2017 Annual Periodic Review Report
Essex-Hope Site, Jamestown, New York

Prepared for

Essex Specialty Products, Inc.

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CH2M HILL Engineers, Inc.

Executive Summary

On behalf of Essex Specialty Products, Inc. (Essex), CH2M HILL Engineers, Inc. (CH2M) has prepared this annual Periodic Review Report (PRR) for the ongoing remedial actions at the Essex-Hope site (the Site; see Figure 1-1) in Jamestown, New York (Site No. 907015) for calendar year 2017. Various constituents of concern have been detected in soil and groundwater at the Site, including:

- Chlorinated volatile organic compounds (CVOCs)
  - Trichloroethene (TCE)
  - cis-1,2-Dichloroethene (cis-1,2-DCE)
  - trans-1,2-DCE
  - Vinyl chloride
  - 1,1-Dichloroethene (1,1-DCE)
- Ketones
  - Acetone
  - 2-Butanone (also known as methyl ethyl ketone)
- Petroleum-related compounds
  - Cumene, benzene, toluene, ethylbenzene, and xylenes (CBTEX)
  - 1,2,4-trimethylbenzene (1,2,4-TMB) and 1,3,5-trimethylbenzene (1,3,5-TMB)
- Bis(2-ethylhexyl) phthalate
- Polychlorinated biphenyls

Operation, maintenance, and monitoring activities have not changed since the last annual PRR of 2016 (CH2M, 2017b), and metal manufacturing operations involving the use of TCE and other solvents continue to occur onsite. This PRR summarizes activities undertaken at the Site in 2017, the effectiveness of the remedial program, a demonstration of compliance with the major elements of the Performance Monitoring Plan (PMP; URS Corporation [URS], 2014), and recommendations for changes or future work.

Remedial actions have been undertaken at the Site, in accordance with the 1994 Record of Decision (ROD). In addition to the actions taken as detailed in the ROD, supplemental investigations and pilot tests have been performed to date. Currently, active engineering controls consist of two shallow and two deep recovery wells, a groundwater treatment system, asphalt and concrete caps, long-term groundwater monitoring, and a subslab depressurization system at an offsite residence. Institutional controls (ICs) exist in the form of a Declaration of Covenants and Restrictions. Figure 1-2 depicts the areas of remediation and the ICs/engineering controls (ECs) at the Site.

In 2017, the IC/ECs continued to be operative, and discharges from the groundwater treatment system were monitored as required and did not exceed the Jamestown Board of Public Utilities (BPU) discharge permit limits. Data obtained from these latest site investigations were used to refine the conceptual site model (CSM), assess the current remedial system performance, and plan for potential future remedial activities.

Based on results from the 2016 Data Gap Investigation (CH2M, 2017d), additional actions were taken in 2017 to complete an assessment of vadose zone soil and shallow and deep groundwater conditions in fall 2017 as part of the 2017 Data Gap Investigation (see Appendix B). Volatile organic compound (VOC) concentrations exceeded remedial action objectives (RAOs) in vadose zone soil, but those exceedances were limited to the North Parking Lot Sump (NPLS) Area and the Former Aboveground Storage Tank

(AST)/Underground Storage Tank (UST) Area. Additionally, nonaqueous phase liquid (NAPL) was not detected in shallow soils under the Plant 5 Building.

Because of the limited effectiveness and asymptotic concentration trends observed at RW-3S, and upon New York State Department of Environmental Control (NYSDEC) acceptance of the recommendations provided as part of the 2016 Annual Periodic Review (CH2M, 2017b), pumping of this recovery well, located at the Former AST/UST Area, was permanently halted on August 8, 2017. Nevertheless, shallow groundwater continues to be extracted from the NPLS Area where CVOC and CBTEX concentrations have generally declined. In 2017, 0.38-pound of VOCs was removed from the Shallow Water-bearing Zone (WBZ). Groundwater in the Shallow WBZ, in areas outside the NPLS Area, migrates to the east-northeast under natural gradient. Additional Shallow WBZ findings that originated from the *2017 Data Gap Investigation Report for the Essex-Hope Site in Jamestown, New York* (see Appendix B) are discussed herein, and as follows:

- The petroleum-constituents plume identified in the Shallow WBZ with rebounding CBTEX concentrations suggests additional source material is present in the eastern portion of the Former UST Area; however, this plume does not appear to extend significantly offsite.
- CVOCs in the Shallow WBZ are present outside the typical capture zones of the groundwater extraction and treatment system and the extent of the plume has been substantially delineated.

In 2017, 117 pounds of VOCs were removed from the Deep WBZ, including acetone. VOCs were not detected above RAOs in existing and newly installed sentinel wells. TCE; cis-1,2-DCE; vinyl chloride; and acetone remain in the Deep WBZ at concentrations above RAOs, although acetone concentrations continue to be on a decreasing trend. Additional Deep WBZ findings that originated from the 2017 Data Gap Investigation Report (see Appendix B; CH2M, 2018) are the following:

- The deep CVOC groundwater plumes have been substantially delineated and additional sentinel wells have been installed, indicating site-related COCs are below the RAOs in these wells; however, CVOC concentrations exist outside the capture zone of the current extraction system.
- NAPL was not observed in deep soils under the Plant 5 Building; however, reported soil concentrations are high enough to be consistent with residual NAPL presence, the presence of persistent high dissolved-phase concentrations. The detection of light nonaqueous phase liquid (LNAPL) in PZ-4D indicates that there is an area of residual NAPL in this area.

In 2017, a Site Management Plan (SMP) was developed in accordance with the requirements of NYSDEC's Division of Environmental Remediation *Technical Guidance for Site Investigation and Remediation* (DER-10), dated May 3, 2010, and the guidelines provided by NYSDEC. This SMP was submitted to NYSDEC in December 2017, and addresses the means for implementing operation, maintenance, and monitoring of the IC/ECs at the Site (CH2M, 2017a). This SMP includes an updated PMP based on the findings from the 2016 and 2017 Data Gap Investigations (see Appendix B). Because the existing PMP (URS, 2014) expired as of the end of 2017, site monitoring activities in 2018 will be performed in compliance with the recently submitted SMP. In 2018, Essex plans to assess potential remedial alternatives or supplements to the existing remedies to further mitigate impacts in the shallow and deep soils and both the Shallow and Deep WBZs, to expedite achieving RAOs.

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Acronyms and Abbreviations

µg/L	micrograms per liter
AS	air sparging
AST	aboveground storage tank
bgs	below ground surface
BPU	Board of Public Utilities
CBTEX	cumene, benzene, toluene, ethylbenzene, and xylenes
CH2M	CH2M HILL Engineers, Inc.
COC	constituent of concern
CPM	Custom Production Manufacturing Inc.
CSM	conceptual site model
CVOC	chlorinated volatile organic compound
DCE	dichloroethene
DPT	direct-push technology
Essex	Essex Specialty Products, Inc.
GAC	granular-activated carbon
gpm	gallons per minute
IC/EC	institutional control/engineering control
ISCO	in situ chemical oxidation
MW	monitoring well
NAPL	nonaqueous phase liquid
NPLS	North Parking Lot Sump
NYSDEC	New York State Department of Environmental Conservation
O&M	operations and maintenance
PCB	polychlorinated biphenyl
PMP	Performance Monitoring Plan
POTW	publicly owned treatment works
PRR	Periodic Review Report
RAO	remedial action objective
RI	remedial investigation
ROD	Record of Decision
RW	recovery well
Site	Essex-Hope Site in Jamestown, New York
SMP	Site Management Plan

SSDS	subslab depressurization system
SVE	soil vapor extraction
SVOC	semivolatile organic compound
TCE	trichloroethene
TMB	trimethylbenzene
TTO	total toxic organic
URS	URS Corporation
UST	underground storage tank
VI	vapor intrusion
VOC	volatile organic compound
WBZ	water-bearing zone
ZVI	zero-valent iron

SECTION 1

Site Overview

On behalf of Essex Specialty Products, Inc. (Essex), CH2M HILL Engineers, Inc. (CH2M) has prepared this annual Periodic Review Report (PRR) for the ongoing remedial actions at the Essex-Hope Site (Site) in Jamestown, New York (Site No. 907015) from January 1 through December 31, 2017. The 1995 New York State Department of Environmental Conservation (NYSDEC) Order on Consent requires an annual report be prepared for site remedial actions, and these reports have been submitted annually since 1997. Performance Monitoring Plans (PMPs) were submitted in 2008, 2011, and 2014 (URS Corporation [URS] 2008, 2011, 2014). A comprehensive Site Management Plan (SMP) was developed and submitted to NYSDEC in December 2017, in accordance with NYSDEC Division of Environmental Remediation *Technical Guidance for Site Investigation and Remediation* (DER-10), dated May 3, 2010 (CH2M, 2017a). The SMP addresses the means for implementing operation, maintenance, and monitoring of the institutional controls and engineering controls (IC/ECs) at the Site. The SMP includes an updated PMP based on the findings from the 2016 and 2017 Data Gap Investigations (see Appendix B), and will be fully implemented upon NYSDEC acceptance. This PRR includes an (IC/EC) Certification Form (Appendix A).

The Site is located at 125 Blackstone Avenue in Jamestown, New York, and comprises approximately 4.7 acres (Figure 1-1). The Site is in a highly industrialized area of the city. Custom Production Manufacturing Inc. (CPM) presently owns the Site. The Site consists of two main buildings, the Plant 5 Building on the northern side of the property and the West Building on the western side of the Site. The remainder of the Site includes paved areas, vegetated areas, a remedial system treatment building, and a Quonset hut. Metal manufacturing operations involving use of trichloroethene (TCE) and other solvents continue to occur onsite.

Various constituents of concern (COCs) are present in soil and groundwater, including:

- Chlorinated volatile organic compounds (CVOCs)
  - TCE
  - cis-1,2-Dichloroethene (cis-1,2-DCE)
  - trans-1,2-DCE
  - Vinyl chloride
  - 1,1-Dichloroethene (1,1-DCE)
- Ketones
  - Acetone
  - 2-Butanone (also known as methyl ethyl ketone)
- Petroleum-related compounds
  - Cumene, benzene, toluene, ethylbenzene, and xylenes (CBTEX)
  - 1,2,4-trimethylbenzene (1,2,4-TMB) and 1,3,5 trimethylbenzene (1,3,5-TMB)
- Bis(2-ethylhexyl) phthalate
- Polychlorinated biphenyls (PCBs)

Three separate areas were identified in the early 1990s during remedial investigations (RIs) and subsequently became the focus of remedial actions (Figure 1-1):

1. PCB-contaminated soils and CVOCs in shallow and deep groundwater were identified in the North Parking Lot Sump (NPLS) Area, located in a parking lot on the southern side of Hopkins Street.
2. Bis(2-ethylhexyl) phthalate-contaminated soils were found in the previously closed Underground Storage Tank (UST) Area, located south of the Plant 5 Building.

3. Petroleum-related compounds were identified in the Former Aboveground Storage Tank (AST)/UST Area soils, located along the back of the West Building.

As the result of further delineation during supplemental investigation activities conducted since the March 1994 Record of Decision (ROD; NYSDEC, 1994), impacts to groundwater have been observed elsewhere at the Site and offsite. Table 1-1 summarizes the historically observed impacts at the Site.

The remedial systems at the Site were designed and constructed to address impacted groundwater and soil using a combination of soil vapor extraction (SVE), air sparging (AS), and a groundwater extraction and treatment system. Figure 1-2 depicts the areas of remediation and location of IC/ECs at the Site. The original remedial action implementation was conducted in 1996 and 1997, based on the March 1994 ROD (NYSDEC, 1994) and a 1995 Basis of Design Report (Dow Environmental Inc., 1995), and included the following:

- A groundwater extraction well network consisting of five shallow and two deep recovery wells for activated carbon groundwater treatment and discharge to the local publicly owned treatment works (POTW)
- Soil excavation in the NPLS Area to remove PCB-impacted soil in the area of a former sump, and on the eastern side of the Former UST Area to remove bis(2-ethylhexyl) phthalate
- SVE wells in the vadose zone and AS wells in the Shallow Water-bearing Zone (WBZ) in the NPLS, Former AST/UST, and Former UST areas to remediate vadose zone soil and supplement the treatment of impacted groundwater via enhanced biodegradation and volatilization of organic constituents
- Capping with either asphalt or concrete in the NPLS, AST/UST, and UST areas to prevent dermal contact and particulate inhalation exposure, minimize leaching of semivolatile organic compounds (SVOCs) into groundwater, and improve the efficiency of the SVE system
- Long-term monitoring of a network of monitoring wells across the Site

This report has been prepared concurrently with the recently completed data gap investigation (see Appendix B; CH2M, 2018). The 2017 data gap investigation goals were to supplement the previous site investigation, refine the conceptual site model (CSM), assess current remedial system performance, and facilitate planning of potential future supplemental remedial activities at the Site. This site investigation encompassed a soil and groundwater assessment including groundwater sampling of existing and newly installed wells. To minimize duplication, results of the 2017 Data Gap Investigation Report (CH2M, 2018) and updates to the CSM are briefly discussed where pertinent in this report and further detailed in a separate report included in Appendix B.

1.1 Geology and Hydrogeology

Updated cross-sections were developed as part of the 2016 and 2017 Data Gap Investigation Reports (CH2M, 2017a; 2018 [see Appendix B]) showing the relationships of the four primary stratigraphic units found at the Site, consisting of the following materials, in order of depth from the surface:

- Sand and gravel with occasional silt and fine-grained sands, generally classified as a silty sand with gravel extending to 10 to 15 feet below ground surface (bgs); although in the southwestern portion of the Site, observed thicknesses in some locations are less than 10 feet, and between 15 and 25 feet north of the Site and across the Former UST Area, adjacent to Bigelow Street (Figure 1-1).
- A shallow silty clay, generally ranging from 5 to 10 feet thick; however, it is absent or only several inches thick in various locations, including in portions of the NPLS Area.
- A generally 15- to 20-foot-thick silt or silt with sand, and in some locations 45 feet thick.
- A 40- to 50-foot-thick deep silty clay.

The depth to water at the Site is generally 7 to 11 feet bgs, and impacted groundwater occurs in two hydrostratigraphic zones. The Shallow WBZ exists in the shallow sands and gravels under unconfined (water table) conditions. The Deep WBZ exists under confined to partially confined conditions in the fine-grained silt with sand and is separated in most areas from the Shallow WBZ by the shallow silty clay layer. Groundwater flow in both Shallow and Deep WBZs under non-pumping conditions is east to northeast toward the Chadakoin River. Groundwater levels in the Shallow WBZ have been observed to vary 1 to 3 feet between synoptic events. The WBZs were further evaluated as part of the 2017 data gap investigation and CSM (Appendix B).

1.2 Major System Modifications

Modifications to the ROD-related remedial systems have been made and communicated to NYSDEC through previous reporting. In 2017, only one system modification took place, consisting of the shutdown of pumping at recovery well RW-3S in August 2017 due to the limited effectiveness and asymptotic concentrations observed at this well. This modification was completed upon NYSDEC acceptance of the recommendations provided as part of the 2016 Annual Periodic Review (CH2M, 2017b).

1.3 Supplemental Remedial Activities and Investigations

From 2000 through 2016, multiple voluntary supplemental remedial actions have been implemented with NYSDEC's approval, as listed in Table 1-2 and depicted on Figure 1-2.

In 2017, in addition to regular performance monitoring, multiple site investigations have been conducted to further define the nature and extent of contamination in soil, soil vapor, and groundwater onsite and offsite (Table 1-2). Three additional site investigations that took place in 2017 are as follows:

- In March 2017, a synoptic survey was conducted and newly installed monitoring wells were sampled. During this event, nonaqueous phase liquid (NAPL) was detected in PZ-4D, screened in the Deep WBZ under the Plant 5 Building.
- In April 2017, a mitigation system evaluation was conducted to assess the effectiveness of the subslab depressurization system (SSDS) at the 159 Hopkins Avenue residence (CH2M, 2017c).
- As a result of the 2016 Data Gap Investigation and March 2017 groundwater sampling findings, a supplemental investigation was undertaken in the fall of 2017, as discussed in more detail in Section 2, *Remedy Performance, Effectiveness, and Protectiveness*, and in the 2017 Data Gap Investigation Report (CH2M, 2018; see Appendix B). Data gap investigation activities completed at the Site in 2017 included the following:
  - Soil drilling and sampling using direct-push technology (DPT) and split-spoon samplers, including assessment of NAPL presence near PZ-4D
  - Soil sample analyses for CVOCs and petroleum-related compounds, and oxidant demand and magnetic susceptibility testing at select soil intervals
  - Groundwater grab sampling
  - Installation of seven monitoring wells
  - Sitewide synoptic water level survey of 96 wells
  - Groundwater sampling of 49 wells in conjunction with the PMP annual sampling requirements, with quantarray analysis and oxidant demand testing at select monitoring wells

1.4 Performance Criteria

The remedial action objectives (RAOs) for soil and groundwater at the Site as listed in the ROD dated March 11, 1994, are as follows:

- Eliminate the potential for direct human or animal contact with contaminated soils
- Mitigate the impacts of contaminated groundwater to the environment
- Mitigate, to the extent practicable, migration of contaminants from onsite areas to groundwater
- Provide for attainment of RAOs for groundwater and soil quality

The RAOs are the criteria to evaluate remediation effectiveness, which are included in the ROD and listed in Table 1-3. The depth to which soil RAOs are applicable was not specified in the ROD (NYSDEC, 1994), but the soil sampling plans in the PMPs produced by URS limited soil sampling to the shallowest 6 feet of soil in the vadose zone. The Covenant signed by CPM and NYSDEC in 2014 restricted use of the Site to industrial purposes (Essex and CPM, 2014).

The groundwater treatment system operates under a Jamestown Board of Public Utilities (BPU) pretreatment permit, first issued in 1996 and most recently renewed in November 2017, for discharge to the city sewer and POTW. Pretreatment effluent limitations are contained in the permit and are described in Section 5.2.2.

1.5 Document Organization

A formal SMP was developed for the Site and submitted to NYSDEC in December 2017. However, site monitoring in 2017 was and continues to be performed in compliance with the current PMP (URS, 2014), until formal acceptance of the SMP is received from NYSDEC.

This PRR is divided into the following sections in accordance with NYSDEC guidance (NYSDEC, 2013):

- Executive Summary
- Section 1, *Site Overview*
- Section 2, *Remedy Performance, Effectiveness, and Protectiveness*
- Section 3, *Institutional Controls/Engineering Controls Plan Compliance*
- Section 4, *Monitoring Plan Compliance*
- Section 5, *Operations and Maintenance Plan Compliance*
- Section 6, *Periodic Review Conclusions and Recommendations*
- Section 7, *References*

Included as part of this PRR submission is the 2017 Data Gap Investigation Report (Appendix B; CH2M, 2018). Supporting material in the form of tables, figures, and appendices are presented at the end of this PRR.

SECTION 2

Remedy Performance, Effectiveness, and Protectiveness

The remedial actions designed and installed in the mid-1990s were focused on remediating the NPLS, Former AST/UST, and Former UST areas. As summarized in Section 1, additional investigations have identified groundwater impacts in other areas onsite (West Building and Plant 5 Building) and offsite. Remedy performance, effectiveness, and protectiveness were assessed by evaluating historical monitoring data, including 2017 data for the groundwater extraction system and results from the 2017 and 2016 data gap investigations, in comparison to the project RAOs. Hydraulic control exerted by the recovery wells was assessed by evaluating recovery well extraction rates, groundwater potentiometric surfaces, vertical gradients, and volatile organic compound (VOC) concentration trends at existing and newly installed downgradient sentinel or observation monitoring wells.

This section summarizes the findings presented in the 2017 Data Gap Investigation Report (Appendix B; CH2M, 2018) in conjunction with an assessment of remedial system performance oriented toward further refinement of the CSM and future remedial activities planning. A discussion addressing potential onsite and offsite exposure pathways is included in the 2017 Data Gap Investigation Report. This section also includes an evaluation of the groundwater extraction and treatment system performance in terms of the hydraulic control exerted by the recovery wells on impacted groundwater, comparison of site groundwater data to RAOs, and evaluation of the effectiveness of the groundwater treatment system at removing contaminant mass. Figure 2-1 shows the updated monitoring well network used to evaluate groundwater levels and concentrations, including seven new monitoring wells installed and sampled as part of the 2017 Data Gap Investigation.

2.1 Hydraulic Control

2.1.1 Shallow Groundwater

2.1.1.1 Recovery Well Extraction Rates

Table 2-1 summarizes groundwater extraction rates and the operational percentages at each recovery well. Appendix C provides a graphical summary of annual extraction volumes and average annualized flow rates at each recovery well. Shallow WBZ recovery wells were operational from 77 percent at RW-1S to 93 percent at RW-2S. RW-3S was off for an extended period of time during the first half of 2017, being operational for only 25 percent of the time, because of low water levels. RW-3S was subsequently permanently shut down in August 8, 2017 upon NYSDEC approval of the recommendations made in the 2016 Annual PRR (CH2M, 2017b). Section 5.2.1 provides additional details regarding pumping downtime at the Shallow WBZ recovery wells. During periods of operation, average flow rates ranged from 0.09-gallon per minute (gpm) for RW-1S to 0.84 gpm for RW-2S. Groundwater extraction rates in the Shallow WBZ are limited by the low saturated thickness, which causes frequent cycling of the pumps as the water level is quickly drawn down during pumping.

2.1.1.2 Flow Conditions

Groundwater elevations were measured in March, June, August, and October 2017. A monitoring well inventory, including the 2017 water level measurements, is provided in Table 2-2. Appendix D contains shallow potentiometric surface maps from March, June, August, and October 2017. Shallow groundwater flow under non-pumping conditions is to the northeast toward the Chadakoin River. Impacted shallow groundwater is captured in portions of the NPLS Area by recovery wells RW-1S and RW-2S. A capture zone was observed encompassing most of the NPLS Area. Groundwater flow at the rest of the Site is generally to the northeast, although a persistent area of groundwater mounding is observed south of the Plant 5 Building and under the eastern portion of the West Building, causing localized radial flow. This area of groundwater mounding is near the 2015 dry well removal and paving extension area; the remedial action does not appear to have had a significant impact on the magnitude of the groundwater mound. Similar flow patterns were observed in 2016 and preceding years. Approximate capture zones are shown on the March, June, August, and October 2017 potentiometric maps provided in Appendix D.

2.1.1.3 Downgradient Volatile Organic Compound Trends

The shallow remedial recovery well system was designed to provide capture of onsite groundwater in the NPLS, Former AST/UST, and Former UST areas. The Former UST Area was addressed using other remedial actions, and the recovery wells in that area were removed from service in 2002 as part of the UST removal. Subsequent investigations have indicated that CVOCs exist offsite in shallow groundwater north and east of the area, and CBTEX exists in shallow groundwater under the West Building and in the eastern portion of the Former UST Area. Impacted groundwater in these locations appears to be migrating to the northeast under natural groundwater flow conditions.

Figure 2-2 shows VOC concentration trends at MW-14S and MW-25S and their locations with respect to RW-2S. Total VOC concentrations at MW-14S, located approximately 55 feet north of RW-2S, continued to decline in 2017, although concentrations of TCE remain slightly above the respective RAO of 5 micrograms per liter [µg/L]. The decline in concentrations at this well, from a maximum total VOC concentration of 6,152 µg/L in 2003 to 16.4 µg/L in October 2017, indicates that operation of the shallow extraction system, in conjunction with natural attenuation processes, has resulted in decreased VOC concentrations in the vicinity of the recovery wells. Total VOC concentrations at MW-25S, located 420 feet east-northeast of RW-2S and offsite, have been relatively steady since 2008 (360 µg/L) through 2015 (366 µg/L), although declines were observed in 2016 and 2017, with total VOC concentrations detected at 119 µg/L and 103 µg/L, respectively.

In 2016, nine monitoring wells (MW-101S through MW-109S) were installed in the Shallow WBZ to delineate and enhance future monitoring of the TCE plume in this WBZ. In 2017 several shallow groundwater grab samples were collected near MW-104S to assist in delineation. A shallow TCE plume exists roughly parallel to Hopkins Avenue. Updated isoconcentration maps are included in the 2017 Data Gap Investigation Report (Appendix B; CH2M, 2018).

The area of highest CBTEX concentrations in the shallow WBZ is limited to beneath the eastern portion of the West Building, with a total CBTEX concentration of 9,092 µg/L in 2017, and 34,000 µg/L in 2016 at MW-30S. This plume has primarily migrated to the northeast outside the capture zone, although groundwater mounding under the West Building and Former UST Area (Appendix D), has caused some plume migration to the south and east, in the vicinity of MW-117S, which contained a combined CBTEX concentration of 188 µg/L in 2017. While this concentration is greater than the RAOs, it is lower than concentrations observed at MW-30S to the north, indicating that the detected concentrations at MW-117S are consistent with an onsite source rather than an offsite source.

In the eastern portion of the Former UST Area to the edge of the property boundary (MW-26S and MW-28S) a separate area of petroleum-related constituents in groundwater exceeds RAOs, with 1,2,4-TMB and 1,3,5-TMB being the constituents with the highest concentrations. In situ chemical oxidation (ISCO) injections were conducted in this area in November 2011, which resulted in an initial decline in COC concentrations, although COC concentrations have since rebounded. However, as detailed in the 2017 Data Gap Investigation Report (Appendix B), only relatively minor concentrations of petroleum-related constituents are present at the eastern and northern property boundaries, indicating only limited offsite migration has occurred.

Essex will assess several potential remedial alternatives or supplements to the existing remedies in 2018 to enhance contaminant migration capture in the Shallow WBZ and/or expedite achievement of RAOs. Appendix B contains additional details and findings related to downgradient VOC trends in the Shallow WBZ from the 2017 Data Gap Investigation.

2.1.2 Deep Groundwater

2.1.2.1 Recovery Well Extraction Rates

Table 2-1 summarizes flow rates for the deep recovery wells, and Appendix D provides a graphical summary of annual extraction volumes and average annualized flow rates at each recovery well. The percentage of time that each Deep WBZ recovery well was operational ranged from 91 percent at RW-2D to 93 percent at RW-6D. Low water levels, plugged lines, and excessive siltation resulted in lower pumping rates than last year. Section 5.2.1 contains additional details regarding pumping downtime at the Deep WBZ recovery wells. Average flow values during periods of operation ranged from 0.31 gpm at RW-6D to 2.02 gpm at RW-2D.

2.1.2.2 Flow Conditions

Groundwater flow in the Deep WBZ under non-pumping conditions is to the north and east. Appendix D contains deep potentiometric surface maps from March, June, August, and October 2017. Pumping of the deep recovery wells RW-2D in the NPLS Area and RW-6D northeast of the Plant 5 Building resulted in a capture zone encompassing most of the site and portions of the areas east and north of the Site as noted during the from March, June, August, and October 2017 water level events. Approximate capture zones are shown on the March, June, August, and October 2017 potentiometric maps (Appendix D).

2.1.2.3 Downgradient Volatile Organic Compound Trends

The Deep WBZ groundwater extraction system originally was designed to provide hydraulic capture and treatment of impacted groundwater in the NPLS Area. In 2007, RW-6D was installed outside the northeastern corner of the Plant 5 Building to capture impacts detected outside the NPLS Area. Historically, and as shown on Figure 1-2, MW-16D and MW-25D have served as sentinel wells for the Deep WBZ; MW-16D is located approximately 175 feet north of RW-2D, and MW-25D is approximately 190 feet east-northeast of RW-6D. MW-16D is approximately 360 feet west-northwest of MW-25D. VOCs have not been detected and remained below RAOs in both of these wells since 2008.

The lack of significant detections at MW-16D and MW-25D previously was interpreted to indicate that the deep groundwater extraction system has been effective at limiting downgradient migration of impacted groundwater. However, in 2016 CVOC impacts were identified northeast of the Site in samples from newly installed monitoring wells MW-106D and MW-110D (CH2M, 2017d). As part of the 2017 Data Gap Investigation, deep groundwater grab samples were collected to the northeast of the Site to delineate the extent of the deep CVOC plume. Updated isoconcentration maps are included in the 2017 Data Gap Investigation Report (Appendix B; CH2M, 2018). Based on these results, MW-109D, MW-120D and MW-121D were installed northeast of the Site to serve as sentinel wells to delineate this deep TCE plume and monitor for its potential downgradient migration. TCE concentrations in groundwater samples collected in October 2017 from these wells did not exceed RAOs. Therefore, it was concluded that the deep TCE plume has been delineated to the northeast of the Site. However, capture may not be as effective and CVOCs could be migrating to the north and east in the area between RW-2D and RW-6D, where MW-15D is located, as discussed in the next section. Groundwater and extraction well monitoring results for 2017 also indicate that the acetone plume in the Deep WBZ around RW-6D is declining in extent and concentration as the result of the groundwater extraction and treatment system.

