0	ND				
22	22-Oct-13	1.0	1.0	ND				
23	13-Jan-14	1.0	1.0	ND				
24	15-Apr-14	1.0	1.0	ND				
25	30-Jul-14	1.0	1.0	ND				
26	17-Nov-14	1.0	1.0	ND				
27	29-Jan-15	0.1	0.1	ND				
28	21-Apr-15	0.1	0.1	ND				
29	24-Oct-17	0.1	0.1	ND				
30	30-Oct-18	0.05	0.05	ND				
31	28-Oct-19	0.05	0.05	ND				
32	28-Oct-20	0.05	0.05	ND				
33	1-Nov-21	0.05	0.05	ND				
34	22-Nov-22	0.08	0.08	ND				
35	28-Nov-23	0.08	0.08	ND				
36	11-Nov-24	0.08	0.08	ND				
37								
38								
39								
40								
	Coefficient of Variation:	-	-					
	Mann-Kendall Statistic (S):	-	-					
	Confidence Factor:	-	-					
	Concentration Trend:	NA	NA					



Notes:

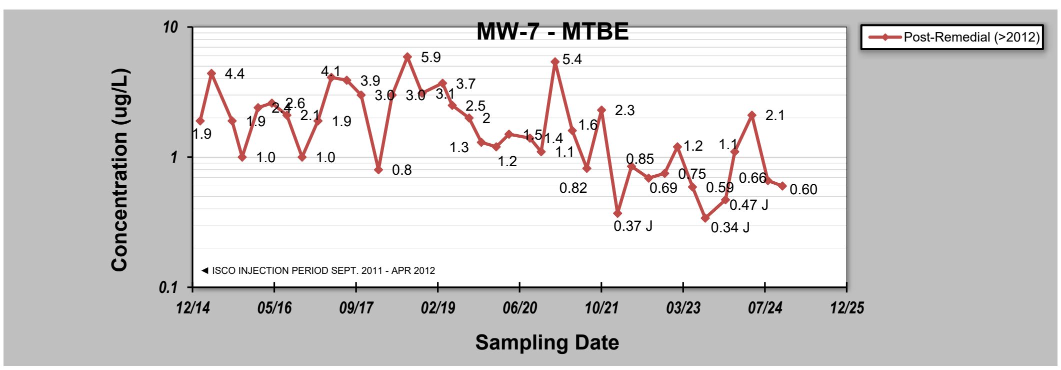
1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: 4-Feb-25
Facility Name: Monrovia BP / Former Green Valley Citgo
Conducted By: P. Reichardt

Job ID: MW-7
Constituent: Methyl tert-Butyl Ether
Concentration Units: ug/L

Sampling Event	Sampling Date	METHYL TERT-BUTYL ETHER CONCENTRATION (ug/L)						
Sampling Point ID:		Post-Remedial (>2012)						
1	12-Feb-15	1.9						
2	22-Apr-15	4.4						
3	26-Aug-15	1.9						
4	26-Oct-15	1.0						
5	1-Feb-16	2.4						
6	25-Apr-16	2.6						
7	26-Jul-16	2.1						
8	27-Oct-16	1.0						
9	1-Feb-17	1.9						
10	24-Apr-17	4.1						
11	27-Jul-17	3.9						
12	23-Oct-17	3.0						
13	6-Feb-18	0.8						
14	1-May-18	3.0						
15	2-Aug-18	5.9						
16	30-Oct-18	3.1						
17	5-Mar-19	3.7						
18	3-May-19	2.5						
19	14-Aug-19	2						
20	28-Oct-19	1.3						
21	27-Jan-20	1.2						
22	14-Apr-20	1.5						
23	20-Aug-20	1.4						
24	28-Oct-20	1.1						
25	21-Jan-21	5.4						
26	6-May-21	1.6						
27	3-Aug-21	0.82						
28	1-Nov-21	2.3						
29	7-Feb-22	0.37	J					
30	3-May-22	0.85						
31	16-Aug-22	0.69						
32	22-Nov-22	0.75						
33	8-Feb-23	1.2						
34	11-May-23	0.59						
35	28-Jul-23	0.34	J					
36	29-Nov-23	0.47	J					
37	24-Jan-24	1.1						
38	8-May-24	2.1						
39	14-Aug-24	0.66						
40	11-Nov-24	0.60						
Coefficient of Variation:		0.71						
Mann-Kendall Statistic (S):		-326						
Confidence Factor:		>99.9%						
Concentration Trend:		Decreasing						



