FIFTH FIVE-YEAR REVIEW REPORT
VESTAL WATER SUPPLY WELL 1-1 SUPERFUND SITE
TOWN OF VESTAL, BROOME COUNTY, NEW YORK

Prepared by:

United States Environmental Protection Agency
Region 2
New York, New York

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Date

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TABLE OF CONTENTS

LIST OF ABBREVIATIONS AND ACRONYMS

ASD	Active Soil Depressurization
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	Contaminant of Concern
EPA	(United States) Environmental Protection Agency
ERT	Environmental Response Team
FYR	Five-Year Review
IC	Institutional Control
NAPL	Non-Aqueous Phase Liquid
NPL	National Priorities List
NYSDEC	New York State Department of Environmental Conservation
O&M	Operation and Maintenance
OU	Operable Unit
PRPs	Potentially Responsible Parties
RAO	Remedial Action Objective
RA	Remedial Action
RD	Remedial Design
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
RPM	Remedial Project Manager
ROD	Record of Decision
TCE	Trichloroethene
UAO	Unilateral Administrative Order
VI	Vapor Intrusion
VOC	Volatile Organic Compound

I. INTRODUCTION

The purpose of a five-year review (FYR) is to evaluate the implementation and performance of a remedy in order to determine if the remedy is and will continue to be protective of human health and the environment. The methods, findings and conclusions of FYRs are documented in FYR reports, such as this one. In addition, FYR reports identify any issues found during the review and, if any, document recommendations in order to address them.

The U.S. Environmental Protection Agency (EPA) is preparing this FYR review, pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), Section 121, consistent with the National Contingency Plan (NCP) (40 CFR Section 300.430(f)(4)(ii)), and considering EPA policy.

This is the fifth five-year review for the Town of Vestal Water Supply Well 1-1 site (Site), located in the Town of Vestal, Broome County, New York. The triggering action for this review is the signing of the previous FYR on September 26, 2013. FYRs for this Site had previously been prepared because the remedial action (RA) will not leave hazardous substances, pollutants or contaminants on site above levels that allow for unlimited use and unrestricted exposure (UU/UE) but requires five or more years to complete and were considered to be policy reviews. However, as a result of a 2016 Record of Decision (ROD) Amendment for the Site, statutory reviews are now required because the amended remedy for the Site will result in hazardous substances, pollutants or contaminants remain at the site above levels that allow for UU/UE.

The Site consists of two operable units (OUs): OU1 addresses volatile organic contaminants (VOCs) in contaminated groundwater and the Well 1-1 drinking water supply; OU2 addresses VOC-contaminated soils in discrete source areas at the Site that have impacted groundwater, as well as additional soil contamination from PCBs. Both OUs are addressed in this FYR.

The EPA FYR team was led by Damian Duda, remedial project manager (RPM) and includes Rob Alvey, hydrogeologist, Marian Olsen, human health risk assessor, Michael Clemetson, ecological risk assessor, Sharon Kivowitz, Site attorney, and Cecilia Echols, community involvement coordinator.

Site Background

The Site is located in the Town of Vestal, Broome County, New York, about five miles southwest of the City of Binghamton, on the South Bank of the Susquehanna River (see **Figure 1**). The Site is divided into two portions: 1) the western portion of the Site, located between the Susquehanna River and New York State Route 17, includes the original Well 1-1 well field and the groundwater extraction and treatment (P&T) system, a fire department training center, state-owned forest lands and a recreational field and 2) the eastern portion of the Site contains the Stage Road Industrial Park (SRIP), approximately 1000 feet southeast of Well 1-1 (see **Figure 2**). The SRIP contains several

active industrial facilities. The eastern portion of the Site, *i.e.*, the SRIP, is where the majority of EPA's investigation has taken place.

Originally, two areas, Area 2 and Area 4, located in the SRIP, were determined to be sources of groundwater contamination. Area 2 consists of approximately one-acre of land, formerly used as a truck parking area between Stage Road and the abandoned Erie Lackawanna railroad tracks. Area 4 consists of a large 60,000 square foot one-story building and an adjacent parking lot, side and back yard. Historically, the building was used for the manufacturing of transformers and electronic circuit boards. Those manufacturing operations ceased in May 2002. Currently, the building is used to restore and repair automobiles. These properties are likely to continue to be zoned for commercial/industrial uses. Approximately 27,000 people reside in the Town of Vestal with approximately 23,000 relying on public water supplies for drinking water.