Appendix B contains the latest isoconcentration maps and additional details and findings related to downgradient VOC trends in the Deep WBZ from the 2017 Data Gap Investigation.

2.1.3 Vertical Gradients

Vertical gradients under pumping conditions are generally downward between the Shallow and Deep WBZs, and as expected, the largest vertical gradients are observed near RW-2D and RW-6D (Table 2-3). While a downward vertical gradient indicates the possibility that contamination in the Shallow WBZ could migrate downward into the Deep WBZ, the presence of the shallow silty clay in most areas of the Site likely slows this migration. However, as discussed in the 2017 Data Gap Investigation Report (Appendix B), the shallow silty clay appears to be absent or thin in the western portion of the NPLS Area. Downward vertical migration from the Shallow WBZ and vadose zone soil in the NPLS Area could be the source of the TCE concentration observed in the Deep WBZ.

2.2 Evaluation of Remedial Effectiveness

2.2.1 Soils

Soil conditions in the vadose zone (generally 0 to 10 feet bgs) in portions of the Site were assessed as part of the 2016 Data Gap Investigation. VOC concentrations greater than RAOs were observed in vadose zone soils in the former AST/UST Area and the NPLS Area in 2016 (CH2M, 2017d). Additional vadose zone soil samples were collected as part of the 2017 Data Gap Investigation to provide additional delineation of vadose zone soil impacts in the NPLS Area, assess vadose zone conditions in the eastern portion of the Former UST Area, and on the Hope Windows property near MW-104S.

Twenty-one samples were collected to assess vadose zone soil conditions against RAOs. Six of the 21 samples exceeded the RAOs for one or more site constituents in the southern portion of the NPLS Area and the Former AST/UST Area. These areas containing soil exceedances could serve as continuing sources of impact to groundwater, primarily by groundwater table fluctuations. Vertical leaching by infiltrating precipitation is expected to be minimal due to the low-permeability asphalt and concrete covers in these areas, as described in Section 3.2.3. Appendix B contains analytical result tables and figures related to the soil assessment performed during the 2016 and 2017 data gap investigations.

2.2.2 Shallow Groundwater

The 2017 shallow groundwater monitoring well sample results tables and isoconcentration maps are presented with the 2017 Data Gap Investigation Report in Appendix B (CH2M, 2018), including groundwater sampling results from March and October 2017 events. Table 2-4 presents the 2017 semiannual shallow recovery well sampling results.

RW-1S and RW-2S recover groundwater from the NPLS Area, while RW-3S recovers groundwater in the Former AST/UST Area until August 2017, when it was permanently shut off. Shallow WBZ exceedances consist of three distinct plumes: 1) the TCE and CBTEX plumes (in the NPLS Area and offsite); 2) the petroleum-constituent plume (primarily CBTEX) under the West Building; and 3) the petroleum-constituent plume (primarily 1,2,4-TMB and 1,3,5-TMB) in the Former UST Area. These three plumes exist outside the current shallow extraction system capture zone. Table 2-5 summarizes the 2017 detected concentrations of COCs in shallow groundwater.

TCE and CBTEX under the NPLS Area, Former AST/UST Area, and Offsite

RW-1S and RW-2S in the NPLS Area capture a portion of the shallow TCE-impacted groundwater (Figure 2-3). The following observations can be made:

- TCE concentrations at RW-2S in the NPLS Area have declined and are approaching the RAO.

RW-3S is located in the Former AST/UST Area and was shut off in August 2017 due to low pumping rates and contaminant recovery. RW-3S concentration trends are depicted on Figure 2-4:

- TCE and CBTEX concentrations at RW-3S, in the Former AST/UST Area, have fluctuated through time. The fluctuating concentrations are likely related to variations in the RW-3S capture zone and fluctuating water levels.

The TCE plume extends offsite, roughly parallel to Hopkins Avenue. Observations about the offsite portion of the plume include:

- The highest concentrations of TCE (510 µg/L) and cis-1,2-DCE (240 µg/L) detected in October 2017 are present at MW-101S, on the north side of the Plant 5 Building, downgradient of the capture zone.
- TCE was present in the easternmost well, MW-108S, at a concentration of 22 µg/L in October 2017. This well was installed in 2016 and has been sampled three times. Once a larger dataset has been obtained, long-term trends will be assessed at this well.

Petroleum-related Compounds under the West Building

Groundwater under the West Building area migrates under natural gradient conditions to the east-northeast, with localized flow to the east and south near an area of groundwater mounding. Plume observations include:

- The highest CBTEX concentrations, primarily total xylenes, have been observed near MW-30 (26,000 µg/L in 2016) and MW-31S (18,100 µg/L in 2014) under the eastern portion of the West Building.
- Concentrations of xylenes and ethylbenzene detected at MW-30 in October 2017 (6,950 J µg/L xylenes) were an order of magnitude lower than observed in November 2016 (26,000 µg/L xylenes).

Petroleum-related Compounds under the Former UST Area

Petroleum impacts at MW-26S and MW-28S near the eastern site boundary rebounded in 2016 since the 2011 ISCO injections (Figure 2-5) from lowest concentrations of CBTEX of 318 µg/L at MW-26S, and non-detect at MW-28S recorded in October 2015.

- 1,2,4-TMB was detected at a concentration of 2,800 µg/L at MW-26S in 2017, with lower concentrations of cumene, ethylbenzene, and total xylenes observed (total CBTEX of 792 µg/L).
- This plume has been substantially delineated with limited offsite impacts to the northeast observed.
- The plume is migrating and attenuating to the northeast in the direction of groundwater flow and is outside the Shallow WBZ capture zone.

2.2.3 Deep Groundwater

The 2017 deep groundwater monitoring well sample results tables and isoconcentration maps are presented with the 2017 Data Gap Investigation Report in Appendix B (CH2M, 2018), including groundwater sampling results from March and October 2017 events. Table 2-6 contains the 2017 semiannual deep recovery well sampling results. Table 2-7 summarizes the 2017 detected concentrations of COCs in deep groundwater. CVOCs were detected in the highest concentrations above the RAOs at MW-21D, PZ-3D, and new monitoring wells MW-118D, MW-119D, and MW-123D.

The area of impacted deep groundwater exists under the NPLS Area, Plant 5 Building, and areas north and east of the Site. Primary VOCs detected in deep groundwater include TCE, cis-1,2-DCE, vinyl chloride, and acetone. The presence of cis-1,2-DCE, vinyl chloride, and geochemical parameters indicate a strongly reducing environment conducive to the reductive dechlorination of TCE but not conducive to the aerobic degradation of vinyl chloride (typically more quickly degraded by aerobic processes).

RW-2D recovers groundwater in the NPLS Area, while RW-6D is located northeast of the Plant 5 Building and recovers groundwater from under the Plant 5 Building and offsite to the east and north. The maximum concentration of TCE observed in a 2017 groundwater sample was at newly installed monitoring well MW-123D (160,000 µg/L), south of RW-2D . MW-123D was installed as a replacement well for MW-7D, but was screened more shallow (25 to 35 feet bgs) than MW-7D (35 to 45 feet bgs) as the 2016 and 2017 Data Gap Investigations indicated that the highest concentrations exist near the top of the Deep WBZ and decline with depth.

While RW-2D and RW-6D have removed significant quantities of VOCs (Section 2.3.2), concentrations remain above RAOs, and exist outside the typical capture zone of the current extraction system. Sentinel wells were installed in 2016 and 2017 to delineate the extent of the plume. CVOCs present in the Deep WBZ outside the capture zone are migrating in the direction of groundwater flow to the northeast. Additional observations from the 2017 investigation include the following:

- NAPL was noted in PZ-4D in March 2017; this piezometer (PZ) is in the western portion of the Plant 5 Building. While no NAPL was noted during 2017 soil investigations near PZ-4D, saturated soil concentrations are consistent with residual NAPL in this area.
- The highest concentrations in groundwater and saturated soils are typically found within the top 10 feet of the Deep WBZ. MW-119D (supplementing MW-14D), MW-122D (replacing PZ-7D), and MW-123D (replacing MW-7D) were installed in 2017 and screened across this upper 10 feet of the Deep WBZ to better monitor the zone of highest concentrations in the Deep WBZ.

Figure 2-6 shows the concentration trends for TCE, cis-1,2-DCE, and vinyl chloride in the NPLS Area for RW-2D and MW-7D. MW-7D was abandoned in October 2017 and replaced with MW-123D. The following observations were made based on 2017 groundwater data from RW-2D and historical groundwater data for MW-7D and 2017 data for replacement well MW-123D:

- Concentrations remain above RAOs and have been relatively steady at RW-2D since 2008 (post-zero-valent iron [ZVI] injections), averaging 2,070 µg/L for TCE; 4,640 µg/L for cis-1,2-DCE; and 720 µg/L for vinyl chloride.
- At MW-7D, screened between 35 and 45 feet bgs, TCE concentrations increased from 8 µg/L in October 2009 to 2,500 µg/L in November 2016. The October 2017 TCE concentration at replacement well MW-123D, screened between 25 and 35 feet bgs, was 160,000 µg/L, indicating that higher CVOC concentrations in the NPLS Area are present between 25 and 35 feet, rather than below 35 feet. Capture by RW-2D may be drawing higher concentration groundwater from under the Plant 5 Building into MW-7D/MW-123D.

The highest concentration of acetone in 2017 was detected at RW-6D (19,000 µg/L) in February; this acetone plume has been delineated around the northeast corner of the Plant 5 Building (see isoconcentration maps in Appendix B). On the northern side of the Plant 5 Building, elevated concentrations of TCE, cis-1,2-DCE, vinyl chloride, and acetone have been detected historically at MW-21D and RW-6D (Figure 2-7). The following observations were made:

- Acetone was first detected in February 2006 at MW-21D and was present in the first sample collected from RW-6D in April 2009. Acetone is highly soluble and does not adsorb significantly to aquifer materials, making it a favorable constituent for remediation by groundwater extraction. Concentrations of acetone at MW-21D peaked at 678,000 µg/L in September 2012 and declined to non-detect (reporting limit of 1,000 µg/L) in October 2017. Groundwater at MW-21D is within the capture zone of RW-6D. At RW-6D, acetone peaked in November 2014 at 138,000 µg/L and declined to 5,600 µg/L in August 2017.
- 2017 CVOC concentrations at MW-21D and RW-6D were similar to previous concentrations.

Concentration trends at MW-15D and MW-22D, located offsite to the north are presented on Figure 2-8. The following observations were made:

- At MW-15D, TCE, cis-1,2-DCE, and vinyl chloride concentrations have been increasing through time. This well is located between RW-2D and RW-6D; the concentration trends indicate capture may not be as effective in this area, and CVOCs could be migrating to the north and east.
- At MW-22D (installed in November 2003), TCE, cis-1,2-DCE, and vinyl chloride concentrations have declined since RW-6D began pumping in 2007.
- Concentrations detected in October 2017 at wells MW-106D (total VOCs of 5,508 µg/L) and MW-110D (total VOCs of 138,500 µg/L) indicate CVOC impacts exist outside the RW-6D and RW-2D capture zone. These wells were installed in 2016 and have been sampled three times. Once a larger dataset has been obtained, long-term trends will be assessed at these wells.

Offsite north and east of the Site, sentinel wells sidegradient and downgradient of the plume include MW-16D, MW-25D, MW-120D, MW-121D, and MW-109D. CVOCs were not detected above RAOs in the October 2017 samples from these wells. These wells will continue to be monitored to assess potential downgradient plume migration.

2.3 Mass Removal by Groundwater Extraction System

The groundwater extraction system performance also is evaluated by calculating the estimated mass of VOCs removed by the extraction and treatment system. Mass removal and extraction rates by well data are presented in Appendix C and summarized below.

2.3.1 Shallow Groundwater

The total mass removed by the shallow extraction system consisting of recovery wells RW-1S, RW-2S, and RW-3S was 0.38-pound in 2017, an increase from 0.28-pound removed in 2016, despite RW-3S being permanently shut down in August 2017. Individual mass removal values are provided in Table 2-8 and Appendix C. In total, the shallow groundwater extraction system has removed approximately 157 pounds of VOCs since 1998, with 86 percent of that mass removed between 1998 and 2002 mainly by RW-S4. The mass removal has decreased because of the decreasing VOC concentrations observed in the Shallow WBZ, the removal of RW-4S and RW-5S from the shallow extraction system in 2002, as well as decreasing groundwater extraction volumes. Mass removal by well through time is presented on Figure 2-9.

While the shallow extraction system exerts some hydraulic control on the Shallow WBZ in the NPLS Area, mass removal has been low and the system has had operational issues because of the limited saturated thickness of the Shallow WBZ.

2.3.2 Deep Groundwater

The total mass removal by the deep groundwater extraction system consisting of recovery wells RW-2D and RW-6D was estimated at 117 pounds in 2017, representing a decrease from the 2016 estimated mass removal of 190 pounds. This decrease in mass removal is primarily related to decreasing concentrations of acetone observed in the deep recovery wells and monthly system influent samples throughout 2017 (ranging from 138,000 µg/L in November 2014 to 5,600 µg/L in August 2017). Individual mass removal values are provided in Table 2-9 and Appendix C. As depicted on Figure 2-10, the total mass removed by the two deep recovery wells increased after RW-6D was installed, but has declined the past two years. In total, the deep groundwater extraction system has removed 2,372 pounds of VOCs since 1998, and 71 percent of the mass extraction has occurred since the 2009 addition of RW-6D to the system.

Although the screen of RW-6D is located in an area of fine materials consisting primarily of silt, causing excessive siltation of the extraction components, this extraction well continues to operate with filtration, extracting a significant mass of COCs in the Deep WBZ. A replacement well for RW-6D was determined to be impractical during the 2016 Data Gap Investigation due to the nature of the fine materials in the surrounding area.

SECTION 3

Institutional Controls/Engineering Controls Plan Compliance

IC/ECs are built into the project remedial action as part of the Operations and Maintenance (O&M) Plan, the PMP, and Deed Restrictions filed by CPM. IC/EC certifications are provided in Appendix A.

3.1 Institutional Controls

ICs in place at the Site include a recently updated O&M Plan (CH2M, 2017e) included in the previous 2016 Annual PRR submittal, groundwater and land use restrictions, and building use restrictions included in a Declaration of Covenants and Restrictions (Covenant) filed at the Chautauqua County Office of Recorder of Deeds, Mayville, New York in 2014 (Essex and CPM, 2014).

The 2017 O&M Plan describes the procedures to operate and maintain the remedial systems at the Site, including the monitoring requirements and schedule of maintenance (CH2M, 2017e). Section 5, *Operations and Maintenance Plan Compliance*, presents the annual summary of system O&M activities.

CPM filed Deed Restrictions to establish permanent notifications in the Chautauqua County Office of Recorder of Deeds, Mayville, New York. The Covenant and the latest deed filing from 2014 are contained in Appendix A of the 2014 PRR (AECOM, 2015). Restrictions imposed by the Covenant, unless prior written approval is granted by NYSDEC, in part include restrictions on groundwater use without necessary treatment, restrict use of the Site to industrial purposes, require that ECs not be disturbed or interfered with, and restrict excavations which threaten the integrity of the ECs or result in an unacceptable human exposure to contaminated soils. These ICs remain fully in place and effective.

3.2 Engineering Controls

ECs have been implemented at the site as part of the NYSDEC Order on Consent (NYSDEC and Essex, 1995), which outlined the remedial actions pursuant to the 1994 ROD issued by NYSDEC (NYSDEC, 1994). The Site's IC/EC Certification Form is included in Appendix A. ECs stipulated in the ROD that are still in place and active at the Site are the following:

- The groundwater extraction and treatment system, presently consisting of three shallow and two deep recovery wells and activated carbon groundwater treatment with onsite discharge to the local POTW.
- Low-permeability asphalt and concrete covers are in the NPLS, Former UST, and Former AST/UST areas.
- A network of monitoring wells across the site (as designated in the PMP [URS, 2014]) used to measure the effectiveness of the groundwater remedial activities. This monitoring well network was upgraded during the 2016 and 2017 Data Gap Investigations (see Figure 2-1 and Appendix B).

Voluntary supplemental remedial activities were initiated in 2000, with NYSDEC's approval, to refine the delineation of subsurface constituents and evaluate potential remedial alternatives to enhance remedial effectiveness. A summary of the additional activities performed at the Site after the initial remedial actions is contained in Table 1-2, and depicted on Figure 1-2.

In November 2008, an SSDS was installed at 159 Hopkins Avenue to mitigate vapor intrusion (VI) concerns at a residence. Performance of the SSDS was evaluated in April 2017 and is described in Section 3.2.4. Additionally, dry wells in the Former UST Area were removed, and the area was paved with asphalt in 2015. This effort enhances the asphalt cover and reduces infiltration (Figure 2-1).

3.2.1 Groundwater Extraction and Treatment System

The performance of the groundwater extraction and treatment system was evaluated through the end of 2017 in accordance with the PMP (URS, 2014) and the 2017 O&M Plan (CH2M, 2017e). This included monitoring groundwater levels to determine degree of capture, monitoring groundwater COC concentrations, evaluating extraction well pumping rates and COC concentrations, providing routine maintenance and logging system performance, and conducting monthly sampling of the influent and effluent concentrations from the granular-activated carbon (GAC) treatment system. The existing PMP (URS, 2014) which expired as of end of 2017 is no longer effective, hence site monitoring activities in 2018 will be performed in compliance with the recently submitted SMP.

Semiannual reports are submitted to the Jamestown BPU and NYSDEC. Performance information for the groundwater extraction and treatment system is discussed in Sections 2 and 5. Additionally, the groundwater extraction and treatment system is inspected semiannually in accordance with the O&M Plan (CH2M, 2017e). Appendix E contains the May and November 2017 groundwater extraction system inspection logs.

Effectiveness of the groundwater extraction system is discussed within Section 2. As discussed in Section 5.2.2, the treatment system has successfully treated COCs to meet BPU permit requirements.

3.2.2 Monitoring Well Network

The monitoring well network for the Shallow WBZ was expanded by 18 wells in 2016 to enhance the capability to monitor the offsite TCE plume and CBTEX plume beneath the West Building. Also, 12 new wells were installed in the Deep WBZ (five in 2016 and seven in 2017), to aid in delineating the Deep WBZ plume and provide additional locations to measure water levels to assist in capture zone assessment. Analytical results from the March 2017 and the annual October 2017 groundwater sampling events are discussed in Section 2 and detailed in the 2017 Data Gap Investigation Report in Appendix B. Table 2-2 contains a complete monitoring well inventory, and Figure 2-1 shows the entire monitoring well network, including the recent additions.

As detailed in the 2017 Data Gap Investigation Report (Appendix B), six monitoring wells were abandoned, eight existing monitoring wells were repaired, and seven existing wells were redeveloped in October 2017, as shown in Table 2-2, and in accordance with NYSDEC CP-43: *Groundwater Monitoring Well Decommissioning Policy* (NYSDEC, 2009). Additionally, several wells that are no longer included in the annual sampling plan were identified as candidates for redevelopment and/or abandonment in the recently submitted SMP (CH2M, 2017a), as shown in Table 2-2.

3.2.3 Asphalt and Concrete Covers

The asphalt and concrete covers in the NPLS, Former AST/UST, and Former UST areas, shown in Figure 1-2, are monitored semiannually in accordance with the O&M Plan (CH2M, 2017e). In November 2015, an asphalt cover was placed in the Former UST Area following drywell removal activities (see Section 5.2.4). The covers were inspected on April 28 and November 19, 2017. Two small and shallow cracks observed near the southeastern corner of the northern slab during the 2016 inspections continue to be monitored for changes in size and depth; however, the overall integrity of the asphalt and concrete covers remains intact. Appendix F contains the 2017 asphalt inspection logs.

3.2.4 Subslab Depressurization System

An SSDS (VI system) was installed in 2008 at the residential building at 159 Hopkins Avenue, northeast of the Site (Figure 1-2). The VI mitigation system is designed to operate 24 hours a day, 365 days a year. Monthly checks are made from outside the residence to ensure the fan is in operation. Annual inspections of the SSDS are conducted during the heating season and in accordance with the O&M Plan

(CH2M, 2017e). On February 9, 2017, the system was found to be in good working condition. Appendix G contains the 2017 SSDS inspection log.

In April 2017, a mitigation system evaluation was conducted to assess the effectiveness of the SSDS (CH2M, 2017c), consisting on the collection of two 24-hour indoor air samples for VOC analysis, one within the first floor of the residence, another within the basement. The results of the indoor air sampling indicated that there were no detections of TCE or cis-1,2-DCE within the residence above laboratory detection limits. A background air sample was also collected outside the residence by the SSDS exhaust, in which VOCs were detected, as expected. This evaluation concluded that the SSDS is currently effective at mitigating the VI pathway posed by the elevated strength of the groundwater source. Continued operation of the SSDS is recommended with routine planned O&M activities and annual certifications until the groundwater plume has been remediated.

SECTION 4

Monitoring Plan Compliance

4.1 Components of the Monitoring Plan

URS prepared a PMP in March 2014 outlining proposed monitoring to assess the soil and groundwater remediation activities implemented at the site. The PMP covers a 3-year monitoring period from 2014 to 2017. Performance monitoring requirements of the 2014 PMP (URS, 2014) included:

- Semiannual recovery well sampling and quarterly monitoring well water level measurement
- Annual performance monitoring well groundwater sampling
- Annual Former UST and Former AST/UST areas soil sampling

In December 21, 2017, an SMP addressing the means for implementing operation, maintenance, and monitoring of the IC/ECs at the Site (CH2M, 2017a) was submitted to NYSDEC, and includes a revised PMP based on the findings from the 2016 and 2017 Data Gap Investigations (Appendix B). Revisions to the expired PMP include modifications to the list of monitoring wells to be sampled annually, as shown in Table 2-2 and on Figure 1-2. Routine monitoring of groundwater levels, COC concentrations, extraction well pumping rates and COC concentrations, routine maintenance and logging system performance, and monthly sampling of the influent and effluent concentrations from the GAC treatment system remained unchanged in the SMP.

4.2 Summary of Monitoring Completed

4.2.1 Groundwater Water Levels

Groundwater elevations were measured on March 13, June 27, August 23, and October 16, 2017. Water level measurement data collected in 2017 are provided in Table 2-2. Appendix D contains Shallow and Deep WBZ potentiometric surface maps for the 2017 synoptic water level events. Water levels and groundwater conditions observed during the fall 2017 sampling event. Annual groundwater sampling monitoring wells included in the PMP (URS, 2014) were sampled from October 17 through October 19, 2017, in conjunction with additional existing wells and several newly installed wells as part of the 2016 and 2017 data gap investigations. A total of 32 shallow-screened and 22 deep-screened monitoring wells were sampled during the annual sampling event in October 2017.

Monitoring well groundwater sample results are discussed in Sections 2.2.2 and 2.2.3 and in Appendix B (which includes result tables and isoconcentration maps). Recovery well sample results are included in Tables 2-4 and 2-6, and 2017 sitewide analytical results are summarized in Tables 2-5 and 2-7.

4.2.2 Soil Sampling

Annual performance soil sampling is prescribed in the PMP (URS, 2014) in the Former UST and Former AST/UST areas. Compliance soil sampling has not been conducted since 2001, with the exception of post-ISCO soil sampling in a portion of the Former UST Area conducted in 2012.

As part of the 2017 Data Gap Investigation, 22 soil borings were advanced throughout the Site, and 21 soil samples were collected to assess vadose zone soil conditions against RAOs across the NPLS Area, West Building, and Former UST Area. Results are discussed in Section 2.2.1 and in the 2017 Data Gap Investigation Report (Appendix B; CH2M, 2018).

The results and details derived from the soil assessment performed through the 2017 Data Gap Investigation are included in Appendix B.

4.3 Comparisons with Remedial Objectives

Comparisons of monitoring data collected in 2017 against the 1994 ROD RAOs for soil and groundwater at the Site are as follows:

- *Eliminate the potential for direct human or animal contact with contaminated soils*. This has been addressed by the asphalt/concrete covers and impacted soil and AST/UST removals, and the 2014 Declaration of Covenants restricting excavation at the Site.
- *Mitigate the impacts of contaminated groundwater to the environment*. Groundwater impacts have been mitigated by the active ECs such as the groundwater extraction and treatment system, past remedial actions listed in Table 1-2, and the SSDS.
- *Mitigate, to the extent practicable, migration of contaminants from onsite areas to groundwater*. Analysis of the capture zones produced by pumping of the recovery wells is provided in Section 2.1 and indicates that the groundwater extraction system provides some migration control of onsite groundwater to offsite areas. Because some offsite migration of impacted groundwater is occurring, actions to mitigate that are currently being considered by Essex.
- *Provide for attainment of RAOs for groundwater and soil quality*. The numerical criteria used to evaluate remediation effectiveness in soil and groundwater were prescribed by the ROD, and are included in Table 1-3. Comparison to site-specific numerical RAOs is presented in Tables 2-5 and 2-7 and discussed in Section 2.2 and Appendix B, and indicates that, although active remediation is ongoing, COCs remain in vadose zone soils, and in groundwater in the Shallow and Deep WBZs at concentrations above RAOs. Future remedies or modifications to existing ECs will be designed to attain the quantitative RAOs in the future.

4.4 Monitoring Deficiencies

No deficiencies in complying with the PMP (URS, 2014) were identified for 2017.

4.5 Conclusions and Recommendations for Changes

Activities required by the PMP, effective from 2014 through 2017, were completed in 2017. This PMP was slightly revised and updated as part of the SMP submission of December 21, 2017, to include modifications to the list of monitoring wells to be sampled annually, as shown in Table 2-2 and on Figure 1-2. No other changes to the activities prescribed in the PMP were proposed in the SMP. Because the existing PMP (URS, 2014) expired as of end of 2017, site monitoring activities in 2018 will be performed in compliance with the recently submitted SMP.

SECTION 5

Operations and Maintenance Plan Compliance

CH2M updated the O&M Plan in March 2017 from its original version (Radian Engineering Inc., 1998) and included it as an attachment in the previous annual PRR submission (CH2M, 2017b). The updated O&M Plan reflects current operational conditions and remedial components, ensures efficient operation of equipment and facilities, and helps maintain equipment in accordance with the latest manufacturers' recommendations, thereby minimizing replacement and repair costs.

The O&M Plan will be reviewed annually and updated as needed. For major changes in facilities, responsibilities, tasks, etc., the O&M Plan will be reissued with a revised tracking number and included as part of the corresponding annual PRR submission to NYSDEC. For non-substantive changes, changes will be tracked and summarized in this section; however, a full report will not be reissued.

5.1 Components of the Operations and Maintenance Plan

The routine maintenance and monitoring activities schedule, as set forth in the updated O&M Plan for the remedial treatment system, is presented in Table 5-1. Maintenance activities for the groundwater treatment system are performed as follows (and as necessary):

- Routine maintenance of the groundwater treatment system (biweekly or as needed)
- Semiannual recovery well inspection and maintenance and as needed
- Carbon vessels maintenance (backflushing, replacement, and cleaning) as required

Groundwater treatment system monitoring required by the updated O&M Plan includes:

- Routine flow readings of all recovery wells and total wastewater treatment system flow
- Monthly influent/effluent sampling and pH monitoring of the waste stream to monitor system performance and compliance with wastewater discharge permit requirements
- Monitoring water levels (quarterly), groundwater sampling of recovery wells (semiannually), and select monitoring wells (annually)

Maintenance and monitoring activities are documented in the treatment plant operator's logbook and applicable maintenance and monitoring forms contained in the updated O&M Plan. A summary report (this report) is prepared annually, and analytical and operational data are provided to the Jamestown BPU and NYSDEC semiannually.

The asphalt and concrete surface areas are to be inspected semiannually for cracks and/or poor drainage, and monitoring wells are to be inspected during well monitoring events for well casing integrity, well cap and lock, and concrete base condition.

The SSDS installed in 2008 at a residence at 159 Hopkins Avenue is included in the updated O&M Plan. Monthly checks are to be made from the outside the residence to ensure the fan is in operation. The system is to be certified annually through the IC/EC Certification included with annual PRR submissions (Appendix A), affirming that the SSDS is in place, performing properly, and remains effective. Routine maintenance is to be conducted annually during the heating season (November through February) or as needed, and includes:

- Conducting a visual inspection of the system
- Inspecting surfaces to which vacuum is applied
- Inspecting components for condition and proper operation

- Identifying and repairing any leaks
- Inspecting the exhaust or discharge points to verify no air intakes have been installed nearby
- Interviewing the occupant regarding the operation of the system

5.2 Operations, Maintenance, and Monitoring Completed

This section summarizes O&M performed at the Site in 2017.

5.2.1 Groundwater Extraction and Treatment System Operations and Maintenance

Routine maintenance (biweekly or as needed) consists of inspection/check of the system piping, pressure gauges, equalization tank including level probes, carbon vessels, and overall operations. Appendix C contains the groundwater extraction performance data.