Notes:

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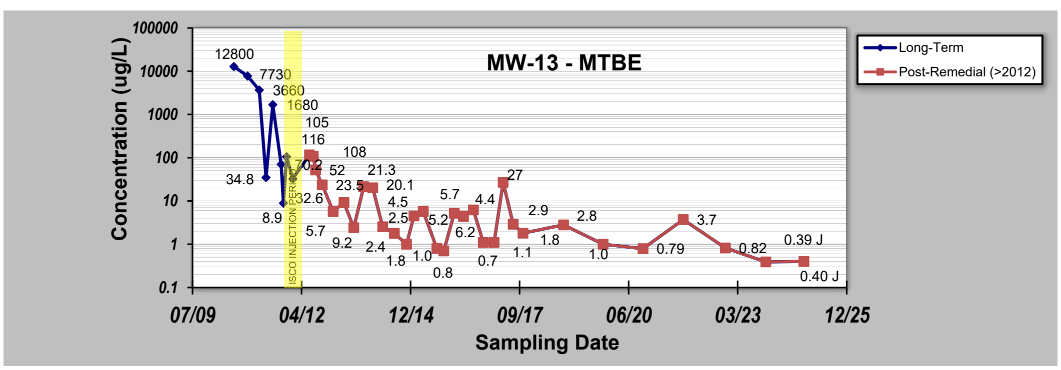
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: 5-Feb-25
Facility Name: Monrovia BP / Former Green Valley Citgo
Conducted By: P. Reichardt

Job ID: MW-13
Constituent: Methyl tert-Butyl Ether
Concentration Units: ug/L

Sampling Event	Sampling Date	METHYL TERT-BUTYL ETHER CONCENTRATION (ug/L)						
Sampling Point ID:		Long-Term	Post-Remedial (>2012)					
1	20-Jul-10	12800						
2	23-Nov-10	7730						
3	10-Mar-11	3660						
4	11-May-11	34.8						
5	12-Jul-11	1680		MS				
6	27-Sep-11	70.2						
7	18-Oct-11	8.9						
8	16-Nov-11	105						
9	12-Jan-12	32.6						
10	13-Jun-12	116	116					
11	17-Jul-12	108	108					
12	8-Aug-12	52	52					
13	8-Oct-12	23.5	23.5					
14	16-Jan-13	5.7	5.69					
15	25-Apr-13	9.2	9.2					
16	24-Jul-13	2.4	2.4					
17	23-Oct-13	21.3	21.3					
18	14-Jan-14	20.1	20.1					
19	15-Apr-14	2.5	2.5					
20	31-Jul-14	1.8	1.8					
21	20-Nov-14	1.0	1.0	ND				
22	27-Jan-15	4.5	4.5					
23	22-Apr-15	5.7	5.7					
24	25-Aug-15	0.8	0.8					
25	27-Oct-15	0.7	0.7					
26	1-Feb-16	5.2	5.2					
27	25-Apr-16	4.4	4.4					
28	25-Jul-16	6.2	6.2					
29	24-Oct-16	1.1	1.1					
30	31-Jan-17	1.1	1.10					
31	24-Apr-17	27	27.0					
32	25-Jul-17	2.9	2.90					
33	23-Oct-17	1.8	1.80					
34	30-Oct-18	2.8	2.80					
35	28-Oct-19	1.0	1.00					
36	28-Oct-20	0.79	0.79					
37	1-Nov-21	3.7	3.70					
38	22-Nov-22	0.82	0.82					
39	28-Nov-23	0.39	0.39	J				
40	11-Nov-24	0.40	0.40	J				
Coefficient of Variation:		3.60	2.02					
Mann-Kendall Statistic (S):		-512	-245					
Confidence Factor:		>99.9%	>99.9%					
Concentration Trend:		Decreasing	Decreasing					



Notes:

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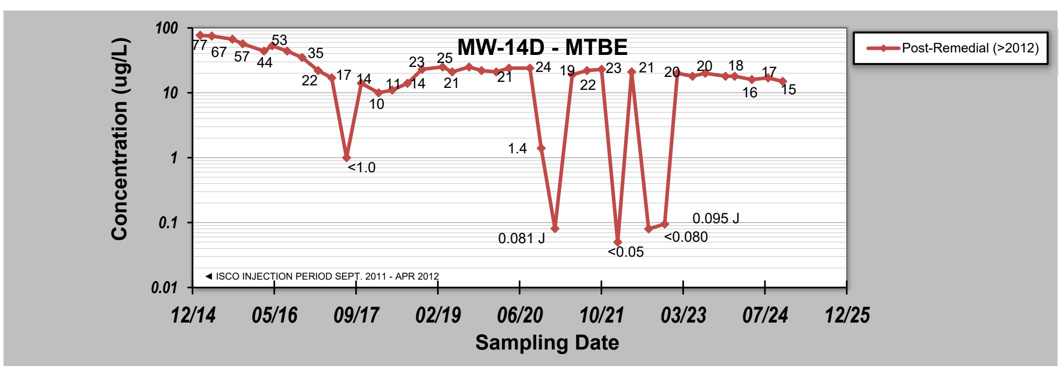
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: 5-Feb-25 **Job ID:** MW-14D
Facility Name: Monrovia BP / Former Green Valley Citgo **Constituent:** Methyl tert-Butyl Ether
Conducted By: P. Reichardt **Concentration Units:** ug/L

Sampling Point ID: Post-Remedial (>2012)

Sampling Event	Sampling Date	METHYL TERT-BUTYL ETHER CONCENTRATION (ug/L)						
1	12-Feb-15	77						
2	24-Apr-15	75						
3	28-Aug-15	67						
4	29-Oct-15	57						
5	8-Mar-16	44						
6	27-Apr-16	53						
7	27-Jul-16	44						
8	27-Oct-16	35						
9	2-Feb-17	22						
10	26-Apr-17	17						
11	26-Jul-17	1.0		ND				
12	24-Oct-17	14						
13	7-Feb-18	10						
14	1-May-18	11						
15	2-Aug-18	14						
16	31-Oct-18	23						
17	5-Mar-19	25						
18	3-May-19	21						
19	14-Aug-19	25						
20	29-Oct-19	22						
21	27-Jan-20	21						
22	14-Apr-20	24						
23	20-Aug-20	24						
24	28-Oct-20	1.4						
25	20-Jan-21	0.081		J				
26	6-May-21	19						
27	4-Aug-21	22						
28	1-Nov-21	23						
29	8-Feb-22	0.05		ND				
30	4-May-22	21						
31	16-Aug-22	0.080		ND				
32	22-Nov-22	0.095		J				
33	8-Feb-23	20						
34	11-May-23	18						
35	28-Jul-23	20						
36	29-Nov-23	18						
37	24-Jan-24	18						
38	8-May-24	16						
39	15-Aug-24	17						
40	12-Nov-24	15						
	Coefficient of Variation:	0.81						
	Mann-Kendall Statistic (S):	-344						
	Confidence Factor:	>99.9%						
	Concentration Trend:	Decreasing						



Notes:

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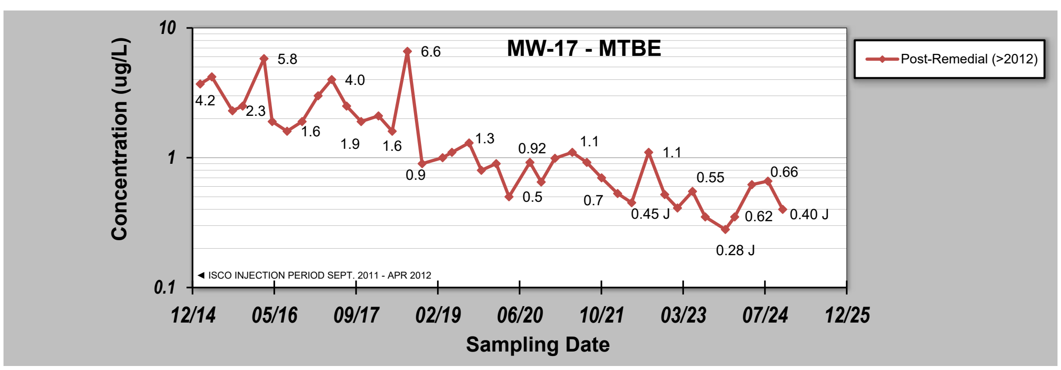
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: 5-Feb-25
Facility Name: Monrovia BP / Former Green Valley Citgo
Conducted By: P. Reichardt
Job ID: MW-17
Constituent: Methyl tert-Butyl Ether
Concentration Units: ug/L

Sampling Point ID: Post-Remedial (>2012)