The aquifer underlying the Site is extremely permeable which results in high production capacities. This characteristic also allows for the rapid migration of contaminants introduced to the aquifer. Also, the variations in the subsurface geology give rise to highly complex groundwater hydrology. The direction of the shallow groundwater flow from the source area is generally from southeast to northwest.

The Site was listed on the National Priorities List (NPL) in September 1983. The documents that were reviewed for the FYR are found in **Table 1**.

FIVE-YEAR REVIEW SUMMARY FORM

SITE IDENTIFICATION		
Site Name: Vestal Water Supply Well 1-1		
EPA ID: NYD980763767		
Region: 2	**State:** NY	**City/County:** Vestal, Broome County

SITE STATUS	
NPL Status: Final	
Multiple OUs? Yes	**Has the site achieved construction completion?** No

REVIEW STATUS
Lead agency: EPA **If "Other Federal Agency" was selected above, enter Agency name:**
Author name (Federal or State Project Manager): Damian Duda
Author affiliation: EPA
Review period: 9/262013 – 9/19/2018
Date of site inspection: 2/22/2018
Type of review: Statutory
Review number: 5
Triggering action date: 9/26/2013
Due date *(five years after triggering action date)*: 9/26/2018

II. RESPONSE ACTION SUMMARY

Basis for Taking Action

The New York State Department of Environmental Conservation (NYSDEC) commenced a remedial investigation/feasibility study (RI/FS) of the Site in April 1985. The RI, risk assessment and FS for the Site which were completed in 1986 confirmed the presence of volatile organic compounds (VOCs) in the groundwater southeast and east of Well 1-1 and identified a future risk to residents consuming drinking water contaminated with trichloroethene (TCE). The contaminants of concern identified in the risk assessment for the ingestion of groundwater were primarily the VOCs TCE, 1,1-Tricholoethane (1,1,1-TCA), 1,1,-Dichoroethene (1,1-DCE) and 1,1-Dichlorethane (1,1-DCA).

In November 1988, the OU2 RI/FS was initiated and revealed significant VOC contamination in subsurface soils located in two areas in the Stage Road Industrial Park, identified as Area 2 and Area 4. Most of the subsurface contamination was determined to reside between five and 25 feet below ground surface with the highest VOC concentrations at depths greater than 10 feet. The OU2 risk assessment identified unacceptable risks to future construction workers exposed through ingestion and dermal contact with the contaminated soil and inhalation of VOCs. In addition, the risk assessment identified unacceptable risk to residents from the ingestion of groundwater contaminants which were leached from the soil.

The ecological risk assessment determined that is unlikely that the soil and groundwater contamination has adversely affected any plant life in the study area, particularly wetlands, due to the considerable depths at which the higher concentrations of contaminants have been detected (below root levels). The study area was considered by EPA to have limited ecological significance (both flora and fauna).

Response Actions

In 1980, as a result of the VOC contamination found in Well 1-1, it was removed from the Town of Vestal water supply network. The groundwater pumped from Well 1-1 was then diverted and discharged into the Susquehanna River in order to capture the contaminant plume hydraulically.

On June 27, 1986, EPA issued the OU1 Record of Decision (ROD) which addressed the VOCs in the groundwater. The OU1 ROD also recommended that a second RI/FS be undertaken to evaluate suspected source areas of contamination upgradient of Well 1-1.

The OU1 ROD had the following remedial action objectives (RAOs):

- Contain the plume of contamination to mitigate further contamination of public water supplies;
- Provide a safe, reliable drinking water supply to the Town of Vestal; and
- Ensure that the quality and best use of the Susquehanna River are not impaired.

In order to achieve the RAOs for the contaminated groundwater, EPA selected the following remedy components in the OU1 ROD:

- Construction of a packed column air stripping system on Well 1-1 in order to return the well to full service as Town of Vestal Water District 1's primary water supply; and
- Initiation of a supplemental RI/FS to investigate further the extent of soil contamination in suspected source areas and to evaluate possible source control measures.

On September 27, 1990, EPA issued the OU2 ROD which addressed source areas, specifically Area 2 and Area 4.

The OU2 ROD had the following RAOs:

- Ensure protection of groundwater from the continued release of VOC-contamination from soils;
- Ensure protection of Well 1-1 water quality from any inorganic groundwater contamination, not addressed in the first operable unit, if necessary; and
- Ensure protection of human health to construction workers who may be potentially exposed to contaminated soils during future excavation.

