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Public Safety & Environment Department
1 Bells Crossing Road
Selkirk, NY 12158

File: MD, Brunswick; Brunswick Yard; 9415381

November 12, 2019

Maryland Department of the Environment
Oil Control Program
Waste Management Administration
1800 Washington Blvd., Suite 620
Baltimore, Maryland 21230-1719

Quarterly Report – Second Quarter 2019
CSXT Brunswick Yard, Brunswick, Maryland
MDE Case No. 1994-1379-FR

To Mr. Psenicnik.:

Please find attached the *Quarterly Report – Second Quarter 2019* for the above referenced site. This site is an active rail yard. This report summarizes the activities completed in the Second Quarter of 2019, including groundwater and LPH monitoring and LPH recovery completed in accordance with the *Remedial Recovery and Monitoring Plan (RRMP)* dated May 23, 2017 and the MDE *RRMP Approval* letter dated December 20, 2017. The activities outlined in the *RRMP* and *RRMP Approval* letter will continue to be implemented progressively in the Third Quarter 2019. If you have any questions or concerns, please do not hesitate to contact me at (518) 767-6049.

Sincerely,

William Parry, CGWP, PG
Manager Environmental Remediation

Copy:
Ellen Jackson, MDE
Nicholas Psenicnik, MDE
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Mr. Nicholas Psenicnik
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Oil Control Program
Waste Management Administration
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ENVIRONMENT

Subject:
Quarterly Report – Second Quarter 2019
CSXT Brunswick Yard, Brunswick, Maryland
CSXT Project # 9415381

Date:
November 12, 2019

Contact:
Albert Buell

Phone:
410.923.7761

Email:
Albert.Buell@arcadis.com

Our ref:
MD000843.0017

Dear Mr. Psenicnik:

On behalf of CSX Transportation, Inc. (CSXT), Arcadis U.S., Inc. (Arcadis) has prepared this quarterly report of the results of work performed during the second quarter of 2019 (April to June) at the CSXT Brunswick Yard (the Site) in Brunswick, Maryland. The work performed was implemented pursuant to the Remedial Recovery and Monitoring Plan (RRMP) Approval letter dated December 20, 2017.

The RRMP was developed following a review of historical investigation results, which subsequently supported a transition to a risk-based management plan for the Site that would include long-term periodic monitoring and no active remediation. The recommendation is founded in a multiple lines of evidence approach, in which historical fluid level gauging data, groundwater monitoring data, the current and historical monitoring well network and extent of liquid phase hydrocarbons (LPH) impacts, LPH recovery, evaluation of LPH transmissivity, and quantification of natural source zone depletion (NSZD) rates are included. To reinforce this finding, transitional and post-remedial monitoring plans were included in the RRMP to further guide the site to an optimized scope of work focused on evaluating pertinent site conditions while maintaining compliance with applicable regulatory guidance.

The specific site transition plan activities conducted during this reporting period included:

- Groundwater and LPH elevation monitoring conducted to further develop existing hydrographs. The graphs were visually examined for trends in

groundwater elevation and LPH thickness to determine trends in LPH stability,

- LPH monitoring and recovery was assessed to determine the feasibility of ongoing LPH mass removal from the subsurface, both manually and hydraulically.

In addition to the completed activities listed above, schedule of upcoming transitional and post-remedial Site activities is outlined in **Table 1**.

TRANSITIONAL LPH RECOVERY AND MONITORING ACTIVITIES

Multiple lines of evidence, developed through historical collection of data and the data collected during the second quarter of 2019, demonstrate LPH plume stability and support a transition in Site management to a risk-based LPH management strategy. To further develop the SCM, demonstrate data consistency, and strengthen the existing lines of evidence, a transitional period of site operation and maintenance, monitoring, and LPH recovery has been conducted since December 2017. The transitional activities have been implemented to guide the Site progressively from its former operational and monitoring status to an optimized scope of activities focused on evaluating existing conditions and potential risk while maintaining the required compliance with applicable regulatory guidance. The following data were collected in the second quarter of 2019 to support this transitional period.

Fluid Level Gauging

The quarterly site-wide gauging of accessible CSXT and National Park Service (NPS) monitoring wells, extraction wells, and collection sumps was conducted on June 17, 2019. The second quarter 2019 well gauging data are presented on **Table 2**, while hydrographs for wells that have historically had measurable LPH present are included as **Attachment 1**. Potentiometric groundwater elevation contours and measured LPH thicknesses from the June 2019 event are presented on **Figure 1**. Groundwater elevations collected during this reporting period remain slightly elevated compared to those measured historically, following a period of sustained high-water table elevations across the Site in the second, third, and fourth quarters of 2018, as shown in previous reports. Measurable LPH was detected in 19 wells during the second quarter 2019, identified with bold print in the table below. All 19 wells where LPH was detected have had measurable LPH present historically. Site wells where LPH has been historically observed are also listed in the table below.

Site Wells with Historic Occurrences of Measurable LPH (1995-present)
CSXT MW-01, **CSXT MW-02**, CSXT MW-4R, CSXT MW-6R, CSXT MW-23, **CSXT MW-26**, CSXT MW-27, CSXT MW-28, CSXT MW-30, CSXT MW-32, **CSXT MW-33**, **CSXT MW-37**, **CSXT MW-38,** CSXT MW-39, **CSXT MW-41**, **CSXT MW-49**, **CSXT MW-53**, **CSXT MW-54**, **CSXT MW-55**, **CSXT MW-56**, **CSXT MW-57**, CSXT MW-58**, CSXT MW-59**, **CSXT MW-60**, **CSXT MW-61**, CSXT MW-62, **CSXT MW-63**, **CSXT MW-65**, **CSXT MW-67**, CSXT MW-70, CS-1, CS-2, CS-3, EW-1, EW-2, **EW-3**, EW-4, EW-5**,** and NPS MW-04.

Measurable LPH thicknesses were generally within a historic range of seasonal fluctuation in the areas near the former AST, east of the former fuel pump house, in the vicinity of the former AST, and west of the former roundhouse, with the exception of the wells where the former LPH skimmer system had previously operated, well CSXT MW-63, and well CSXT MW-67. When evaluating the fluid level measurements and LPH thicknesses at these wells, the following should be taken into consideration:

- All wells with LPH historically were redeveloped in March 2018 at the start of the RRMP implementation.
- The LPH skimmer system operation that began in 2009 was discontinued prior to that redevelopment.
- Manual recovery of LPH from wells has been reduced from monthly to quarterly during routine quarterly site visits.

Observed increases in LPH thickness at monitoring wells where the former LPH skimmer system was operated (CSXT MW-41, CSXT MW-53, CSXT MW-54, CSXT MW-55, and CSXT MW-56, as well as CSXT MW-63 and CSXT MW-67) as compared to gauging events in 2018 are discussed in more detail below.

- At the former wells where the active skimmer system was implemented and well CSXT MW-63 and CSXT MW-67, LPH thicknesses beginning in 2018 and continuing through the beginning of 2019 have increased and have been measured near or above the maximum historical range of LPH thickness during the most recent gauging events. These increases generally coincide with an increase and/or sustained high groundwater elevations observed across the site, indicating the likely presence of a confining layer in the subsurface in these areas and subsequent confined LPH behavior, as opposed to the unconfined behavior observed historically when groundwater elevations have been lower in the formation. In prior gauging events when elevated groundwater conditions occurred, the common characteristics of this behavior may have been diminished or masked by the ongoing LPH recovery efforts at these wells. Per the Interstate Technology and Regulatory Council (ITRC), LPH thickness under confined conditions may be exaggerated compared to the interval in the formation where mobile LPH is present. The increased thicknesses in response to the increased and sustained high groundwater table elevation are expected under these conditions, and are not an indication of increased mobility, migration, or potential recoverability. This behavior has been noted previously at the site at CSXT MW-59 and has been discussed in previously submitted documents.
- LPH recovery efforts at these wells have historically included the active skimming system, as well as implementation of passive skimming and periodic manual LPH recovery events. Gauging data collected following the discontinued operation of the skimming system and reduction in recovery frequency at these wells indicates LPH thicknesses may be just coming into or have not yet reached an equilibrium with the mobile LPH interval in the formation at some wells. However, the limited volume of LPH able to be collected from these wells during manual recovery is consistent with the findings of previously conducted transmissivity testing, which indicated that ongoing LPH recovery is infeasible. Tests conducted at wells were below the ITRC upper-bound criteria for feasible LPH recovery of 0.8 square feet per day.
- The reappearance of or slight increase in LPH thickness as compared to gauging completed in 2018 at a number of wells, including CSXT MW-02, CSXT MW-57, and CSXT MW-58, is likely due to fluctuations or sustained elevated groundwater elevations at the site, or as in the case of the former skimming wells, the potential presence of a confining unit at the well location coupled with the reduction in recovery effort. As noted previously, well redevelopment occurred at each of these wells in the beginning of 2018. The presence of LPH at their respective current thicknesses

indicates an improved connection between the well and surrounding formation following redevelopment. The time between redevelopment and LPH occurrence, and the thickness as well as it being within historical range at these locations, suggest that LPH is likely stable and represent a mobile LPH interval in the subsurface that only possesses the ability to mobilize into an adjacent well. Fluid levels at these wells will continue to be monitored as part of the quarterly gauging events to confirm LPH stability.

LPH Recovery

Manual LPH recovery was conducted via peristaltic pump on June 17, 2019 at monitoring wells with greater than 0.2 feet of measurable LPH. The volume of LPH removed at each well was recorded, and the recovered LPH was stored in on-site containers (e.g. 55-gallon drums). LPH recovery volumes are presented in **Table 2**.

Hydrographs depicting the historical fluid gauging data for LPH thickness and potentiometric groundwater elevations are included in **Attachment 1** for the wells listed below. The bolded well below indicate that more than 0.2 feet of LPH was present in 10 wells at the time of gauging in June 2019, and manual LPH recovery was performed.

Well Locations Included in Attachment 1 (Historical Gauging Data Charts)
CSXT MW-02, CSXT MW-04R, CSXT MW-26, CSXT MW-28, CSXT MW-32, **CSXT MW-37**, CSXT MW-38, **CSXT MW-41**, CSXT MW-49, **CSXT MW-53**, **CSXT MW-54**, **CSXT MW-55**, **CSXT MW-56**, **CSXT MW-57**, CSXT MW-58, CSXT MW-59, **CSXT MW-60**, **CSXT MW-63**, **CSXT MW-67**, CSXT EW-3, and CSXT EW-5

Total LPH recovery in the second quarter of 2019 was 14.5 gallons and cumulative recovery since July 2009, including LPH recovered through the skimmer system implementation, is approximately 1,358 gallons of LPH. Based on the LPH thicknesses measured in the wells and some conservative assumptions regarding borehole size approximately 11.4 gallons of LPH was present in the well casings collectively, while an additional 5.3 gallons of LPH was present in the filter pack surrounding the well (total of 16.7 gallons). The manual recovery of 14.5 gallons, less than what was available in the well casing and adjacent filter pack, supports previous findings that ongoing recovery of LPH from existing wells is infeasible.

POST REMEDIAL MONITORING

Following the transition phase and in accordance with the RRMP, a post-remedial monitoring plan will be implemented as a long-term solution to site and risk management. The following changes to the transitional activities are expected to be proposed as conditions and results from ongoing activities allow:

- Fluid level gauging will be further reduced from quarterly to bi-annually;
- Fluid level gauging will be reduced to a well network that focuses on downgradient, fringe, and representative wells;

- Following stabilization of dissolved-phase total petroleum hydrocarbons – diesel range organics (TPH-DRO) concentrations, groundwater monitoring will be further reduced from bi-annually to annually;
- Following stabilization of dissolved-phase TPH-DRO concentrations, groundwater monitoring will be further reduced to a well network that focuses on downgradient, fringe, and representative sentinel wells; and
- Upon confirmation that LPH is not feasibly recoverable through transmissivity and recoverability testing, combined with additional evidence of ongoing NSZD, LPH recovery will no longer be conducted.

SUMMARY

Since December 2017, Site activities and monitoring plan modifications have been implemented to move towards a risk-based management strategy for the Site per the RRMP. These activities are outlined in **Table 3**. Data collected during the second quarter 2019 continued to support the lines of evidence established to transition the Site to a risk based LPH management strategy, as presented in the RRMP and the Site Conceptual Model -Second Addendum:

- Fluid Level gauging:
  - Measurable LPH thicknesses continue to be observed in wells within the currently defined LPH footprint (as presented in the RRMP). Measurable LPH has not been detected in wells outside of the LPH footprint since implementation of the RRMP (December 2017), verifying LPH plume stability and that the LPH plume is not migrating.
- LPH Recoverability and Transmissivity Testing
  - LPH recovery volumes during the second quarter 2019 continue to be less than what was available in the well casing and adjacent filter pack, supporting previous findings that ongoing recovery of LPH from existing wells is infeasible.

FUTURE ACTIVITIES

The RRMP dated May 23, 2017 and the Maryland Department of the Environment (MDE) RRMP Approval letter dated December 20, 2017 outlines the remedial path forward for the site. RRMP implementation commenced upon receipt of approval in December 2017. The activities detailed in the RRMP and the RRMP Approval letter will continue to be implemented progressively throughout 2019 during quarterly events, as outlined in **Table 1**. The expected monitoring program activities and potential modifications are summarized below.

- Site wide synoptic water level measurements will be collected.
- Groundwater sampling at 19 CSXT and NPS monitoring wells for VOCs, TPH-DRO and total petroleum hydrocarbons – gasoline range organics. The wells include CSXT MW-03, CSXT MW-6R, CSXT MW-22, CSXT MW-24, CSXT MW-25, CSXT MW-29, CSXT MW-43, CSXT MW-51, CSXT MW-64, CSXT MW-69, CSXT MW-71, NPS MW-01, NPS MW-02, NPS MW-04, NPS MW-05, NPS MW-13, NPS MW-14, NPS MW-16, NPS MW-18.

- LPH recovery will be conducted only at wells that have greater than 0.2 feet of LPH and have been evaluated for potential recovery with a finding that LPH is feasibly recoverable, or at wells with greater than 0.2 feet of LPH where recoverability has not been evaluated.
- Based on recent gauging data, supplemental transmissivity testing is anticipated to be completed at select wells by either qualitative or quantitative methodology as described in the RRMP in the third quarter 2019. Wells may include CSXT MW-02, CSXT MW-26, CSXT MW-32, CSXT MW-38, CSXT MW-49, CSXT MW-57, CSXT MW-58, CSXT MW-59, CSXT MW-63, and CSXT MW-67.
- Potential well abandonments and analytical program refinements will be considered following review of the available data. Any proposed modifications to the RRMP will be conducted under a separate submittal to MDE for approval prior to implementation.