Recovery well maintenance consists of well development on an as-needed basis, pump/meter disassembly inspection and cleaning, and level probe inspection/cleaning. Well redevelopment was completed in October 2017 at recovery wells RW-1S, RW-2S, RW2D, RW-3S, and RW-6D.

Operational issues observed and maintenance performed in 2017 included:

- Recovery well RW-3S was offline from March 23 through June 6, 2017 because of pump variable speed controller issues and low water levels. This recovery well was then permanently taken off-line as of August 8, 2017.
- A cracked piping segment on the system's discharge line was replaced on April 4, 2017.
- The entire system was offline for three and half days in April (from April 6 to April 10, 2017) because of a high-level alarm in the equalization tank, and for seven days in June (from June 5 to June 13, 2017) due to an unexpected power loss within the treatment building.
- Recovery well RW-1S was off-line from June 26 through August 30, 2017, because of pump variable speed controller issues and low water levels. The variable speed controller was replaced by an electrician on August 23, 2017.
- The system was intermittently offline for approximately 228 cumulative hours in November 2017 and 120 consecutive hours in December 2017 (between December 22 through December 27, 2017) because of high-level alarms in the equalization tank caused by restricted flows and clogged filters, primarily due to the excessive amounts of sediment running through the system and accumulating at the filters and the bottom of the equalization tank. The equalization tank was cleaned out and sediment was removed and disposed of on December 4, 2017.
- Recovery well RW-6D was observed to be running at reduced flows throughout 2017, as were flows in RW-2S in June, August and December 2017, likely because of excessive sediment in the level sensors and low water levels. RW-6D flows seemed to decrease even further after redevelopment took place for the active recovery wells in October 2017.
- All recovery wells experienced other minor periodic shutdowns for mechanical and electrical repairs, and equipment maintenance or replacement.
- A total of approximately 600 cumulative hours of system downtime were experienced in 2017.

CH2M conducted the following maintenance and improvements to the treatment system in 2017:

- GAC within the vessels was changed out on January 4 and August 31, 2017.
- Leaks in the effluent discharge line were repaired on August 1, 2017.
- Well vaults for RW-2S and RW-2D were repaired in October 2017.
- Sediment within the equalization tank was cleaned out on December 4, 2017.

The recovery wells were inspected on May 24 and November 30, 2017. RW-1S, RW-2S, and RW-2D were found to be in good condition with minimal sediment accumulation during both inspections. RW-6D was found to have moderate to significant sediment accumulation during both inspections. RW-3S was taken completely off-line as of August 8, 2017, upon NYSDEC approval of the recommendations made in the 2016 PRR (CH2M, 2017b). Appendix E contains the groundwater extraction system inspection logs. Table 2-1 provides the percentage of time that the recovery wells were operational in 2017.

In 2012, the Jamestown BPU Water Division conducted a state-required analysis of commercial and industrial water connections to the BPU water system and backflow prevention devices. As part of the analysis, a Backflow Prevention Device Inventory Form was submitted in September 2012. In September 2013, a licensed plumber inspected site operations, and the building was deemed nonhazardous to the public water supply and exempt from a requirement to install a backflow prevention device. A Form for Backflow Prevention Device Exemption is required to be submitted annually to certify that none of the conditions at the building has changed since it was originally inspected. This form was submitted to the BPU Water Division in September 2017 (Appendix H).

5.2.2 Groundwater Extraction and Treatment System Monitoring

Pursuant to the City of Jamestown BPU Industrial Wastewater Discharge Permit Number 26, renewed in November 2017, the pretreatment system is monitored monthly for pH and total toxic organic (TTO) VOCs to ensure compliance with the permit requirements. The TTO VOC discharge limit is 2,130 µg/L, and pH is required to be between 5.5 and 10 standard units. Recovery well and totalizer flow meter readings are collected during routine inspections. Average flow rates are calculated from these data. Additionally, influent/effluent sample collection was conducted monthly from January through December 2017.

Analytical results for influent (pre-carbon, before the treatment system), primary carbon effluent (collected after the first carbon vessel), and secondary carbon effluent (post-carbon, after both carbon vessels, representative of effluent discharged to the POTW) are presented in Tables 5-2, 5-3, and 5-4. These results are reported to the Jamestown BPU semiannually. The 2017 semiannual BPU reports are contained in Appendix I.

Acetone is not included in the U.S. Environmental Protection Agency TTO list contained in 40 *Code of Federal Regulations* 401, Part 15, *Toxic Pollutants*. In addition, acetone has been documented as not being a toxic compound for the biological treatment processes used at the Jamestown POTW. Consequently, acetone has not been reported as a TTO in the BPU semiannual reports since 2012; however, acetone levels are reported in the semiannual BPU reports for reference. Monthly results for post-carbon TTOs were all below the permit level of 2,130 µg/L in 2017.

As discussed in Sections 2.1.2 and 4.2.1, groundwater levels were measured at all monitoring wells in March, June, August, and October 2017 (Table 2-2 and Appendix D) to monitor capture and assess if the RAO to "*mitigate, to the extent practicable, migration of contaminants from onsite areas to groundwater*" is being achieved at the Site. Groundwater sampling of recovery wells was conducted in February and August 2017, and monitoring wells were sampled in March and October 2017 (Tables 2-5 and 2-7, and Appendix B). Results of groundwater monitoring activities were compared against the RAOs as described in Sections 2 and 4.

5.2.3 Monitoring Well Inspections

Monitoring wells were inspected during quarterly groundwater elevation measurement events. Well integrity issues, repairs, and abandonments were documented and are included in Table 2-2. Additionally, seven monitoring wells were installed and surveyed as part of the 2017 Data Gap Investigation in fall 2017 (Appendix B).

5.2.4 Asphalt and Concrete Cover Inspection

The covers were inspected on April 28 and November 19, 2017. Two small and shallow cracks were observed near the southeastern corner of the northern slab during the 2016 inspections and are being monitored for changes in size and depth. Based on the 2017 inspections, it was determined that these two small cracks have not grown in size or depth, and that the integrity of the asphalt and concrete covers remains intact. The need for preventative maintenance of the covers such as crack sealing will be evaluated, and if deemed necessary, implemented in 2018. The concrete cover and asphalt inspection logs are provided in Appendix F.

5.2.5 Vapor Mitigation System Inspection

Monthly checks are made from the outside the residence to ensure the fan is in operation. The SSDS at 159 Hopkins Avenue was fully inspected on February 9, 2017, and found to be operating and in good condition. The vacuum gauge was observed to be in good condition with a reading of 0.5-inch of water column. Appendix G contains the SSDS inspection log.

5.3 Evaluation of the Remedial Systems

Sections 2.1 and 2.3 provide an evaluation of the groundwater treatment system. The groundwater extraction and treatment system is generally operating as designed. As discussed in Sections 2.1.1 and 2.3.1, the low saturated thickness of the Shallow WBZ limits the flow rates at which the shallow recovery wells can be operated, and the mass removed by the shallow recovery wells has decreased. RW-6D experienced diminished extraction rates in 2017 due to excessive siltation; however, this extraction well continues to operate with filtration, extracting a significant mass of COCs from the deep WBZ.

Analytical results are evaluated in terms of remedial effectiveness in Sections 2.2.2 (Shallow WBZ) and 2.2.3 (Deep WBZ). The SSDS is operating as designed (Section 3.2.4), and the asphalt/concrete covers are in good condition and limit infiltration in these areas (Section 3.2.3).

5.4 Operations and Maintenance Deficiencies

No deficiencies or non-compliance with the O&M Plan were identified in 2017.

5.5 Conclusions and Recommendations for Improvements

While the shallow extraction system exerts some hydraulic control on the Shallow and Deep WBZs in the NPLS and Former AST/UST areas, mass removal has been low, and concentrations of COCs above the RAOs remain in areas outside the current capture zones. The system has had operational issues because of the low saturated thickness of the Shallow WBZ limiting extraction rates from the Shallow WBZ, and the fine-grained soils surrounding RW-6D causing low extraction rates for the Deep WBZ.

While CH2M has conducted significant maintenance work to keep the deep recovery wells pumping, continued production of silt by RW-6D impacted pumping rates at the deep recovery wells in 2017, and redevelopment of this well in October 2017 appears to have exacerbated the sediment intrusion into the extraction well components, which lead to further decreases in flows (Table 2-2). Therefore, it is recommended that future redevelopment of RW-6D is performed on a specific as-needed basis as opposed to annually.

In 2018, Essex plans to assess potential remedial alternatives or supplements to the existing remedies to further mitigate impacts in soils and groundwater, and to expedite achieving of the RAOs.

SECTION 6

Periodic Review Conclusions and Recommendations

The following sections provide a summary of this PRR conclusions and recommendations derived from an evaluation of SMP compliance and of the performance and effectiveness of the ECs. Operation, maintenance, and monitoring activities have not changed since the last annual PRR of 2016 (CH2M, 2017b), and metal manufacturing operations involving containment of waste TCE and other solvents continue to occur onsite, as stated in IC/ECs Certification form included in Appendix A.

6.1 Site Management Plan Compliance

The O&M Plan, PMP, and IC/ECs are currently addressed in individual site plans that have been prepared for the remedial actions, and in conjunction, have serve as the interim SMP for the Essex-Hope site. Included in these plans are the remedial design drawings, specifications, and later revisions (incorporated into the updated O&M Plan [CH2M, 2017e]), which were all followed and complied with in 2017.

A single comprehensive SMP was developed in 2017, in accordance with the requirements of the NYSDEC DER-10 and the guidelines provided by the NYSDEC, and submitted to NYSDEC in December 2017.

This PRR demonstrates that the requirements of the current SMP elements have been achieved. Conclusions include:

- The remedial systems for groundwater extraction and treatment have continued to operate through 2017 with some intermittent shutdowns for maintenance/repairs.
- The groundwater treatment system has met monthly effluent limitations without any noncompliant discharges in 2017.
- Performance monitoring was performed as required by the PMP (URS, 2014), including annual groundwater sampling of monitoring wells, semiannual sampling of recovery wells, and quarterly measurement of water levels. Soil sampling was performed in 2017 as part of the data gap investigation.
- The O&M Plan was updated in 2016 and reviewed in 2017. No additional updates were deemed necessary upon review in 2017 as operation, maintenance and monitoring activities have not changed since the 2016 annual PRR was submitted.
- O&M monitoring and inspections were conducted, including quarterly groundwater elevation measurements, routine treatment system inspections including flow readings of all recovery wells and the treatment system totalizers, monthly influent/effluent sampling, maintenance of carbon vessels, inspections of monitoring and recovery wells, asphalt/concrete cover, and the SSDS.
- Strong background indoor sources of TCE remain present at Plant 5 and industrial operations (metal manufacturing) have not changed. As detailed in historical reports, previous datasets suggest indoor air concentrations of TCE were controlled primarily by the TCE-containing products that were used and stored within the building for the industrial processes. Therefore the industrial hygiene values should be applied to the current exposures (CH2M, 2016; URS, 2015). As requested by NYSDEC, this report will continue to document TCE use at the facility.
- IC/ECs, including Deed Restrictions and Covenants and the groundwater extraction and treatment system, continue to be in force at the Site.

6.2 Performance and Effectiveness of the Remedy

The groundwater extraction and treatment system continues to operate at the site. Performance and effectiveness of the remedy were further assessed through the 2017 Data Gap Investigation. The following conclusions were made regarding the performance and effectiveness of this remedy in the Shallow WBZ:

- VOC concentrations exceed RAOs in vadose zone soils at the Site, but exceedances are limited to two portions of the Site: the NPLS Area and the Former AST/UST Area where concentrations are low but still exceed RAOs. ECs at these locations include low-permeability asphalt caps; however, soils near the water table could serve as a continuing source when water levels fluctuate.
- In 2017, 0.38-pound of VOCs was recovered from the shallow groundwater system. Mass removal rate has declined from levels observed in the late 1990s and early 2000s.
- Concentrations of TCE and its daughter products have declined in shallow groundwater since initiation of remedial activities in the late 1990s in the NPLS Area, but remain above RAOs and have increased slightly in 2017 from 2015 and 2016 conditions. The maximum concentrations recorded in 2017 include:
  - TCE concentration of 510 µg/L at MW-101S
  - Cis-1,2-DCE concentration of 730 J µg/L at RW-1S
  - Vinyl chloride concentration of 250 µg/L at HW-6
- RW-1S and RW-2S provide capture of the Shallow WBZ in the NPLS Area.
- RW-3S provided localized capture in the Former AST/UST Area, but this recovery well was permanently taken off-line in August 2017. Concentrations of VOCs have fluctuated over the years at this well, and have generally declined, although remain above RAOs, with maximum concentrations recorded in 2017 as follows:
  - Benzene at 4.8 µg/L
  - Cumene at 6 µg/L
  - N-pylbenzene at 14 µg/L
  - Total xylenes at 9.6 J µg/L
  - TCE at 56 µg/L
  - cis-1,2-DCE at 37 µg/L
  - 1,2,4-TMB at 9.4 µg/L
  - 1,3,5-TMB at 5.5 µg/L

Several areas of the Shallow WBZ impacted by COCs above RAOs exist outside the shallow extraction system capture zone. Specifically, these include:

- The CBTEX plume in the Shallow WBZ under the eastern portion of the West Building has been substantially delineated. There does not appear to be an offsite contribution. Concentrations recorded in 2017 include:
  - Maximum ethylbenzene concentration of 2,100 µg/L at MW-30S.
  - Maximum total xylenes concentration of 7,000 J µg/L at MW-30S.
  - 1,2,4-TMB, 1,3,5-TMB, isopropylbenzene (cumene), naphthalene, n-propylbenzene, and sec and tert-butylbenzene have also been detected above RAOs at MW-30S.

- Rebounding concentration of petroleum-related compounds (approaching pre-ISCO concentrations) in the eastern side of the Former UST Area suggest additional source material is present in this area. Remaining concentrations of CBTEX are migrating to the east-northeast under natural gradient conditions. Maximum concentrations were observed at MW-26S as follows:
  - Ethylbenzene at 270 µg/L
  - Cumene at 82 µg/L
  - Total xylene at 440 µg/L
  - 1,2,4-TMB at 2,800 µg/L
  - 1,3,5-TMB at 660 µg/L
- TCE and cis-1,2-DCE exist offsite to the north and east of the site, Concentrations of TCE (85 µg/L) and cis-1,2-DCE (21 µg/L) at MW-25S have remained relatively steady. Impacted groundwater in this area migrates to the east-northeast under natural gradient and natural attenuation conditions.

The following conclusions were made regarding the performance and effectiveness of the remedy in the Deep WBZ:

- In 2017, 117 pounds of VOCs were removed from the Deep WBZ. Mass removal has been relatively steady since 2013 but declined in 2016 and 2017, mostly because of lower VOC concentrations in groundwater extracted by RW-6D, and decreasing concentrations of acetone observed in the deep recovery wells and monthly system influent samples throughout 2017 (ranging from 3,700 µg/L to non-detect).
- Concentrations of COCs in the Deep WBZ continue to exist at levels higher than site RAOs.
- Groundwater capture zones in the Deep WBZ appear to encompass the entire Site and portions of the offsite plume to the north and east of the Site. Declining VOC concentrations at MW-22D indicate that RW-6D, when pumping, is capturing groundwater near that well, but increasing VOC concentrations at MW-15D indicate that the existing deep extraction system may not be effectively capturing impacted groundwater in that area. Upcoming additional groundwater monitoring rounds at the newly installed deep WBZ wells should provide enough data to begin assessing concentration trends downgradient of the capture zone.
- Although sentinel wells MW-16D and MW-25D had no detections of COCs above RAOs, the TCE plume in the Deep WBZ extends further northeast and CVOC concentrations exist offsite, outside the capture zone of the current extraction system. Maximum concentrations observed outside the Deep WBZ capture zone are as follows:
  - TCE concentration of 120,000 µg/L at MW-110D
  - cis-1,2-DCE concentration of 30,000 µg/L at MW-110D
  - Vinyl chloride concentration of 3,000 µg/L at MW-106D
- Maximum concentrations in the Deep WBZ were TCE at 160,000 µg/L (MW-123D); cis-1,2-DCE at 180,000 µg/L (MW-118D); and vinyl chloride at 40,000 µg/L (MW-21D). The highest concentrations exist in the NPLS area and north and northeast of the Plant 5 Building.
- Acetone concentrations at RW-6D (19,000 µg/L) and MW-21D (5,000 µg/L) appear to be declining, but remain above the NYSDEC ambient groundwater quality standard of 50 µg/L.

Except for the partial extent of capture provided by the groundwater extraction and treatment system, all other remedial actions undertaken at the Site, including active ECs such as the SSDS at 159 Hopkins Avenue and the asphalt and concrete covers, and the ICs enacted at the Site continue to be effective.

6.3 Future Periodic Reviews

Operation, maintenance, and monitoring of the remedial systems will continue in 2018. A slightly revised monitoring program is included in the SMP recently developed for the Site and submitted to NYSDEC in December 2017. Because the existing PMP (URS, 2014) expired as of end of 2017, site monitoring activities in 2018 will be performed in compliance with the recently submitted SMP. Potential remedial alternatives or supplements to the existing remedies required to further mitigate impacts in the Shallow and Deep WBZs and soils will be assessed in 2018.

Annual PRR reports will continue to be submitted until the Site achieves RAOs. The 2018 PRR will be submitted at the end of the first quarter of 2019.

SECTION 7

References

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Tables

Table 1-1. Key Areas and Historically Observed Impacts

2017 Annual Periodic Review Report

Essex-Hope Site, Jamestown, New York

Area	Soil	Shallow Water-bearing Zone	Deep Water-bearing Zone
North Parking Lot Sump Area[a]	CVOCs CBTEX PCBs	CVOCs	CVOCs
Former Underground Storage Tank Area	CBTEX Bis(2-ethylhexyl)phthalate	CBTEX/TMB	None
Former Aboveground Storage Tank/Underground Storage Tank Area[a]	CBTEX	CBTEX CVOCs	None
West Building[a]	None	CBTEX	CBTEX (minor)
Plant 5 Building	Not assessed	CVOCs (northern) CBTEX (southern)	CVOCs Acetone
Offsite North and East	Not assessed	CVOCs	CVOCs Acetone

[a] Observed impacts updated based on 2016 and 2017 Data Gap Investigation findings (CH2M, 2017d, 2018).

CBTEX = cumene, benzene, toluene, ethylbenzene, and xylenes

CVOC = chlorinated volatile organic compound

PCB = polychlorinated biphenyl

TMB = 1,2,4,-trimethylbenzene and 1,3,5-trimethylbenzene

Table 1-2. Summary of Site Investigations
2017 Annual Periodic Review Report
Essex-Hope Site, Jamestown, New York

Year	Investigation Name	Description	Consultant
1993	Phase I Remedial Investigation	-Further characterization of distribution of VOCs in groundwater to evaluate potential remedial options	O'Brien & Gere Engineers
1994	Phase II Remedial Investigation/Feasibility Study	-Presentation of RI results and evaluation of potential remedial actions that may be implemented to satisfy the remedial action objectives for the Site	
1995	Basis of Design	- Presentation of the physical, chemical, and regulatory basis for the design of remedial actions	Dow Environmental
1998	Remedial Action Closeout Report	- Description of the implementation of the various remedial systems at the Site	Radian Engineering
2000	Supplemental Investigations for SMAART Evaluations	- Assessment of remedial alternatives, including natural attenuation, in the Former AST/UST Area, and a ZVI permeable reactive wall in the NPLS Area	Radian International
2001	Plant 5 East Area and UST Area Investigations Report	- Investigation of the Former UST Area to determine if additional source existed - Investigation of the source and extent of vinyl chloride on the east side of the Plant 5 Building	URS
2004	UST Area and Groundwater Vinyl Chloride Investigations	- Investigation of VOCs contamination extent in the Former UST Area and vinyl chloride in the area east of the Plant 5 Building	
2006	UST Area and Offsite Groundwater Investigations	- Delineation of the southern VOC contamination extent in the Former UST Area - Determination of VOC contamination extent in groundwater north and east of the Site	
2008	Soil Vapor Sampling at 159 Hopkins Avenue	- Investigation of soil vapor conditions near a residence underlain by a TCE plume identified by the 2006 Offsite Groundwater Investigation	
2014	Draft West Area Site Investigation	- Delineation of CBTEX plume west of the Former UST Area under the West Building	
	Supplemental Offsite Investigation	- Evaluation and confirmation of the extent of offsite VOC contamination north and east of the Site - Completion of the western delineation of CBTEX contamination underneath the West Building	AECOM
2015	Soil Vapor Intrusion Investigation at the Plant 5 Building and West Building	- Assessment of presence of CBTEX contamination under the West Building and TCE and daughter products beneath the Plant 5 Building	URS
2016	Vapor Intrusion Investigation (HAPSITE)	- Assessment of potential for vapor intrusion against potential indoor sources in the Plant 5 Building	CH2M
	Data Gap Investigation	- Refinement of conceptual site model - Assessment of current remedial system performance - Planning for potential future remedial activities	
2017	159 Hopkins Avenue Mitigation System - Effectiveness Evaluation	- Collect additional data and observations to confirm the effectiveness of the subslab depressurization system at the residence	
	Data Gap Investigation	- Further refinement of conceptual site model - Additional planning for potential future remedial activities	

AST = aboveground storage tank
CBTEX = cumene (isopropylbenzene), benzene, toluene, ethylbenzene, and xylenes
HAPSITE = Hazardous Air Pollutants on Site (field portable gas chromatograph mass spectrometer)
NPLS = North Parking Lot Sump
SMAART = Systematic Application of Advanced Remedial Technologies
TCE = trichloroethene
UST = underground storage tank
VOC = volatile organic compound
ZVI = zero-valent iron

Table 1-3. Remedial Action Objectives

2017 Annual Periodic Review Report

Essex-Hope Site, Jamestown, New York

Media	Parameter	RAO from 1994 ROD
Soil	Total VOCs	10 ppm
	Each Individual VOC	1 ppm
	Total SVOCs	500 ppm
	Each Individual SVOC	50 ppm
	PCBs	10 ppm
Groundwater	Trans-1,2-DCE	5 ppb
	TCE	5 ppb
	Vinyl Chloride	5 ppb
	Ethylbenzene	5 ppb
	Toluene	5 ppb
	Xylene	5 ppb
	PCB	0.1 ppb
	Other Compounds	NYSDEC Ambient Groundwater Quality Standard[a]

[a] Current NYSDEC Ambient Groundwater Quality Standards for other compounds commonly found at the site include: acetone – 50 µg/L; benzene – 1 µg/L; cis-1,2-DCE – 5 µg/L; 2-butanone (methyl ethyl ketone) – 50 µg/L; 1,1-DCE – 5 µg/L; isopropylbenzene (cumene) – 5 µg/L; 1,2,4-trimethylbenzene - 5 µg/L; 1,3,5-trimethylbenzene - 5 µg/L

NYSDEC = New York State Department of Environmental Conservation
PCB = polychlorinated biphenyl
ppb = parts per billion
ppm = parts per million
RAO = remedial action objective
ROD = Record of Decision
SVOC = semivolatile organic compound
VOC = volatile organic compound

Table 2-1. Recovery Well Extraction Rates and Operational Percentage
2017 Annual Periodic Review Report
Essex-Hope Site, Jamestown, New York

Well	Extraction Rates (gpm)			Percent Operational
	Minimum	Maximum	Average	
Shallow WBZ				
RW-1S	0.01	0.25	0.09	77%
RW-2S	0.08	1.98	0.84	93%
RW-3S[a]	0.001	0.72	0.13	25%
Deep WBZ				
RW-2D	0.06	3.16	2.02	91%
RW-6D	0.01	1.09	0.31	93%

[a] RW-3S was shut down in August 8, 2017, because of its historically low pumping rates and its hydraulic location (upgradient from RW-1S and RW-2S). This was proposed by CH2M in the 2016 Annual PRR (CH2M, 2017b), and approved by NYSDEC via letter dated May 1, 2017.

% = percent
gpm = gallons per minute
WBZ = water-bearing zone

Notes:
All values based on weekly to biweekly totalizer flowmeter readings.

Average extraction rate is calculated only using data during periods of operation for each well (that is, calculations do not include periods of downtime).

Percent operational represents the percentage of the time (weeks) that the well was operational (versus down for maintenance) in 2017. Hours of lost productivity due to intermittent system shutdowns are also included in the calculation.

Table 2-2. Monitoring Well Inventory and 2017 Groundwater Elevation Measurements
2017 Annual Periodic Review Report
Essex-Hope Site, Jamestown, New York

Monitoring Well ID	Northing	Easting	Top of Casing Elevation (feet AMSL)	Depth to Top of Screen (feet)	Depth to Bottom of Screen (feet)	Screened Zone	Groundwater Elevation (feet AMSL)				Monitoring Well Condition/Updates as of October 2017
							13-Mar-17	27-Jun-17	23-Aug-17	16-Oct-17	
GP-1S	769418.53	977328.64	1278.34	8	12.8	Shallow	1269.46	NM	NM	1268.36	Good
GP-2D	769380.34	977348.27	1278.03	30	34.8	Deep	1265.62	NM	NM	1265.11	Sediment above top of screen
GP-2S	769379.13	977344.67	1277.97	2.6	12.6	Shallow	1269.35	NM	NM	1269.57	Good
GP-3D	769435.18	977388.08	1278.15	34	38.8	Deep	NM	NM	1264.70	1264.33	Good
GP-3S	769439.01	977385.71	1278.25	4	14	Shallow	NM	NM	1266.85	1266.61	Good
GP-4D	769400.36	977281.12	1277.48	39	43.8	Deep	1264.16	1264.39	1258.84	1262.67	3 ft sediment in well
GP-4S	769402.76	977283.85	1277.43	10.8	15.8	Shallow	1268.64	1268.92	1268.40	1271.43	Good
GP-5D	769467.41	977310.00	1276.30	36	40.8	Deep	NM	NM	NM	NM	Repaired; sediment above top of screen
GP-5S	769466.37	977307.37	1276.79	7	11.8	Shallow	NM	NM	NM	NM	Destroyed
GP-7	769539.53	977376.36	1276.17	9	14.8	Shallow	NM	NM	NM	NM	Could Not Locate
HW-1	769310.73	977237.35	1278.46	--	--	--	NM	NM	NM	NM	PVC casing broken; Could not locate in October 2017 to repair
HW-2	769407.31	977201.19	1280.57	--	--	Shallow	NM	1268.87	1268.40	1268.56	Good
HW-3	769259.85	977127.74	1282.60	--	--	--	NM	NM	NM	1270.65	Good
HW-6	769321.82	977304.10	1280.98	6	16	Shallow	1269.47	NM	NM	1269.30	Good
HW-6A	769317.15	977304.53	1279.85	--	--	--	NM	NM	NM	1269.65	Good
HW-8	769356.63	977469.24	1277.18	6	16	Shallow	1263.92	1270.59	1269.97	1270.14	Good
HW-9	769334.70	977479.33	1280.35	6	16	Shallow	1270.40	1270.38	1269.14	1269.90	Good
HW-10	769233.13	977139.27	1279.43	7	17	Shallow	1270.78	1270.83	1270.73	1273.69	Good
MW-1	769311.21	977562.85	1280.10	15	20	Shallow	NM	NM	NM	1267.33	PVC casing pinched; could not repair
MW-10	769402.92	977316.21	1277.28	8.5	18.5	Shallow	1268.87	1269.23	1268.82	1274.63	Good
MW-11	769378.08	977235.76	1277.13	5	15	Shallow	1268.60	1268.96	1267.08	1266.78	Repaired
MW-11D	769381.99	977233.72	1277.17	35	45	Deep	1264.56	1265.15	1264.32	1263.22	Good
MW-12	769328.16	977258.42	1277.51	4	14	Shallow	1268.96	1269.51	1268.84	1268.96	Good
MW-13	769254.15	977431.38	1277.65	8	18	Shallow	1268.20	1268.49	1267.96	1267.57	Repaired and re-developed
MW-14D	769491.93	977221.65	1279.40	40	50	Deep	1263.57	1265.85	1264.58	1263.75	Good
MW-14S	769493.34	977227.86	1279.64	10	20	Shallow	1266.53	1268.09	1266.49	1266.44	Good
MW-15D	769533.32	977340.57	1278.90	34	44	Deep	1264.25	1265.91	1264.50	1263.72	Good
MW-15S	769538.87	977337.64	1279.00	10	20	Shallow	1266.30	1266.99	1265.30	1265.74	Good
MW-16D	769618.24	977288.15	1278.47	36	46	Deep	1264.82	1266.14	1264.64	1264.39	Good
MW-16S	769621.11	977287.09	1278.74	7	17	Shallow	1266.54	1266.79	1265.85	1266.28	Good