Sampling Event	Sampling Date	METHYL TERT-BUTYL ETHER CONCENTRATION (ug/L)						
1	12-Feb-15	3.7						
2	24-Apr-15	4.2						
3	28-Aug-15	2.3						
4	29-Oct-15	2.5						
5	8-Mar-16	5.8						
6	27-Apr-16	1.9						
7	27-Jul-16	1.6						
8	27-Oct-16	1.9						
9	2-Feb-17	3.0						
10	26-Apr-17	4.0						
11	26-Jul-17	2.5						
12	23-Oct-17	1.9						
13	6-Feb-18	2.1						
14	1-May-18	1.6						
15	2-Aug-18	6.6						
16	31-Oct-18	0.9						
17	5-Mar-19	1.0						
18	1-May-19	1.1						
19	14-Aug-19	1.3						
20	28-Oct-19	0.8						
21	27-Jan-20	0.9						
22	14-Apr-20	0.5						
23	20-Aug-20	0.92						
24	28-Oct-20	0.65						
25	20-Jan-21	0.99						
26	6-May-21	1.1						
27	3-Aug-21	0.92						
28	1-Nov-21	0.7						
29	7-Feb-22	0.53						
30	4-May-22	0.45	J					
31	16-Aug-22	1.1						
32	22-Nov-22	0.52						
33	8-Feb-23	0.41	J					
34	11-May-23	0.55						
35	28-Jul-23	0.35	J					
36	28-Nov-23	0.28	J					
37	24-Jan-24	0.35	J					
38	8-May-24	0.62						
39	14-Aug-24	0.66						
40	12-Nov-24	0.40	J					
	Coefficient of Variation:	0.93						
	Mann-Kendall Statistic (S):	-531						
	Confidence Factor:	>99.9%						
	Concentration Trend:	Decreasing						



Notes:

1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
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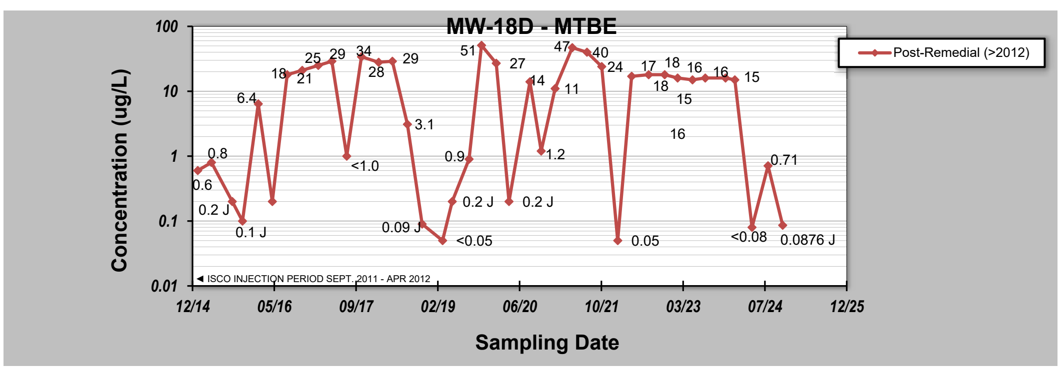
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	5-Feb-25	Job ID:	MW-18D
Facility Name:	Monrovia BP / Former Green Valley Citgo	Constituent:	Methyl tert-Butyl Ether
Conducted By:	P. Reichardt	Concentration Units:	ug/L

Sampling Point ID: Post-Remedial (>2012)

Sampling Event	Sampling Date	METHYL TERT-BUTYL ETHER CONCENTRATION (ug/L)							
1	01/28/2015	0.6							
2	04/22/2015	0.8							
3	08/27/2015	0.2	J						
4	10/28/2015	0.1	J						
5	02/02/2016	6.4							
6	04/28/2016	0.2	J						
7	07/28/2016	18							
8	10/28/2016	21							
9	02/03/2017	25							
10	04/27/2017	29							
11	07/27/2017	1.0	ND						
12	10/25/2017	34							
13	02/07/2018	28							
14	05/02/2018	29							
15	08/02/2018	3.1							
16	10/31/2018	0.09	J						
17	03/05/2019	0.05	ND						
18	05/03/2019	0.2	J						
19	08/14/2019	0.9							
20	10/29/2019	51							
21	01/27/2020	27							
22	04/14/2020	0.2	J						
23	08/20/2020	14							
24	10/28/2020	1.2							
25	01/21/2021	11							
26	05/06/2021	47							
27	08/04/2021	40							
28	11/02/2021	24							
29	02/08/2022	0.05	ND						
30	05/04/2022	17							
31	08/16/2022	18							
32	11/22/2022	18							
33	2/9/2023	16							
34	05/11/2023	15							
35	07/28/2023	16							
36	11/29/2023	16							
37	01/25/2024	15							
38	05/09/2024	0.08	ND						
39	08/15/2024	0.71							
40	11/12/2024	0.086	J						
Coefficient of Variation:		1.04							
Mann-Kendall Statistic (S):		7							
Confidence Factor:		52.8%							
Concentration Trend:		No Trend							