The next planned RRMP activities include quarterly groundwater and LPH monitoring, semi-annual groundwater sampling, and transmissivity testing in September 2019.

Please contact the undersigned at 410.923.7761 if you have any questions or require additional information regarding this correspondence.

Sincerely,

Arcadis U.S., Inc.

Joshua R. Wilson
Associate Project Manager

Albert Buell
Project Manager

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Enclosures:

Tables

1 2019 Groundwater Gauging, Sampling, Remedial Action and Reporting Schedule
2 Well Gauging and LPH Recovery Summary (Second Quarter 2019)
3 Completed RRMP Site Activities

Figure

1 Groundwater Elevation Contours and LPH Thickness Map – June 17, 2019

Attachments

1 Hydrographs

TABLES

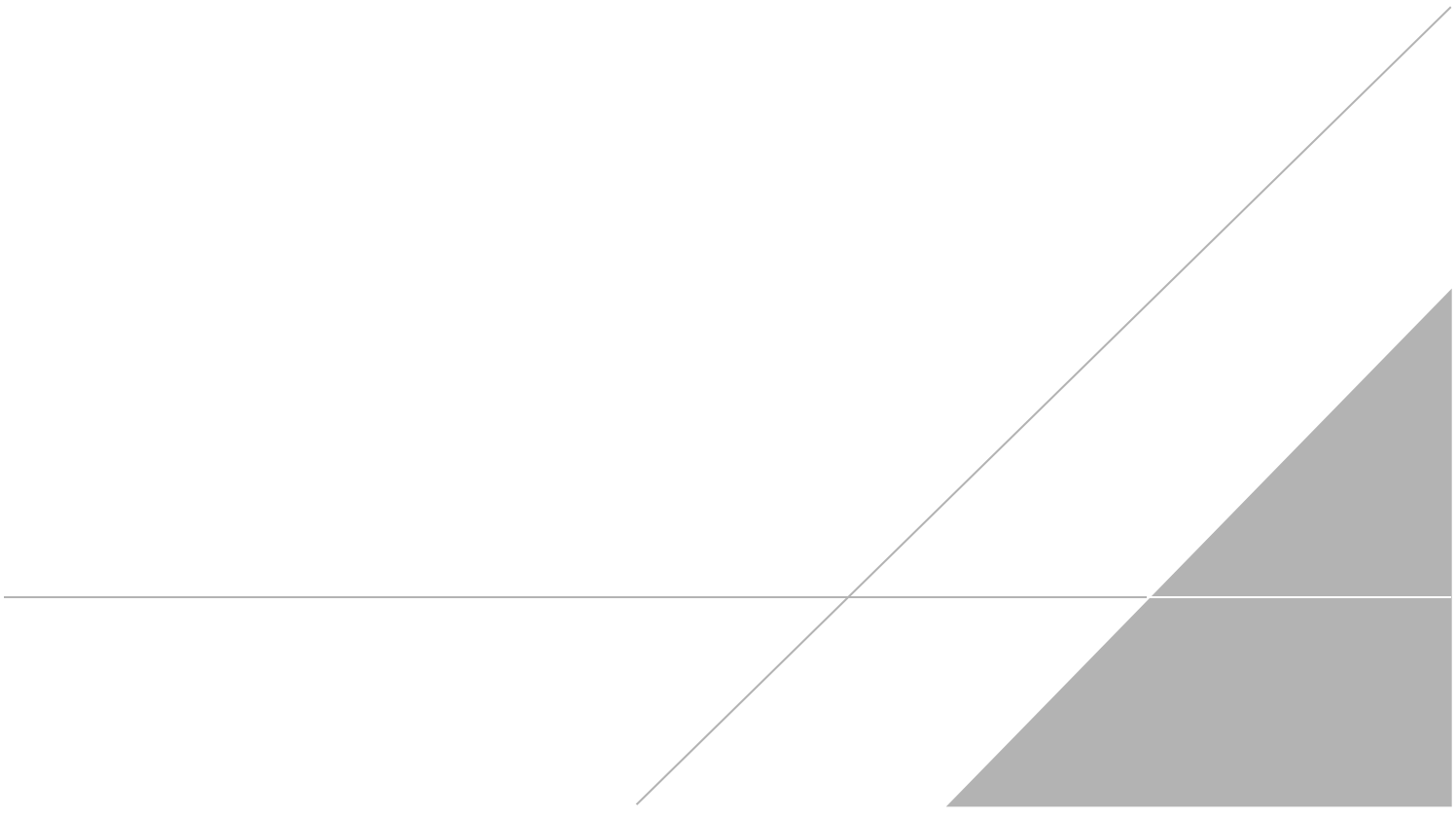


Table 1
2019 Groundwater Gauging, Sampling, Remedial Action and Reporting Schedule
Quarterly Report – Second Quarter 2019
Brunswick Yard, Brunswick, Maryland

ARCADIS Design & Consultancy for natural and built assets

Date	Task			
	LPH Monitoring and Recovery[1]	Groundwater Monitoring & Sampling[2,3]	Remedial Recovery and Monitoring Plan Activities[4,5]	Remedial Action Progress Report
January 2019				
February 2019				✓ (for 4th Quarter 2018)
March 2019	✓	✓	✓	
April 2019				
May 2019				✓ (for 1st Quarter 2019)
June 2019	✓		✓	
July 2019				
August 2019				✓ (for 1st Quarter 2019)
September 2019	✓	✓	✓	✓ (for 2nd Quarter 2019)
October 2019				✓ (for 2nd Quarter 2019)
November 2019				✓ (for 3rd Quarter 2019)
December 2019	✓		✓	
January 2020				✓ (for 4th Quarter 2019)

Notes:

1. Liquid phase hydrocarbon (LPH) Monitoring and System Operation and Maintenance (O&M) will be conducted at a quarterly frequency through December 2018, per Maryland Department of the Environment (MDE) approval and implementation of the *Remedial Recovery and Monitoring Plan*.
2. Groundwater sampling will be conducted on a semi-annual basis at monitoring wells CSXT MW-3, CSXT MW-6R, CSXT MW-22, CSXT MW-24, CSXT MW-25, CSXT MW-29, CSXT MW-43, CSXT MW-51, CSXT MW-64, CSXT MW-69, CSXT MW-71, NPS MW-1, NPS MW-2, NPS MW-4, NPS MW-5, NPS MW-13, NPS MW-14, NPS MW-16, and NPS MW-18.
3. Site-wide synoptic water level and LPH measurements and manual LPH recovery will be conducted on a quarterly basis.
4. LPH recoverability and transmissivity testing will be conducted at up to 10 additional wells during subsequent quarterly events.
5. Any proposed modifications to *Remedial Recovery and Monitoring Plan* will be submitted to the MDE for approval prior to implementation.

Table 2
Well Gauging and LPH Recovery Summary
Quarterly Report - Second Quarter 2019
Brunswick Yard, Brunswick, Maryland

Well ID	Well Casing Diameter (inches)	Measurement Date	Top of Casing Elevation (feet amsl)	DTLPH (feet bTOC)	DTW (feet bTOC)	LPH Thickness (feet)	Groundwater Elevation (feet amsl)	LPH Recovery Method	LPH Present in Well Casing (gallons)	LPH Present in Filter Pack/Borehole (gallons)	LPH Recovered (gallons)	Total LPH Recovered Since July 2009 (gallons)
CS-1	6	6/17/2019	239.38	0.00	7.62	0.00	232.41		0.00	0.00		0.02
CS-2	6	6/17/2019	236.90	0.00	5.19	0.00	232.44		0.00	0.00		0.00
CS-3	6	6/17/2019	235.13	0.00	5.38	0.00	230.30		0.00	0.00		0.00
CS-4	6	6/17/2019	234.81	0.00	4.99	0.00	230.38		0.00	0.00		0.00
CS-5	6	6/17/2019	232.45	0.00	4.95	0.00	230.36		0.00	0.00		0.00
EW-1	6	6/17/2019	243.50	0.00	7.55	0.00	235.99		0.00	0.00		0.03
EW-2	6	6/17/2019	243.30	0.00	6.01	0.00	236.89		0.00	0.00		0.04
EW-3	6	6/17/2019	242.70	11.00	11.07	0.07	232.58		0.10	0.03		16.49
EW-4	6	6/17/2019	243.20	0.00	9.81	0.00	233.51		0.00	0.00		0.00
EW-5	6	6/17/2019	243.60	0.00	11.75	0.00	232.57		0.00	0.00		5.56
EW-6	6	6/17/2019	242.40	0.00	11.55	0.00	231.64		0.00	0.00		0.00
EW-7	6	6/17/2019	243.20	0.00	11.51	0.00	232.46		0.00	0.00		0.16
MW-01	4	6/17/2019	247.20	0.00	14.65	0.00	233.22		0.00	0.00		0.00
MW-02	4	6/17/2019	247.55	14.49	14.50	0.01	234.41		0.01	0.00		0.54
MW-03	4	6/17/2019	248.38	0.00	15.42	0.00	233.62		0.00	0.00		0.00
MW-04R	4	6/17/2019	244.68	0.00	10.09	0.00	233.86		0.00	0.00		2.28
MW-05	4	6/17/2019	245.37	0.00	12.42	0.00	233.66		0.00	0.00		0.00
MW-06R	4	6/17/2019	233.63	0.00	5.00	0.00	229.32		0.00	0.00		0.00
MW-08	4	6/17/2019	235.51	0.00	11.12	0.00	225.46		0.00	0.00		0.00
MW-09	4	6/17/2019	237.54	0.00	12.75	0.00	225.31		0.00	0.00		0.00
MW-20	4	6/17/2019	236.27	0.00	7.93	0.00	229.59		0.00	0.00		0.00
MW-22	4	6/17/2019	245.65	0.00	12.06	0.00	234.42		0.00	0.00		0.00
MW-23	4	6/17/2019	244.57	0.00	1.21	0.00	234.92		0.00	0.00		0.03
MW-24	4	6/17/2019	244.50	0.00	9.33	0.00	236.26		0.00	0.00		0.00
MW-25	4	6/17/2019	245.36	0.00	11.05	0.00	232.91		0.00	0.00		0.00
MW-26	4	6/17/2019	244.67	12.01	12.09	0.08	233.42		0.05	0.02		4.50
MW-27	4	6/17/2019	244.29	0.00	7.41	0.00	236.80		0.00	0.00		0.00
MW-28	4	6/17/2019	244.23	--	--	--	--		--	--		0.15
MW-29	4	6/17/2019	243.74	0.00	13.02	0.00	231.10		0.00	0.00		0.00
MW-30	4	6/17/2019	245.46	0.00	11.81	0.00	234.17		0.00	0.00		0.00
MW-32	4	6/17/2019	245.80	0.00	11.91	0.00	234.77		0.00	0.00		4.46
MW-33	4	6/17/2019	244.26	11.91	11.93	0.02	232.86		0.01	0.01		0.00
MW-35	4	6/17/2019	245.80	0.00	13.42	0.00	232.95		0.00	0.00		0.00
MW-37	4	6/17/2019	245.06	11.95	13.95	2.00	233.51	PP	1.31	0.51	1.32	26.77
MW-38	4	6/17/2019	246.09	4.75	4.77	0.02	241.33		0.01	0.01		88.52
MW-41	4	6/17/2019	246.07	12.32	16.79	4.47	233.86	PP	2.92	1.15	2.81	175.48

Table 2
Well Gauging and LPH Recovery Summary
Quarterly Report - Second Quarter 2019
Brunswick Yard, Brunswick, Maryland

Well ID	Well Casing Diameter (inches)	Measurement Date	Top of Casing Elevation (feet amsl)	DTLPH (feet bTOC)	DTW (feet bTOC)	LPH Thickness (feet)	Groundwater Elevation (feet amsl)	LPH Recovery Method	LPH Present in Well Casing (gallons)	LPH Present in Filter Pack/Borehole (gallons)	LPH Recovered (gallons)	Total LPH Recovered Since July 2009 (gallons)
MW-43	4	6/17/2019	238.90	0.00	6.38	0.00	233.29		0.00	0.00		0.00
MW-49	4	6/17/2019	246.02	5.17	5.32	0.15	241.11		0.10	0.04		50.16
MW-51	4	6/17/2019	249.34	0.00	11.21	0.00	239.05		0.00	0.00		0.00
MW-52	4	6/17/2019	247.00	0.00	9.71	0.00	237.65		0.00	0.00		0.00
MW-53	2	6/17/2019	246.10	12.65	15.87	3.22	233.83	PP	0.53	0.37	0.00	186.03
MW-54	2	6/17/2019	245.60	12.02	16.15	4.13	233.85	PP	0.67	0.47	1.12	135.85
MW-55	2	6/17/2019	246.12	12.45	16.20	3.75	233.97	PP	0.61	0.43	1.65	284.05
MW-56	2	6/17/2019	244.63	11.25	16.35	5.10	232.15	PP	0.83	0.58	1.06	182.41
MW-57	2	6/17/2019	244.52	12.46	12.98	0.52	233.59	PP	0.08	0.06	0.36	42.65
MW-58	2	6/17/2019	244.42	0.00	11.59	0.00	233.57		0.00	0.00		3.85
MW-59	4	6/17/2019	246.07	8.94	9.11	0.17	238.54		0.11	0.04		17.11
MW-60	4	6/17/2019	245.57	12.01	13.50	1.49	234.16	PP	0.97	0.38	1.39	24.05
MW-61	4	6/17/2019	245.63	12.25	12.26	0.01	234.16		0.01	0.00		1.82
MW-62	4	6/17/2019	246.08	0.00	12.88	0.00	234.00		0.00	0.00		7.44
MW-63	4	6/17/2019	246.25	12.85	16.09	3.24	233.76	PP	2.12	0.83	3.17	94.09
MW-64	4	6/17/2019	245.45	0.00	4.21	0.00	241.31		0.00	0.00		0.00
MW-65	4	6/17/2019	245.54	5.10	5.11	0.01	241.14		0.01	0.00		0.18
MW-67	4	6/17/2019	245.83	12.25	13.95	1.70	234.16	PP	1.11	0.44	1.59	2.98
MW-68	4	6/17/2019	245.09	0.00	4.10	0.00	241.28		0.00	0.00		0.00
MW-69	4	6/17/2019	244.98	0.00	12.38	0.00	233.34		0.00	0.00		0.00
MW-70	4	6/17/2019	245.57	0.00	12.81	0.00	233.43		0.00	0.00		0.35
MW-71	4	6/17/2019	246.21	0.00	13.35	0.00	233.50		0.00	0.00		0.00
NPS MW-01	4	6/17/2019	234.94	0.00	7.15	0.00	230.74		0.00	0.00		0.00
NPS MW-02	4	6/17/2019	237.19	0.00	4.95	0.00	232.93		0.00	0.00		0.00
NPS MW-03	4	6/17/2019	234.50	0.00	4.97	0.00	231.34		0.00	0.00		0.00
NPS MW-04	4	6/17/2019	238.50	0.00	6.25	0.00	232.82		0.00	0.00		0.00
NPS MW-05	4	6/17/2019	235.69	0.00	6.93	0.00	230.10		0.00	0.00		0.00
NPS MW-10	4	6/17/2019	237.73	0.00	5.80	0.00	232.81		0.00	0.00		0.00
NPS MW-12	4	6/17/2019	242.61	0.00	10.40	0.00	232.92		0.00	0.00		0.00
NPS MW-13	4	6/17/2019	234.72	0.00	10.70	0.00	225.41		0.00	0.00		0.00
NPS MW-14	4	6/17/2019	234.74	0.00	4.93	0.00	231.56		0.00	0.00		0.00
NPS MW-15	4	6/17/2019	234.38	0.00	5.25	0.00	229.99		0.00	0.00		0.00
NPS MW-16	4	6/17/2019	240.09	0.00	9.02	0.00	231.96		0.00	0.00		0.00
NPS MW-17	4	6/17/2019	242.71	0.00	14.18	0.00	229.63		0.00	0.00		0.00
NPS MW-18	4	6/17/2019	234.15	0.00	6.28	0.00	233.15		0.00	0.00		0.00
								Total:	11.4	5.3	14.5	1358.0