In order to achieve the RAOs for the Site soils, EPA selected the following remedy components in the OU2 ROD:

- In-situ soil vapor extraction (SVE)vapor VOCs from soils in source Area 2 and Area 4 within the SRIP, followed by carbon adsorption, with subsequent treatment and disposal of contaminated carbon at a permitted off-site facility;
- A monitoring program to evaluate progress of the in-situ vacuum extraction remedy;
- A monitoring program to assess periodically inorganic contaminants in the aquifer upgradient of Well 1-1 (the decision to implement a monitoring program for organic contamination was contained in the EPA's June 27, 1986 ROD for OU1); and
- A contingency remedy for Well 1-1 involving treatment of inorganic contaminants and groundwater to be implemented, if necessary, in the future.

During the implementation of the OU2 ROD, it was determined that while SVE was an appropriate technology for remediating the soils in Area 2, SVE was not going to be successful in Area 4. Subsequent investigations and technology evaluations led to a 2016 OU2 ROD Amendment for Area 4. This decision document also identified the need for remediation in Area 3 and included newly discovered COCs (PCBs, 1,2,4-trimethylbenzene and 1,3,5-trimethylbenzene).

The OU2 ROD Amendment had the following RAOs:

- Prevent and or minimize human and ecological exposures, including ingestion, inhalation and dermal contact to the contaminants present in soils;
- Ensure protection of construction workers who could be exposed to contaminated soils through excavation; and
- Ensure protection of groundwater from the continued release of VOCs from soils.

In order to achieve the RAOs for the Site soils in Area 3 and Area 4, the amended OU2 remedy selected the following actions:

In-situ thermal treatment (ISTT):

- Treatment of VOC-contaminated soils utilizing Thermal Conductive Heating, Steam Enhanced Extraction, Electrical Resistance Heating or some combination of these three ISTT technologies based upon remedial design (RD) evaluation.

- Installation of sheet piling, if determined to be necessary during the RD, prior to any thermal treatment in order to reduce groundwater flow in the more transmissive zones of the subsurface environment.
- Installation of treatment wells beneath the building, if determined necessary during the RD, utilizing appropriate methods that would limit impacts to the building (e.g., via directional drilling).
- Monitoring of temperature and pressure to track subsurface heating, pneumatic, and hydraulic control.

PCB Excavation:

- Pre-design sampling to identify the limits of PCB-contaminated soils excavation.
- Decommissioning of existing monitoring wells (those within and around the excavation footprints).
- Installation (and removal) of sheet piling and associated tie-backs.
- Excavation dewatering.
- On-Site treatment of contaminated groundwater that is collected as part of any necessary dewatering operations and subsequent discharge to a publicly-owned treatment works or permitted outfall.
- Excavation of soils to a depth of approximately 10 feet yielding approximately 730 cubic yards of soils.
- Transport and off-Site disposal of excavated soils, in accordance with applicable requirements under the Resource Conservation and Recovery Act, 42 U.S.C. §6901-6992k and the Toxic Substances Control Act, 15 U.S.C. §§ 2601-2687.
- Backfilling excavations with clean fill, along with appropriate restoration (e.g., asphalt paving, topsoil, seeding).

Institutional Controls (ICs):

- Reliance on governmental ICs in the form of the commercial/light industrial zoning that is currently in place at 200 Stage Road. Other ICs, including proprietary or contractual, also may be utilized.

The areas identified for remediation are shown in **Figure 4**.

Status of Implementation

OU1

Groundwater

During May/ June 1988, EPA sent Special Notice letters to Vestal Asphalt, Inc. and Chenango Industries, Inc. These letters were intended to provide official notification from EPA to individuals or corporations of their status as potentially responsible parties (PRPs) for a release of contamination and for the cleanup deemed necessary by EPA. The basis for this notification was that the potential source Area 1 was partially within the Vestal Asphalt property, the potential source Area 3 and Area 4 were located on the Chenango property and the potential source Area 2 was partially within a truck

parking area owned by the New York State Department of Transportation but predominantly used by Vestal Asphalt, Inc. At the time, neither Chenango Industries nor Vestal Asphalt, Inc. expressed a willingness to negotiate a settlement that would provide for their implementation of the selected remedy for OU1.