Notes:

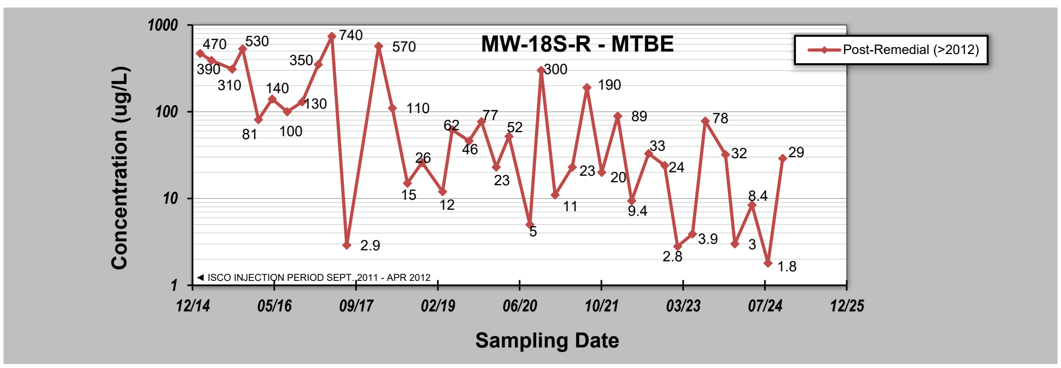
1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
2. Confidence in Trend = Confidence (in percent) that constituent concentration is increasing (S>0) or decreasing (S<0): >95% = Increasing or Decreasing; ≥ 90% = Probably Increasing or Probably Decreasing; < 90% and S>0 = No Trend; < 90%, S≤0, and COV ≥ 1 = No Trend; < 90% and COV < 1 = Stable.
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: 5-Feb-25
Facility Name: Monrovia BP / Former Green Valley Citgo
Conducted By: P. Reichardt
Job ID: MW-18S-R
Constituent: Methyl tert-Butyl Ether
Concentration Units: ug/L

Sampling Point ID: Post-Remedial (>2012)

Sampling Event	Sampling Date	METHYL TERT-BUTYL ETHER CONCENTRATION (ug/L)					
1	12-Feb-15	470					
2	22-Apr-15	390					
3	27-Aug-15	310					
4	29-Oct-15	530					
5	3-Feb-16	81					
6	27-Apr-16	140					
7	28-Jul-16	100					
8	28-Oct-16	130					
9	3-Feb-17	350					
10	27-Apr-17	740					
11	27-Jul-17	2.9					
12	7-Feb-18	570					
13	2-May-18	110					
14	2-Aug-18	15					
15	31-Oct-18	26					
16	5-Mar-19	12					
17	3-May-19	62					
18	14-Aug-19	46					
19	29-Oct-19	77					
20	27-Jan-20	23					
21	14-Apr-20	52					
22	20-Aug-20	5					
23	28-Oct-20	300					
24	21-Jan-21	11					
25	6-May-21	23					
26	4-Aug-21	190					
27	2-Nov-21	20					
28	8-Feb-22	89					
29	4-May-22	9.4					
30	16-Aug-22	33					
31	22-Nov-22	24					
32	9-Feb-23	2.8					
33	11-May-23	3.9					
34	28-Jul-23	78					
35	29-Nov-23	32					
36	25-Jan-24	3					
37	9-May-24	8.4					
38	15-Aug-24	1.8					
39	12-Nov-24	29					
40							
	Coefficient of Variation:	1.42					
	Mann-Kendall Statistic (S):	-346					
	Confidence Factor:	>99.9%					
	Concentration Trend:	Decreasing					



Notes:

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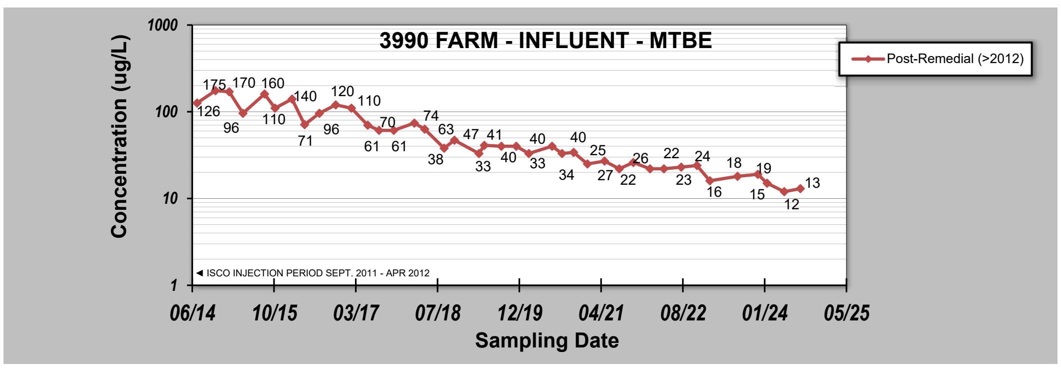
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	5-Feb-25	Job ID:	3990 Farm Ln. - Influent
Facility Name:	Monrovia BP / Former Green Valley Citgo	Constituent:	Methyl tert-Butyl Ether
Conducted By:	P. Reichardt	Concentration Units:	ug/L

Sampling Point ID: Post-Remedial (>2012)

Sampling Event	Sampling Date	METHYL TERT-BUTYL ETHER CONCENTRATION (ug/L)						
1	9-Jul-14	126						
2	30-Oct-14	175						
3	22-Jan-15	170						
4	16-Apr-15	96						
5	26-Aug-15	160						
6	29-Oct-15	110						
7	10-Feb-16	140						
8	27-Apr-16	71						
9	26-Jul-16	96						
10	3-Nov-16	120						
11	7-Feb-17	110						
12	18-May-17	70						
13	26-Jul-17	61						
14	24-Oct-17	61						
15	27-Feb-18	74						
16	1-May-18	63						
17	28-Aug-18	38						
18	30-Oct-18	47						
19	29-Mar-19	33						
20	1-May-19	41						
21	13-Aug-19	40						
22	12-Nov-19	40						
23	28-Jan-20	33						
24	18-Jun-20	40						
25	18-Aug-20	33						
26	28-Oct-20	34						
27	20-Jan-21	25						
28	5-May-21	27						
29	3-Aug-21	22						
30	28-Oct-21	26						
31	7-Feb-22	22						
32	3-May-22	22						
33	17-Aug-22	23						
34	21-Nov-22	24						
35	8-Feb-23	16						
36	27-Jul-23	18						
37	28-Nov-23	19						
38	24-Jan-24	15						
39	8-May-24	12						
40	14-Aug-24	13						
Coefficient of Variation:		0.79						
Mann-Kendall Statistic (S):		-670						
Confidence Factor:		>99.9%						
Concentration Trend:		Decreasing						



Notes:

1. At least four independent sampling events per well are required for calculating the trend. *Methodology is valid for 4 to 40 samples.*
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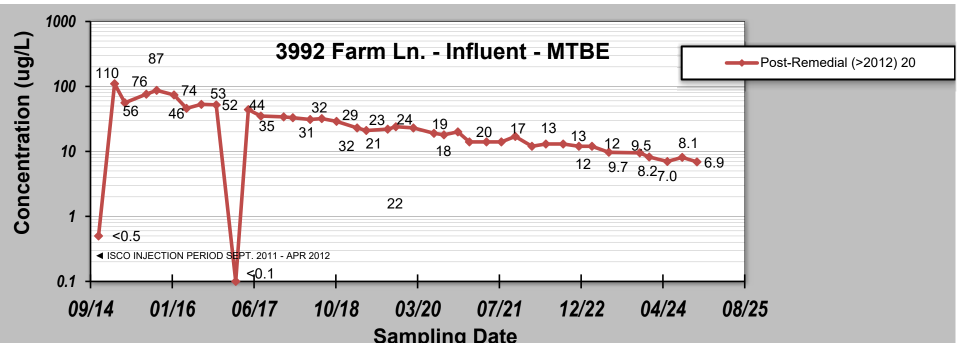
3. Methodology based on "MAROS: A Decision Support System for Optimizing Monitoring Plans", J.J. Aziz, M. Ling, H.S. Rifai, C.J. Newell, and J.R. Gonzales, *Ground Water*, 41(3):355-367, 2003.

GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: 5-Feb-25 **Job ID:** 3992 Farm Ln. Influent
Facility Name: Monrovia BP / Former Green Valley Citgo **Constituent:** Methyl tert-Butyl Ether
Conducted By: P. Reichardt **Concentration Units:** ug/L

Sampling Point ID: Post-Remedial (>2012)

Sampling Event	Sampling Date	METHYL TERT-BUTYL ETHER CONCENTRATION (ug/L)						
1	6-Nov-14	0.5	ND					
2	12-Feb-15	110						
3	16-Apr-15	56						
4	25-Aug-15	76						
5	27-Oct-15	87						
6	10-Feb-16	74						
7	27-Apr-16	46						
8	26-Jul-16	53						
9	25-Oct-16	52						
10	22-Feb-17	0.1	ND					
11	10-May-17	44						
12	25-Jul-17	35						
13	12-Dec-17	34						
14	6-Feb-18	33						
15	23-May-18	31						
16	2-Aug-18	32						
17	31-Oct-18	29						
18	6-Mar-19	23						
19	1-May-19	21						
20	9-Sep-19	22						
21	29-Oct-19	24						
22	13-Feb-20	23						
23	18-Jun-20	19						
24	18-Aug-20	18						
25	11-Nov-20	20						
26	20-Jan-21	14						
27	5-May-21	14						
28	4-Aug-21	14						
29	28-Oct-21	17						
30	7-Feb-22	12						
31	3-May-22	13						
32	17-Aug-22	13						
33	21-Nov-22	12						
34	9-Feb-23	12						
35	23-May-23	9.7						
36	28-Nov-23	9.5						
37	25-Jan-24	8.2						
38	15-May-24	7.0						
39	14-Aug-24	8.1						
40	12-Nov-24	6.9						
Coefficient of Variation:		0.87						
Mann-Kendall Statistic (S):		-594						
Confidence Factor:		>99.9%						
Concentration Trend:		Decreasing						



Notes:
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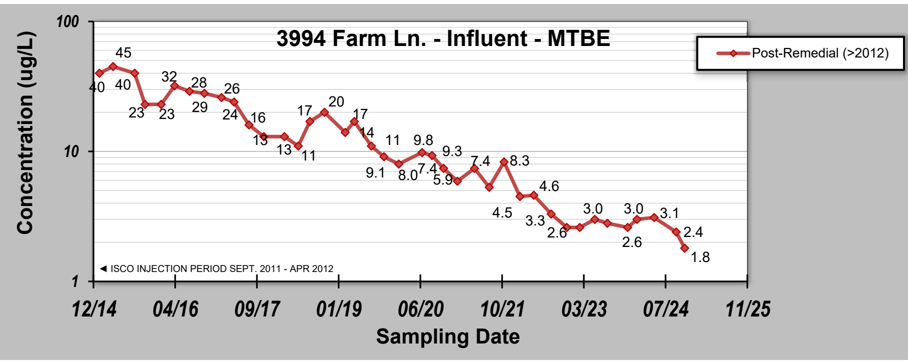
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date:	14-Nov-24	Job ID:	3994 Farm Ln. - Influent
Facility Name:	Monrovia BP / Former Green Valley Citgo	Constituent:	Methyl tert-Butyl Ether
Conducted By:	P. Reichardt	Concentration Units:	ug/L

Sampling Point ID: Post-Remedial (>2012)