Notes:
amsl - above mean sea level
bTOC - below top of well casing
DTLPH- depth to liquid phase hydrocarbons
DTW - depth to water
LPH - liquid phase hydrocarbon
PP - Peristaltic pump
* - Borehole diameter was estimated to be 2 inches larger than the well casing at each location, and a LPH specific yeild value of 0.175 (per ATSM E2856) was used to calculate borehole/filter pack storage capacity.

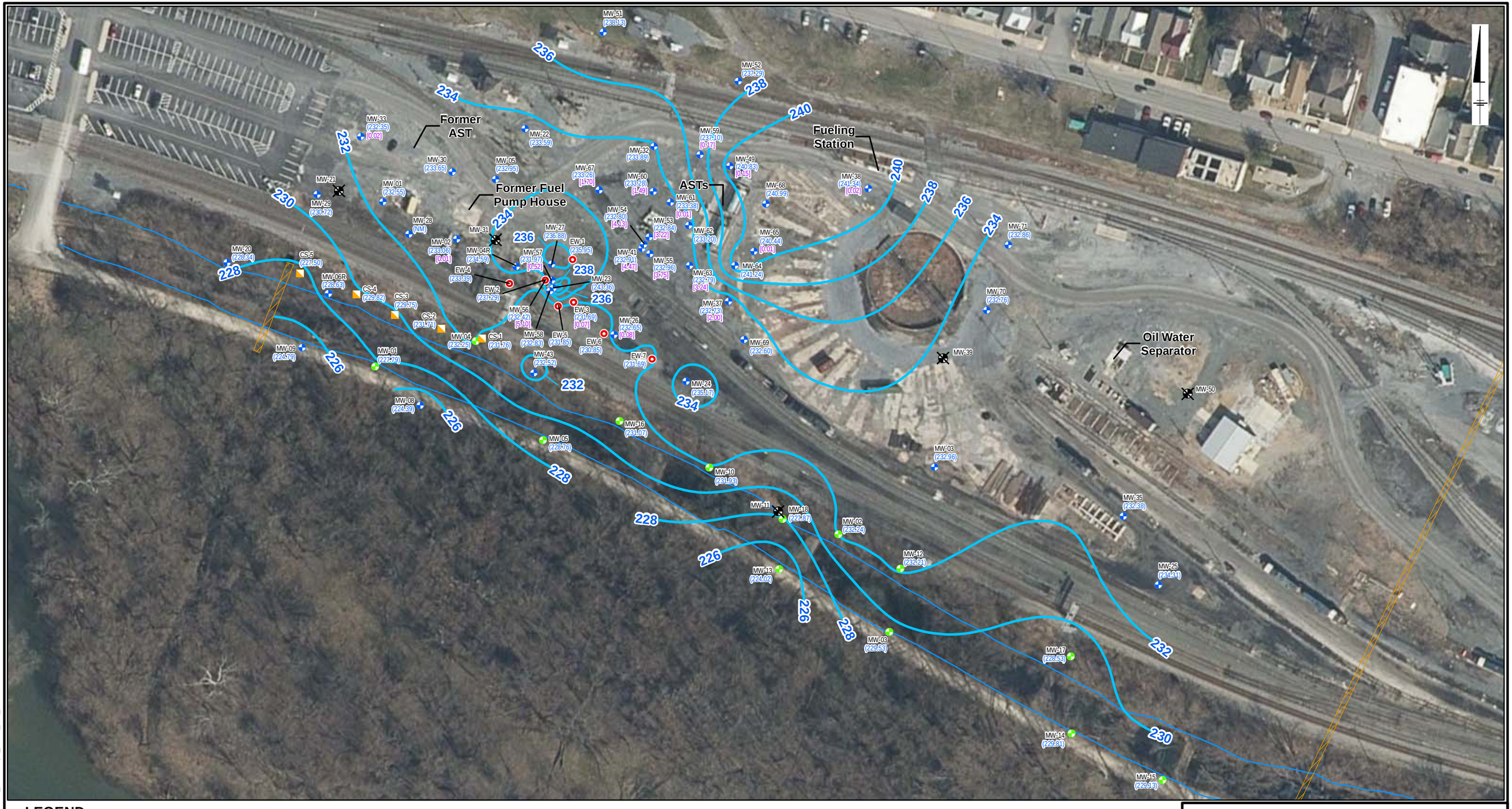
Table 3
Completed RRMP Site Activites
Quarterly Report – Second Quarter 2019
Brunswick Yard, Brunswick, Maryland

Date	TASK				
	Groundwater and LPH Monitoring and Recovery[1,3]	Groundwater Sampling[2]	Remedial Recovery and Monitoring Plan Activities	Location Type	Location ID
March 2018	X	X	Well Redevelopment	Extraction Well	CSXT EW-1, CSXT EW-2, CSXT EW-3, CSXT EW-4, CSXT EW-5, CSXT EW-6 and CSXT EW-7
				Monitoring Well	CSXT MW-3, CSXT MW-6R, CSXT MW-22, CSXT MW-24, CSXT MW-25, CSXT MW-26, CSXT MW-29, CSXT MW-32, CSXT MW-37, CSXT MW-38, CSXT MW-41, CSXT MW-43, CSXT MW-49, CSXT MW-51, CSXT MW-53, CSXT MW-54, CSXT MW-55, CSXT MW-56, CSXT MW-57, CSXT MW-58, CSXT MW-59, CSXT MW-60, CSXT MW-61, CSXT MW-62, CSXT MW-63, CSXT MW-64, CSXT MW-65, CSXT MW-67, CSXT MW-69, CSXT MW-71, NPS MW-01, NPS MW-02, NPS MW-04, NPS MW-05, NPS MW-13, NPS MW-14, NPS MW-16, and NPS MW-18
June 2018	X		Monitoring Well Abandonment	Monitoring Well	CSXT MW-21, CSXT MW-31, and CSXT MW-50
			NSZD Sampling	NSZD	NSZD-6, NSZD-7, NSZD-8, NSZD-9, and NSZD-10
			Transmissivity Testing	Monitoring Well	CSXT MW-37 and CSXT MW-60
September 2018	X	X	Transmissivity Testing	Monitoring Well	CSXT MW-37 and CSXT MW-61
December 2018	X		Transmissivity (Skimming Test)	Monitoring Well	CSXT MW-59 and CSXT MW-67
			Transmissivity (Qualitative Test)	Extraction Well	CSXT EW-3, CSXT EW-5, CSXT EW-7, and CSXT MW-26
March 2019	X	X	NSZD Sampling	NSZD	NSZD-11, NSZD-12, and NSZD-13
June 2019	X				

Abbreviations
CSXT - CSX Transportation, Inc.
LPH - Liquid phase hydrocarbon
MW - Monitoring well
NPS - National Park Service
NSZD - Natural source zone depletion
USEPA - United States Environmental Protection Agency

Notes
1. LPH Monitoring will be conducted at a quarterly frequency through December 2019, per Maryland Department of the Environment approval and implementation of the Remedial Recovery and Monitoring Plan.
2. Groundwater sampling will be conducted on a semi-annual basis at monitoring wells CSXT MW-3, CSXT MW-6R, CSXT MW-22, CSXT MW-24, CSXT MW-25, CSXT MW-29, CSXT MW-43, CSXT MW-51, CSXT MW-64, CSXT MW-69, CSXT MW-71, NPS MW-1, NPS MW-2, NPS MW-4, NPS MW-5, NPS MW-13, NPS MW-14, NPS MW-16, and NPS MW-18. The analytic parameters include full-suite volatile organic compounds, including fuel oxygenates, using USEPA Method 8260 and total petroleum hydrocarbons/diesel-range organics by USEPA by Method 8015B. Field parameters including temperature, pH, and specific conductivity shall be measured during the well purging process. Groundwater samples will be collected after three well volumes have been purged from each well with new polyethylene bailers, provided there is no measurable LPH present in the well at the time of sampling.
3. Site-wide synoptic water level and LPH measurements will be collected on a quarterly basis.

FIGURES



LEGEND

- National Park Service Monitoring Well
- CSXT Monitoring Well
- Extraction Well
- Collection Sump
- Abandoned Monitoring Well
- Existing Canal
- Stone Drainage Culvert
- Groundwater Elevation Contour (Dashed Where Inferred)
- (224.39) Groundwater Elevation in Feet Mean Sea Level (MSL)
- [3.24] Liquid Phase Hydrocarbon Thickness (FT)
- (NM) Not Measured

0 100 200

SCALE IN FEET

Coordinate System: NAD 1983 StatePlane Maryland FIPS 1900 Feet
Imagery Source: ESRI World Imagery 2015

CSX TRANSPORTATION, INC.
BRUNSWICK, MARYLAND

GROUNDWATER ELEVATION CONTOURS AND LPH THICKNESSES MAP JUNE 17, 2019

ARCADIS

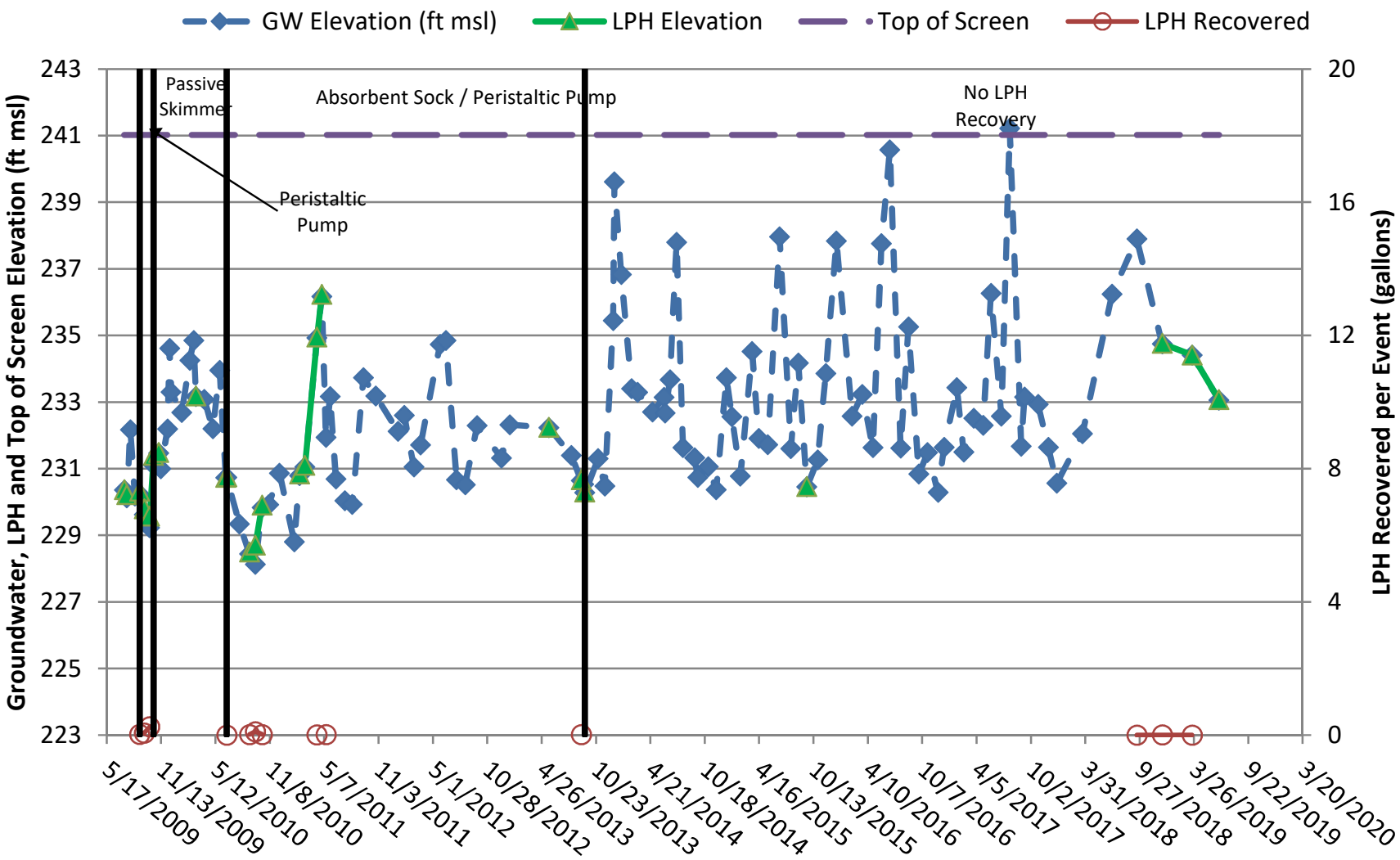
FIGURE 1

CITY: (KNOXVILLE) DIV/GROUP:(ENV/GIS) DB:(B.ALTOM) PIC:(J.MADDALENA) PM:(A.BUELL) TM:(L.BAUMGARTNER)
PATH: Z:\GIS\Projects_ENV\CSX_Brunswick\Q2_2019\Fig1_GWE_Q2_2019.mxd SAVED: 8/27/2019 BY: vri00988
PROJECT: MD000843.0013