As a result, in May 1989, EPA began construction of the air stripping facility which was completed in July 1990. In December 1993, as a result of poor performance of the aged Well 1-1, Well 1-1 was abandoned and a new well, Well 1-1A, was installed with a maximum pumping capacity of 1150 gallons per minute (gpm), averaging 300 to 500 gpm. In March 1995, EPA issued a remedial action report which determined that Well 1-1A and the associated air stripping facility were fully operational and functional as a potable water supply.

In May 1995, the Town Vestal indicated that it no longer required the water from Well 1-1A for its drinking water supply. EPA performed the first 10 years of the long-term response action (LTRA) to treat the extracted groundwater and discharge the treated water from Well 1-1A to the Susquehanna River before concluding the LTRA and transferring the operation and maintenance (O&M) of the treatment system to NYSDEC.

In 2006, NYSDEC assumed the responsibility for the O&M of the P&T facility for Well 1-1A with a potential contingency remedy for potable water treatment of inorganics should it ever be needed.

Soils

In October 1996, the SVE systems for Area 2 and Area 4 were constructed and operations for Area 2 began in January 1997. In November 2000, the SVE system for Area 2 achieved ROD clean-up levels and was shut down.

In 2003, the SVE system for Area 4 began operations but was not as successful as in Area 2. In January 2006, as a result of the tight aquifer formation in the subsurface of Area 4, the SVE was shut down permanently.

The 2016 ROD Amendment for OU2 selected remedy for the soils (thermal treatment and soil excavation) is currently in the RD phase. Once the selected remedy has been implemented, *i.e.*, source removal, additional monitoring data will be evaluated and a determination will be made as to whether to restart the P&T system for Well 1-1A.

ICs Summary

Table A – IC Summary Table

Media, engineered controls, and areas that do not support UU/UE based on current conditions	ICs Needed	ICs Called for in the Decision Documents	Impacted Parcel(s)	IC Objective	Title of IC Instrument Implemented and Date (or planned)
Groundwater	Yes	No	Site	Prevent groundwater use and drinking water well installation	New York State Sanitary Code (Title 10/Section 5-2.4), Broome County and Town of Vestal Codes (Current)
Soils and groundwater	Yes	Yes	Site	Ensure continued commercial/industrial use	Proprietary/contractual controls (2021)

The Consent Decree is binding on the current and future property owners to cooperate with EPA on all aspects of access, investigation, ICs and remediation.

Operations, Maintenance and Monitoring

OU1

Since the last FYR, the P&T system operated only briefly. On February 28, 2014, after a remedial system optimization and a series of repair issues, the Well 1-1A air stripper was shut down. During the shutdown, the stripper was inspected to reveal that the stripper media had calcified. Without maintenance to descale media or replacement of the media, the stripper was not able to be brought back online. NYSDEC, as the lead for O&M of the system, recommended that a decision regarding the repair/replacement of the strippers and the restart of the system await the completion of EPA's cleanup of the remaining source area soils, *i.e.*, the selected remedy in the OU2 ROD Amendment. This will allow the effects of the source area cleanup on groundwater quality to be considered in evaluating the need to restart the system.

The groundwater monitoring criteria for the P&T system are designed to monitor the effectiveness of capture of the groundwater contamination plume and to determine the progress of groundwater restoration and compliance with the groundwater quality standards. As discussed below, since the shutdown of the P&T system for Well 1-1A, quarterly groundwater monitoring data continue to indicate that there is little change in the shallow, intermediate and deep groundwater plume distribution and migration.

While the P&T facility was operating, NYSDEC and Arcadis, NYSDEC's contractor, managed the long-term O&M activities for the P&T system. Since the P&T shutdown, NYSDEC and Arcadis

continue to sample the groundwater monitoring wells regularly, as well as the Town of Vestal Well 1-2A and Well 1-3. **Figure 3** shows the locations of the monitoring wells that are included in the groundwater sampling program in order to monitor the groundwater plume.

In addition, starting in 2007, EPA's Environmental Response Team (ERT) has conducted VI sampling every two years in the 200 Stage Road building and another nearby commercial property (Unit 104). During the VI sampling, ERT personnel installs 24-hour canisters in locations throughout each building, as well as connecting canisters to the associated subslab ports, also at locations throughout the buildings. ERT performs the work according to an EPA-approved Quality Assurance Project Plan and Sampling and Analysis Plan.