Table 2-2. Monitoring Well Inventory and 2017 Groundwater Elevation Measurements
2017 Annual Periodic Review Report
Essex-Hope Site, Jamestown, New York

Monitoring Well ID	Northing	Easting	Top of Casing Elevation (feet AMSL)	Depth to Top of Screen (feet)	Depth to Bottom of Screen (feet)	Screened Zone	Groundwater Elevation (feet AMSL)				Monitoring Well Condition/Updates as of October 2017
							13-Mar-17	27-Jun-17	23-Aug-17	16-Oct-17	
MW-17	769386.50	977119.12	1278.01	25	30	Deep	NM	NM	1267.27	1265.44	Sediment above top of screen
MW-18	769558.19	977549.59	1275.05	5	15	Shallow	1265.75	1265.50	1264.90	1265.09	Good
MW-19D	769481.56	977468.50	1275.64	34	44	Deep	1265.54	1265.69	1265.64	1263.68	Repaired
MW-19S	769486.62	977468.82	1275.95	9	19	Shallow	1266.40	1266.10	1265.40	1265.69	Good
MW-2	769235.80	977145.80	1279.09	6	16	Shallow	NM	1270.99	NM	NM	Abandoned
MW-20	769381.21	977365.24	1278.10	6.5	11.5	Shallow	1269.59	1269.20	1268.40	1268.85	Good
MW-21D	769507.36	977414.36	1275.61	31.5	41	Deep	1265.61	1265.88	1265.02	1264.19	Good
MW-22D	769584.11	977467.04	1275.53	32.5	42	Deep	1266.08	1265.61	1264.98	1265.16	Good
MW-23D	769324.69	977431.09	1277.36	28	37.5	Deep	1267.56	1266.57	1265.73	1265.55	Good
MW-23S	769330.65	977429.42	1277.30	5	14.5	Shallow	1270.75	1270.66	1269.59	1270.20	Good
MW-24S	769295.26	977357.27	1278.25	5	14.5	Shallow	NM	1270.18	1269.55	1272.65	Good
MW-25D	769596.57	977648.45	1274.50	31	41	Deep	1264.90	1264.75	1263.58	1264.20	Good
MW-25S	769599.31	977655.01	1274.30	7	17	Shallow	1264.90	1264.50	1263.98	1264.15	Good
MW-26S	769402.60	977514.59	1277.09	5	15	Shallow	1268.67	1268.14	1268.08	1267.81	Good
MW-27S	769420.49	977594.25	1276.46	10	20	Shallow	1267.16	1267.63	1266.39	1267.84	Good
MW-28S	769383.88	977607.30	1276.87	7	17	Shallow	1266.57	1267.51	1267.25	1267.36	Good
MW-29S	769267.33	977370.58	1278.35	4	14	Shallow	1270.03	1269.45	1269.50	1272.63	Good
MW-30S	769261.22	977342.56	1278.47	10	16	Shallow	1269.65	1269.64	1269.09	1269.11	Good
MW-31S	769248.04	977369.79	1278.29	10	15	Shallow	1269.84	1269.97	1269.54	1269.51	Good
MW-101S	769495.85	977385.68	1275.68	8	18	Shallow	1266.33	1266.03	1265.18	1265.54	Good
MW-102S	769527.50	977462.33	1275.43	9	14	Shallow	1266.18	1265.88	1265.13	1265.43	Good
MW-103S	769581.66	977463.10	1275.32	8	18	Shallow	1266.17	1265.87	1265.12	1265.39	Good
MW-104S	769708.58	977409.23	1279.22	9	14	Shallow	1266.91	1266.94	1266.92	1266.84	Good
MW-105S	769762.88	977561.18	1278.79	8	18	Shallow	1265.29	1264.76	1263.89	1264.47	Good
MW-106S	769641.05	977554.52	1275.29	10	15	Shallow	1265.59	1265.10	1264.29	1264.76	Good
MW-106D	769644.34	977553.22	1275.19	24	34	Deep	1264.94	1264.21	1263.74	1263.76	Good
MW-107S	769669.94	977845.78	1272.98	9	19	Shallow	1263.78	1263.57	1262.35	1263.19	Good
MW-108S	769725.67	977754.10	1274.30	7	17	Shallow	1263.90	1263.67	1262.39	1263.23	Good
MW-109S	769813.86	977747.51	1275.19	7	12	Shallow	1263.69	1263.65	1263.64	Dry	Good
MW-109D	769810.78	977743.91	1275.04	28	38	Deep	**Not Yet Installed**			37.99	Good
MW-110D	769637.03	977446.46	1275.75	28	38	Deep	1265.40	1265.45	1264.20	1264.23	Good
MW-111D	769320.09	977274.77	1277.59	32	42	Deep	1264.54	1265.54	1263.94	1263.44	Good
MW-112S	769273.84	977338.29	1278.59	6	16	Shallow	1269.78	1269.79	1269.17	1269.39	Good
MW-113D	769254.29	977349.06	1278.47	29	39	Deep	1265.59	1266.77	1266.32	1265.96	Good

Table 2-2. Monitoring Well Inventory and 2017 Groundwater Elevation Measurements
2017 Annual Periodic Review Report
Essex-Hope Site, Jamestown, New York

Monitoring Well ID	Northing	Easting	Top of Casing Elevation (feet AMSL)	Depth to Top of Screen (feet)	Depth to Bottom of Screen (feet)	Screened Zone	Groundwater Elevation (feet AMSL)				Monitoring Well Condition/Updates as of October 2017
							13-Mar-17	27-Jun-17	23-Aug-17	16-Oct-17	
MW-114S	769203.86	977244.48	1279.15	8	13	Shallow	1269.30	1269.44	1269.33	1269.26	Good
MW-115D	769212.79	977155.02	1279.03	35	40	Deep	1270.42	1269.58	1269.92	1269.87	Good
MW-116S	769162.39	977173.32	1278.91	8	13	Shallow	1269.41	1269.73	1269.65	1269.59	Good
MW-117S	769220.98	769220.98	1278.14	6	16	Shallow	1269.41	1269.73	1269.46	1269.33	Good
MW-118D	769419.08	977325.34	1278.15	24	34	Deep	**Not Yet Installed**			1264.97	Good
MW-119D	769496.13	977235.78	1276.37	22	32	Deep	**Not Yet Installed**			1265.06	Good
MW-120D	769783.18	977493.70	1277.60	28	38	Deep	**Not Yet Installed**			1263.75	Good
MW-121D	769891.60	977620.85	1272.09	28	38	Deep	**Not Yet Installed**			1262.07	Good
MW-122D	769550.68	977553.25	1275.07	22	32	Deep	**Not Yet Installed**			1264.42	Good
MW-123D	769431.82	977294.35	1276.86	25	35	Deep	**Not Yet Installed**			1262.65	Good
MW-4	769170.13	977100.42	1280.70	13	18	Shallow	NM	1271.45	1271.28	NM	Good
MW-6	769420.79	977237.79	1277.28	9.9	19.9	Shallow	1268.99	1268.48	1266.74	1266.63	Repaired
MW-7D	769437.24	977291.46	1277.12	35	45	Deep	1268.70	1264.82	1263.44	NM	Abandoned
MW-7DD	769435.52	977293.59	1277.09	90	100	Glacial Till	1275.79	1275.79	1275.69	1275.64	Good
MW-7S	769440.65	977291.06	1277.04	10	20	Shallow	NM	1268.29	1268.25	1268.39	Repaired
MW-8	769407.61	977252.34	1277.30	39.6	49.6	Deep	1264.04	1264.34	1263.79	NM	Abandoned
PZ-11D	769432.94	977590.25	1276.14	21.3	41.3	Deep	1266.39	1265.91	1265.39	NM	Abandoned
PZ-1D	769442.95	977285.37	1277.23	25	45	Deep	1260.48	NM	NM	1265.83	5 ft of sediment in well
PZ-1S	769443.57	977282.97	1277.25	7	17	Shallow	1268.65	NM	NM	1268.55	6 ft of sediment in well
PZ-2D	769442.57	977286.80	1277.14	25	45	Deep	1257.02	NM	NM	1264.94	Kink in casing
PZ-3D	769416.94	977325.13	1278.35	20	40	Deep	1266.05	NM	NM	1265.80	8.5 ft of sediment in well
PZ-4D	769419.63	977320.19	1278.24	25	45	Deep	1258.14[a]	NM	NM	1260.09[a]	6 ft of sediment in well
PZ-5D	769418.77	977464.00	1275.88	21.5	41.5	Deep	1268.37	1266.23	1264.98	1264.90	Good
PZ-5S	769422.15	977463.92	1275.92	5.5	12	Shallow	1268.50	1267.57	1267.02	1267.29	Good
PZ-6D	769456.59	977464.40	1275.91	25.5	45.5	Deep	1267.90	1264.52	1264.71	1263.96	Good
PZ-6S	769459.23	977464.52	1276.09	8.5	13.5	Shallow	1268.24	1266.79	1265.59	1266.40	Good
PZ-7D	769559.50	977553.39	1275.19	22	42	Deep	1265.14	1265.08	1263.94	NM	Abandoned
RW-1D	769375.07	977258.14	1275.87	32	57	Deep	1264.27	1264.57	1263.97	1263.91	Good
RW-1S	769386.12	977269.36	1275.36	10.5	16	Shallow	1265.05	1268.96	1268.47	1266.56	Redeveloped
RW-2D	769444.16	977280.70	1275.92	27	42	Deep	1250.52	1241.92	1250.93	1265.12	Repaired and redeveloped
RW-2S	769438.98	977265.94	1275.89	10	15.5	Shallow	1266.69	1266.29	1264.91	1267.29	Repaired and redeveloped
RW-3S	769245.55	977167.43	1277.72	9	13.5	Shallow	1269.97	1268.77	1270.32	NM	Redeveloped
RW-5S	769390.30	977475.71	1276.83	7	10	Shallow	1269.44	1269.33	1269.02	NM	Good

Table 2-2. Monitoring Well Inventory and 2017 Groundwater Elevation Measurements
2017 Annual Periodic Review Report
Essex-Hope Site, Jamestown, New York

Monitoring Well ID	Northing	Easting	Top of Casing Elevation (feet AMSL)	Depth to Top of Screen (feet)	Depth to Bottom of Screen (feet)	Screened Zone	Groundwater Elevation (feet AMSL)				Monitoring Well Condition/Updates as of October 2017
							13-Mar-17	27-Jun-17	23-Aug-17	16-Oct-17	
RW-6D	769525.89	977464.22	1274.95	--	--	Deep	1260.70	1261.77	1260.50	1262.95	Redeveloped
VP-1S	769423.04	977327.44	1278.26	--	--	Shallow	NM	NM	NM	NM	Casing clogged
VP-2S	769410.90	977332.10	1278.32	--	--	Shallow	NM	NM	NM	NM	Could not open
VP-3S	769320.40	977328.50	--	--	--	Shallow	NM	NM	NM	NM	Could Not Locate
VP-4S	769357.39	977390.18	1278.25	--	--	Shallow	NM	NM	NM	NM	Could Not Locate
VP-5D	769366.31	977241.12	1277.53	12.5	34.3	Deep	1266.52	NM	NM	NM	Abandoned
VP-6D	769487.64	977538.82	1276.11	29.5	39.5	Deep	NM	1265.72	1265.25	1265.20	Repaired and redeveloped
VP-6S	769483.33	977539.59	1276.08	18.3	24	Shallow	1266.31	1265.98	1266.25	1265.98	Good
VP-7D	769294.32	977519.73	1278.22	20.4	39.3	Deep	1266.67	1265.85	1265.43	1267.97	Good
VP-8D	769465.51	977305.11	1276.69	20	39	Deep	1265.74	1266.94	1266.21	1265.61	Good

-- = Data unavailable or unknown
AMSL = above mean sea level
ft = feet
GP = geoprobe piezometer, HW = monitoring well (Hope Well), MW = monitoring well, PZ = piezometer, RW = recovery well, VP = vapor probe
NM = Not measured (innaccessible or unable to locate during gauging activities)
PVC = polyvinyl chloride

Notes:

Blue shading indicates monitoring wells (total of 21) part of the Annual Performance Monitoring Well Program proposed in the 2017 Site Management Plan (CH2M, 2017a)

Green shading indicates monitoring wells that were identified as candidates for redevelopment or abandonment

Red shading indicates wells that were identified as candidates for abandonment

All wells were located on the north edge of the steel casing.

Horizontal Datum: NY West State Plane Coordinate System, NAD83(2011), Epoch: 2010.00

Vertical Datum: NAVD88, Geoid12B, derived using OPUS Post processing and RTK GNSS to local NGS Benchmark U-88

To convert an NGVD29 elevation to and NAVD88 elevation, subtract 0.51 feet.

* Light Non-Aqueous Phase Liquid was detected in PZ-4D in March and October 2017. Reported depths are depth to water, but have not been adjusted for product thickness because narrow diameter of well makes it difficult to get accurate LNAPL thickness with probe.

Table 2-3. 2017 Groundwater Vertical Gradients
2017 Annual Periodic Review Report
Essex-Hope Site, Jamestown, New York

Water-bearing Zone	Well	Mid-Screen Depth (ft bgs)	Groundwater Elevation (feet AMSL)			
			13-Mar-17	27-Jun-17	23-Aug-17	16-Oct-17
Shallow	**MW-7S**	**15.0**	NM	1268.29	1268.25	1268.39
Deep	**MW-7D**	**40.0**	1268.70	1264.82	1263.44	NM
Vertical Gradient (ft/ft)			NA	**0.14**	**0.19**	NA
Deep	**MW-7D**	**40.0**	1268.70	1264.82	1263.44	NM
Deepest Sand and Gravel	**MW-7DD**	**95.0**	1275.79	1275.79	1275.69	1275.64
Vertical Gradient (ft/ft)			**0.13**	**0.20**	**0.22**	NA
Shallow	**MW-11**	**10.0**	1268.60	1268.96	1267.08	1266.78
Deep	**MW-11D**	**40.0**	1264.56	1265.15	1264.32	1263.22
Vertical Gradient (ft/ft)			**0.13**	**0.13**	**0.09**	**0.12**
Shallow	**MW-14S**	**15.0**	1266.53	1268.09	1266.49	1266.44
Deep	**MW-14D**	**45.0**	1263.57	1265.85	1264.58	1263.75
Vertical Gradient (ft/ft)			**0.10**	**0.07**	**0.06**	**0.09**
Shallow	**MW-15S**	**15.0**	1266.30	1266.99	1265.30	1265.74
Deep	**MW-15D**	**39.0**	1264.25	1265.91	1264.50	1263.72
Vertical Gradient (ft/ft)			**0.09**	**0.04**	**0.03**	**0.08**
Shallow	**MW-16S**	**12.0**	1266.54	1266.79	1265.85	1266.28
Deep	**MW-16D**	**41.0**	1264.82	1266.14	1264.64	1264.39
Vertical Gradient (ft/ft)			**0.06**	**0.02**	**0.04**	**0.07**
Shallow	**MW-18**	**10.0**	1265.75	1265.50	1264.90	1265.09
Deep	**PZ-7D**	**32.0**	1265.14	1265.08	1263.94	NM
Vertical Gradient (ft/ft)			**0.03**	**0.02**	**0.04**	NA
Shallow	**MW-19S**	**14.0**	1266.40	1266.10	1265.40	1265.69
Deep	**MW-19D**	**39.0**	1265.54	1265.69	1265.64	1263.68
Vertical Gradient (ft/ft)			**0.03**	**0.02**	**0.01**	**0.08**
Shallow	**MW-23S**	**10.0**	1270.75	1270.66	1269.59	1270.20
Deep	**MW-23D**	**33.0**	1267.56	1266.57	1265.73	1265.55
Vertical Gradient (ft/ft)			**0.14**	**0.18**	**0.17**	**0.20**
Shallow	**MW-25S**	**12.0**	1264.90	1264.50	1263.98	1264.15
Deep	**MW-25D**	**36.0**	1264.90	1264.75	1263.58	1264.20
Vertical Gradient (ft/ft)				**-0.01**	**0.017**	**-0.002**

Water-bearing Zone	Well	Mid-Screen Depth (ft bgs)	Groundwater Elevation (feet AMSL)			
			13-Mar-17	27-Jun-17	23-Aug-17	16-Oct-17
Shallow	**MW-27S**	**15.0**	1267.16	1267.63	1266.39	1267.84
Deep	**PZ-11D**	**31.0**	1266.39	1265.91	1265.39	NM
Vertical Gradient (ft/ft)			**0.05**	**0.11**	**0.06**	NA
Shallow	**GP-2S**	**7.6**	1269.35	NM	NM	1269.57
Deep	**GP-2D**	**32.5**	1265.62	NM	NM	1265.11
Vertical Gradient (ft/ft)			**0.15**	NA	NA	**0.18**
Shallow	**GP-3S**	**9.0**	NM	NM	1266.85	1266.61
Deep	**GP-3D**	**36.5**	NM	NM	1264.70	1264.33
Vertical Gradient (ft/ft)			NA	NA	**0.08**	**0.08**
Shallow	**GP-4S**	**13.3**	1268.64	1268.92	1268.40	1271.43
Deep	**GP-4D**	**41.5**	1264.16	1264.39	1258.84	1262.67
Vertical Gradient (ft/ft)			**0.16**	**0.16**	**0.34**	**0.31**
Shallow	**PZ-5S**	**8.8**	1268.50	1267.57	1267.02	1267.29
Deep	**PZ-5D**	**31.5**	1268.37	1266.23	1264.98	1264.90
Vertical Gradient (ft/ft)			**0.01**	**0.06**	**0.09**	**0.11**
Shallow	**PZ-6S**	**11.0**	1268.24	1266.79	1265.59	1266.40
Deep	**PZ-6D**	**35.5**	1267.90	1264.52	1264.71	1263.96
Vertical Gradient (ft/ft)			**0.01**	**0.09**	**0.04**	**0.10**
Shallow	**VP-6S**	**21.2**	1266.31	1265.98	1266.25	1265.98
Deep	**VP-6D**	**34.5**	NM	1265.72	1265.25	1265.20
Vertical Gradient (ft/ft)			NA	**0.02**	**0.07**	**0.06**
Shallow	**MW-106S**	**12.5**	1265.59	1265.10	1264.29	1264.76
Deep	**MW-106D**	**29.0**	1264.94	1264.21	1263.74	1263.76
Vertical Gradient (ft/ft)			**0.04**	**0.05**	**0.03**	**0.06**
Shallow	**MW-103S**	**13.0**	1266.17	1265.87	1265.12	1265.39
Deep	**MW-22D**	**37.0**	1266.08	1265.61	1264.98	1265.16
Vertical Gradient (ft/ft)			**0.004**	**0.01**	**0.01**	**0.01**
Shallow	**MW-30**	**13.0**	1269.65	1269.64	1269.09	1269.11
Deep	**MW-113D**	**34.0**	1265.59	1266.77	1266.32	1265.96
Vertical Gradient (ft/ft)			**0.19**	**0.14**	**0.13**	**0.15**

amsl = above mean sea level   NA = not available
bgs = below ground surface   NM = not measured
ft = feet

Notes:

Mid-screen depths are depth below ground surface in feet (at middle of the screen).

Positive gradient indicates downward gradient; negative gradient indicates upward gradient.

Table 2-4. Shallow WBZ Analytical Results – Recovery Wells
2017 Annual Periodic Review Report
Essex-Hope Site, Jamestown, New York

Volatile Organic Compounds (Method 8260C) – µg/L	NYSDEC GWQS (µg/L)	RW-1S		RW-2S		RW-3S	
		2/2/2017	9/14/2017	2/2/2017	8/8/2017	2/2/2017	8/8/2017
1,1,1,2-Tetrachloroethane	5	10 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
1,1,1-Trichloroethane	5	10 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
1,1,2,2-Tetrachloroethane	5	2.0 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
1,1,2-Trichloroethane	1	6.0 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U
1,1-Dichloroethane	5	10 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
1,1-Dichloroethene	5	2.5	0.28 J	0.50 U	0.50 U	0.50 U	0.59
1,1-Dichloropropene	5	10 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
1,2,3-Trichlorobenzene	5	10 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
1,2,3-Trichloropropane	0.04	10 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
1,2,4-Trichlorobenzene	5	10 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
1,2,4-Trimethylbenzene	5	10 U	2.5 U	2.5 U	2.5 U	**9.4**	2.5 U
1,2-Dibromo-3-Chloropropane	0.04	10 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
1,2-Dibromoethane (Ethylene Dibromide)	0.0006	8.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
1,2-Dichlorobenzene	3	10 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
1,2-Dichloroethane	0.6	2.0 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
1,2-Dichloroethene, Total	5	**730 J**	**91**	4.2	**31**	2.5 U	**37**
1,2-Dichloropropane	1	4.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,3,5-Trimethylbenzene (Mesitylene)	5	10 U	2.5 U	2.5 U	2.5 U	**5.5**	2.5 U
1,3-Dichlorobenzene	3	10 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
1,3-Dichloropropane	5	10 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
1,3-Dichloropropene, Total	0.4	2.0 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
1,4-Dichlorobenzene	3	10 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
1,4-Dioxane (P-Dioxane)	NS	1000 U	250 U	250 U	250 U	250 U	250 U
2,2-Dichloropropane	5	10 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
2-Butanone (Methyl Ethyl Ketone)	50	20 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
2-Chlorotoluene	5	10 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
2-Hexanone	50	20 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
4-Chlorotoluene	5	10 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
4-Methyl-2-Pentanone	NS	20 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Acetone	50	20 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Benzene	1	2.0 U	0.50 U	0.50 U	0.50 U	**4.8**	**1.4**
Bromobenzene	5	10 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
Bromochloromethane	5	10 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
Bromodichloromethane	50	2.0 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Bromoform	50	8.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Bromomethane	5	10 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
Carbon Disulfide	60	20 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Carbon Tetrachloride	5	2.0 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Chlorobenzene	5	10 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
Chlorodibromomethane	50	2.0 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Chloroethane	5	10 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
Chloroform	7	10 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
Chloromethane	5	10 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
cis-1,2-Dichloroethene	5[a]	**730**	**91**	4.2	**31**	2.5 U	**37**

Table 2-4. Shallow WBZ Analytical Results – Recovery Wells
2017 Annual Periodic Review Report
Essex-Hope Site, Jamestown, New York

Volatile Organic Compounds (Method 8260C) – µg/L	NYSDEC GWQS (µg/L)	RW-1S		RW-2S		RW-3S	
		2/2/2017	**9/14/2017**	**2/2/2017**	**8/8/2017**	**2/2/2017**	**8/8/2017**
cis-1,3-Dichloropropene	0.4	2.0 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Dibromomethane (Methylene Bromide)	5	20 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Dichlorodifluoromethane	5	20 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Dichloromethane	5	10 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
Ethylbenzene	5[a]	10 U	2.5 U	2.5 U	2.5 U	4.5	2.5 U
Hexachlorobutadiene	0.5	10 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
Isopropylbenzene	5	10 U	2.5 U	2.5 U	2.5 U	**6.0**	1.0 J
Naphthalene	10	10 U	2.5 U	2.5 U	2.5 U	2.7	2.5 U
N-Butylbenzene	5	10 U	2.5 U	2.5 U	2.5 U	1.6 J	2.5 U
N-Propylbenzene	5	10 U	2.5 U	2.5 U	2.5 U	**14**	2.5 U
P-Isopropyltoluene	5	10 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
Sec-Butylbenzene	5	10 U	2.5 U	2.5 U	2.5 U	1.1 J	2.5 U
Styrene	5	10 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
T-Butylbenzene	5	10 U	2.5 U	2.5 U	2.5 U	2.2 J	1.2 J
Tert-Butyl Methyl Ether	10	10 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
Tetrachloroethene	5	2.0 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Toluene	5[a]	10 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
Trans-1,2-Dichloroethene	5[a]	3.1 J	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
Trans-1,3-Dichloropropene	0.4	2.0 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Trichloroethene	5[a]	**350**	**26**	**5.4**	**14**	0.92	**56**
Trichlorofluoromethane	5	10 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U
Vinyl Acetate	NS	20 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Vinyl Chloride	5[a]	**31**	**6.0**	0.77 J	2.0	1.0 U	1.6
Xylene, o	5[a]	10 U	2.5 U	2.5 U	2.5 U	0.97 J	2.5 U
Xylenes, m & p	5[a]	10 U	2.5 U	2.5 U	2.5 U	**8.6**	2.5 U
Xylenes, Total	5[a]	10 U	2.5 U	2.5 U	2.5 U	**9.6 J**	2.5 U

[a] Site groundwater remedial action objectives (RAOs) set forth in the March 1994 Record of Decision.

µg/L = micrograms per liter
J = Estimated detection
NS = No standard or guidance value established (TOGS 1.1.1)
NYSDEC GWQS = New York State Department of Environmental Conservation Ambient Groundwater Quality Standards and Guidance Values (Technical and Operational Guidance Series [TOGS] 1.1.1)
U = Analyte not detected
WBZ = water-bearing zone

Notes:
Exceedances of NYSDEC GWQS and RAOs in bold.
Non-detects are reported to the adjusted reporting limit.

Table 2-5. Summary of COCs in Shallow Groundwater
2017 Annual Periodic Review Report
Essex-Hope Site, Jamestown, New York

COC	RAO (µg/L)	Maximum Concentration (µg/L)	No. Wells > RAO	No. Wells < RAO[a]
Chlorinated VOCs				
TCE	5	510 (MW-101S)	18	21
Cis-1,2-DCE	5	730 (RW-1S)	15	24
Vinyl chloride	5	250 (HW-6)	3	36
Petroleum-related Compounds				
Benzene	1	21 (MW-29S)	4	35
sec-butylbenzene	5	15 J (MW-26S)	2	37
tert-butylbenzene	5	5.3 (HW-10)	1	38
Cumene	5	160 (MW-29S)	9	30
Ethylbenzene	5	2,100 (MW-30S)	7	32
Naphthalene	10	91 J (MW-30S)	5	34
n-propylbenzene	5	510 (MW-26S)	7	32
Toluene	5	29 (MW-117S)	2	37
1,2,4-Trimethylbenzene	5	3,900 (MW-26S)	10	29
1,3,5-Trimethylbenzene	5	1,100 (MW-26S)	3	36
Total Xylenes	5	7,000 J (MW-30S)	7	32

[a] Well counts in this column include all non-detects, even those with reporting limits above the respective RAO.

µg/L = micrograms per liter
cis-1,2-DCE = cis-1,2-dichloroethene
COC = constituent of concern
VOC = volatile organic compound
No. = number
RAO = remedial action objective
TCE = trichloroethene
WBZ = water-bearing zone

Note:
A total of 39 monitoring/recovery wells (existing and newly installed) screened in the Shallow WBZ were sampled in 2017.