Sampling Event	Sampling Date	METHYL TERT-BUTYL ETHER CONCENTRATION (ug/L)					
1	22-Jan-15	40					
2	16-Apr-15	45					
3	26-Aug-15	40					
4	28-Oct-15	23					
5	4-Feb-16	23					
6	26-Apr-16	32					
7	26-Jul-16	29					
8	25-Oct-16	28					
9	7-Feb-17	26					
10	25-Apr-17	24					
11	25-Jul-17	16					
12	24-Oct-17	13					
13	27-Feb-18	13					
14	23-May-18	11					
15	2-Aug-18	17					
16	30-Oct-18	20					
17	6-Mar-19	14					
18	1-May-19	17					
19	13-Aug-19	11					
20	29-Oct-19	9.1					
21	28-Jan-20	8.0					
22	18-Jun-20	9.8					
23	18-Aug-20	9.3					
24	28-Oct-20	7.4					
25	20-Jan-21	5.9					
26	5-May-21	7.4					
27	3-Aug-21	5.3					
28	2-Nov-21	8.3					
29	7-Feb-22	4.5					
30	3-May-22	4.6					
31	17-Aug-22	3.3					
32	21-Nov-22	2.6					
33	8-Feb-23	2.6					
34	11-May-23	3.0					
35	27-Jul-23	2.8					
36	28-Nov-23	2.6					
37	24-Jan-24	3.0					
38	8-May-24	3.1					
39	20-Sep-24	2.4					
40	11-Nov-24	1.8					
Coefficient of Variation:		0.85					
Mann-Kendall Statistic (S):		-664					
Confidence Factor:		>99.9%					
Concentration Trend:		Decreasing					



Notes:

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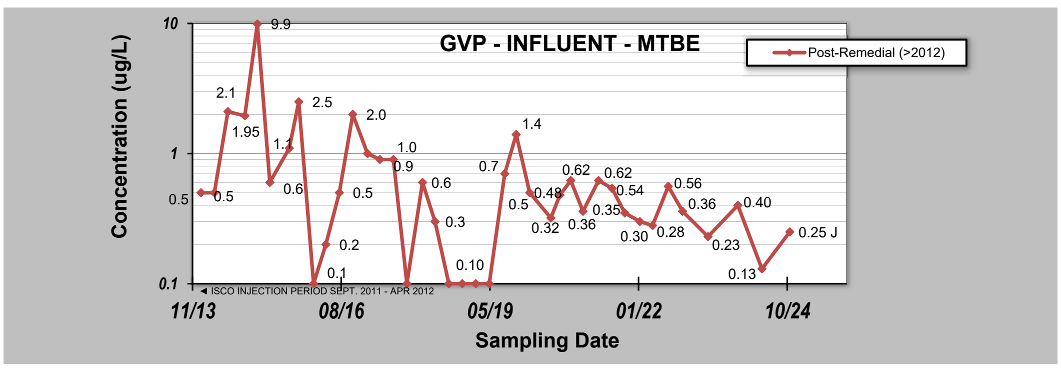
GSI MANN-KENDALL TOOLKIT
for Constituent Trend Analysis

Evaluation Date: 5-Feb-25 | **Job ID:** GVP - Influent
Facility Name: Monrovia BP / Former Green Valley Citgo | **Constituent:** Methyl tert-Butyl Ether
Conducted By: P. Reichardt | **Concentration Units:** ug/L

Sampling Point ID:		Post-Remedial (>2012)					
Sampling Event	**Sampling Date**	**METHYL TERT-BUTYL ETHER CONCENTRATION (ug/L)**					
1	8-Jan-14	0.5					
2	8-Apr-14	0.5					
3	8-Jul-14	2.1					
4	30-Oct-14	1.95					
5	22-Jan-15	9.9					
6	16-Apr-15	0.6					
7	25-Aug-15	1.1					
8	27-Oct-15	2.5					
9	4-Feb-16	0.1					
10	26-Apr-16	0.2					
11	26-Jul-16	0.5					
12	25-Oct-16	2.0					
13	1-Feb-17	1.0					
14	25-Apr-17	0.9					
15	25-Jul-17	0.9					
16	24-Oct-17	0.10					
17	6-Feb-18	0.6					
18	1-May-18	0.3					
19	2-Aug-18	0.10					
20	31-Oct-18	0.10					
21	30-Jan-19	0.10					
22	1-May-19	0.10					
23	13-Aug-19	0.7					
24	29-Oct-19	1.4					
25	28-Jan-20	0.5					
26	18-Jun-20	0.32					
27	18-Aug-20	0.48					
28	30-Oct-20	0.62					
29	20-Jan-21	0.36					
30	5-May-21	0.62					
31	4-Aug-21	0.54					
32	28-Oct-21	0.35					
33	7-Feb-22	0.30					
34	3-May-22	0.28					
35	17-Aug-22	0.56					
36	21-Nov-22	0.36					
37	11-May-23	0.23					
38	28-Nov-23	0.40					
39	8-May-24	0.13					
40	11-Nov-24	0.25	J				
Coefficient of Variation:		1.83					
Mann-Kendall Statistic (S):		-232					
Confidence Factor:		99.7%					
Concentration Trend:		Decreasing					



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