OU2

Since the RD/RA is underway for the selected remedy identified in the OU2 2016 ROD Amendment, there is currently no on-going O&M for OU2. As discussed above, the SVE system had been previously abandoned.

Potential site impacts from climate change have been assessed, and the performance of the remedy is currently not at risk due to the expected effects of climate change in the region and near the Site.

III. PROGRESS SINCE THE LAST FIVE-YEAR REVIEW

Table B: Protectiveness Determinations/Statements from the 2013 FYR.

OU #	Protectiveness Determination	Protectiveness Statement
1	Protective	The remedy at OU1 currently protects human health and the environment.
2	Short-term Protective	The remedies at second operable unit (OU2) are protective of human health and the environment in the short term. In order to be protective in the long term, the Area 4 in-situ vacuum extraction system needs to be enhanced, or other measures need to be taken to remediate the soils to ROD cleanup levels.
Sitewide	Short-term Protective	The Site is protective of human health and the environment in the short term. For the Site to be protective in the long term the Area 4 in-situ vacuum extraction system needs to be enhanced

Table C: Status of Recommendations from the 2013 FYR

OU #	Issue	Recommendations	Current Status	Current Implementation Status Description	Completion Date (if applicable)
2	The in-situ vacuum extraction system is not capable of remediating the remaining volatile organic compounds from the soil in Area 4 to ROD soil cleanup levels since the remaining contaminants are located in fine-textured soils and/or in the saturated zone.	Complete an FFS and determine the required remedy enhancements/modifications needed to achieve ROD soil cleanup levels and update the remedy decision document as appropriate.	Completed	Remedial Design for soil excavation and thermal treatment (ongoing) [OU2 ROD Amendment]	9/30/2016

As discussed above, an additional IC will be developed in order to ensure that the Site area will continue to be zoned for commercial/industrial use only.

Quarterly groundwater monitoring data continue to show that there is little change in the shallow, intermediate and deep groundwater contaminant plume distribution and migration since the shutdown of the Well 1-1A P&T system. Once the selected remedy of the OU2 ROD Amendment implemented, EPA and NYSDEC will evaluate the effects of the source area cleanup on groundwater quality and, subsequently, will evaluate the need to restart the P&T system.

IV. FIVE-YEAR REVIEW PROCESS

Community Notification, Involvement and Site Interviews

On October 2, 2017, EPA Region 2 posted a notice on its website indicating that it would be reviewing site cleanups and remedies at 31 Superfund sites in New York and New Jersey, including the Town of Vestal Well 1-1 site. The announcement can be found at the following web address: https://www.epa.gov/sites/production/files/2017-10/documents/five_year_reviews_fy2018_final.pdf.

In addition to this notification, a public notice was made available on EPA's Vestal Water Supply Well 1-1 website: https://www.epa.gov/superfund/vestal-well-1-1. On January 24, 2018, the public notice was also sent to Town Clerk's office. The purpose of the public notice is to inform the community about the FYR and to list where the final report will be posted. Once the FYR is completed, the results will be made available on EPA's webpage and at the Site repositories located

at EPA, 290 Broadway, 18th Floor, New York, New York and at the Vestal Public Library and Town Hall, Vestal, New York.

Community interest in the Site has been historically low. The Site property owners and lessees, as well as a representative of Vestal, were informed that a FYR of the Site was underway. No comments or concerns were received.

Data Review

Groundwater Monitoring

Historically, the 1990 OU2 ROD identified that sampling for inorganics would be considered in the groundwater sampling program for Well 1-1. One reason for inclusion in the selected remedy was to delineate, if possible, any patterns of potential inorganic contamination in the groundwater in order that suspected source areas could be identified. Well 1-1 never showed inorganic contaminants above health-based levels. When Well 1-1 was eventually abandoned, EPA installed Well 1-1A and focused the sampling program on chlorinated VOCs which were determined to be the primary COCs at the Site. Since the source contamination was determined to be from VOCs, inorganic source contaminants were ultimately not considered COCs at the Site.

As discussed above, on February 28, 2014, the P&T system was shut down because of fouling of the air stripper and has been off since that time. NYSDEC has maintained the system in a standby mode in the event that it needs to be brought back online.