Table 2-6. Deep WBZ Analytical Results – Recovery Wells
2017 Annual Periodic Review Report
Essex-Hope Site, Jamestown, New York

Volatile Organic Compounds (Method 8260C) – µg/L	**NYSDEC GWQS (µg/L)**	**RW-2D**		**RW-6D**	
		2/2/2017	**8/8/2017**	**2/2/2017**	**8/8/2017**
1,1,1,2-Tetrachloroethane	5	62 U	100 U	250 U	250 U
1,1,1-Trichloroethane	5	62 U	100 U	250 U	250 U
1,1,2,2-Tetrachloroethane	5	12 U	20 U	50 U	50 U
1,1,2-Trichloroethane	1	38 U	60 U	150 U	150 U
1,1-Dichloroethane	5	62 U	100 U	250 U	250 U
1,1-Dichloroethene	5	**27**	**14 J**	**71**	**42 J**
1,1-Dichloropropene	5	62 U	100 U	250 U	250 U
1,2,3-Trichlorobenzene	5	62 U	100 U	250 U	250 U
1,2,3-Trichloropropane	0.04	62 U	100 U	250 U	250 U
1,2,4-Trichlorobenzene	5	62 U	100 U	250 U	250 U
1,2,4-Trimethylbenzene	5	62 U	100 U	250 U	250 U
1,2-Dibromo-3-Chloropropane	0.04	62 U	100 U	250 U	250 U
1,2-Dibromoethane (Ethylene Dibromide)	0.0006	50 U	80 U	200 U	200 U
1,2-Dichlorobenzene	3	62 U	100 U	250 U	250 U
1,2-Dichloroethane	0.6	12 U	20 U	50 U	50 U
1,2-Dichloroethene, Total	5	**3100 J**	**3100**	**20000**	**16000**
1,2-Dichloropropane	1	25 U	40 U	100 U	100 U
1,3,5-Trimethylbenzene (Mesitylene)	5	62 U	100 U	250 U	250 U
1,3-Dichlorobenzene	3	62 U	100 U	250 U	250 U
1,3-Dichloropropane	5	62 U	100 U	250 U	250 U
1,3-Dichloropropene, Total	0.4	12 U	20 U	50 U	50 U
1,4-Dichlorobenzene	3	62 U	100 U	250 U	250 U
1,4-Dioxane (P-Dioxane)	NS	6200 U	10000 U	25000 U	25000 U
2,2-Dichloropropane	5	62 U	100 U	250 U	250 U
2-Butanone (Methyl Ethyl Ketone)	50	120 U	200 U	500 U	500 U
2-Chlorotoluene	5	62 U	100 U	250 U	250 U
2-Hexanone	50	120 U	200 U	500 U	500 U
4-Chlorotoluene	5	62 U	100 U	250 U	250 U
4-Methyl-2-Pentanone	NS	120 U	200 U	500 U	500 U
Acetone	50	120 U	200 U	**19000**	**5600**
Benzene	1	**9.5 J**	**6.4 J**	**68**	**44 J**
Bromobenzene	5	62 U	100 U	250 U	250 U
Bromochloromethane	5	62 U	100 U	250 U	250 U
Bromodichloromethane	50	12 U	20 U	50 U	50 U
Bromoform	50	50 U	80 U	200 U	200 U
Bromomethane	5	62 U	100 U	250 U	250 U
Carbon Disulfide	60	120 U	200 U	500 U	500 U
Carbon Tetrachloride	5	12 U	20 U	50 U	50 U
Chlorobenzene	5	62 U	100 U	250 U	250 U
Chlorodibromomethane	50	12 U	20 U	50 U	50 U
Chloroethane	5	62 U	100 U	250 U	250 U

Table 2-6. Deep WBZ Analytical Results – Recovery Wells
2017 Annual Periodic Review Report
Essex-Hope Site, Jamestown, New York

Volatile Organic Compounds (Method 8260C) – µg/L	NYSDEC GWQS (µg/L)	RW-2D		RW-6D	
		2/2/2017	8/8/2017	2/2/2017	8/8/2017
Chloroform	7	62 U	100 U	250 U	250 U
Chloromethane	5	62 U	100 U	250 U	250 U
cis-1,2-Dichloroethene	5*	**3100**	**3100**	**20000**	**16000**
cis-1,3-Dichloropropene	0.4	12 U	20 U	50 U	50 U
Dibromomethane (Methylene Bromide)	5	120 U	200 U	500 U	500 U
Dichlorodifluoromethane	5	120 U	200 U	500 U	500 U
Dichloromethane	5	62 U	100 U	250 U	250 U
Ethylbenzene	5[a]	62 U	100 U	250 U	250 U
Hexachlorobutadiene	0.5	62 U	100 U	250 U	250 U
Isopropylbenzene (Cumene)	5	62 U	100 U	250 U	250 U
Naphthalene	10	62 U	100 U	250 U	250 U
N-Butylbenzene	5	62 U	100 U	250 U	250 U
N-Propylbenzene	5	62 U	100 U	250 U	250 U
P-Isopropyltoluene	5	62 U	100 U	250 U	250 U
Sec-Butylbenzene	5	62 U	100 U	250 U	250 U
Styrene	5	62 U	100 U	250 U	250 U
T-Butylbenzene	5	62 U	100 U	250 U	250 U
Tert-Butyl Methyl Ether	10	62 U	100 U	250 U	250 U
Tetrachloroethene	5	12 U	20 U	50 U	50 U
Toluene	5[a]	62 U	100 U	250 U	250 U
Trans-1,2-Dichloroethene	5[a]	**33 J**	100 U	250 U	250 U
Trans-1,3-Dichloropropene	0.4	12 U	20 U	50 U	50 U
Trichloroethene	5[a]	**2000**	**1800**	**12000**	**5400**
Trichlorofluoromethane	5	62 U	100 U	250 U	250 U
Vinyl Acetate	NS	120 U	200 U	500 U	500 U
Vinyl Chloride	5[a]	**1300**	**540**	**4500**	**4300**
Xylene, o	5[a]	62 U	100 U	250 U	250 U
Xylenes, m & p	5[a]	62 U	100 U	250 U	250 U
Xylenes, Total	5[a]	62 U	100 U	250 U	250 U

[a] Site groundwater remedial action objectives (RAOs) set forth in the March 1994 Record of Decision.

µg/L = micrograms per liter
J = Estimated detection
D = Result from diluted analysis
NS = No standard or guidance value established (TOGS 1.1.1)
NYSDEC GWQS = New York State Department of Environmental Conservation Ambient Groundwater Quality Standards and Guidance Values (Technical and Operational Guidance Series [TOGS] 1.1.1)
U = Analyte not detected
UJ = Analyte not detected (estimated)
WBZ = water-bearing zone

Notes:
Exceedances of NYSDEC GWQS and RAOs in bold

Table 2-7. Summary of COCs in Deep Groundwater
2017 Annual Periodic Review Report
Essex-Hope Site, Jamestown, New York

COC	RAO (µg/L)	Maximum Concentration (µg/L)	No. Wells > RAO	No. Wells < RAO[a]
Chlorinated VOCs				
1,2-dichloroethane	0.6	1.8 J (MW-118D)	1	26
1,1-dichloroethene	5	330 (MW-123D)	7	20
cis-1,2-dichloroethene	5	180,000 (MW-118D)	14	13
trans-1,2-dichloroethene	5	120 (MW-119D)	2	25
Trichloroethene	5	160,000 (MW-123D)	11	16
Vinyl chloride	5	40,000 (MW-21D)	14	13
Ketones				
Acetone	50	19,000 (RW-6D)	2	25
Petroleum-related Compounds				
Benzene	1	82 J (PZ-3D)	6	21
Toluene	5	28 (MW-118D)	1	26
Total Xylenes	5	20 J (MW-118D)	1	26

[a] Well counts in this column include all non-detects, even those with reporting limits above the respective RAO.

µg/L = micrograms per liter
cis-1,2-DCE = cis-1,2-dichloroethene
COC = compound of concern
CVOC = chlorinated volatile organic compund
No. = number
RAO = remedial action objective
TCE = trichloroethene
WBZ = water-bearing zone

Note:
A total of 27 monitoring/recovery wells (existing and newly installed) screened in the Deep WBZ were sampled in 2017.

Table 2-8. Shallow WBZ Recovery Well VOC Mass Extraction Summary
2017 Annual Periodic Review Report
Essex-Hope Site, Jamestown, New York

Well		Volume Extracted in 2017 (gallons)	Average Total VOC Concentrations in 2017 (µg/L)	Mass Removed in 2017 (pounds)	Total Mass Removed All-time (pounds)
RW-1S	2017 1st Half	28,191	1117	0.26	
	2017 2nd Half	10,358	123	0.01	**21.37**
	2017 TOTAL	**38,549**	**620**	**0.27**	
RW-2S	2017 1st Half	271,640	10	0.02	
	2017 2nd Half	174,795	47	0.07	**22.81**
	2017 TOTAL	**446,434**	**29**	**0.09**	
RW-3S	2017 1st Half	18,282	62	0.010	
	2017 2nd Half	4,149	99	0.003	**4.42**
	2017 TOTAL	**22,431**	**81**	**0.013**	
TOTAL SHALLOW WBZ		**507,414**	**N/A**	**0.38**	**157**

µg/L = micrograms per liter
VOC = volatile organic compound
WBZ = water-bearing zone

Notes:

RW-4S and RW-5S removed approximately 107.9 and 0.65 pounds, respectively, from 1998-2002.

Totals may be slightly off individual values due to rounding.

RW-3S was shut down on August 8, 2017 because of its historically low pumping rates and its hydraulic location (upgradient from RW-1S and RW-2S). This was proposed by CH2M in the 2016 Annual PRR (CH2M, 2017b), and approved by NYSDEC via letter dated May 1, 2017.

Table 2-9. Deep WBZ Recovery Well Mass Extraction Summary
2017 Annual Periodic Review Report
Essex-Hope Site, Jamestown, New York

Well		Volume Extracted in 2017 (gallons)	Average Total VOC Concentrations in 2017 (µg/L)	Mass Removed in 2017 (pounds)	Total Mass Removed All-time (pounds)
RW-2D	2017 1st Half	552,991	9,170	42	
	2017 2nd Half	477,620	5,460	22	**1,219**
	2017 TOTAL	**1,030,611**	**7,315**	**64**	
RW-6D	2017 1st Half	64,208	55,639	30	
	2017 2nd Half	89,498	31,386	23	**1,152**
	2017 TOTAL	**153,707**	**43,513**	**53**	
	TOTAL DEEP WBZ	**1,184,317**	**N/A**	**117**	**2,372**

µg/L = micrograms per liter
VOC = volatile organic compound
WBZ = water-bearing zone

Notes:
1.56 pounds were removed by RW-1D in 1998 and 1999.

Totals may be slightly off individual values due to rounding.

Mass removal calculations include acetone, which is removed but not treated.

Table 5-1. Inspection, Maintenance, Monitoring, and Sampling Schedule
2017 Annual Periodic Review Report
Essex-Hope Site, Jamestown, New York

System	Routine (Biweekly or As Needed)	Monthly	Quarterly	Semiannual	Annual	As Required
GWE&T System Treatment Plant Building	Cartridge filter inspection/ replacement (Sec. 2.4)					
	Inspect Carbon vessels (Sec. 2.4)	Obtain monthly samples and pH readings per Wastewater Discharge Permit (Sec. 5.1)				Replace GAC (Sec. 2.4, Table 5.0)
	Check transfer pump-flow rate (Sec. 2.4)					
	Inspect piping/valves (Sec. 2.4)					Clean flow meters (Sec. 2.4)
	Inspect storage tank (Sec. 2.4)					Clean out storage tank (Sec. 2.4)
	Record recovery well/system flow-rates (Sec. 5.1)					
	Record System pressure readings (Sec. 5.1)					Backflush carbon vessels (Sec. 2.4)
GWE&T System Recovery Wells	Confirm recovery wells are operating properly (Sec. 2.4)			Inspection/maintenance (Sec. 2.4)		Flush piping system (Sec. 2.4)
				Obtain analytical samples per SMP (Sec. 5.1)		Clean pumps/level controls (Sec. 2.4)
					Well redevelopment (Sec. 2.4)	
SSD/VIM System Residence at 159 Hopkington Avenue		Ensure system is in operation (Sec. 4.3)			Inspection/maintenance (Sec. 4.3)	Maintenance (Sec. 4.3)
Asphalt & Concrete Caps				Inspection (Sec. 3.2)		Maintenance (Sec. 3.2)
Monitoring Well System			Measure water levels (Sec. 5.2)		Obtain analytical samples in accordance with SMP (Sec. 5.2)	
			Inspect well integrity (Sec. 5.2)			

GAC = granular-activated carbon
GWE&T = groundwater extraction and treatment
Sec. = section
SMP = site management plan
SSD/VIM = subslab depressurization/vapor intrusion mitigation

Note:
Sections and appendices referenced in this table pertain to the latest O&M Plan for the Site.

Table 5-2. POTW Monthly Monitoring Summary – Pre-carbon Influent
2017 Annual Periodic Review Report
Essex-Hope Site, Jamestown, New York

Parameter	Units	Sample Date											
		January 11	February 2	March 16	April 5	May 10	June 22	July 20	August 8	September 14	October 5	November 14	December 15
Acetone	µg/L	**1,200**	**950**	**750**	**960**	**800**	**280**	**420**	**360**	**590**	**190**	**3,700**	**3,600**
Benzene	µg/L	**7.2**	**7.0 J**	**8.4 J**	**8.6 J**	**7.7 J**	**6.6 J**	**11 J**	**7.6 J**	**5.7 J**	**6.2**	**14 J**	**14 J**
2-Butanone (MEK)	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloromethane	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Isopropylbenzene (Cumene)	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	µg/L	**9.5**	**8.9 J**	**16 J**	**12 J**	**13**	**11**	**18**	**11 J**	**9.9 J**	**13**	**17 J**	**15 J**
cis-1,2-Dichloroethene	µg/L	**3,200 D**	**2,600**	**3,600**	**3,100**	**3,400**	**3,100**	**4,700**	**3,700**	**2,900**	**3,200 E**	**4,800**	**4,700**
trans-1,2-Dichloroethene	µg/L	**14**	ND	ND	ND	**17 J**	**15 J**	**26 J**	ND	ND	**17 J**	ND	ND
1,4-Dioxane	µg/L	ND	ND	**0.583**[a]	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methylene Chloride	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Naphthalene	µg/L	ND	ND	ND	**48 J**	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	µg/L	**0.59 J**	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	µg/L	**1,700 D**	**1,400**	**2,400**	**1,900**	**2,200**	**1,900**	**2,600**	**1,500**	**1,400**	**1,600**	**4,000**	**3,900**
Vinyl Chloride	µg/L	**500**	**420**	**620**	**440**	**570**	**480**	**690**	**610**	**520**	**460**	**1,000**	**560**
Total Xylenes	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Pre-Carbon Total VOCs	**µg/L**	**6,631**	**5,386**	**7,394**	**6,469**	**7,008**	**5,793**	**8,465**	**6,189**	**5,426**	**5,486**	**13,531**	**12,789**

[a] = Tested for 1-4 Dioxane via 8270D-SIM as per NYSDEC request
µg/L = micrograms per liter
D = sample results obtained from a dilution
E = Result exceeded calibration range.
J = Result is less than the reporting limit but greater than or equal to the method detection limit and the concentration is an approximate value.
ND = Not detected/detected below minimum laboratory reporting limit
VOC = volatile organic compound

Table 5-3. POTW Monthly Monitoring Summary – Primary Carbon Effluent

2017 Annual Periodic Review Report

Essex-Hope Site, Jamestown, New York

Parameter	Units	Sample Date											
		January 11	February 2	March 16	April 5	May 10	June 22	July 20	August 8	September 14	October 5	November 14	December 15
Acetone	µg/L	8.1 J	ND	45 J	71 J	2.2 J	ND	ND	ND	ND	ND	270	2,000
Benzene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Butanone (MEK)	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloromethane	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Isopropylbenzene (Cumene)	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	µg/L	ND	0.42 J	ND	4.4 J	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,2-Dichloroethene	µg/L	23	130	990	1,500	3.2	44	200	360	ND	ND	ND	ND
trans-1,2-Dichloroethene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methylene Chloride	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Naphthalene	µg/L	ND	ND	ND	14 J	ND	ND	ND	ND	ND	ND	7 J	ND
Toluene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	µg/L	0.60 J	5.9	96	120	0.36 J	0.67	1.9 J	3.8 J	0.37 J	ND	ND	ND
Vinyl Chloride	µg/L	12	290 E	570	570	600 E	1,100 D	710	870	0.27 J	16	1,000	300
Total Xylenes	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Primary Carbon Total VOCs	**µg/L**	**44**	**426**	**1,701**	**2,279**	**606**	**1,145**	**912**	**1,234**	**1**	**16**	**1,277**	**2,300**

µg/L = Micrograms per liter

D = Sample results obtained from a dilution

J = Result is less than the reporting limit but greater than or equal to the method detection limit and the concentration is an approximate value.

ND = Not detected/detected below minimum laboratory reporting limit

VOC = Volatile organic compound

Note:

Primary carbon results represent effluent from the primary carbon vessel in the two carbon vessel system.

Table 5-4. POTW Monthly Monitoring Summary – Post-carbon Effluent
2017 Annual Periodic Review Report
Essex-Hope Site, Jamestown, New York

Parameter	Units	Sample Date											
		January 11	**February 2**	**March 16**	**April 5**	**May 10**	**June 22**	**July 20**	**August 8**	**September 14**	**October 5**	**November 14**	**December 15**
Acetone	µg/L	ND	ND	ND	**1.5 J**	ND	ND	**1.6 J**	ND	**2.3 J**	ND	**1,100 D**	**2.6 J**
Benzene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**0.16 J**	ND
2-Butanone (MEK)	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroethane	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**1.1 J**	ND
Chloroform	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloromethane	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Isopropylbenzene (Cumene)	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**1.5 J**	ND
1,1-Dichloroethane	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**0.22 J**	ND
cis-1,2-Dichloroethene	µg/L	**1.7**	**1.1 J**	**0.81 J**	**0.82 J**	ND	ND	ND	ND	**5.9**	**4.5**	**4.6**	ND
cis-1,3-Dichloropropene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	**0.39 J**	ND
trans-1,2-Dichloroethene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methylene Chloride	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Naphthalene	µg/L	ND	ND	**0.7 J**	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	µg/L	ND	ND	ND	ND	**0.22 J**	**0.29 J**	**0.31 J**	**0.25 J**	**0.26 J**	ND	**0.41 J**	**0.18 J**
Vinyl Chloride	µg/L	**15**	**4.4**	**23**	**83**	ND	**0.74 J**	**2.1**	**8.0**	**10**	**4.7**	**8.4**	**0.18 J**
Total Xylenes	µg/L	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Post-Carbon Total VOCs	**µg/L**	**16.7**	**5.5**	**24.5**	**85.3**	**0.2**	**1.0**	**4.0**	**8.3**	**18.5**	**9.2**	**1,116.8**	**3.0**
Post-Carbon TTOs	**µg/L**	**16.7**	**5.5**	**24.5**	**83.8**	**0.2**	**1.0**	**2.4**	**8.3**	**16.2**	**9.2**	**16.8**	**0.4**

µg/L = micrograms per liter
D = sample results obtained from a dilution
F1 = MS and/or MSD Recovery is outside acceptance limits.
J = Result is less than the reporting limit but greater than or equal to the method detection limit and the concentration is an approximate value.
ND = Not detected/detected below minimum laboratory reporting limit
TTOs = total toxic organics
VOC = volatile organic compound

Notes:

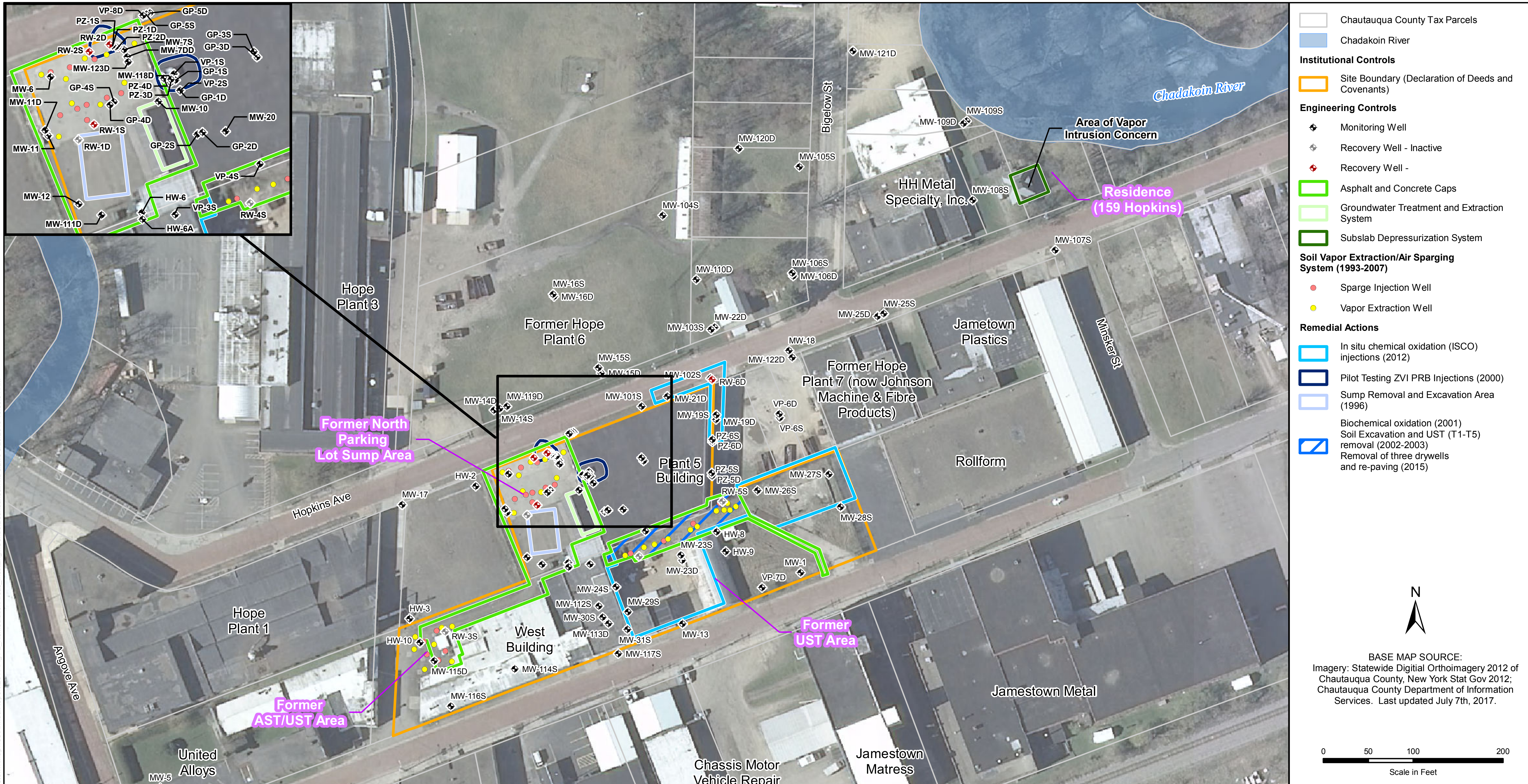
Post-carbon results represent system effluent from the secondary carbon vessel to the POTW.

Post-carbon sample is a laboratory-prepared composite of four grab samples taken at 30-minute intervals.

POTW Discharge Limit = 2,130 µg/L TTOs

Figures

FIGURE 1-1
Site Location and Layout Map
2017 Annual Periodic Review



Essex Specialty Products, Inc

Essex/Hope Site, Jamestown, New York

FIGURE 1-2
Remediation Areas and Institutional and Engineering Control Boundaries
2017 Annual Periodic Review

CREATED BY: LA
REVIEWED BY: MV

ch2m

- Monitoring Well - Annual Sampling Program
- Recovery Well - Semiannual Sampling (Alternating Seasons)
- Monitoring Well
- Site Boundary
- Chautauqua County Tax Parcels
- Chadakoin River

BASE MAP SOURCE:
Imagery: Statewide Digitial Orthoimagery 2012 of Chautauqua County, New York Stat Gov 2012;
Tax Parcel Source: Chautauqua County Department of Information Services. Last updated July 7th, 2017.