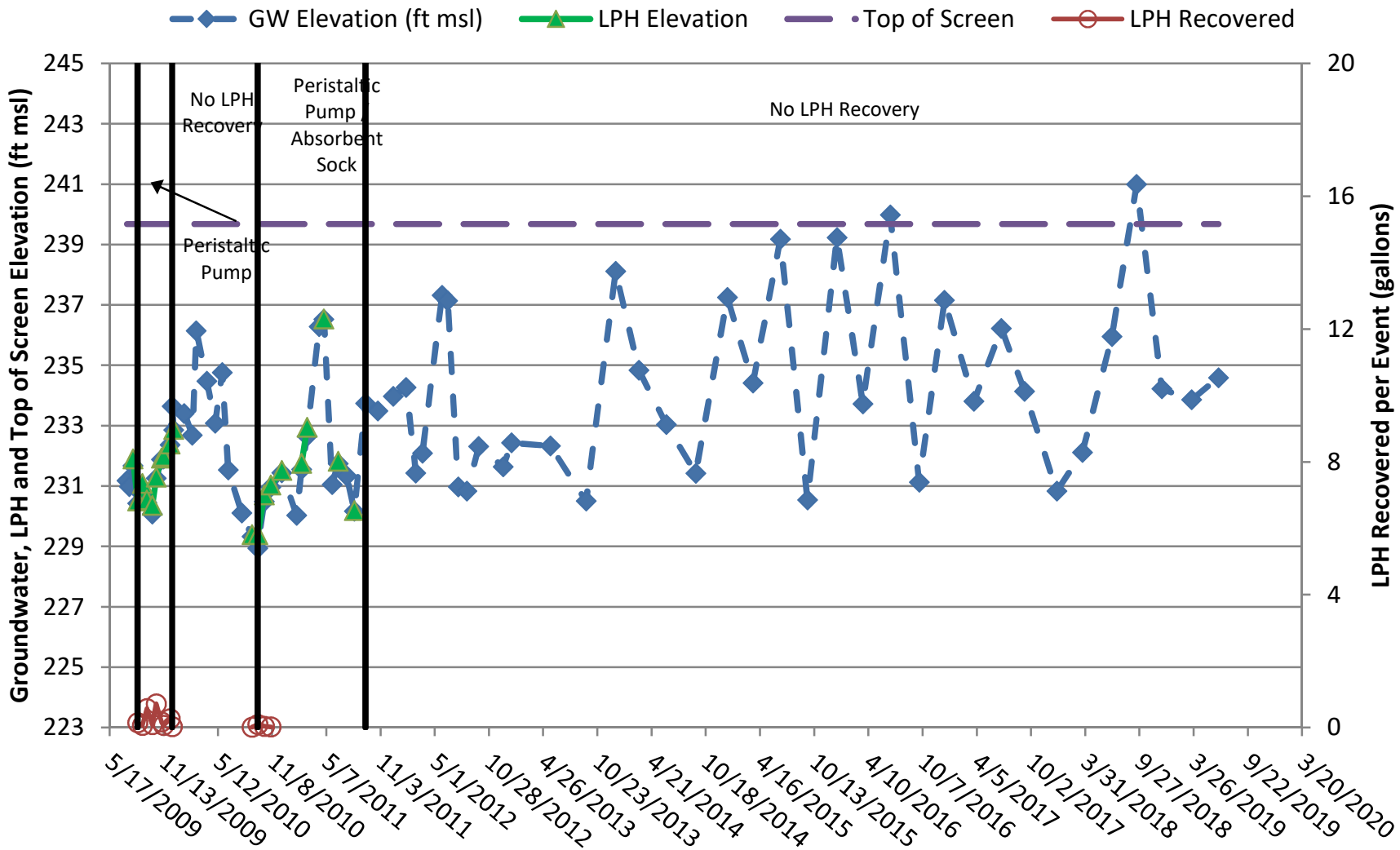
ATTACHMENT 1

Hydrographs

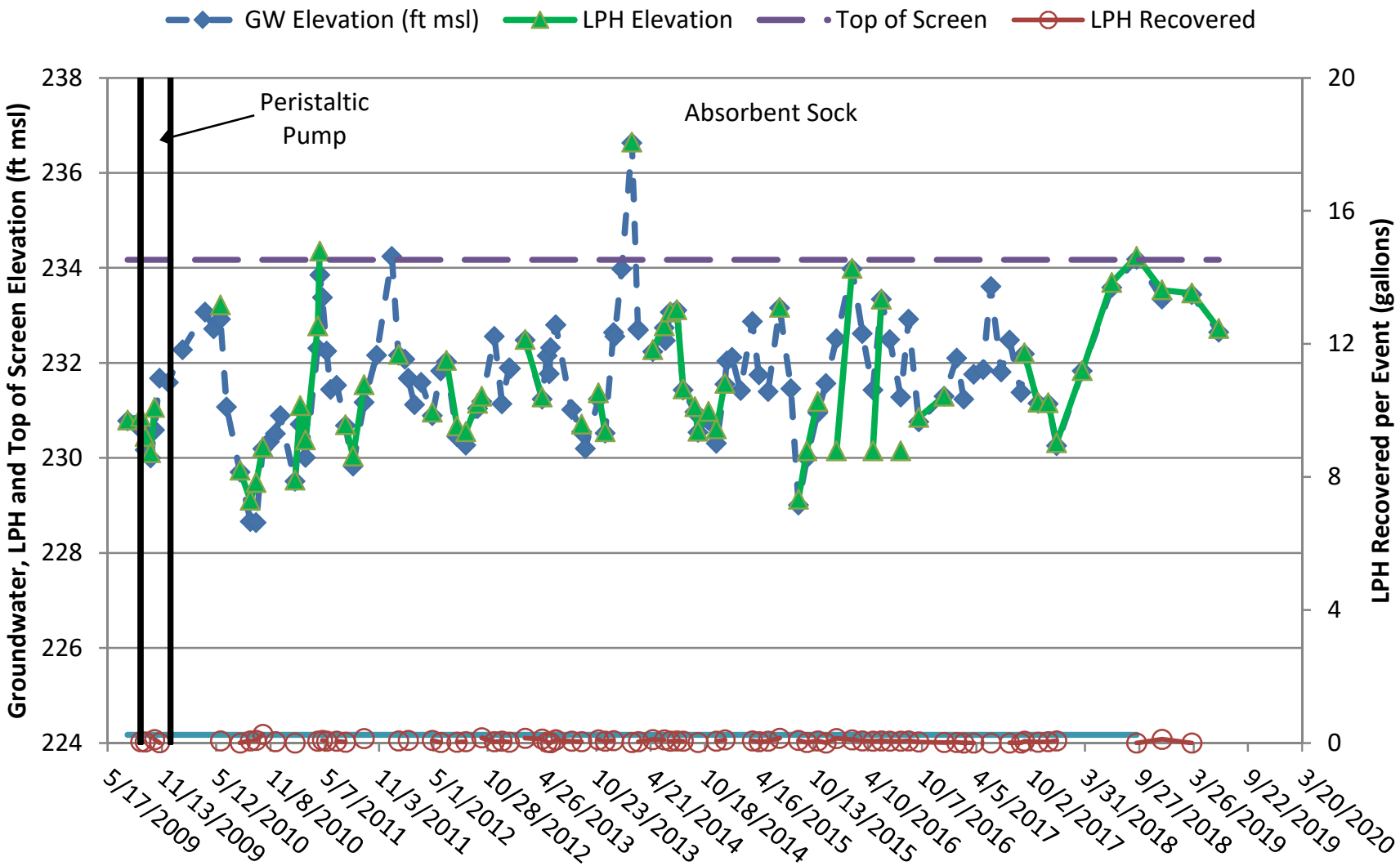
LPH and Groundwater Elevations and LPH Recovery: MW-2
July 12, 2009 through June 17, 2019
CSXT Brunswick Yard, Brunswick, Maryland



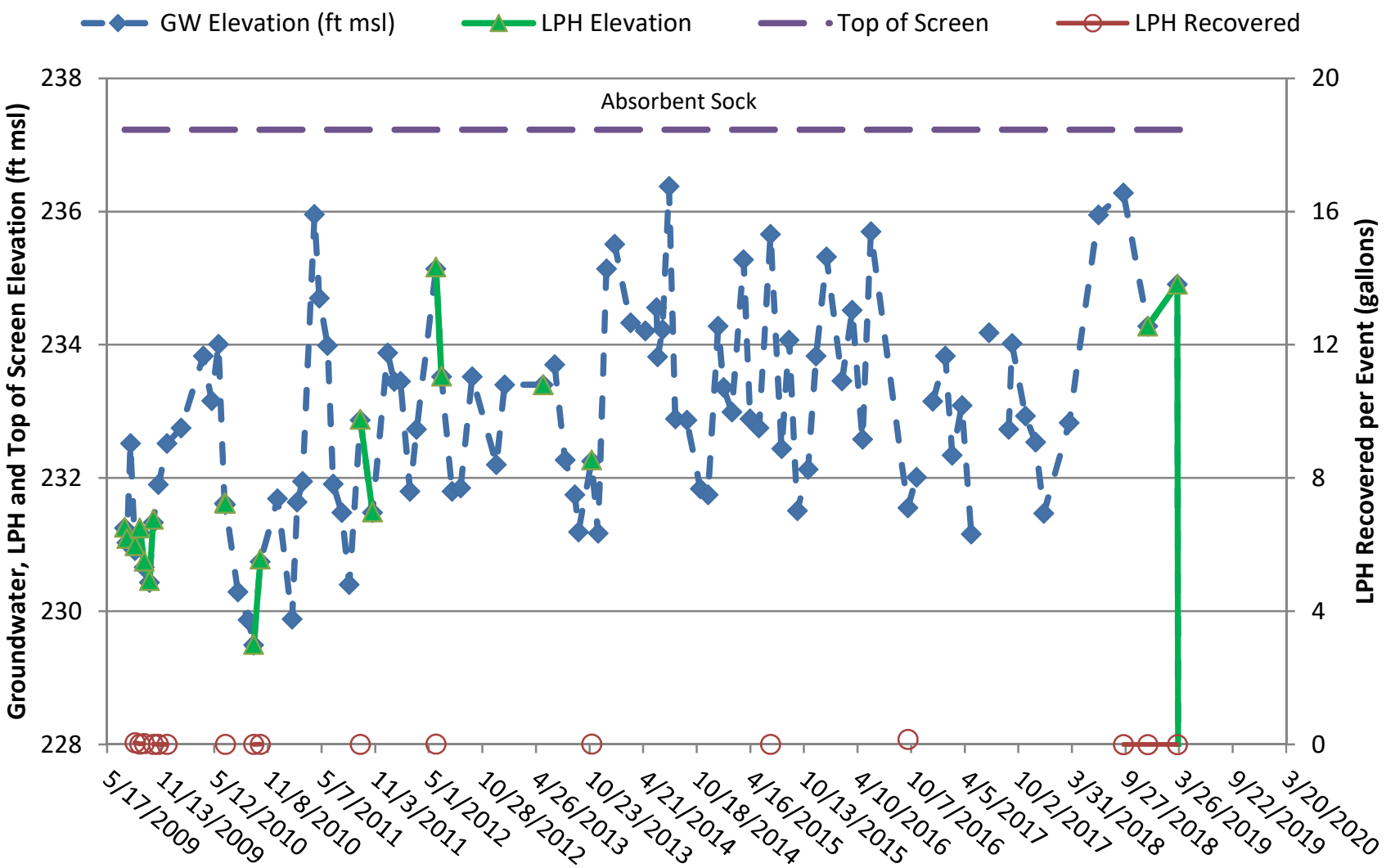
LPH and Groundwater Elevations and LPH Recovery: MW-4R
July 12, 2009 through June 17, 2019
CSXT Brunswick Yard, Brunswick, Maryland



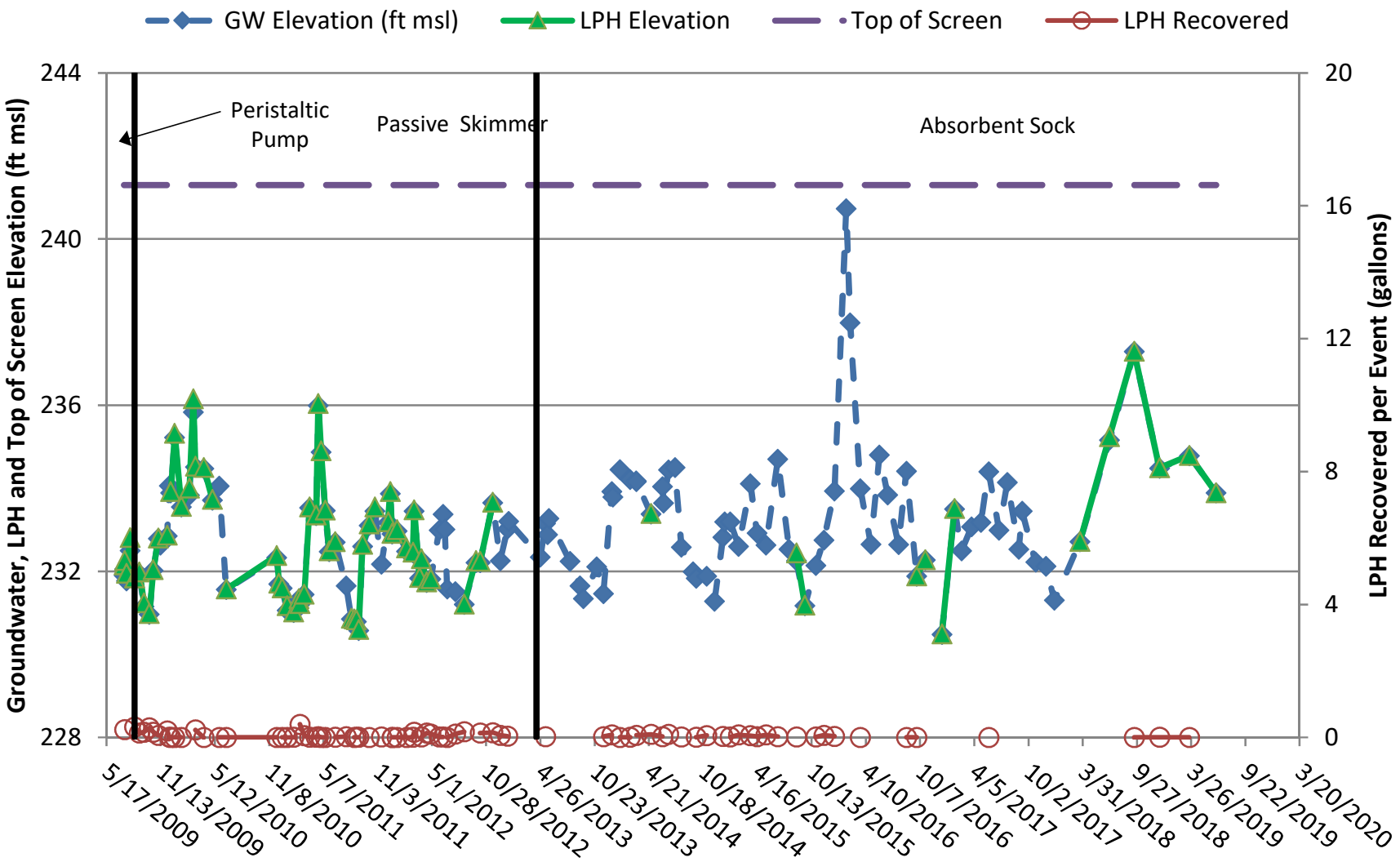
LPH and Groundwater Elevations and LPH Recovery: MW-26
July 12, 2009 through June 17, 2019
CSXT Brunswick Yard, Brunswick, Maryland