The following are the groundwater monitoring wells (MWs) at the Site (refer to **Figure 3**): 1) shallow zone: 4009-1, 2, 3, 6, 7, 9, 10, 11A, 13A, 16A, 23S, 24, 25S, 25D and 30A; 2) intermediate zone: 4009-4, 5, 8, 12A, 23D, 26, 27S, 27I and 29I; and, 3) deep zone: 4009-11, 12, 14, 15, 16, 19, 22, 27D, 28D and 29D. The groundwater monitoring program includes a select group of these wells from the three zone depths.

The June 2018 groundwater sampling results showed the highest concentrations of VOCs were benzene, 1,1,1-TCA, 1,1-DCA, 1,1-DCE, cis-1,2-DCE, TCE and vinyl chloride (VC). VOC concentrations measured at the shallow, intermediate, and deep groundwater monitoring zones are shown in **Figures 5, 6, and 7**, respectively.

Quarterly groundwater monitoring data continue to indicate that there is little change in the shallow, intermediate, and deep groundwater plume distribution and migration since the shutdown of the Well 1-1A P&T system. Total VOCs detected in the groundwater samples collected in the June 2018 sampling event are generally consistent with the range of results reported during the last six events with the exception of six wells: 4009-8, 4009-11, 4009-12, 4009-26, 4009-29S, and 4009-29D. VOC concentrations in those wells continue to fluctuate. As shown on **Figure 5**, MW 4009-26 has shown a slight increase in several analytes in the past six events, but these noted increases and fluctuations in VOC concentrations from all six wells are similar to those previously reported.

Concentrations of VOCs in samples from the monitoring wells in the vicinity of the Vestal's current water supply wells 1-2A and 1-3 (MWs 4009-16, 4009-16A, 4009-18, 4009-19, 4009-21, 4009-30

and 4009-30A) are generally consistent with the previous sampling events. VOCs were not detected at concentrations greater than state standards in MWs 4009-16A, 4009-18, 4009-19 and 4009-30A. Benzene was the only VOC detected at a concentration exceeding the state standard of 1 µg/L in MWs 4009-16 (5.7 µg/L), 4009-21 (11 µg/L) and 4009-30 (4.1 µg/L). Concentration trends will continue to be monitored.

In June 2018, benzene concentrations in the samples collected from deep MWs 4009-12 (1.7 µg/L), 4009-14 (11 µg/L), 4009-15 (9.0 µg/L), 4009-16 (5.7 µg/L), 4009-21 (11 µg/L) and 4009-30 (4.1 µg/L), exceeded state standards but are similar to previously reported results. The source of benzene has not yet been determined. Currently, benzene is not a COC at the Site. Benzene, however, was not detected above state standards in the samples from MWs 4009-7, 4009-8 or 4009-26 during the 2017 and 2018 sampling events.

Drinking Water Well Monitoring

Monthly analytical data are provided by the Vestal's Water Superintendent for Well 1-2A and Well 1-3. Samples were collected on April 4, 2017, May 19, 2017, and June 20, 2017. Pre-treatment groundwater samples were also collected by Arcadis, NYSDEC's contractor, from the Town of Vestal water supply Well 1-2A and Well 1-3 on April 26, 2017, May 24, 2017, and June 21, 2017. These samples were used to supplement the Town's monthly influent sampling data and to evaluate potential impacts to the Town's water supply wells related to the shutdown of the Well 1-1A treatment plant. Town of Vestal Well 1-2A and Well 1-3 provide the community with safe and reliable drinking water.

Groundwater Summary

Since the shutdown of the P&T system for Well 1-1A, quarterly groundwater monitoring data continue to indicate that there is little change in the shallow, intermediate and deep groundwater plume distribution and migration. VOCs associated with contamination from the source area at 200 Stage Road were not detected in any of the pre-treatment effluent samples collected from the Town of Vestal water supply Well 1-2A and Well 1-3 during this reporting period. In addition, it is anticipated that the overall groundwater quality throughout the Site will improve with the implementation of the selected remedy identified in 2016 ROD Amendment.

Vapor Intrusion

Starting in 2007, vapor intrusion (VI) sampling has been conducted every two years in the 200 Stage Road building and another commercial building nearby (Unit 104). Numerous subslab and indoor samples were collected over a 24-hour period during two VI sampling events in January 2015 and January 2017.