Essex Specialty Products, Inc	Essex/Hope Site, Jamestown, New York

FIGURE 2-1
Monitoring Well Network
2017 Annual Periodic Review

CREATED BY: LA
REVIEWED BY: MV

ch2m

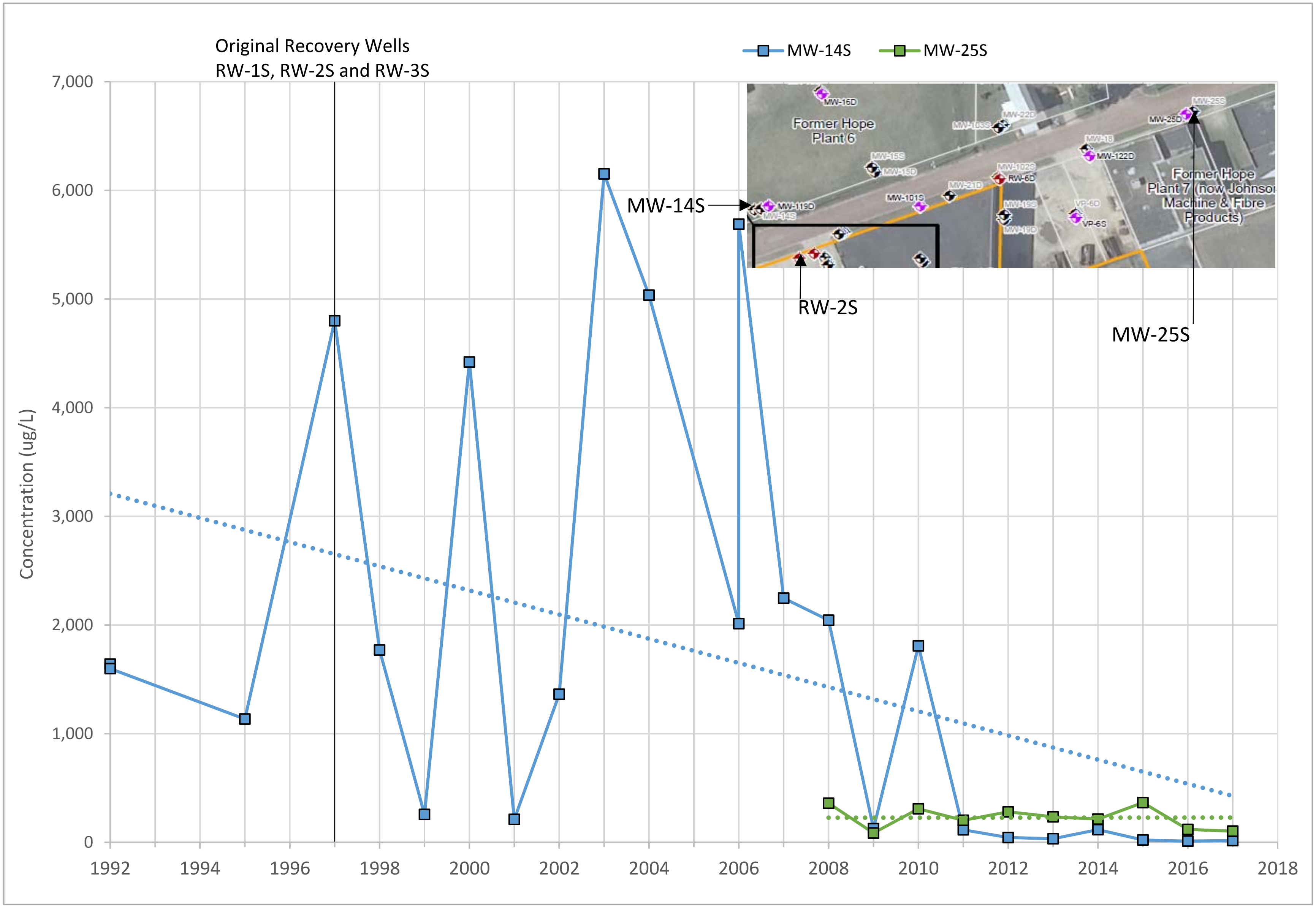


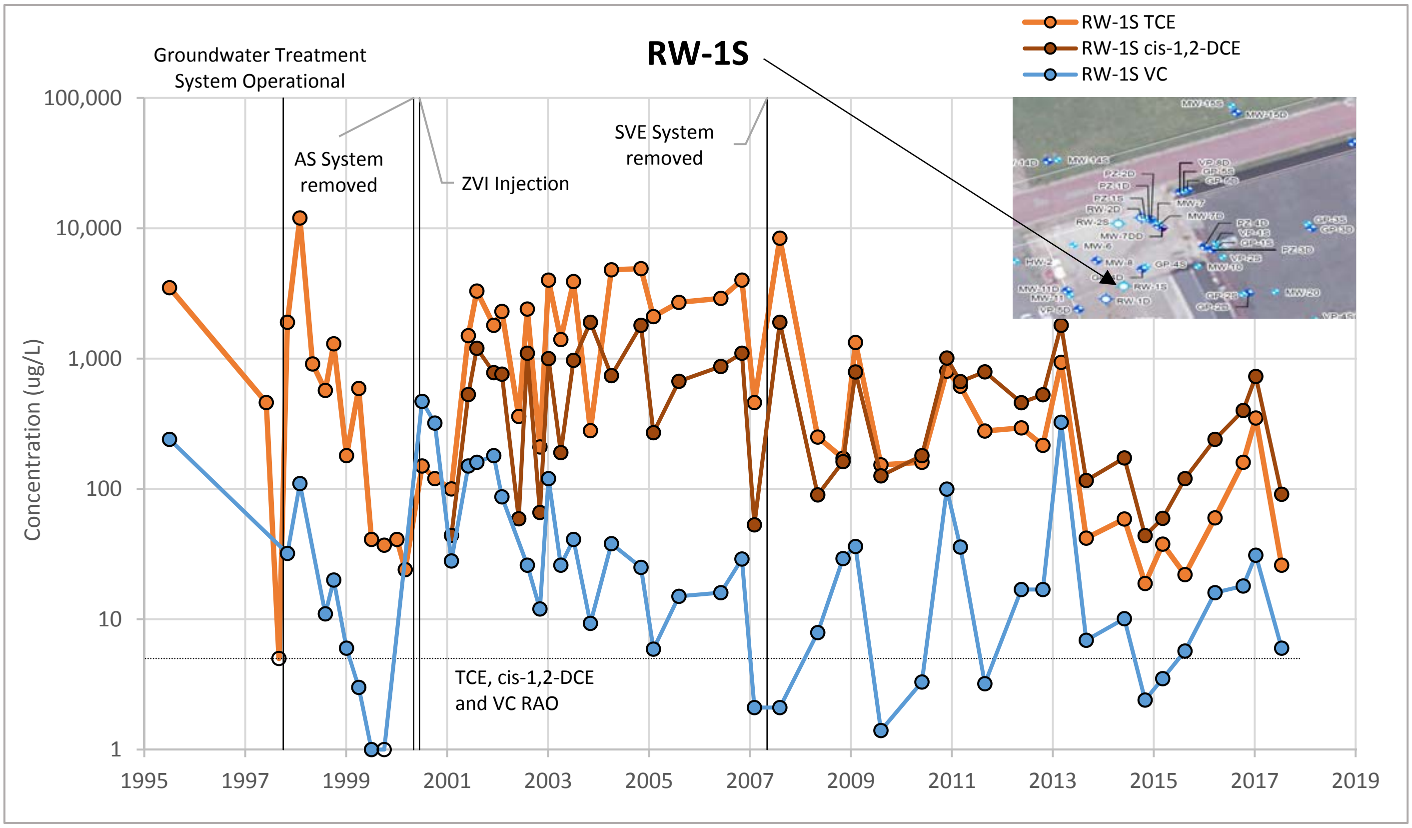
FIGURE 2-2

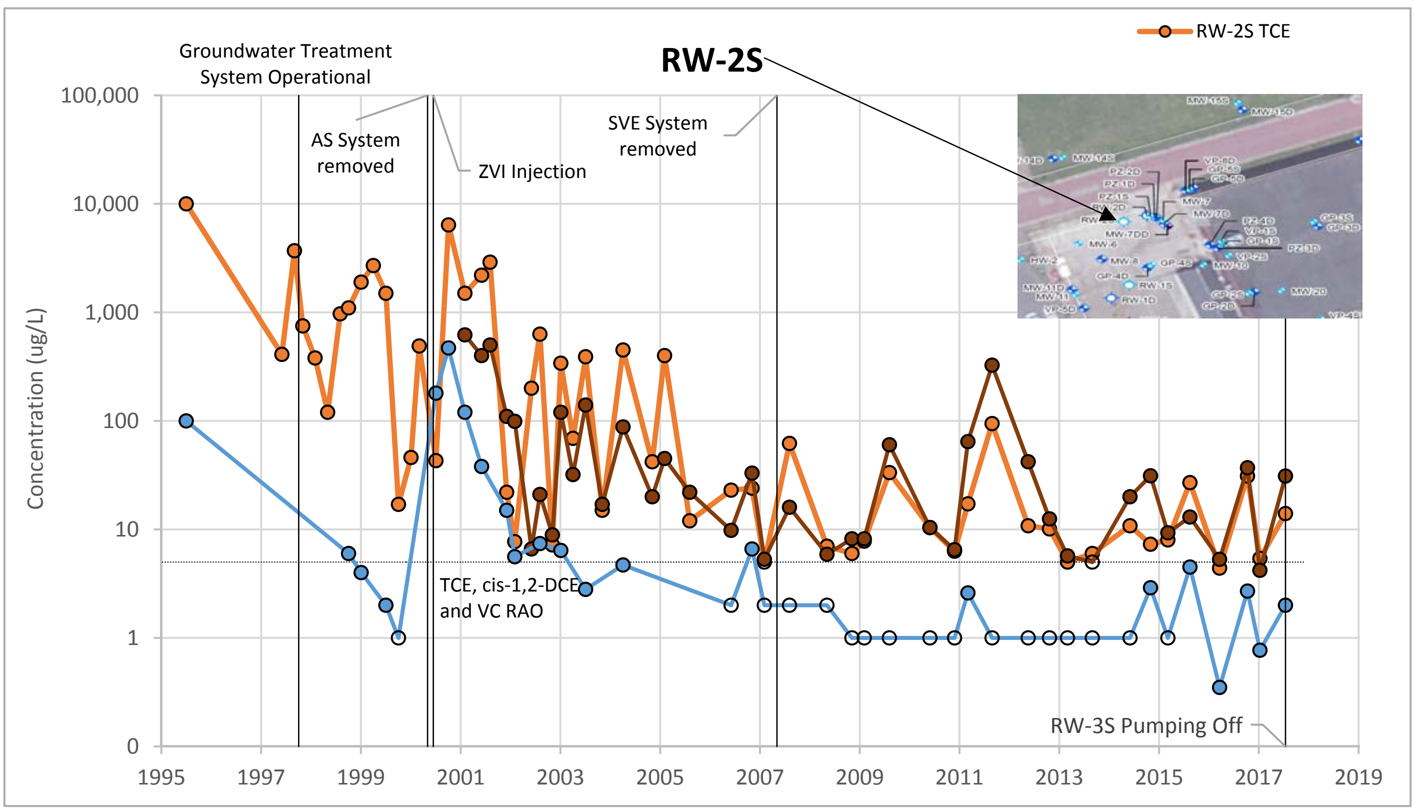
Total VOC Groundwater Concentration Trends at MW-14S and MW-25S

2017 Annual Periodic Review Report

Essex-Hope Site, Jamestown, New York

ch2m





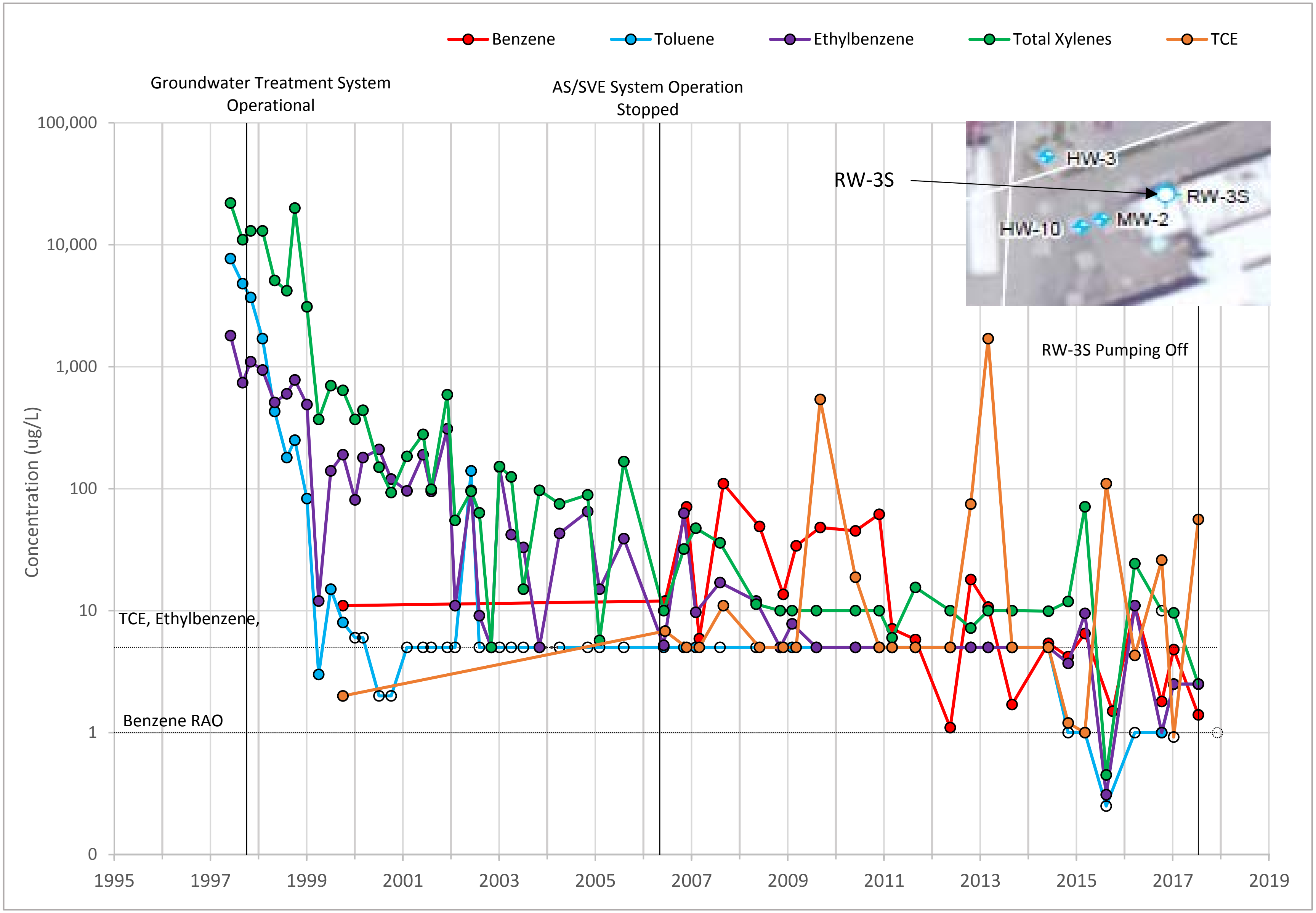
Empty circles indicate non-detect results

FIGURE 2-3

Groundwater Concentration Trends at RW-1S and RW-2S, NPLS Area

2017 Annual Periodic Review Report

Essex-Hope Site, Jamestown, New York



Empty circles indicate non-detect result

FIGURE 2-4

Groundwater Concentration Trends at RW-3S, Former AST/UST Area

2017 Annual Periodic Review Report

Essex-Hope Site, Jamestown, New York

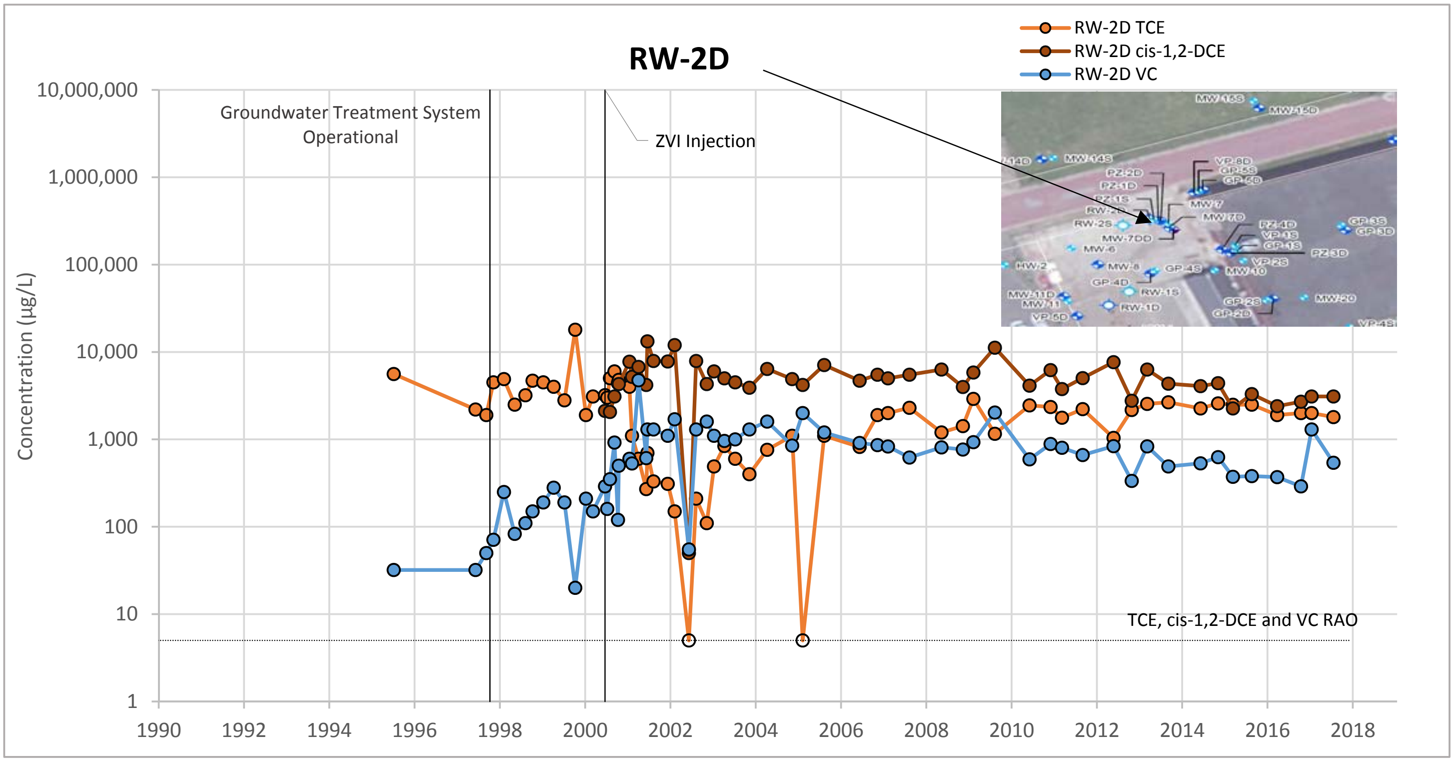
Empty circles indicate non-detect results

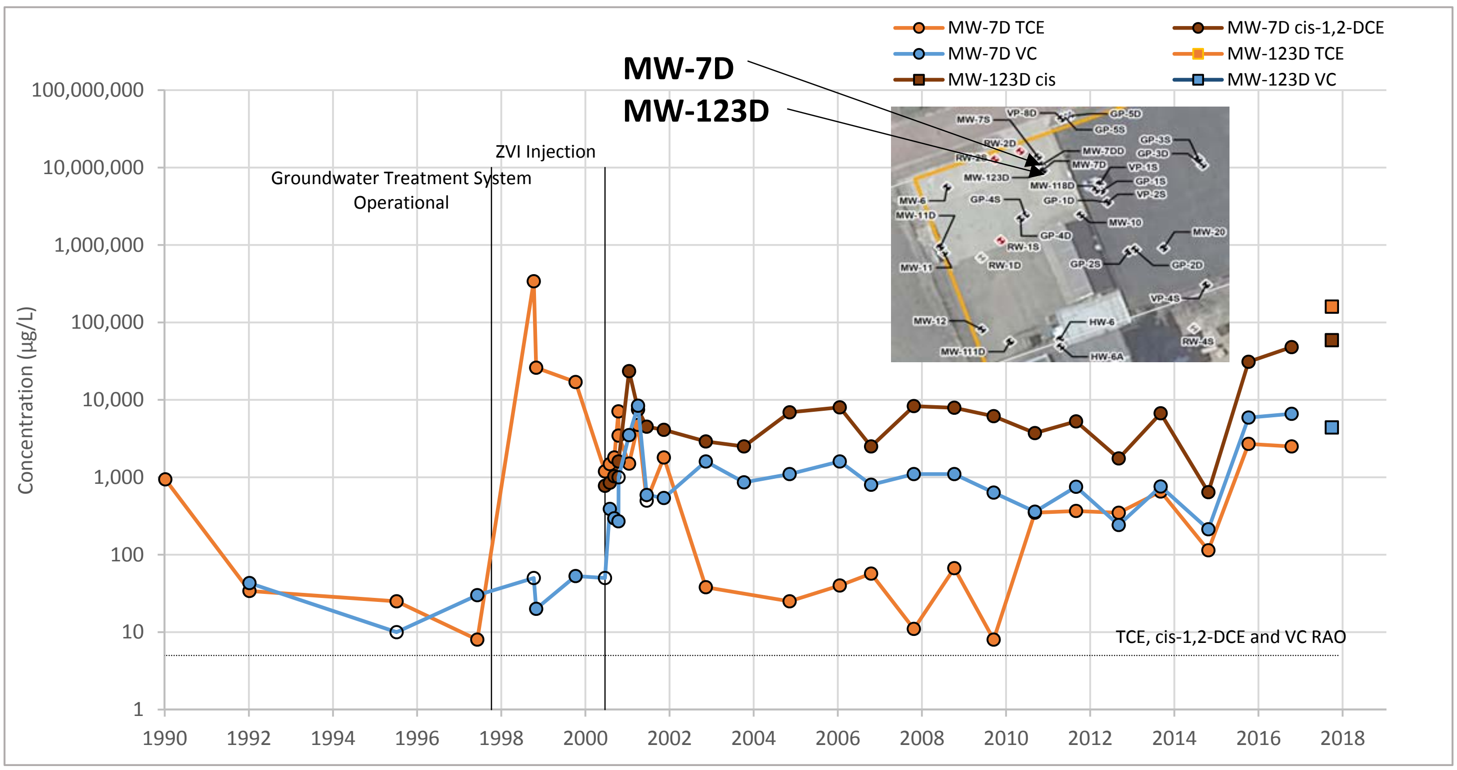
FIGURE 2-5

Shallow WBZ Total CBTEX Concentration Trends, Former UST Area

2017 Annual Periodic Review Report

Essex-Hope Site, Jamestown, New York



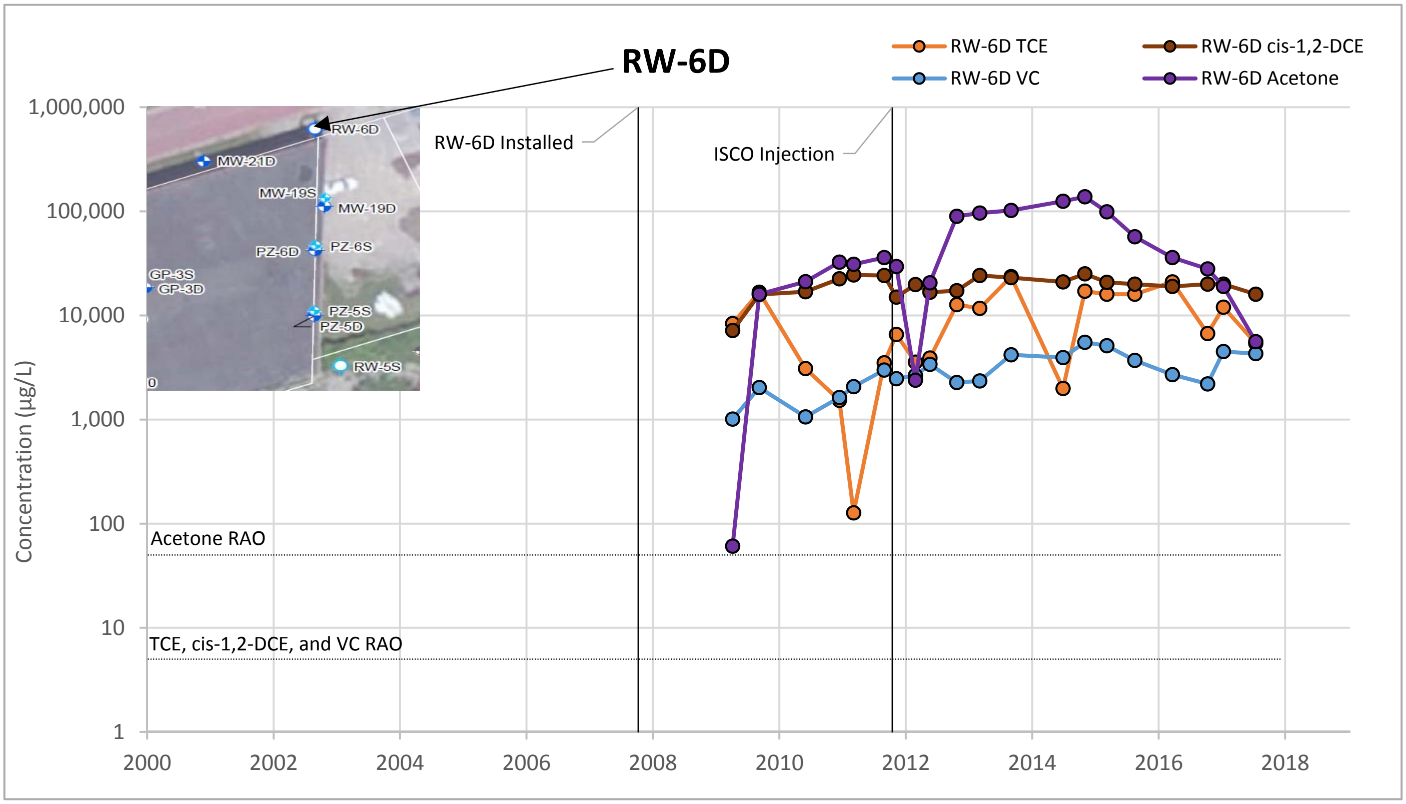


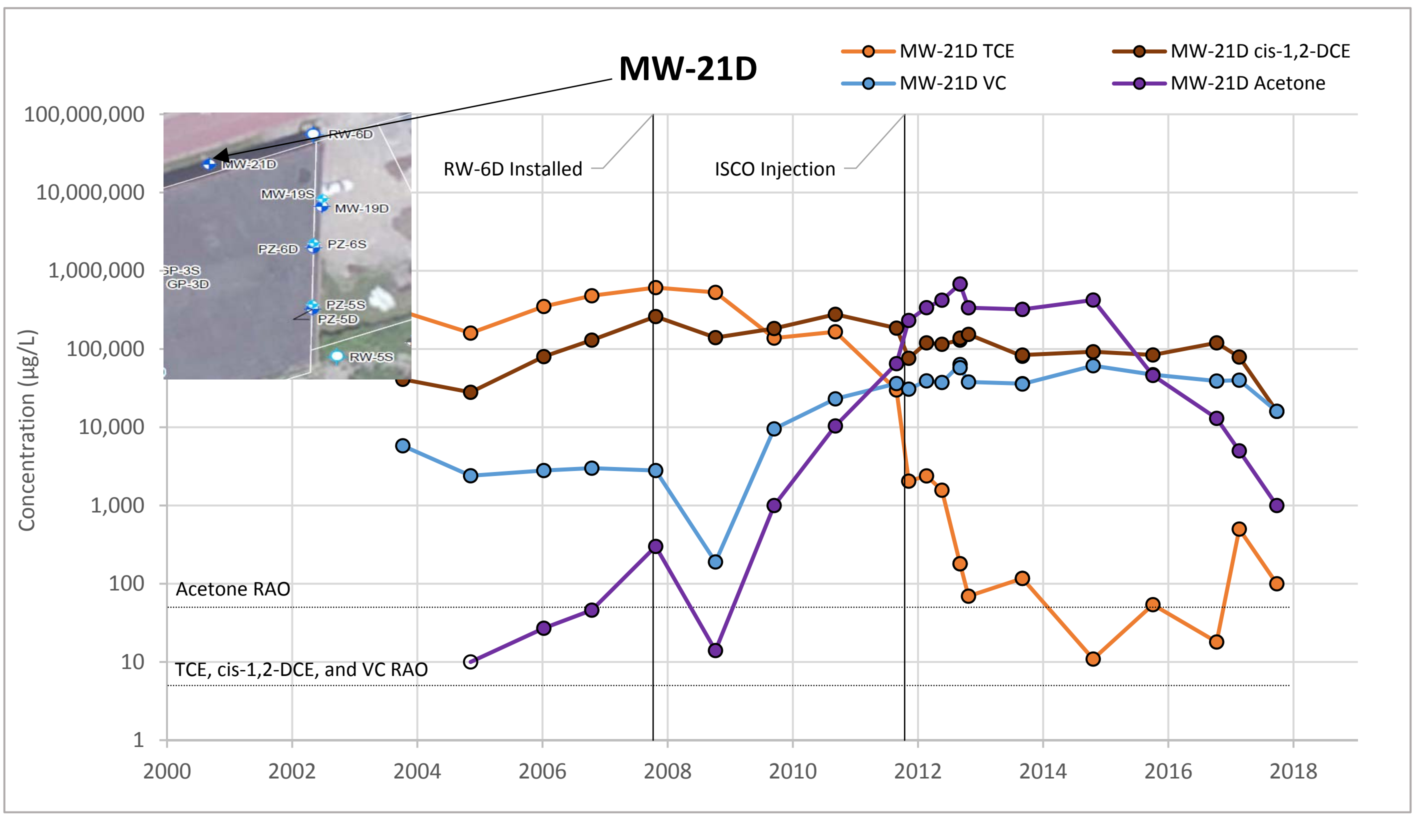
1. Empty circles indicate non-detect results

2. MW-7D was abandoned in 2017 and replaced by MW-123D, although MW-123D is screened higher (25-35 ft bgs) than MW-7D (35-45 ft bgs)

FIGURE 2-6
Groundwater Concentration Trends at RW-2D and MW-7D, NPLS Area
2017 Annual Periodic Review Report
Essex-Hope Site, Jamestown, New York

ch2m





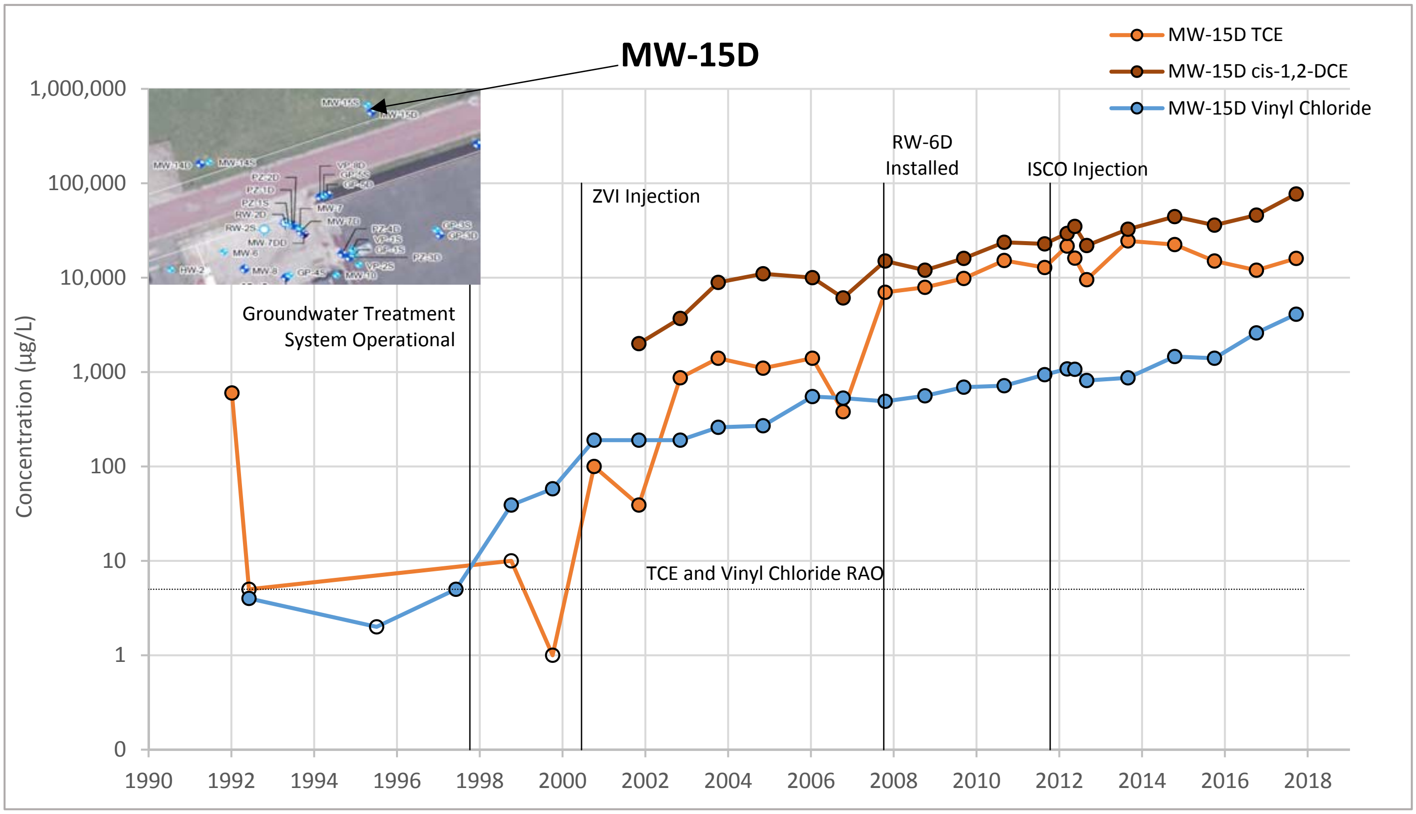
Empty circles indicate non-detect results