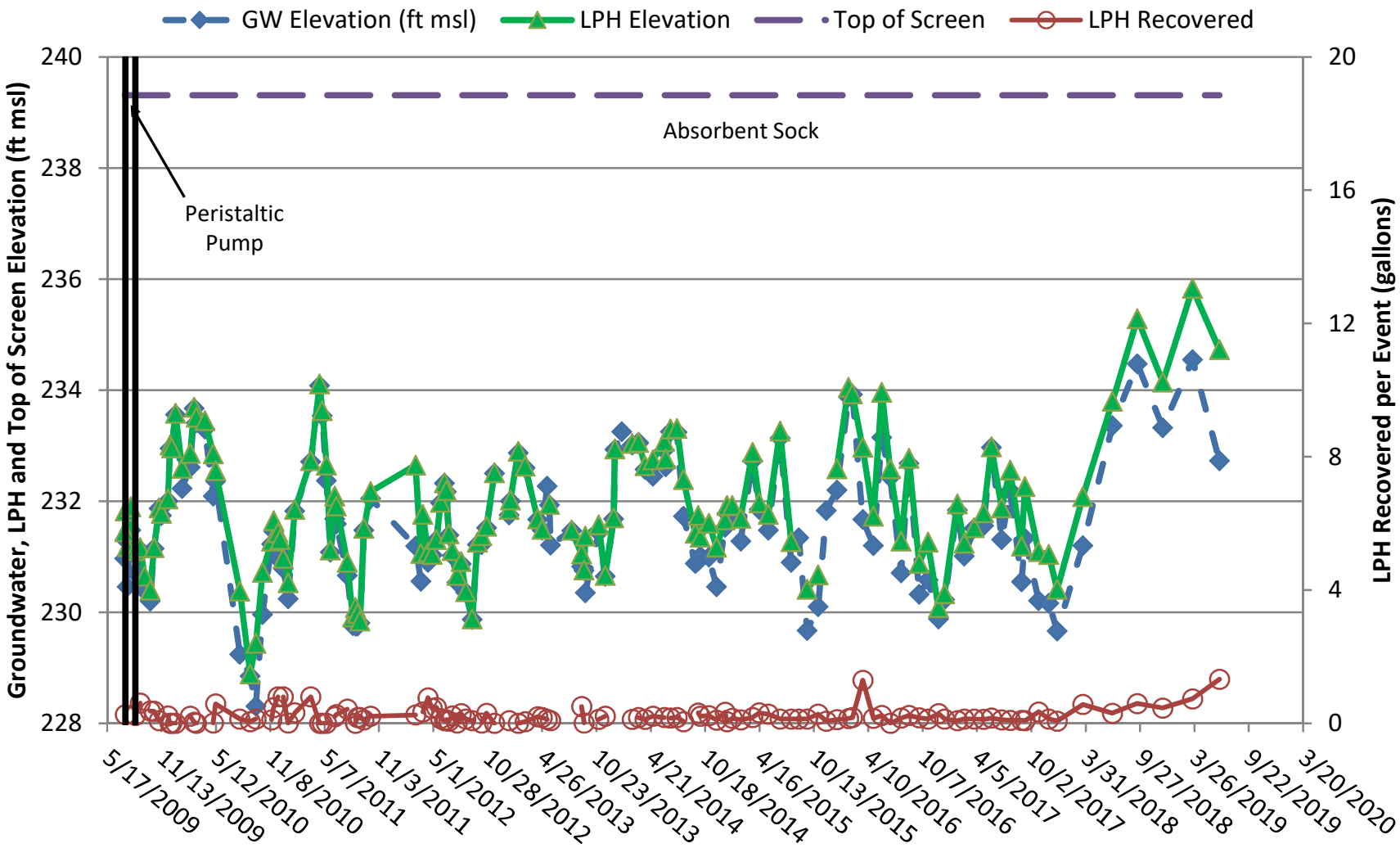
LPH and Groundwater Elevations and LPH Recovery: MW-28
July 12, 2009 through June 17, 2019
CSXT Brunswick Yard, Brunswick, Maryland



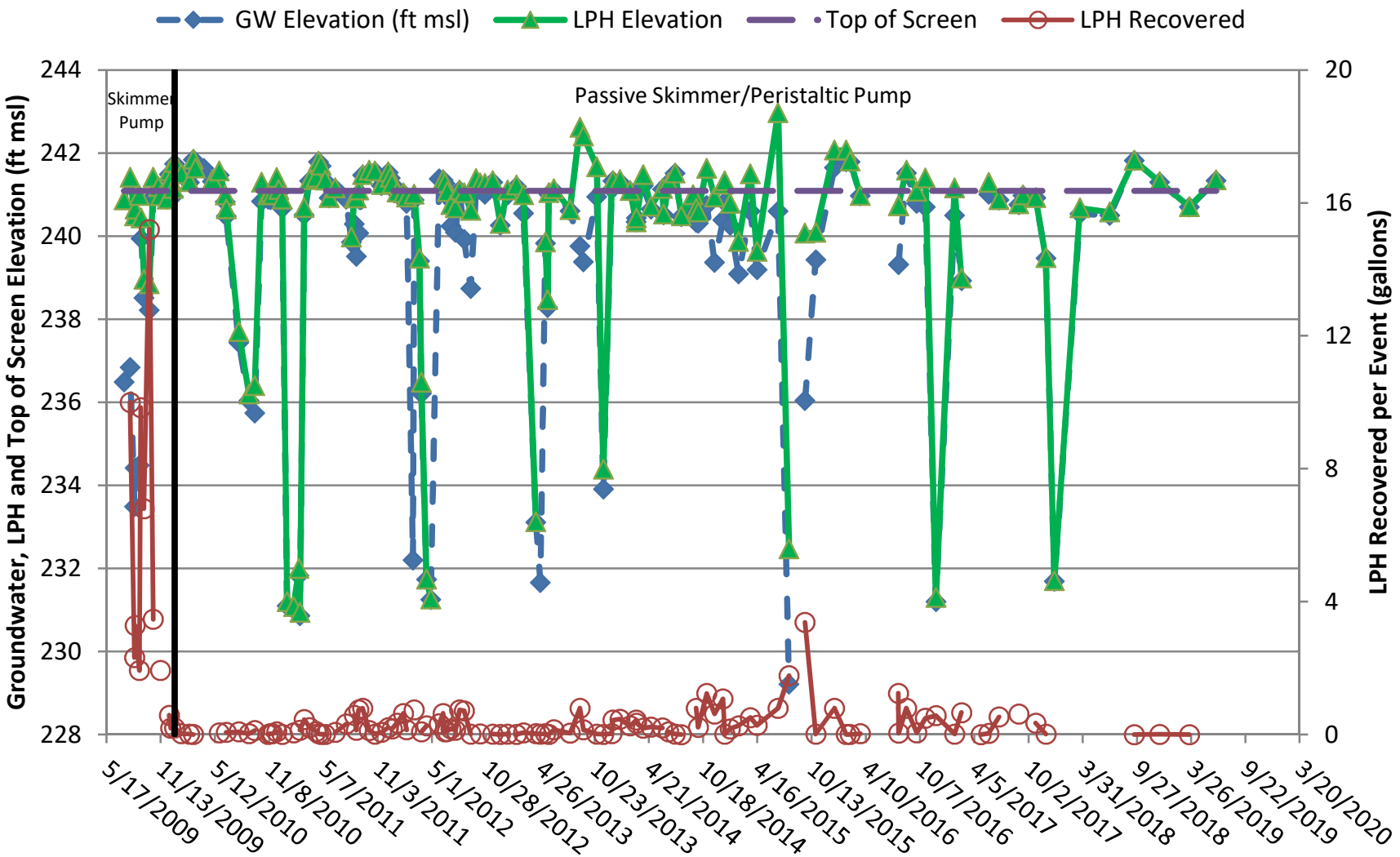
LPH and Groundwater Elevations and LPH Recovery: MW-32
July 12, 2009 through June 17, 2019
CSXT Brunswick Yard, Brunswick, Maryland



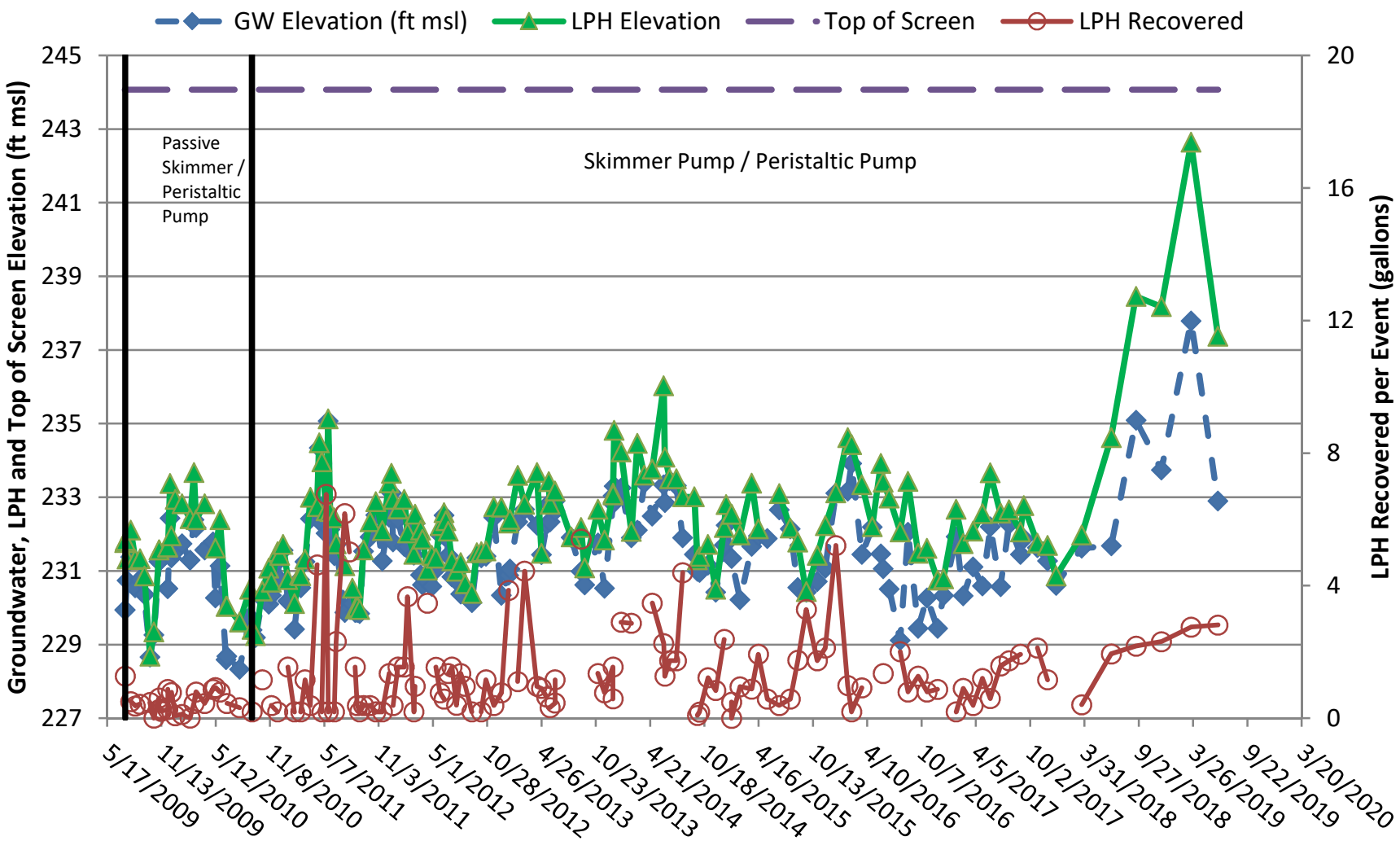
LPH and Groundwater Elevations and LPH Recovery: MW-37
July 12, 2009 through June 17, 2019
CSXT Brunswick Yard, Brunswick, Maryland