<u>200 Stage Road Building</u>

In 2017, the VI data review (indoor air and subslab sampling) showed the indoor air concentrations over time had slight changes in the concentrations for the majority of the COCs, with the exception of TCE. Specifically, the indoor air sampled in the Break Room of the building showed an increase

in TCE to 12 µg/m3 in 2017, above the industrial screening level. All other sample results were below the industrial level. The subslab TCE concentrations also showed an increase. The majority of the ambient air concentrations were non-detects below their respective screening levels for residential and industrial land use. During March/April 2018, in response to the elevated levels of TCE in the indoor air in the Break Room at the 200 Stage Road building, EPA, through its Removal program, installed three active soil depressurization (ASD) systems. The systems are operating. The next round of VI sampling will be conducted during the winter of 2018/2019 and is expected to confirm the effectiveness of the ASD systems. Overall, the data indicate the need for continued monitoring, especially for TCE. EPA intends to perform VI sampling in the winter 2018/2019.

Unit 104

In 2017, the VI data review (indoor air and subslab sampling) showed that the majority of COC concentrations were non-detect. Any detections were below their respective indoor air and subslab guidance values.

Site Inspection

EPA performed a Site inspection at the Site on February 22, 2018. This Site inspection was also a Site reconnaissance for the RD activities for the OU2 ROD Amendment which is currently being conducted by the U.S. Army Corps of Engineers (Army Corps). There were no new or outstanding issues identified. The RPM also verified stable Site conditions from previous Site visits which had been conducted in April 2017 during pre-design investigation activities which also included a review of the western portion of the Site where the inactive P&T system, the NYSDEC flood easement property and local fire training facilities are located.

The following personnel were in attendance – from EPA: Damian Duda, remedial project manager (RPM); from NYSDEC: Payson Long, project manager; from the Army Corps: Travis Young; from JFM Real Estate, Erick Webb (property owner representative); from HDR (Army Corps contractor) Dan St. Germain and Dean Matuszewski; and from OBG (Army Corps contractor): Tm Cornuet and Paul Freyer and from Parratt-Wolff (driller): Will Hackett.

The group toured the 200 Stage Road building; the majority of which houses the auto-restoration/repair activities, as well as administrative offices. Many vehicles were seen in various stages of repair. The property manager also provided a brief tour of recently refurbished office facilities and a narrow section of the building that had previously contained offices. The property manager is aware of the proposed thermal treatment remedy for the Site soils. The existing Site monitoring wells were observed, as well as, the valve houses and treatment plant building for the inactive SVE system on the south side of the 200 Stage Road building.

V. TECHNICAL ASSESSMENT

Question A: Is the remedy functioning as intended by the decision documents?

The P&T system has been shut down due to calcification of the air strippers. A decision regarding the repair/replacement of the strippers and the restart of the system will await the completion of the cleanup of the remaining source area soils; this will allow the effects of the soil cleanup on groundwater quality to be considered in evaluating the need to restart the system.
Quarterly groundwater monitoring data continue to indicate that there is little change in the shallow, intermediate, and deep groundwater plume distribution and migration since the shutdown of the Well 1-1A P&T system.

Part of the remedy for OU2 was completed, *i.e.*, Area 2 was remediated successfully using in-situ SVE. Area 3 and Area 4 modified remedy are under design.

The OU 2 ROD Amendment called for ICs to ensure continued commercial/industrial use of the 200 Stage Road property. It is expected that this IC will be established by 2021.

During March/April 2018, in response to the elevated levels of TCE in the indoor air in the Break Room at the 200 Stage Road building, a VI subslab mitigation system was installed under removal authority. During the winter of 2018/2019, further VI sampling will be conducted at the 200 Stage Road building to ensure the protection of the workers and additional sampling will be conducted at other buildings in the area to confirm no VI issues.

Question B: Are the exposure assumptions, toxicity data, cleanup levels and RAOs used at the time of the remedy still valid?

Since the ROD and ROD Amendments have been written, exposure assumptions and RAOs have changed by activities conducted to date have adequately addressed impacts to human health and the environment.

Groundwater

The risks from ingestion of contaminated drinking water from Well 1-1 by community residents has been eliminated since residents receive their drinking water from a public water supply. Vestal Well 1-1 and Well 1-1A are no longer part of the Town of Vestal water supply system. The primary COCs identified in the original ROD for groundwater were the VOCs: TCE and 1,1,1-TCA. New York State Sanitary Code (Title 10/Section 5-2.4), Broome County and Town Codes (current) prevent groundwater use and drinking water well installation

There have been no changes in the federal and state standards since the previous FYR. In addition, there have been no changes in the toxicity values for the various COCs identified in the ROD and updates to these toxicity values are not anticipated. The federal and state standards remain protective.