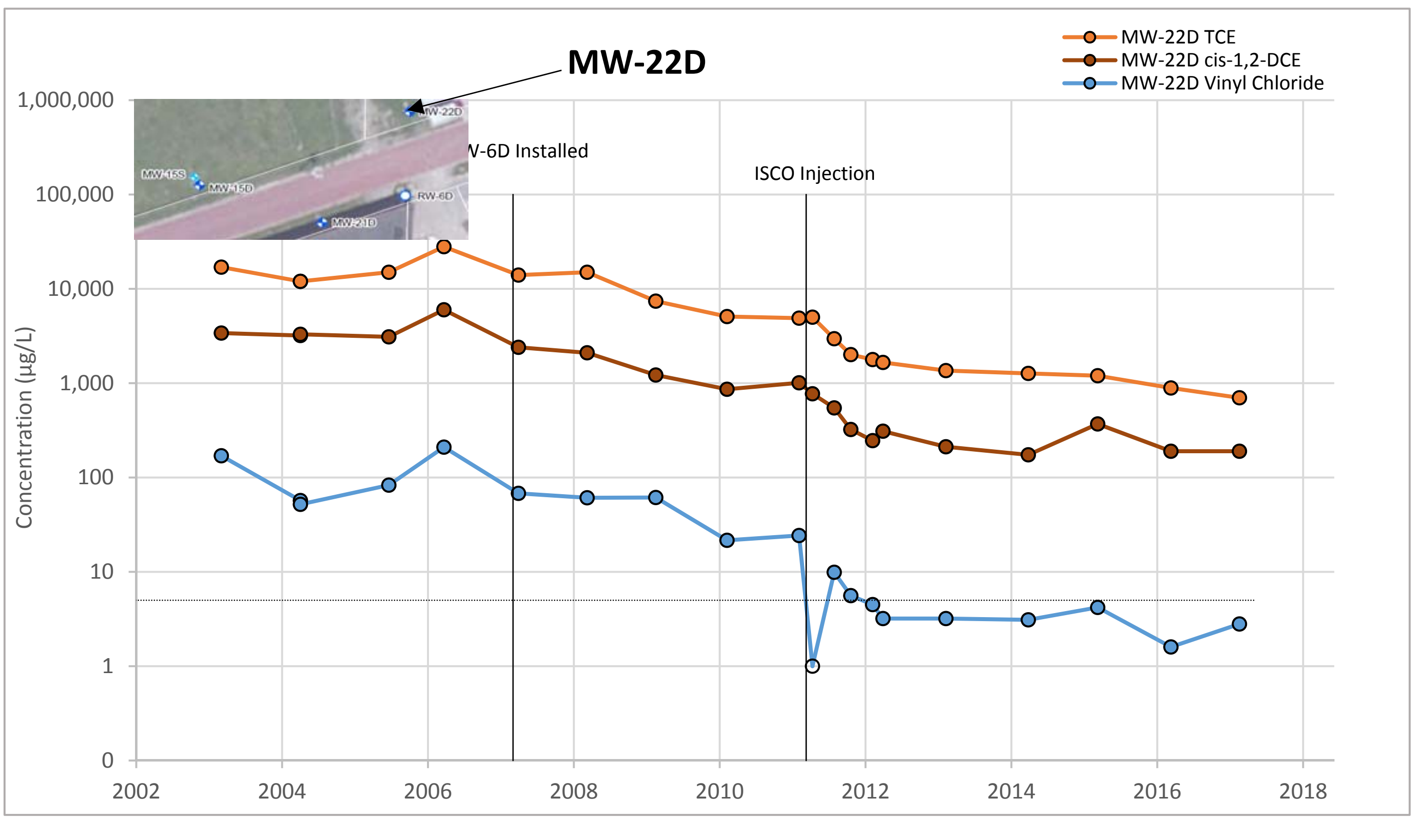
FIGURE 2-7

Groundwater Concentration Trends at RW-6D and MW-21D, Plant 5 Building

2017 Annual Periodic Review Report

Essex-Hope Site, Jamestown, New York





Empty circles indicate non-detect results
MW-15D was installed in November 2003

FIGURE 2-8
Groundwater Concentration Trends at MW-15D and MW-22D
2017 Annual Periodic Review Report
Essex-Hope Site, Jamestown, New York

ch2m

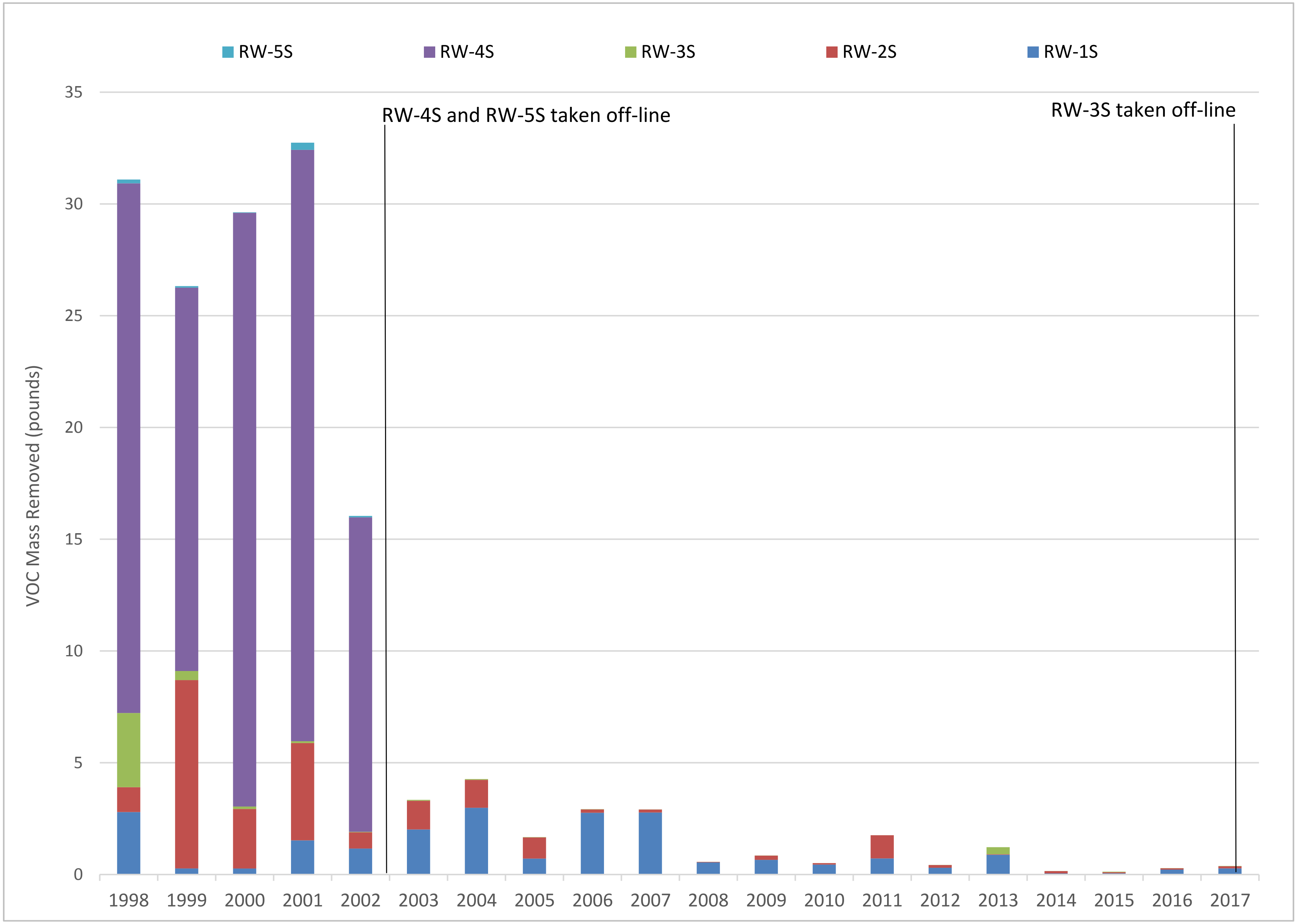


FIGURE 2-9
Shallow WBZ Groundwater Extraction System Mass Removal
2017 Annual Periodic Review Report
Essex-Hope Site, Jamestown, New York

Note:

RW-3S was shut down in August 8, 2017 because of its historically low pumping rates and its hydraulic location (upgradient from RW-1S and RW-2S). This was proposed by CH2M in the 2016 Annual Periodic Review Report (CH2M, 2017), and approved by NYSDEC via letter dated May 1, 2017.

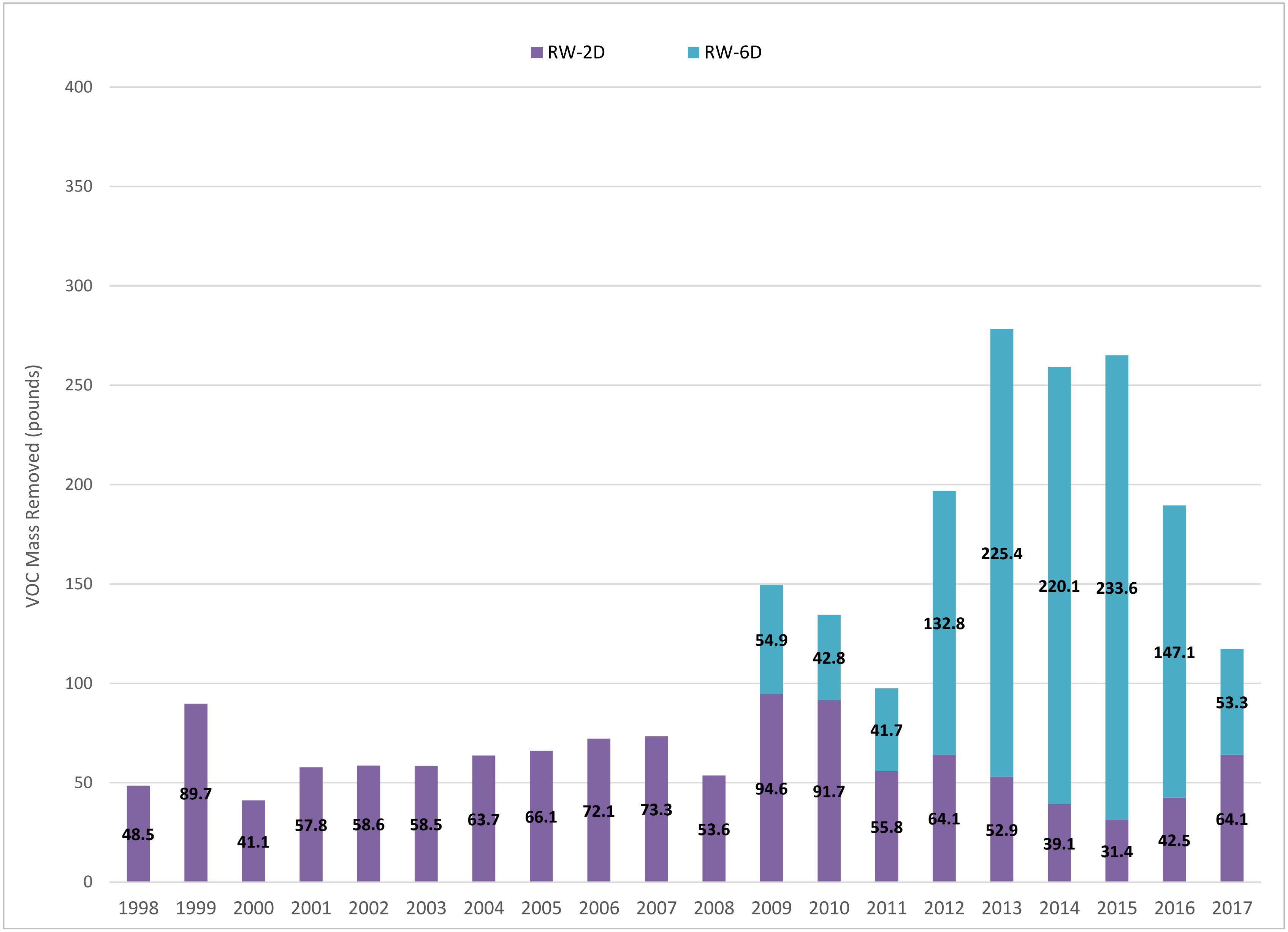


FIGURE 2-10

Deep WBZ Groundwater Extraction System Mass Removal

2017 Annual Periodic Review Report

Essex-Hope Site, Jamestown, New York

Notes:

Mass removed by RW-1D in 1998 and 1999 not available.

Mass removal calculations include Acetone, which is removed but not not treated.

Appendix A
IC/EC Certifications

Enclosure 1

Certification Instructions

I. Verification of Site Details (Box 1 and Box 2):

Answer the three questions in the Verification of Site Details Section. The Owner and/or Qualified Environmental Professional (QEP) may include handwritten changes and/or other supporting documentation, as necessary.

II. Certification of Institutional Controls/ Engineering Controls (IC/ECs)(Boxes 3, 4, and 5)

1.1.1. Review the listed IC/ECs, confirming that all existing controls are listed, and that all existing controls are still applicable. If there is a control that is no longer applicable the Owner / Remedial Party should petition the Department separately to request approval to remove the control.

2. In Box 5, complete certifications for all Plan components, as applicable, by checking the corresponding checkbox.

3. If you <u>cannot</u> certify “YES” for each Control listed in Box 3 & Box 4, sign and date the form in Box 5. Attach supporting documentation that explains why the **Certification** cannot be rendered, as well as a plan of proposed corrective measures, and an associated schedule for completing the corrective measures. Note that this **Certification** form must be submitted even if an IC or EC cannot be certified; however, the certification process will not be considered complete until corrective action is completed.

If the Department concurs with the explanation, the proposed corrective measures, and the proposed schedule, a letter authorizing the implementation of those corrective measures will be issued by the Department's Project Manager. Once the corrective measures are complete, a new Periodic Review Report (with IC/EC Certification) must be submitted within 45 days to the Department. If the Department has any questions or concerns regarding the PRR and/or completion of the IC/EC Certification, the Project Manager will contact you.

III. IC/EC Certification by Signature (Box 6 and Box 7**):**

If you certified "YES" for each Control, please complete and sign the IC/EC Certifications page as follows:

- For the Institutional Controls on the use of the property, the certification statement in Box 6 shall be completed and may be made by the property owner or designated representative.

- For the Engineering Controls, the certification statement in Box 7 must be completed by a Professional Engineer or Qualified Environmental Professional, as noted on the form.

Enclosure 2
NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
Site Management Periodic Review Report Notice
Institutional and Engineering Controls Certification Form

Site Details **Box 1**

Site No. 907015

Site Name Essex; Hope Site

Site Address: 125 Blackstone Avenue Zip Code: 14701
City/Town: Jamestown
County: Chautauqua
Site Acreage: 4.7

Reporting Period: March 01, 2017 to March 01, 2018

	YES	NO
1. Is the information above correct?	☒	☐
If NO, include handwritten above or on a separate sheet.		
2. Has some or all of the site property been sold, subdivided, merged, or undergone a tax map amendment during this Reporting Period?	☐	☒
3. Has there been any change of use at the site during this Reporting Period (see 6NYCRR 375-1.11(d))?	☐	☒
4. Have any federal, state, and/or local permits (e.g., building, discharge) been issued for or at the property during this Reporting Period?	☐	☒
If you answered YES to questions 2 thru 4, include documentation or evidence that documentation has been previously submitted with this certification form.		
5. Is the site currently undergoing development?	☐	☒

Box 2

	YES	NO
6. Is the current site use consistent with the use(s) listed below? Industrial (metal manufacturing operations involving use of TCE and other solvents)	☒	☐
7. Are all ICs/ECs in place and functioning as designed?	☒	☐

IF THE ANSWER TO EITHER QUESTION 6 OR 7 IS NO, sign and date below and DO NOT COMPLETE THE REST OF THIS FORM. Otherwise continue.

A Corrective Measures Work Plan must be submitted along with this form to address these issues.

____ ________________
Signature of Owner, Remedial Party or Designated Representative Date

SITE NO. 907015 **Box 3**

Description of Institutional Controls

Parcel	Owner	Institutional Control
303-8-2	Custom Production Mfg. Inc.	O&M Plan Ground Water Use Restriction Land Use Restriction Building Use Restriction

Site in operation and maintenance (O&M) phase of remediation.
Declaration of Covenants and Restrictions filed with Chautauqua County on March 14, 2014
Prohibition of groundwater use
Industrial use restriction
Adhere to O&M Plan

Description of Engineering Controls **Box 4**

Parcel	Engineering Control
303-8-2	Groundwater Extraction and Treatment System Vapor Intrusion Mitigation System Groundwater Containment Asphalt and Concrete Caps

Groundwater containment by recovery wells
Activated Carbon Treatment
Discharge to POTW
One residential sub-slab depressurization system

Box 5

Periodic Review Report (PRR) Certification Statements

1. I certify by checking "YES" below that:

   a) the Periodic Review report and all attachments were prepared under the direction of, and reviewed by, the party making the certification;

   b) to the best of my knowledge and belief, the work and conclusions described in this certification are in accordance with the requirements of the site remedial program, and generally accepted engineering practices; and the information presented is accurate and compete.

YES	NO
☒	☐

2. If this site has an IC/EC Plan (or equivalent as required in the Decision Document), for each Institutional or Engineering control listed in Boxes 3 and/or 4, I certify by checking "YES" below that all of the following statements are true:

   (a) the Institutional Control and/or Engineering Control(s) employed at this site is unchanged since the date that the Control was put in-place, or was last approved by the Department;

   (b) nothing has occurred that would impair the ability of such Control, to protect public health and the environment;

   (c) access to the site will continue to be provided to the Department, to evaluate the remedy, including access to evaluate the continued maintenance of this Control;

   (d) nothing has occurred that would constitute a violation or failure to comply with the Site Management Plan for this Control; and

   (e) if a financial assurance mechanism is required by the oversight document for the site, the mechanism remains valid and sufficient for its intended purpose established in the document.

YES	NO
☒	☐

IF THE ANSWER TO QUESTION 2 IS NO, sign and date below and
DO NOT COMPLETE THE REST OF THIS FORM. Otherwise continue.

A Corrective Measures Work Plan must be submitted along with this form to address these issues.

____ ____________________

Signature of Owner, Remedial Party or Designated Representative Date

IC CERTIFICATIONS
SITE NO. 907015

Box 6

SITE OWNER OR DESIGNATED REPRESENTATIVE SIGNATURE

I certify that all information and statements in Boxes 1,2, and 3 are true. I understand that a false statement made herein is punishable as a Class "A" misdemeanor, pursuant to Section 210.45 of the Penal Law.

I **Timothy A. King** at **c/o The Dow Chemical Company 2001 Union Carbide Dr. South Charleston, WV**,
print name / print business address

am certifying as **Remedial Party (Essex Specialty)** (Owner or Remedial Party)

for the Site named in the Site Details Section of this form.

Signature of Owner, Remedial Party, or Designated Representative Rendering Certification

Date 3/28/18

IC/EC CERTIFICATIONS

Box 7

Professional Engineer Signature

I certify that all information in Boxes 4 and 5 are true. I understand that a false statement made herein is punishable as a Class "A" misdemeanor, pursuant to Section 210.45 of the Penal Law.

I **Key Rosebrook** at **CH2M HILL 2411 Dulles Corner Park, Suite #500 Herndon,VA 20171**,

print name — print business address

am certifying as a Professional Engineer for the **Remedial Party (Essex Specialty)**

(Owner or Remedial Party)

STATE OF NEW YORK
KEY ROSEBROOK
089440-1
LICENSED PROFESSIONAL ENGINEER

Key Rosebrook

Signature of Professional Engineer, for the Owner or Remedial Party, Rendering Certification

Stamp (Required for PE)

3/14/18

Date

Enclosure 3
Periodic Review Report (PRR) General Guidance

I. Executive Summary: (1/2-page or less)
   A. Provide a brief summary of site, nature and extent of contamination, and remedial history.
   B. Effectiveness of the Remedial Program - Provide overall conclusions regarding;
      1. progress made during the reporting period toward meeting the remedial objectives for the site
      2. the ultimate ability of the remedial program to achieve the remedial objectives for the site.
   C. Compliance
      1. Identify any areas of non-compliance regarding the major elements of the Site Management Plan (SMP, i.e., the Institutional/Engineering Control (IC/EC) Plan, the Monitoring Plan, and the Operation & Maintenance (O&M) Plan).
      2. Propose steps to be taken and a schedule to correct any areas of non-compliance.
   D. Recommendations
      1. recommend whether any changes to the SMP are needed
      2. recommend any changes to the frequency for submittal of PRRs (increase, decrease)
      3. recommend whether the requirements for discontinuing site management have been met.

II. Site Overview (one page or less)
   A. Describe the site location, boundaries (figure), significant features, surrounding area, and the nature and extent of contamination prior to site remediation.
   B. Describe the chronology of the main features of the remedial program for the site, the components of the selected remedy, cleanup goals, site closure criteria, and any significant changes to the selected remedy that have been made since remedy selection.

III. Evaluate Remedy Performance, Effectiveness, and Protectiveness

   Using tables, graphs, charts and bulleted text to the extent practicable, describe the effectiveness of the remedy in achieving the remedial goals for the site. Base findings, recommendations, and conclusions on objective data. Evaluations and should be presented simply and concisely.

IV. IC/EC Plan Compliance Report (if applicable)
   A. IC/EC Requirements and Compliance
      1. Describe each control, its objective, and how performance of the control is evaluated.
      2. Summarize the status of each goal (whether it is fully in place and its effectiveness).
      3. Corrective Measures: describe steps proposed to address any deficiencies in ICECs.
      4. Conclusions and recommendations for changes.
   B. IC/EC Certification
      1. The certification must be complete (even if there are IC/EC deficiencies), and certified by the appropriate party as set forth in a Department-approved certification form(s).

V. Monitoring Plan Compliance Report (if applicable)
   A. Components of the Monitoring Plan (tabular presentations preferred) - Describe the requirements of the monitoring plan by media (i.e., soil, groundwater, sediment, etc.) and by any remedial technologies being used at the site.
   B. Summary of Monitoring Completed During Reporting Period - Describe the monitoring tasks actually completed during this PRR reporting period. Tables and/or figures should be used to show all data.
   C. Comparisons with Remedial Objectives - Compare the results of all monitoring with the remedial objectives for the site. Include trend analyses where possible.
   D. Monitoring Deficiencies - Describe any ways in which monitoring did not fully comply with the monitoring plan.
   E. Conclusions and Recommendations for Changes - Provide overall conclusions regarding the monitoring completed and the resulting evaluations regarding remedial effectiveness.

VI. Operation & Maintenance (O&M) Plan Compliance Report (if applicable)
   A. Components of O&M Plan - Describe the requirements of the O&M plan including required activities, frequencies, recordkeeping, etc.
   B. Summary of O&M Completed During Reporting Period - Describe the O&M tasks actually completed during this PRR reporting period.
   C. Evaluation of Remedial Systems - Based upon the results of the O&M activities completed, evaluated the ability of each component of the remedy subject to O&M requirements to perform as

designed/expected.

D. O&M Deficiencies - Identify any deficiencies in complying with the O&M plan during this PRR reporting period.

E. Conclusions and Recommendations for Improvements - Provide an overall conclusion regarding O&M for the site and identify any suggested improvements requiring changes in the O&M Plan.

VII. Overall PRR Conclusions and Recommendations

A. Compliance with SMP - For each component of the SMP (i.e., IC/EC, monitoring, O&M), summarize;
   1. whether all requirements of each plan were met during the reporting period
   2. any requirements not met
   3. proposed plans and a schedule for coming into full compliance.

B. Performance and Effectiveness of the Remedy - Based upon your evaluation of the components of the SMP, form conclusions about the performance of each component and the ability of the remedy to achieve the remedial objectives for the site.

C. Future PRR Submittals
   1. Recommend, with supporting justification, whether the frequency of the submittal of PRRs should be changed (either increased or decreased).
   2. If the requirements for site closure have been achieved, contact the Departments Project Manager for the site to determine what, if any, additional documentation is needed to support a decision to discontinue site management.

VIII. Additional Guidance

Additional guidance regarding the preparation and submittal of an acceptable PRR can be obtained from the Departments Project Manager for the site.

Appendix B
2017 Data Gap Investigation Report

(included under separate cover)

Appendix B is submitted under separate cover.

Appendix C
Groundwater Extraction Monitoring Data

C1
2017 Groundwater Extraction System Data

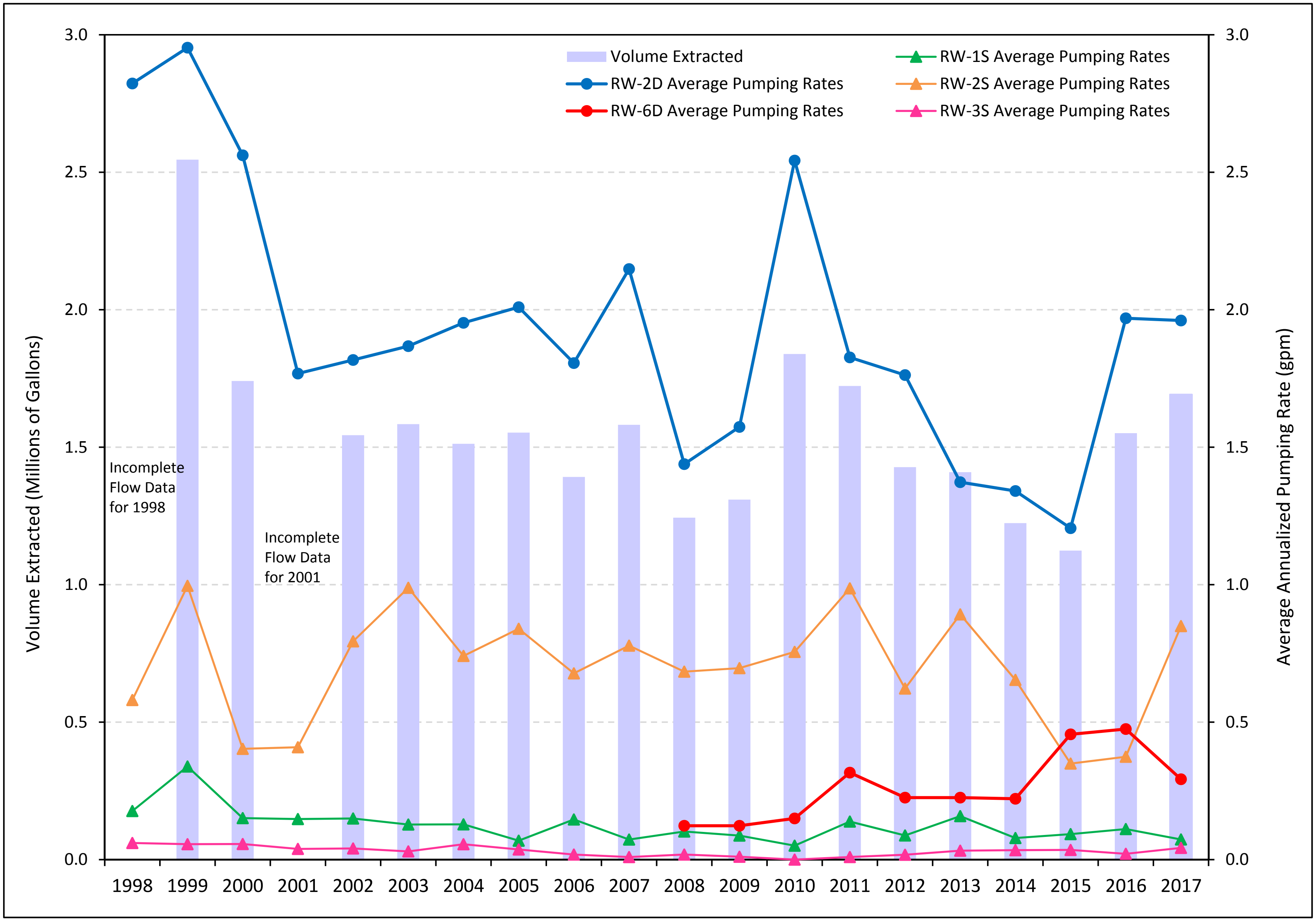


FIGURE C1
Annual Groundwater Extraction by Recovery Well
2017 Annual Periodic Review Report
Essex/Hope Site, Jamestown, New York

Notes:

1. Volume extracted in 2017 includes January through December data.
2. Pumping rates for 2017 were averaged over 365-day reporting period.

ch2m

C2
2017 Recovery Well Performance Data

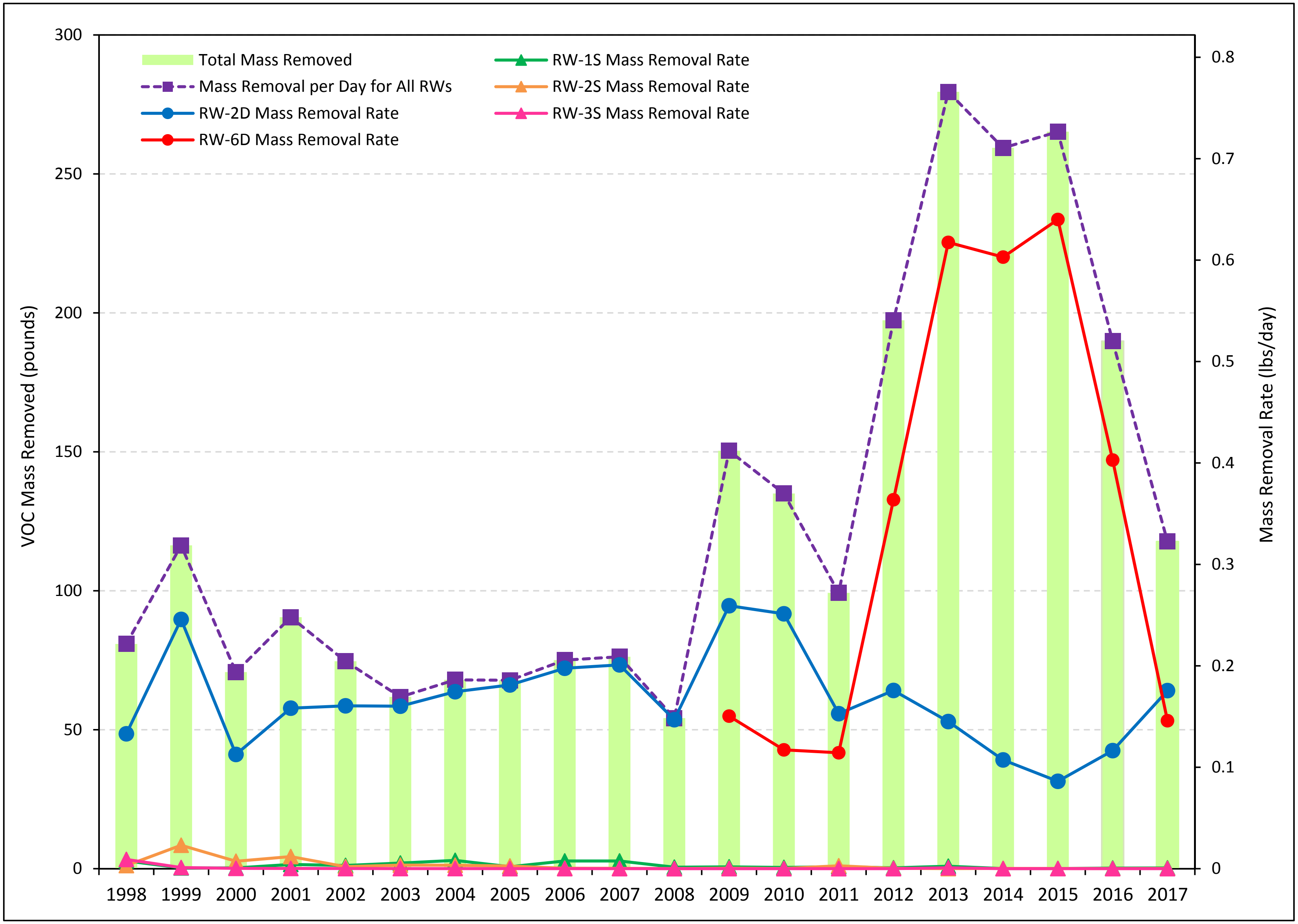


FIGURE C2
Annual VOC Mass Removed by Well
2017 Annual Periodic Review Report
Essex/Hope Site, Jamestown, New York

Notes:

1. Mass removal calculations include acetone, which is removed but not not treated.
2. VOC Mass Removed in 2017 includes January through December data.