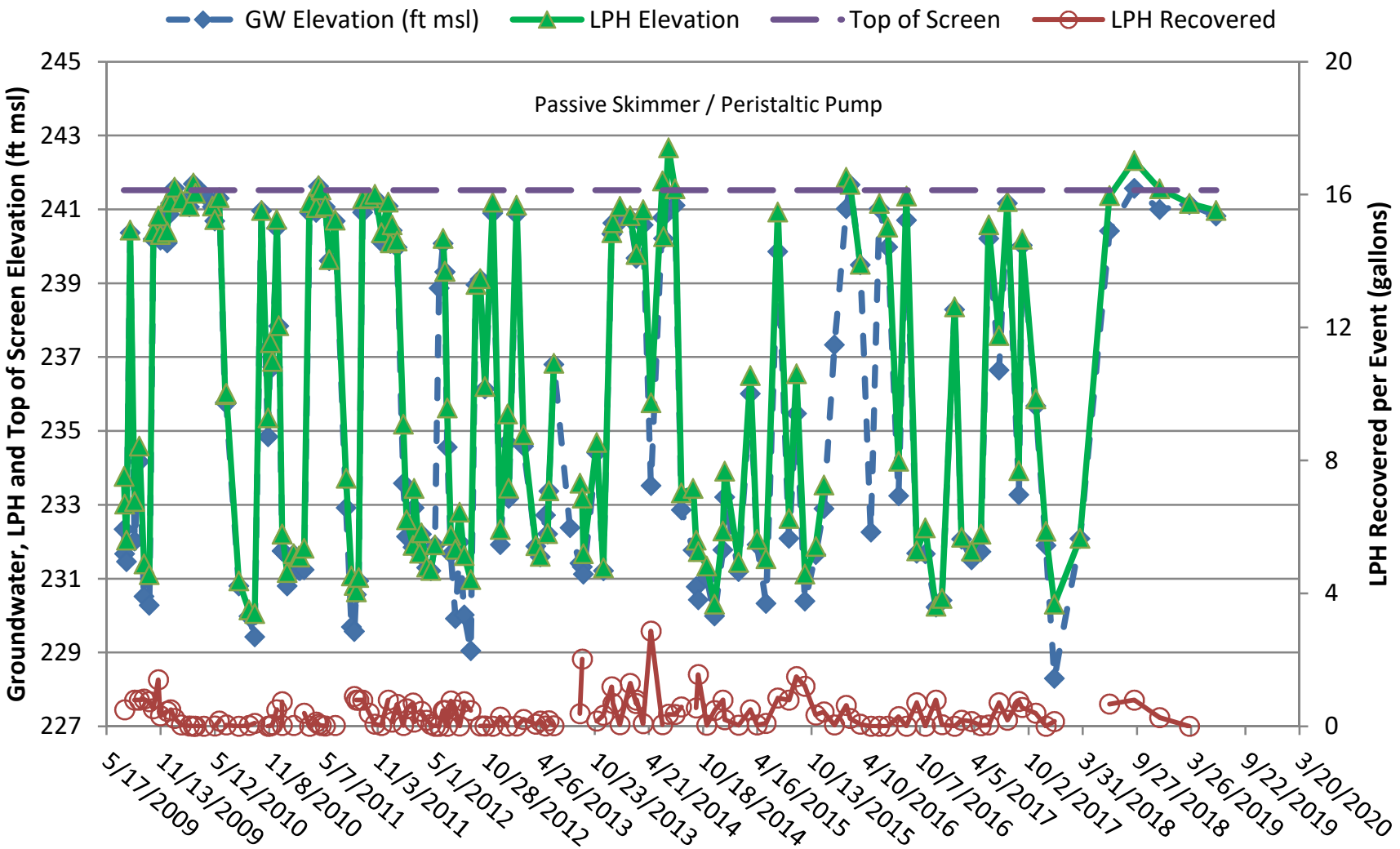
LPH and Groundwater Elevations and LPH Recovery: MW-38
July 12, 2009 through June 17, 2019
CSXT Brunswick Yard, Brunswick, Maryland



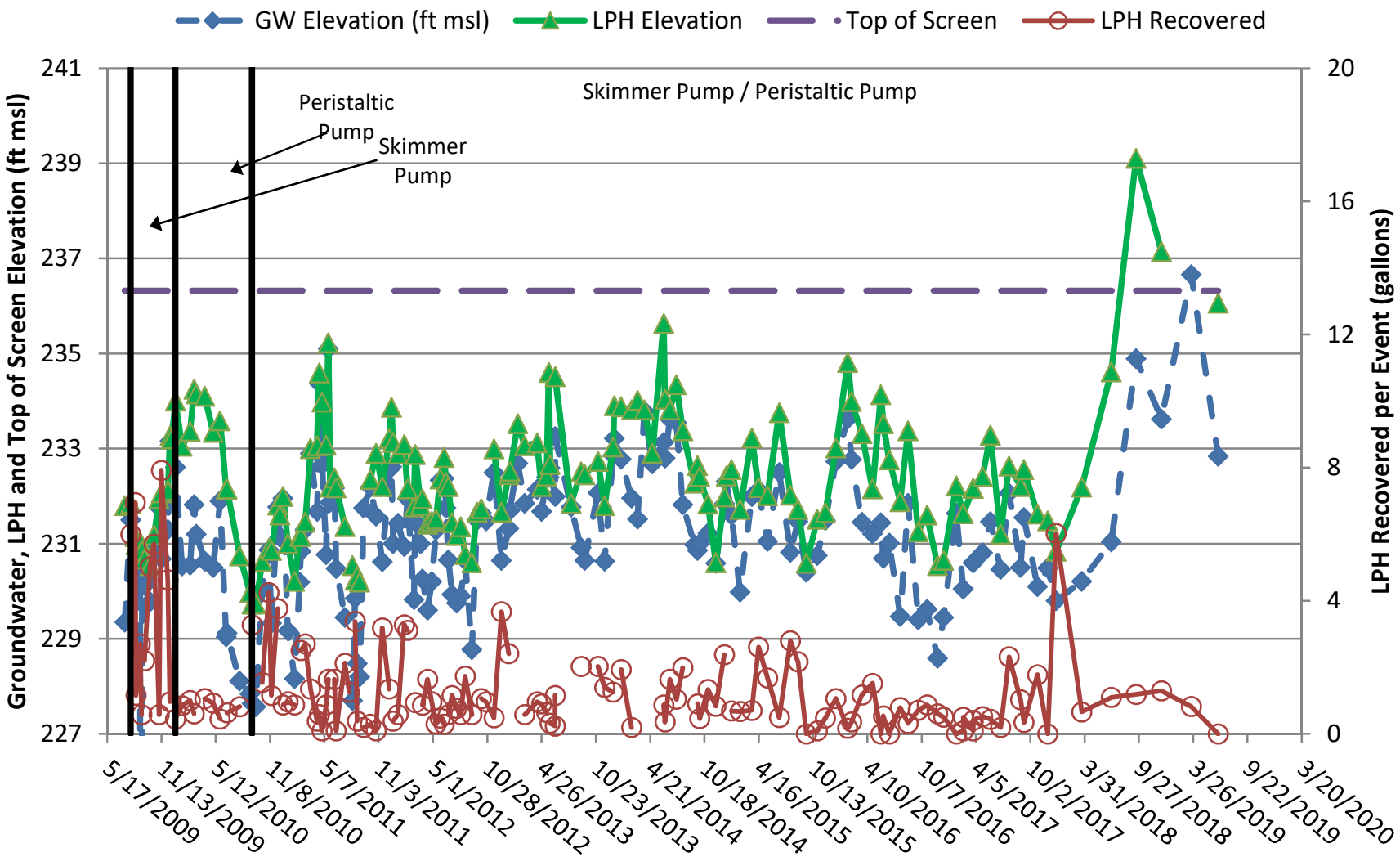
LPH and Groundwater Elevations and LPH Recovery: MW-41
July 12, 2009 through June 17, 2019
CSXT Brunswick Yard, Brunswick, Maryland



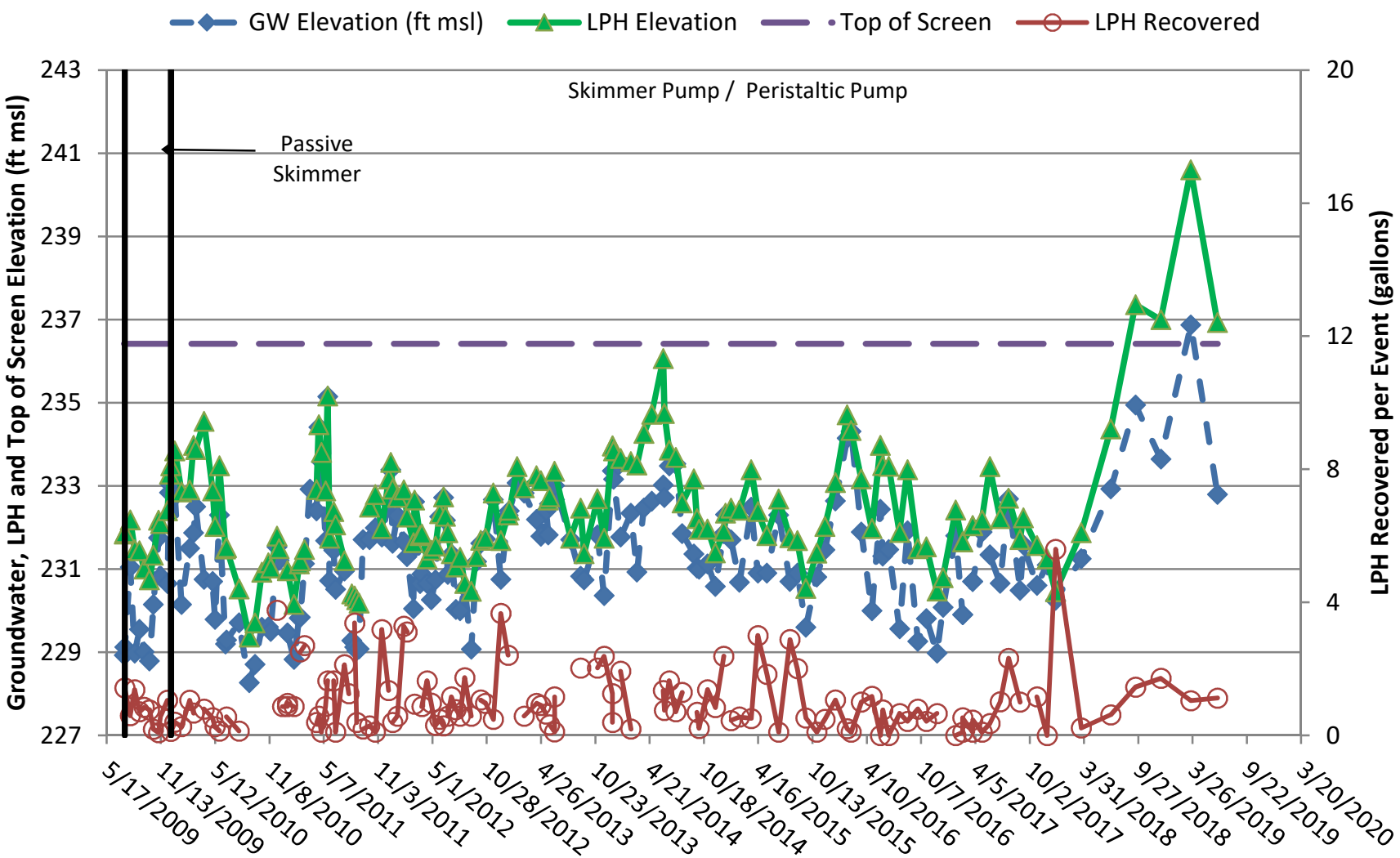
LPH and Groundwater Elevations and LPH Recovery: MW-49
July 12, 2009 through June 17, 2019
CSXT Brunswick Yard, Brunswick, Maryland



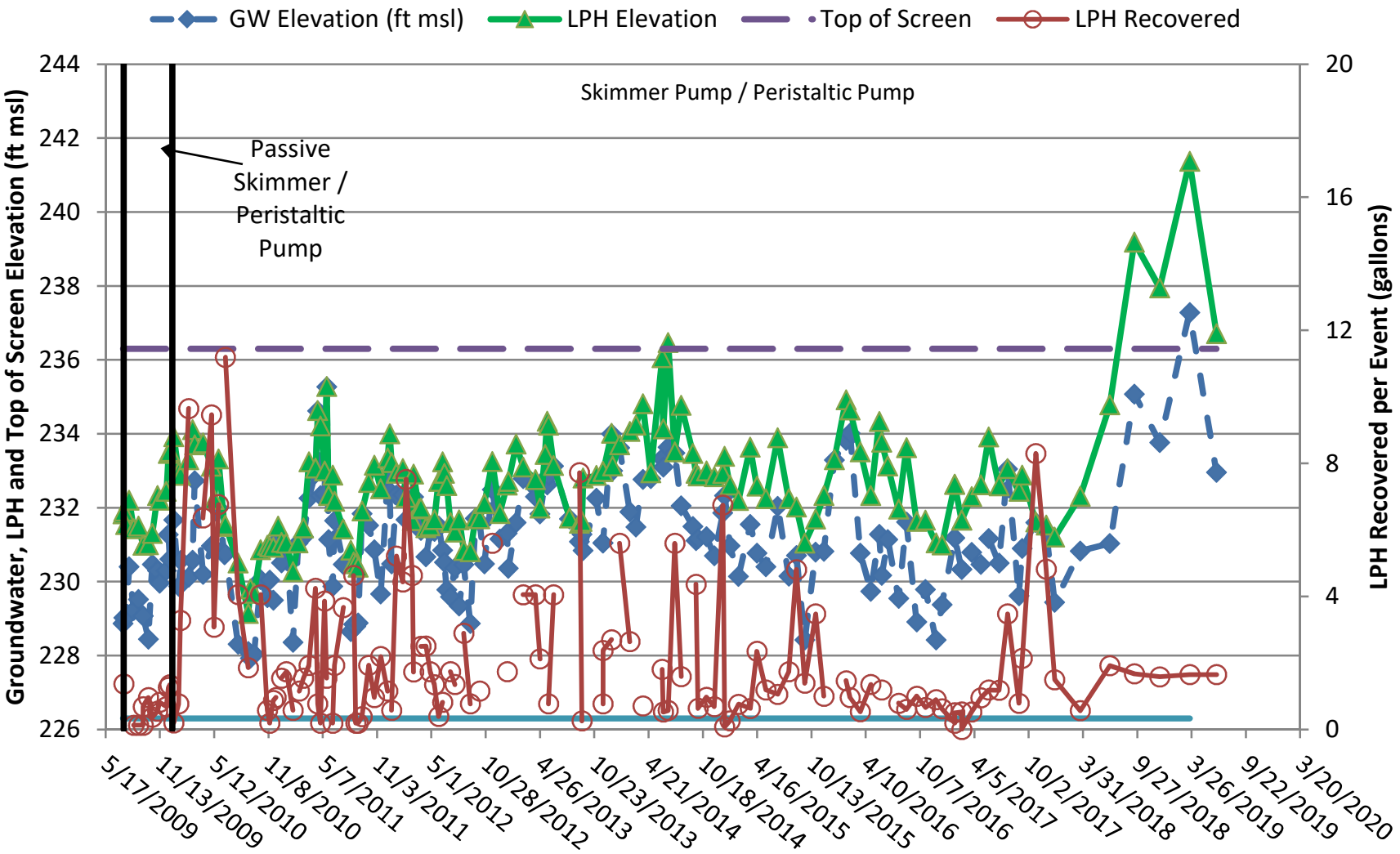
LPH and Groundwater Elevations and LPH Recovery: MW-53
July 12, 2009 through June 17, 2019
CSXT Brunswick Yard, Brunswick, Maryland



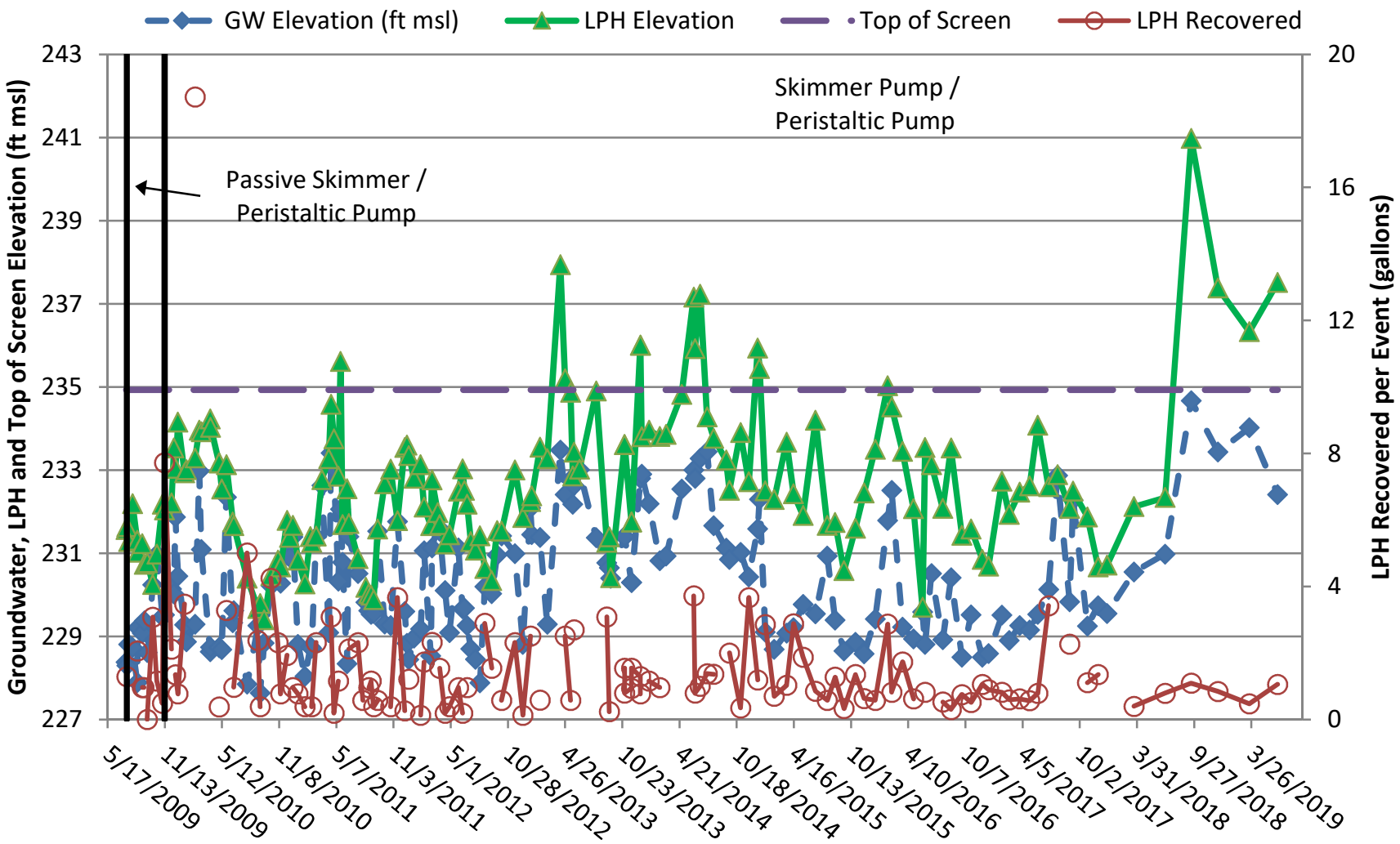
LPH and Groundwater Elevations and LPH Recovery: MW-54
July 12, 2009 through June 17, 2019
CSXT Brunswick Yard, Brunswick, Maryland



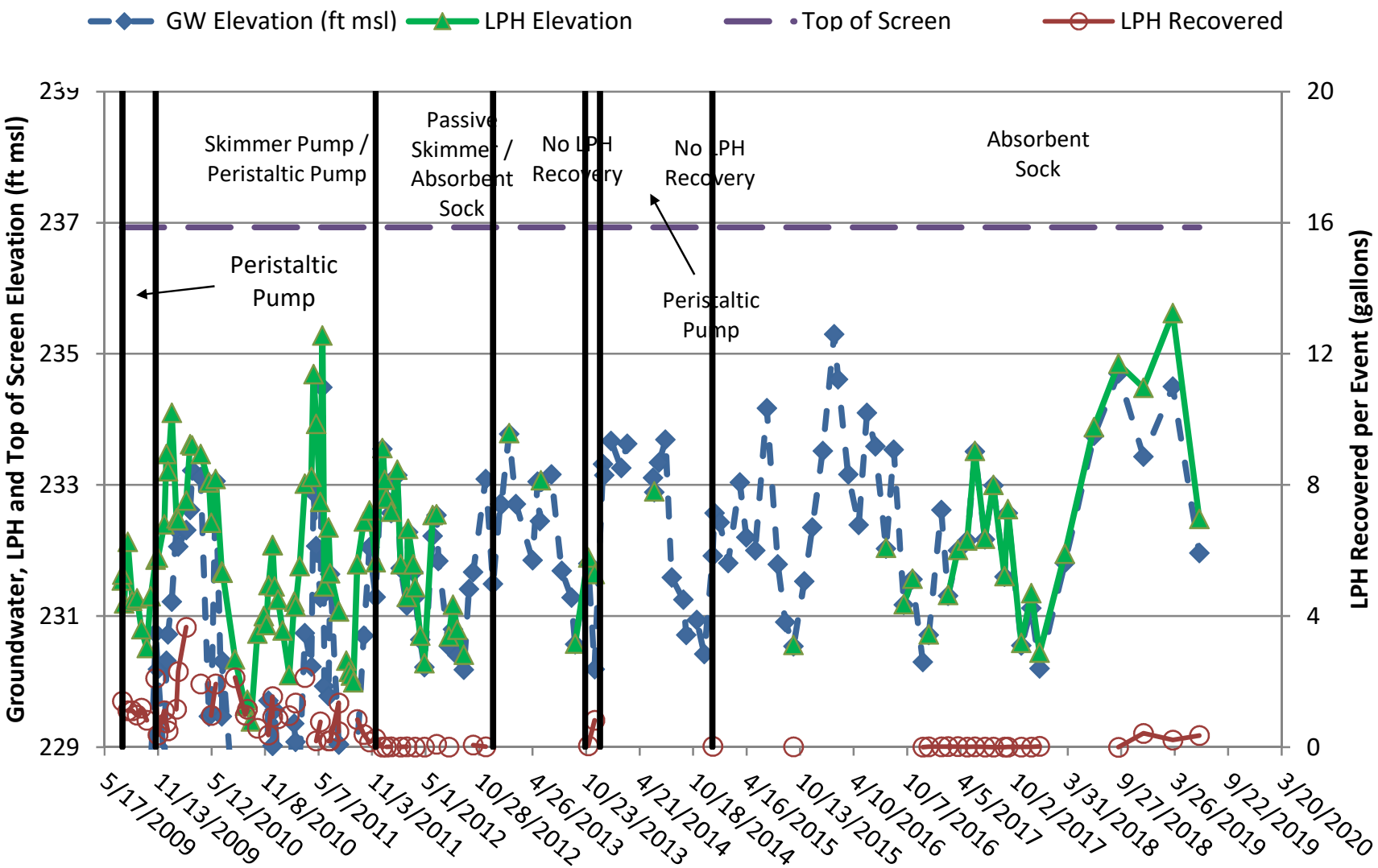
LPH and Groundwater Elevations and LPH Recovery: MW-55
July 12, 2009 through June 17, 2019
CSXT Brunswick Yard, Brunswick, Maryland



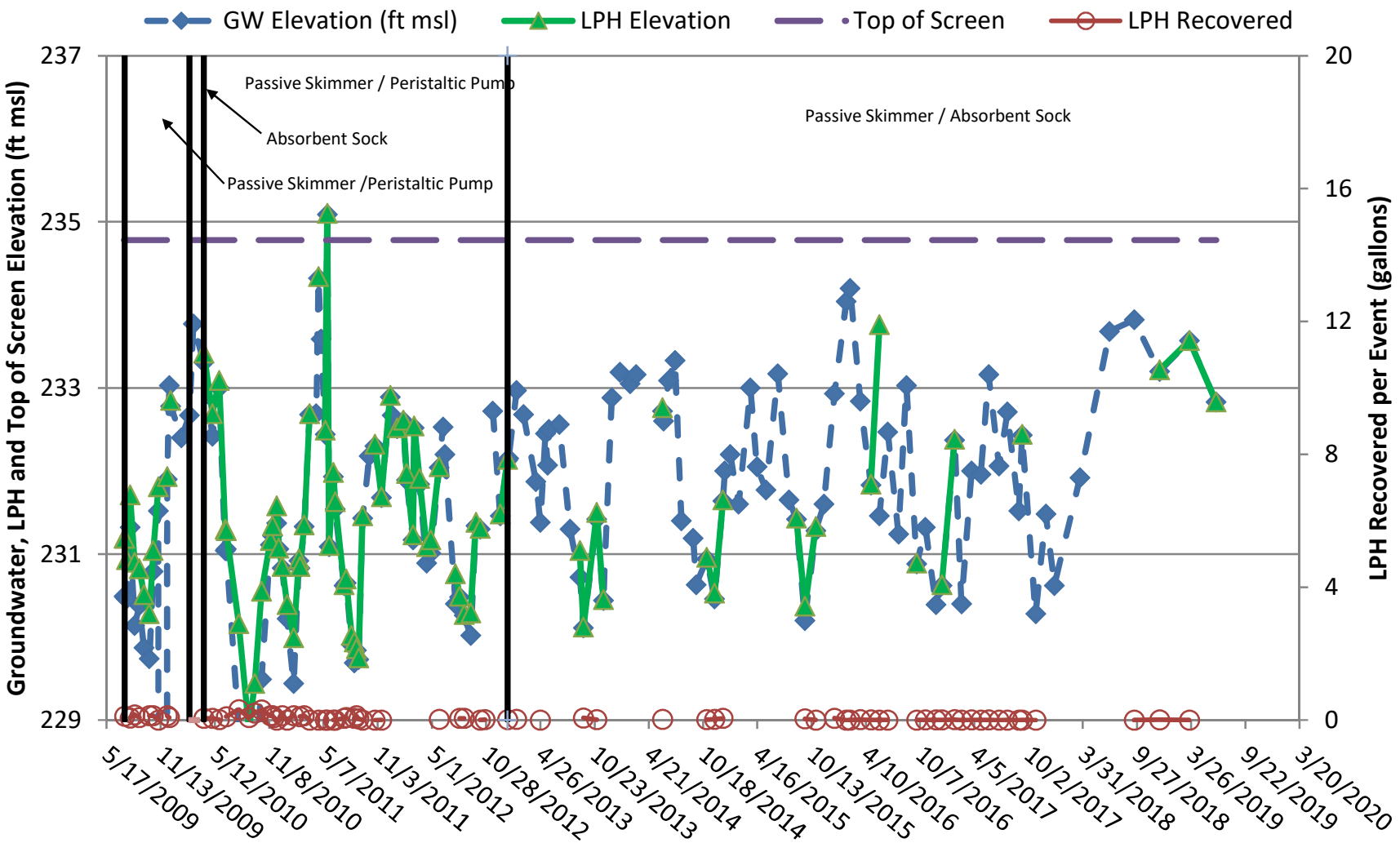
LPH and Groundwater Elevations and LPH Recovery: MW-56
July 12, 2009 through June 17, 2019
CSXT Brunswick Yard, Brunswick, Maryland