RW = Recovery Well

VOCs = volatile organic compounds

Appendix D
2017 Groundwater Potentiometric Surface Maps

Monitoring Well
Piezometer
Active Recovery Well
Groundwater Elevation Contour (Dashed where inferred)
Chautauqua County Tax Parcels
streets
Extent of Capture Zone
Approximate Site Boundary
Chadakoin River

Note:
1. HW-8 water level appears to be anomalous, not included in contouring.
2. All elevations are in feet above mean sea level, NAVD88.
3. March 2017 pumping rates (gpm):
RW-1S: 0.12
RW-2S: 1.14
RW-3S: 0.04 (Offline from 3/23/2017 through 6/6/2017)
4. gpm = gallons per minute

N

BASE MAP SOURCE:
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

0 25 50 100
Scale in Feet

Essex Specialty Products, Inc	Essex/Hope Site, Jamestown, New York

FIGURE D1
Shallow WBZ Potentiometric Surface Map
March 13th, 2017
2017 Annual Periodic Review Report

CREATED BY: LA
REVIEWED BY: MV

ch2m.

Inactive Recovery Well

Monitoring Well

Piezometer

Active Recovery Well

Groundwater Elevation Contour (Dashed where inferred)

Extent of Capture Zone

Approximate Site Boundary

Chautauqua County Tax Parcels

Note:
1. All elevations are in feet above mean sea level, NAVD88.
2. March 2017 pumping rates (gpm):
RW-2D: 2.88
RW-6D: 0.25
3. gpm = gallons per minute
4. MW-7D water level appears anomalous, not included in contouring

N

BASE MAP SOURCE:
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

0 25 50 100
Scale in Feet

Essex Specialty Products, Inc	Essex/Hope Site, Jamestown, New York

FIGURE D2
Deep WBZ Potentiometric Surface Map
March 13th, 2017
2017 Annual Periodic Review Report

CREATED BY: LA
REVIEWED BY: MV

ch2m:

Monitoring Well

Piezometer

Active Recovery Well

streets

Groundwater Elevation Contour (Dashed where inferred)

Chautauqua County Tax Parcels

Extent of Capture Zone

Chadakoin River

Approximate Site Boundary

Note:
1. All elevations are in feet above mean sea level, NAVD88.
2. June 2017 pumping rates (gpm):
RW-1S: 0.06
RW-2S: 1.34
RW-3S: 0.37 (Offline from 3/23/2017 through 6/6/2017)
3. gpm = gallons per minute

N

BASE MAP SOURCE:
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

0 25 50 100
Scale in Feet

Essex Specialty Products, Inc	Essex/Hope Site, Jamestown, New York

FIGURE D3
Shallow WBZ Potentiometric Surface Map
June 27th, 2017
2017 Annual Periodic Review Report

CREATED BY: LA
REVIEWED BY: MV

ch2m:

Inactive Recovery Well

Monitoring Well

Piezometer

Active Recovery Well

Groundwater Elevation Contour (Dashed where inferred)

Extent of Capture Zone

Approximate Site Boundary

Chautauqua County Tax Parcels

Note:
1. All elevations are in feet above mean sea level, NAVD88.
2. June 2017 pumping rates (gpm):
RW-2D: 2.14
RW-6D: 0.51
3. gpm = gallons per minute

N

BASE MAP SOURCE:
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

0 25 50 100

Scale in Feet

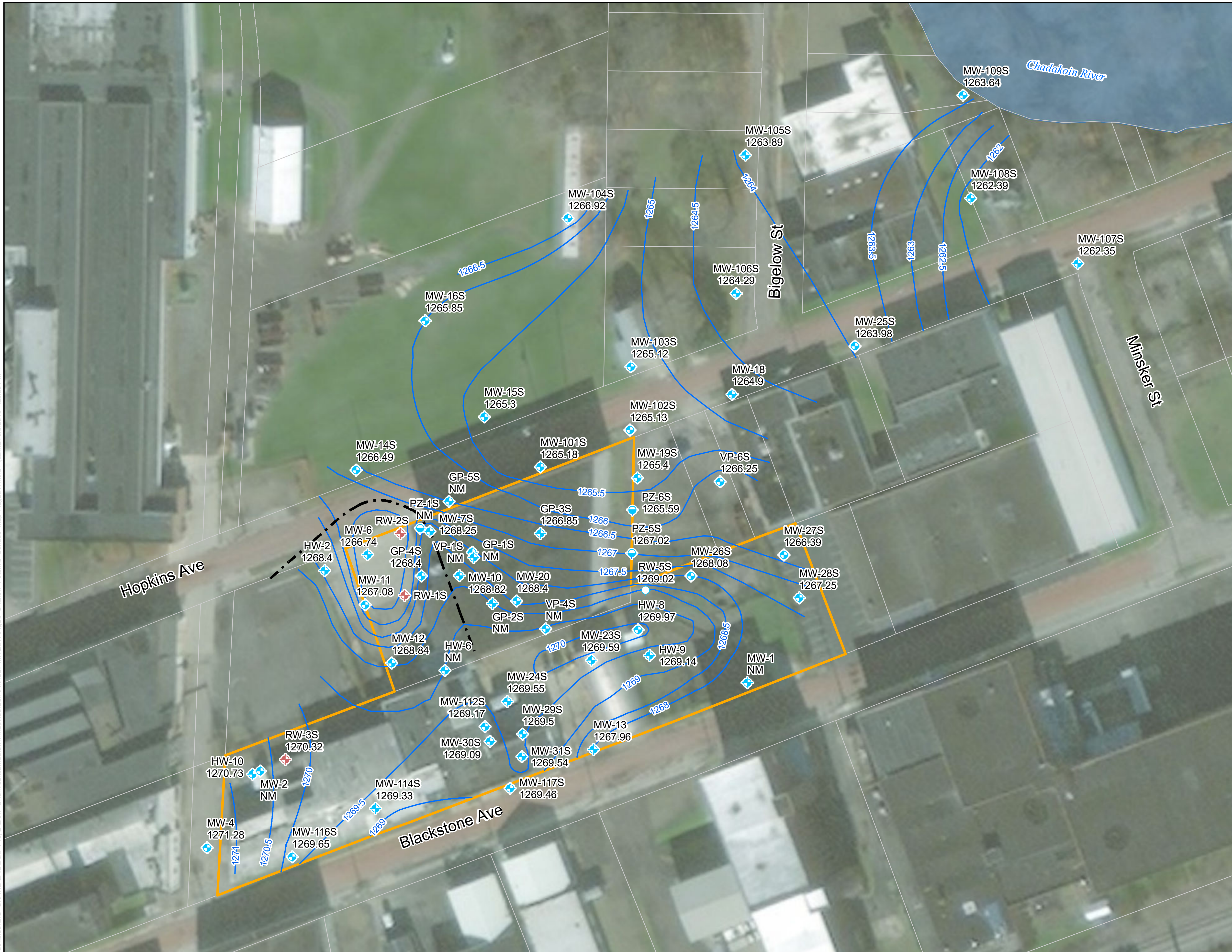
Essex Specialty Products, Inc	Essex/Hope Site, Jamestown, New York

FIGURE D4
Deep WBZ Potentiometric Surface Map
June 27th, 2017
2017 Annual Periodic Review Report

CREATED BY: LA

REVIEWED BY: MV

ch2m



- Active Recovery Well
- Monitoring Well
- Piezometer
- Inactive Recovery Well
- Extent of Capture Zone
- Groundwater Elevation Contour (dashed where inferred)
- Approximate Site Boundary
- Chautauqua County Tax Parcels
- Chadakoin River

Notes:
1. All elevations are in feet above mean sea level, NAVD88.
2. August 2017 pumping rates (gpm):
RW-1S: Off-line from 7/5/2017 to 8/30/17 due to faulty controller
RW-2S: 0.3 gpm
RW-3S: Off-line since 5/8/2017; shut off permanently as of 8/30/2017
3. gpm = gallons per minute

N

BASE MAP SOURCE:
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

0 25 50 100
Scale in Feet

Essex Specialty Products, Inc	Essex/Hope Site, Jamestown, New York

FIGURE D5
Shallow WBZ Potentiometric Surface Map, August 23rd 2017
2017 Annual Periodic Review Report

CREATED BY: LA
REVIEWED BY: FR

ch2m:

Monitoring Well
Piezometer
Inactive Recovery Well
Recovery Well
Extent of Capture Zone
Groundwater Elevation Contour (dashed where inferred)
Approximate Site Boundary
Chautauqua County Tax Parcels

Notes:
1. All elevations are in feet above mean sea level, NAVD88.
2. August 2017 pumping rates (gpm):
RW-2D: 1.5 gpm
RW-6D: 0.2 gpm
3. gpm = gallons per minute
4. VP-8D and GP-4D appear to be anomalous, not included in contouring.

N

BASE MAP SOURCE:
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

0 25 50 100
Scale in Feet

Essex Specialty Products, Inc	Essex/Hope Site, Jamestown, New York

FIGURE D6
Deep WBZ Potentiometric Surface Map, August 23rd 2017
2017 Annual Periodic Review Report

CREATED BY: LA	ch2m:
REVIEWED BY: FR	

Shallow Sampling Points

- Monitoring Well
- Piezometer
- Recovery Well
- Inactive Recovery Well
- Extent of Capture Zone
- Groundwater Elevation Contour (dashed where inferred)
- Approximate Site Boundary
- Chautauqua County Tax Parcels
- Chadakoin River

Note:
1. All elevations are in feet above mean sea level, NAVD88.
2. Oct 2017 pumping rates (gpm):
RW-1S: 0.08 gpm
RW-2S: 1.42 gpm
RW-3S: Permanently shut off as of 8/30/2017.
3. gpm = gallons per minute
4. HW-10, GP-4S, and MW-10 appear to be anomalous and not included in contours.

N

BASE MAP SOURCE:
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

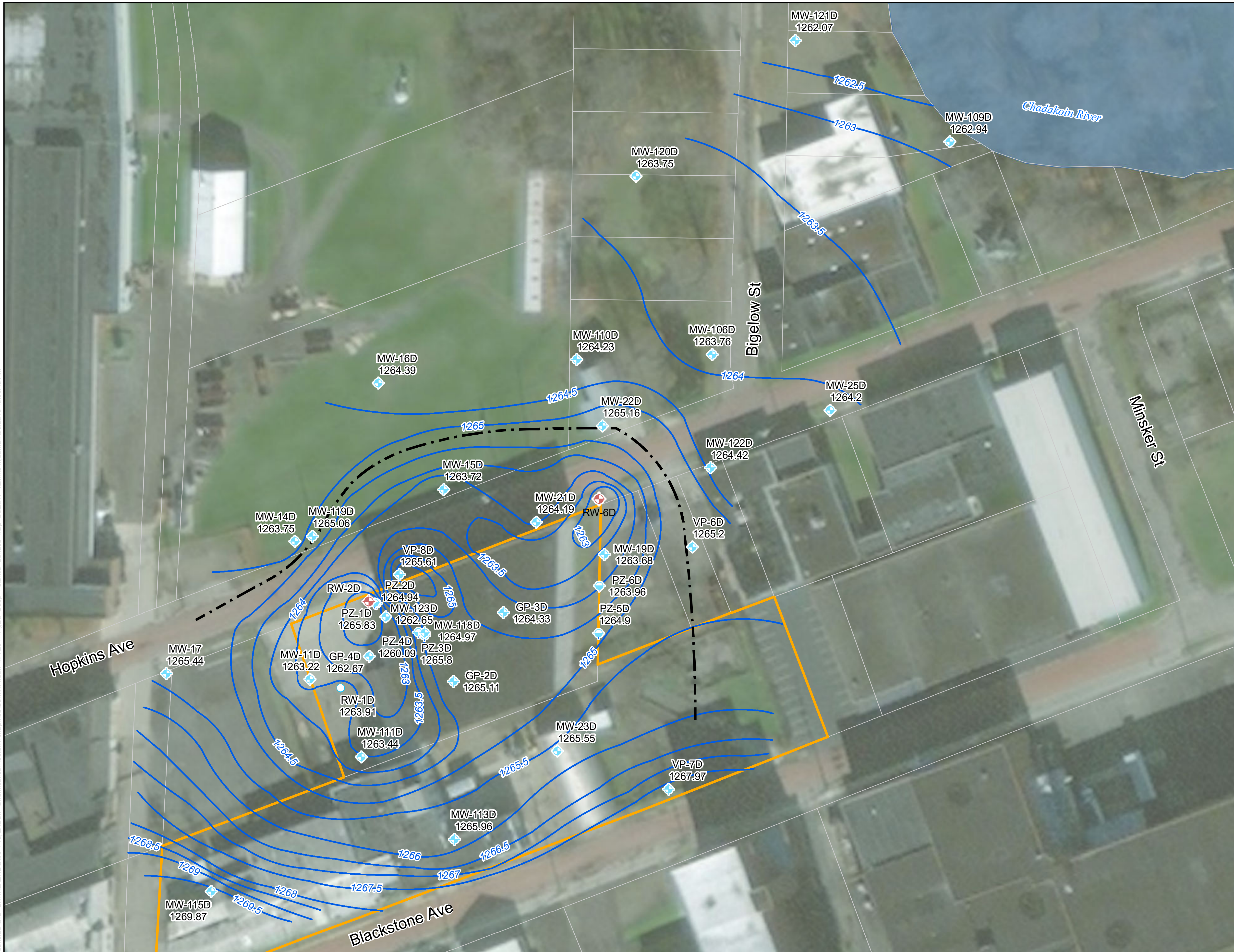
0 25 50 100
Scale in Feet

Essex Specialty Products, Inc	Essex/Hope Site, Jamestown, New York

FIGURE D7
Shallow WBZ Potentiometric Surface Map, October 16th, 2017
2017 Annual Periodic Review Report

CREATED BY: LA
REVIEWED BY: FR

ch2m



Monitoring Well

Piezometer

Recovery Well

Inactive Recovery Well

Extent of Capture Zone

Groundwater Elevation Contour (dashed where inferred)

Approximate Site Boundary

Chautauqua County Tax Parcels

Chadakoin_River

Note:
1. All elevations are in feet above mean sea level, NAVD88.
2. Oct 2017 pumping rates (gpm):
RW-2D: 2.3 gpm
RW-6D: 0.3 gpm
3. gpm = gallons per minute
4. PZ-1D, PZ-2D, PZ-3D, and PZ-4D appear to be anomalous, not included in contouring.
5. MW-14D not included in contouring.

N

BASE MAP SOURCE:
Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

0 25 50 100
Scale in Feet

Essex Specialty Products, Inc	Essex/Hope Site, Jamestown, New York

FIGURE D8
Deep WBZ Potentiometric Surface Map, October 16th, 2017
2017 Annual Periodic Review Report

CREATED BY: LA
REVIEWED BY: FR

ch2m:

Appendix E
Groundwater Extraction System
Inspection Logs

ch2m
18 Tremont Street, Suite 700
Boston, MA 02108
(617) 523-2260

Groundwater Extraction System Inspection Log
Dow - Jamestown, New York Groundwater Treatment System

Inspection Date and Time: May 24, 2017 - 15:00 PM & May 25, 2017 - 08:30 AM

Inspected By: Jon Gowing

Recovery Well RW-1S			
Pump Condition:	Good	Fair	Poor
Motor Condition:	Good	Fair	Poor
Level Control Condition:	Good	Fair	Poor
Sediment Accumulation:	Significant	Moderate	Minimal/None
Notes/Recommended Repairs:			
None; Recovery well working OK.			
Recovery Well RW-2S			
Pump Condition:	Good	Fair	Poor
Motor Condition:	Good	Fair	Poor
Level Control Condition:	Good	Fair	Poor
Sediment Accumulation:	Significant	Moderate	Minimal/None
Notes/Recommended Repairs:			
None; Recovery well working OK.			
Recovery Well RW-2D			
Pump Condition:	Good	Fair	Poor
Motor Condition:	Good	Fair	Poor
Level Control Condition:	Good	Fair	Poor
Sediment Accumulation:	Significant	Moderate	Minimal/None
Notes/Recommended Repairs:			
None; Recovery well working OK.			
Recovery Well RW-3S			
Pump Condition:	Good	Fair	Poor
Motor Condition:	Good	Fair	Poor
Level Control Condition:	Good	Fair	Poor
Sediment Accumulation:	Significant	Moderate	Minimal/None
Notes/Recommended Repairs:			
Off-line due to low water leverls			
Recovery Well RW-6D			
Pump Condition:	Good	Fair	Poor
Motor Condition:	Good	Fair	Poor
Level Control Condition:	Good	Fair	Poor
Sediment Accumulation:	Significant	Moderate	Minimal/None
Notes/Recommended Repairs:			
None; Recovery well working OK.			

18 Tremont Street, Suite 700
Boston, MA 02108
(617) 523-2260

Groundwater Extraction System Inspection Log
Dow - Jamestown, New York Groundwater Treatment System

Inspection Date and Time: November 30, 2017 - 10:30 AM

Inspected By: Jon Gowing

Recovery Well RW-1S			
Pump Condition:	Good	Fair	Poor
Motor Condition:	Good	Fair	Poor
Level Control Condition:	Good	Fair	Poor
Sediment Accumulation:	Significant	Moderate	Minimal/None
Notes/Recommended Repairs:			
None; Recovery well working OK.			

Recovery Well RW-2S			
Pump Condition:	Good	Fair	Poor
Motor Condition:	Good	Fair	Poor
Level Control Condition:	Good	Fair	Poor
Sediment Accumulation:	Significant	Moderate	Minimal/None
Notes/Recommended Repairs:			
None; Recovery well working OK.			

Recovery Well RW-2D			
Pump Condition:	Good	Fair	Poor
Motor Condition:	Good	Fair	Poor
Level Control Condition:	Good	Fair	Poor
Sediment Accumulation:	Significant	Moderate	Minimal/None
Notes/Recommended Repairs:			
None; Recovery well working OK.			

Recovery Well RW-3S			
Pump Condition:	Good	Fair	Poor
Motor Condition:	Good	Fair	Poor
Level Control Condition:	Good	Fair	Poor
Sediment Accumulation:	Significant	Moderate	Minimal/None
Notes/Recommended Repairs:			
Taken completely off-line as of August 8, 2017 upon NYSDEC approval			

Recovery Well RW-6D			
Pump Condition:	Good	Fair	Poor
Motor Condition:	Good	Fair	Poor
Level Control Condition:	Good	Fair	Poor
Sediment Accumulation:	Significant	Moderate	Minimal/None
Notes/Recommended Repairs:			
Significant sediment build-up, recovery wells needs to stay on and running.			

Appendix F
Asphalt Inspection Logs

18 Tremont Street, Suite 700
Boston, MA 02108
(617) 523-2260

Asphalt and Concrete Cap Inspection Log
Dow - Jamestown, New York Groundwater Treatment System

Inspection Date(s) and Time(s) April 28, 2017 - 09:30 AM

Inspected By: Jon Gowing

Cap Description

Typical asphalt caps consist of NYSDOT Type 3 binder and Type 7 wear coarse - approximately 3.5 inches thick, combined.

Typical concrete caps consist of 4500 psi, 28 day compressive strength concrete - up to 8-inches thick.

Cap Conditions (cracks, poor drainage areas, etc.)

No deficiencies noted

Repairs Recommended

None, not applicable

Photo(s)

18 Tremont Street, Suite 700
Boston, MA 02108
(617) 523-2260

Asphalt and Concrete Cap Inspection Log
Dow - Jamestown, New York Groundwater Treatment System

Inspection Date(s) and Time(s) November 19, 2017 - 15:15 PM

Inspected By: Travis Pendry

Cap Description
Typical asphalt caps consist of NYSDOT Type 3 binder and Type 7 wear coarse - approximately 3.5 inches thick, combined. Typical concrete caps consist of 4500 psi, 28 day compressive strength concrete - up to 8-inches thick.
Cap Conditions (cracks, poor drainage areas, etc.)
No deficiencies noted
Repairs Recommended
None, not applicable
Photo(s)
None taken, same conditions as those in the April 28, 2017 inspection.

Appendix G
SSDS Inspection Log

18 Tremont Street, Suite 700
Boston, MA 02108
(617) 523-2260

Vapor Intrusion Mitigation System Inspection Log
Dow - Jamestown, New York Groundwater Treatment System

Inspection Date(s) and Time(s): February 9, 2017 - 14:45 PM

Inspected By: Jon Gowing
Address: 159 Hopkins Avenue Residence
Occupants: Home owner

Radon System Description

Exterior mounted RADONAWAY GP-501 fan, max 4.2 wci static pressure, with exhaust vent to roofline.
1 - Exterior on/off switch
1 - 3" PVC manifolded air line connecting all suction cavities
4 - Suction cavities - strategic spacing at four comers of basement
1 - U-tube manometer - suction riser

Property/Basement Conditions

Condition of basement OK; although very musty odor.

Radon System Condition (piping, floor seals, outside riser pipe and blower)

Vacuum gauge(s) pressure, in.: 0.5

Piping and sytem in OK condition; blower is operating.

Photo(s)

Appendix H
Backflow Prevention Exemption Certification

Jamestown Board of Public Utilities
Water Division
PO Box 700
Jamestown, NY 14702-0700
tlinamen@jamestownbpu.com

Backflow Prevention Device Exemption Renewal Form

THIS FORM IS TO BE FILLED OUT BY THE PROPERTY OWNER

If an exemption from having to install a backflow prevention device is approved by this office, the property owner of that facility must complete and send us this form **each year**. It serves as an assurance by the property owner that **none** of the conditions of his or her building have changed since it was initially inspected and approved as non-hazardous to the Jamestown BPU public water system. Please submit this report to Terri Linamen at the Jamestown Board of Public Utilities Water Department by either mail or email.

Most Recently Assigned Approval # : **1273-1016**

Facility Name: Essex Specialty
Contact Person: Kyle Block/CH2M

Service Address: 126 Hopkins Avenue
Contact Phone #: 617-626-7013

Mailing Address: 126 Hopkins Avenue
Email Address: kyle.block@ch2m.com

By signing below, you are confirming that none of the conditions listed on the initial *Form for Backflow Prevention Device Exemption* have changed, and therefore, your facility can still be deemed non-hazardous and exempt from having to install a backflow prevention device. You are additionally agreeing that if the ownership of the property were to change, you will inform the new owner of their responsibility of completing and sending in this renewal form annually.

Property Owner's Name: Timothy King/Dow

Owner's Mailing Address: 2001 Union Carbide Drive, South Charleston, WV 25303

Owner's Phone Number: 304-747-3763

Owner's Signature: [signature]

Date: 9/20/17

From:	Block, Kyle/BOS
To:	Vidal, Maria/BOS
Subject:	FW: 2018 - Backflow Prevention Renewal [EXTERNAL]
Date:	Thursday, February 8, 2018 10:34:01 AM
Attachments:	image002.png Backflow Exemption Renewal Form.pdf

CH2M is now Jacobs

Kyle Block
Project Manager

From: Brenda Wagner [mailto:bwagner@jamestownbpu.com]
Sent: Thursday, February 08, 2018 10:33 AM
To: Block, Kyle/BOS <Kyle.Block@CH2M.com>
Subject: RE: 2018 - Backflow Prevention Renewal [EXTERNAL]

Mr. Block,

Good morning, I apologize for the delayed response! We have received the *Backflow Prevention Device Exemption Renewal Form* for Essex Specialty Products at 126 Hopkins Ave. in Jamestown. The exemption from having to install a backflow prevention device at this facility remains in effect. Your updated Approval # is as follows:

Approval #: **1273-1017**

The first four digits of your Approval # are unique to your facility, while the last four digits indicate the month and year that the exemption was renewed. Please remember that the property owner must complete and send in the attached *Backflow Prevention Device Exemption Renewal Form* to this office every year since the date that the exemption was last approved. For instance, if your Approval # is 0000-1017, your exemption was last approved in October of 2017 and needs to be renewed again by October of 2018.

The Renewal Form serves as an assurance by the property owner that none of the conditions of the building have changed since it was initially inspected and approved as non-hazardous to the BPU public water system. An updated Approval # will be assigned to your facility each year, so please keep track of it in your records. Please make note of when your exemption is due to be renewed each year. If you become overdue for renewing your exemption, a reminder letter will be sent to you. If you fail to renew your exemption after that point, however, it will result in the loss of your exemption and the need to install the appropriate backflow prevention device at your facility.

The Renewal Form can also be found on the BPU website (www.jamestownbpu.com under Quick Links < Cross Connection & Backflow Prevention). Please let us know if you have any questions. Thank you very much for your time and attention to this matter.

Sincerely,

Brenda Wagner
Civil Engineering Technician
Jamestown Board of Public Utilities
PO Box 700, Jamestown, NY 14702
Telephone: (716) 661-1688
FAX: (716) 661-1617
Email: bwagner@jamestownbpu.com

From: Block, Kyle/BOS [mailto:Kyle.Block@CH2M.com]
Sent: Friday, February 02, 2018 11:45 AM
To: Terri Linamen <tlinamen@jamestownbpu.com>
Cc: Vidal, Maria/BOS <Maria.Vidal@ch2m.com>; Brenda Wagner <bwagner@jamestownbpu.com>
Subject: RE: 2018 - Backflow Prevention Renewal

Terri – We don't have any records of your receipt of this request so are just following up to ensure that it was received.

Thanks

CH2M is now Jacobs

Kyle Block
Project Manager

From: Block, Kyle/BOS
Sent: Wednesday, September 20, 2017 2:48 PM
To: 'tlinamen@jamestownbpu.com' <tlinamen@jamestownbpu.com>
Cc: Vidal, Maria/BOS <Maria.Vidal@ch2m.com>
Subject: 2018 - Backflow Prevention Renewal

Terri –

Please find attached our annual Backflow Prevention Device Exemption Renewal Form for the Essex Specialty site located at 126 Hopkins Avenue. Please let me know if you have any further questions.

Thanks

CH2M

Kyle Block
Project Manager

Appendix I
Semiannual BPU Reports

(included under separate cover)

Appendix I is submitted under separate cover.