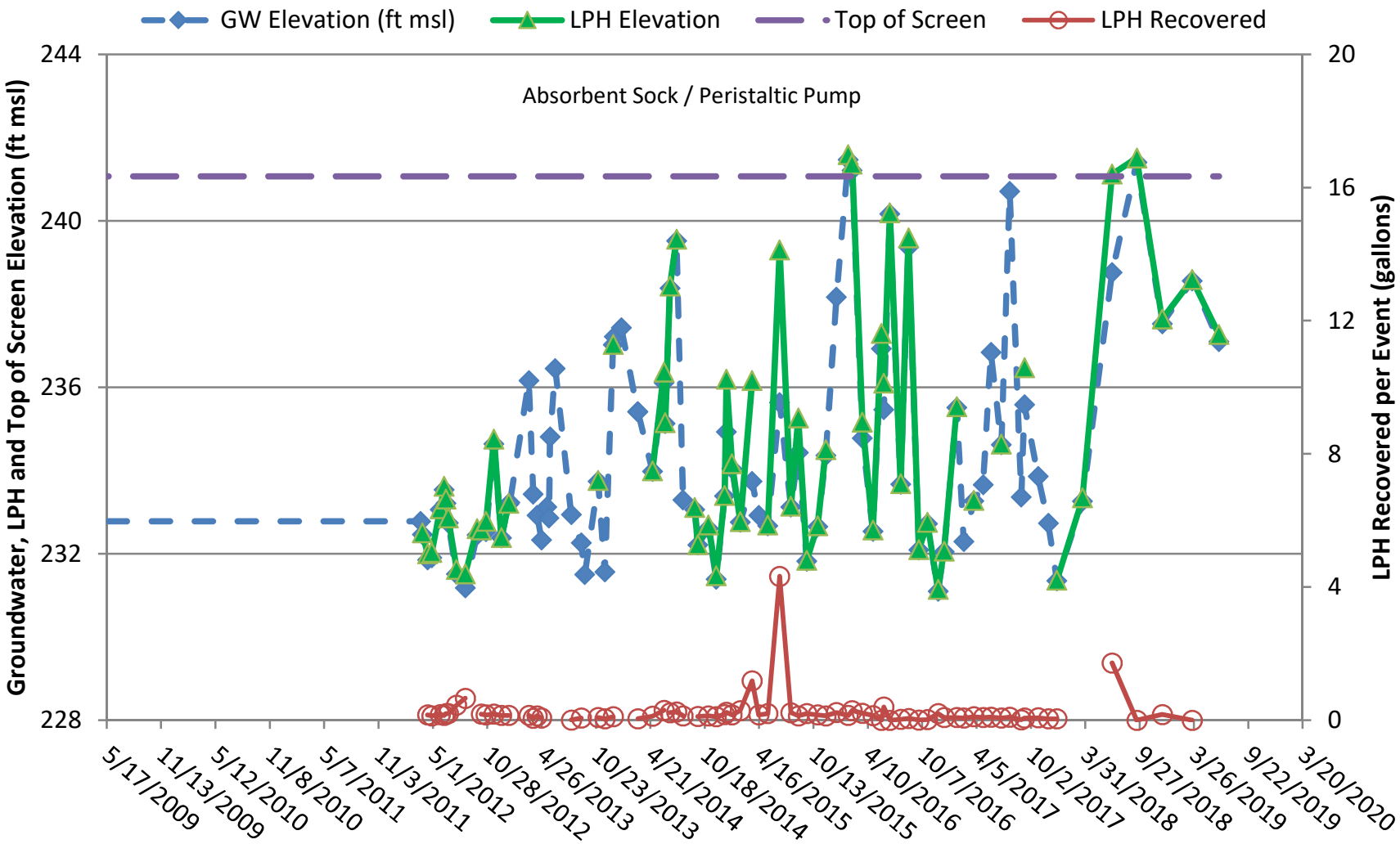
LPH and Groundwater Elevations and LPH Recovery: MW-57
July 12, 2009 through June 17, 2019
CSXT Brunswick Yard, Brunswick, Maryland



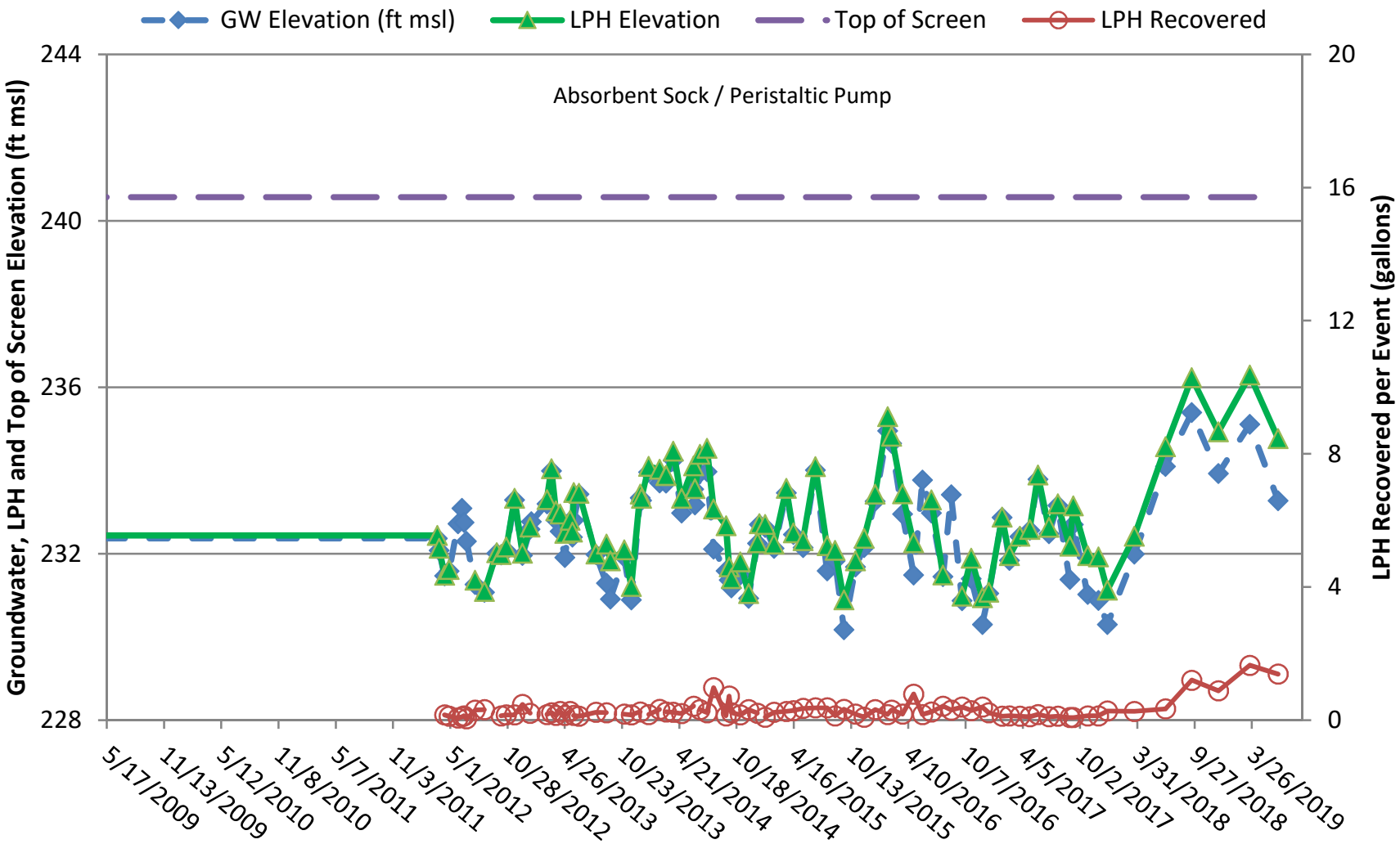
LPH and Groundwater Elevations and LPH Recovery: MW-58
July 12, 2009 through June 17, 2019
CSXT Brunswick Yard, Brunswick, Maryland



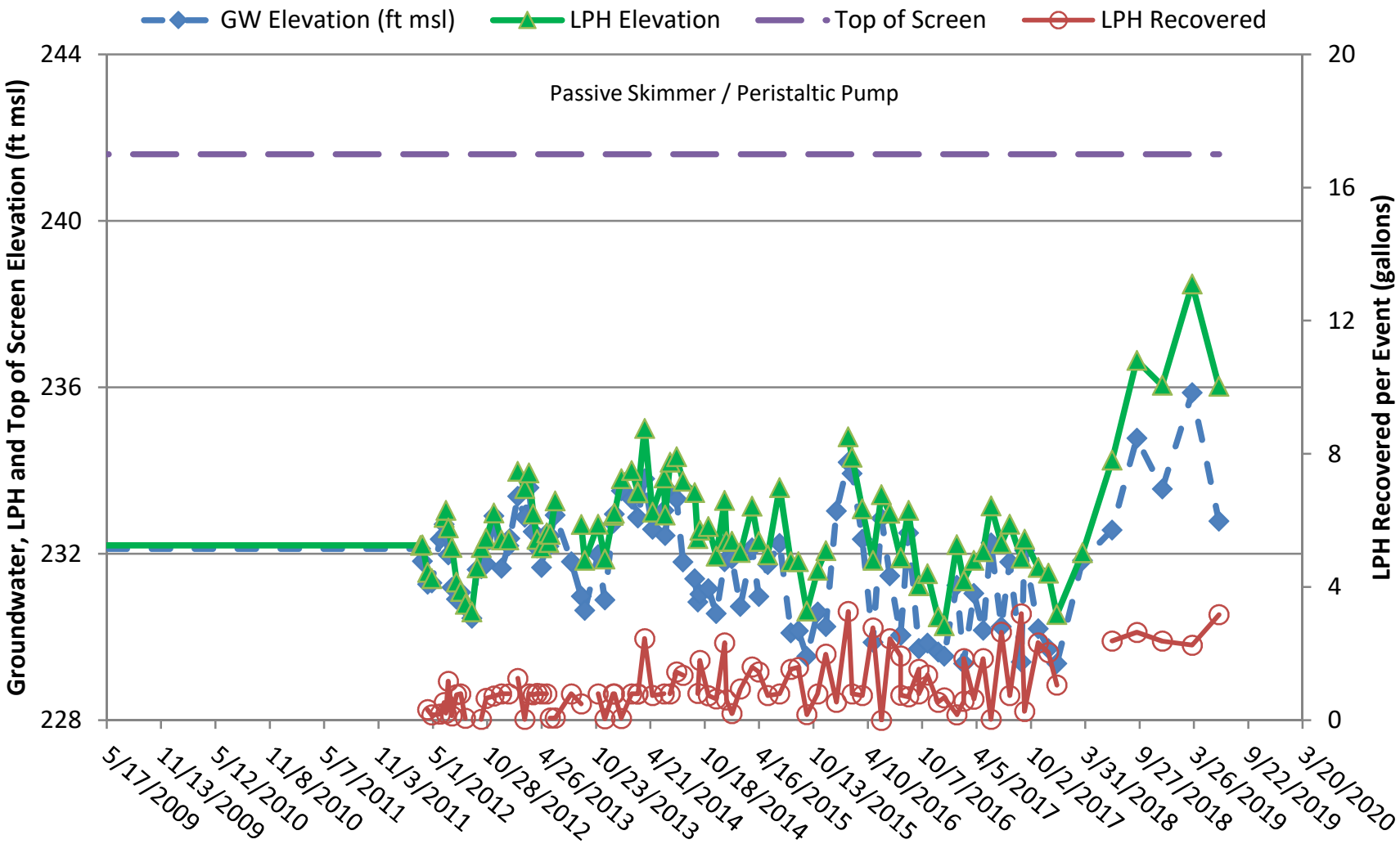
LPH and Groundwater Elevations and LPH Recovery: MW-59
March 21, 2012 through June 17, 2019
CSXT Brunswick Yard, Brunswick, Maryland



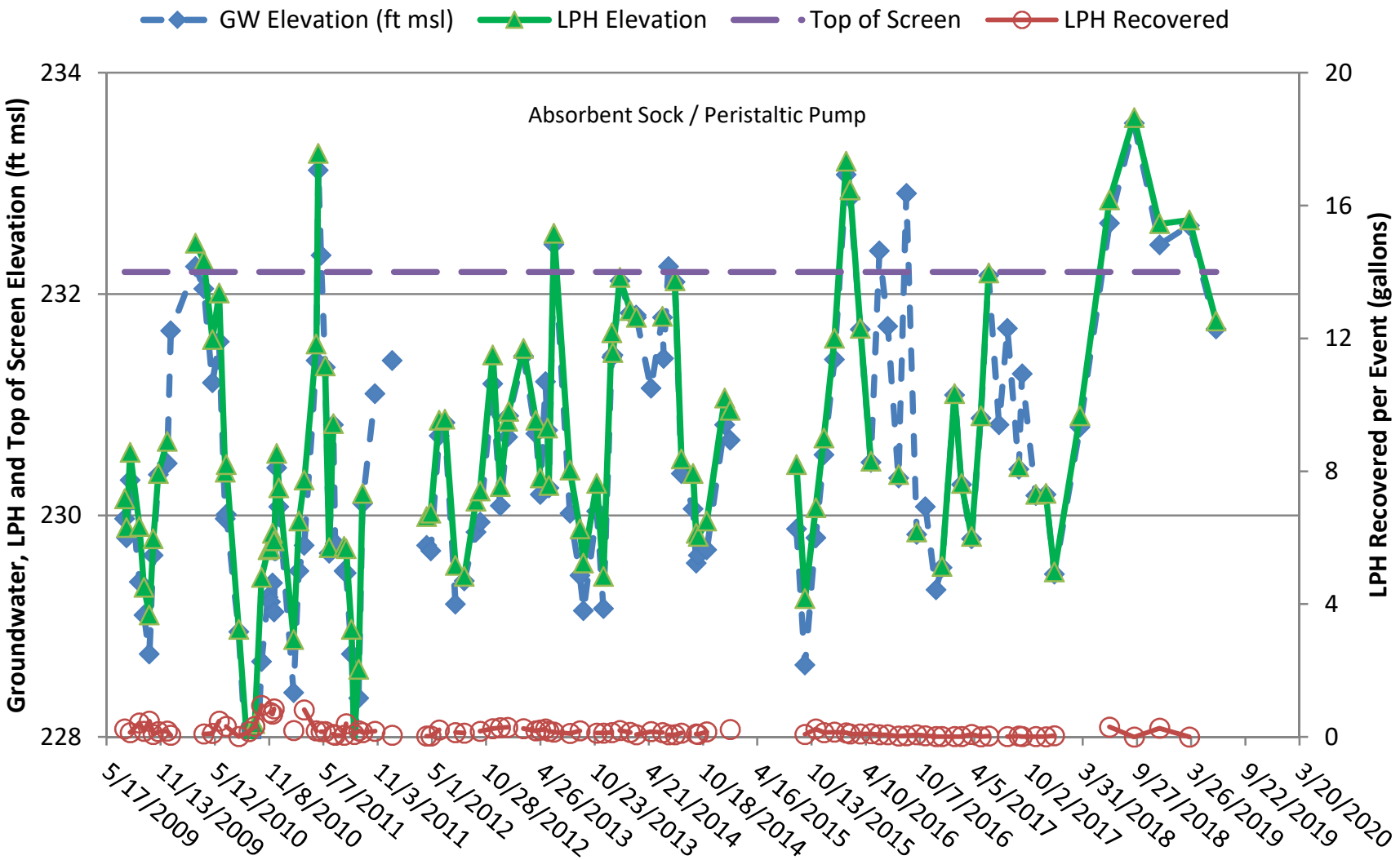
LPH and Groundwater Elevations and LPH Recovery: MW-60
March 21, 2012 through June 17, 2019
CSXT Brunswick Yard, Brunswick, Maryland



LPH and Groundwater Elevations and LPH Recovery: MW-63
March 21, 2012 through June 17, 2019
CSXT Brunswick Yard, Brunswick, Maryland



LPH and Groundwater Elevations and LPH Recovery: EW-3
July 12, 2009 through June 17, 2019
CSXT Brunswick Yard, Brunswick, Maryland



LPH and Groundwater Elevations and LPH Recovery: EW-5
July 12, 2009 through June 17, 2019
CSXT Brunswick Yard, Brunswick, Maryland