The OU1 remedy for the Site is in interim shut down mode; however, monitoring confirms that there is no impact from the Site to the downgradient Town of Vestal water supply production wells.

Soils

The original risk assessment identified unacceptable risks to the future construction worker exposed through ingestion and dermal contact with the contaminated soils and inhalation of VOCs. Minor changes in the exposure assumptions since the original risk assessment do not significantly change the results of the risk assessment or the remedial action objectives. The original OU2 ROD selected soil remediation levels that were designed to reduce the impacts to groundwater and, also, to reduce the potential future risk from human exposure to excavated soils.

The OU2 remedial levels were 140 micrograms per kilogram (µg/kg) for TCE; 170 µg/kg for TCA; and 188 µg/kg for 1,1-DCE and are below NYSDEC Part 375 soil cleanup objectives for unrestricted use and the protection of groundwater (470 µg/kg for TCE, 680 µg/kg for TCA and 190 µg/kg for 1,1-DCE). The removal of VOCs from Area 2 soils has removed this potential route of exposure. The original remediation levels are lower than risk based residential concentrations for these same contaminants calculated using current exposure and toxicity values. The soil remedial levels for TCE, 1,1,1-TCA and 1,1-DCE are still valid and protective of the groundwater. Also, the remediation levels remain protective for direct contact with soils.

Vapor Intrusion

In order to address the level of concern of TCE concentrations identified in the previous FYR, as well as data gathered in January 2017, three subslab mitigation systems were installed in areas of the 200 Stage Road building currently affected by VI, *i.e.*, elevated levels of TCE in indoor air. The system will be monitored beginning in the 2018/2019 heating season, and monitoring results will be evaluated prior to the next FYR.

Land and Resource Use

There have been no changes in the physical conditions of the Site that would affect the protectiveness of the remedy. Current local zoning requirements indicate that the land use for the Site is expected to remain commercial/industrial over the next five years at which time the next FYR will be performed. The land use considerations and potential exposure pathways considered in the baseline human health risk assessment remain valid. In addition, residents and industries in the area continue to obtain drinking water from public supply wells.

Based upon review of the past and current data, the previous conclusion that there are no completed exposure pathways for ecological receptors is still valid. The RAOs used at the time of the remedy selection are still valid and protective of the environment.

Question C: Has any other information come to light that could call into question the protectiveness of the remedy

At the present time, there is no new information, beyond that identified and addressed in the OU2 ROD amendment (discussed above), that would call into question the protectiveness of the remedies.

VI. ISSUES, RECOMMENDATIONS AND FOLLOW-UP ACTIONS

OU(s): 1 and 2	**Issue Category:** Remedy Performance			
	Issue: The source control remedy has not been implemented			
	Recommendation: Implement the OU2 amended remedy and make decisions on whether the OU1 remedy should be restarted			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	Yes	EPA	EPA	09/30/2022

The pre-treatment and post-treatment sampling of the Town of Vestal's public water supply wells, Wells 1-2A and Well 1-3, should continue to be sampled on a monthly basis until the final remedies for OU1 and OU2 are fully implemented. In addition, quarterly groundwater monitoring should continue while Well 1-1A P&T system is shut down.

Any future potential for VI mitigation and sampling will be assessed during the implementation of the selected remedy for the OU2 ROD Amendment and the O&M plan will be updated accordingly.

VII. PROTECTIVENESS STATEMENT

Protectiveness Statement(s)		
Operable Unit: 1	*Protectiveness Determination:* Short-term Protective	*Addendum Due Date (if applicable):* Click here to enter date.
Protectiveness Statement: The remedy for OU1 protects human health and the environment in the short-term. Although it is currently not operating, no one is being exposed to groundwater contamination and the plume is stable. In order for the remedy to be protective in the long-term, the source control remedy needs to be implemented and a decision on the pump and treat system operation needs to be made.		
Operable Unit: 2	*Protectiveness Determination:* Short-term Protective	*Addendum Due Date (if applicable):* Click here to enter date.
Protectiveness Statement: The remedy for OU2 protects human health and the environment in the short-term. In order for the remedy to be protective in the long-term, the source control remedy and ICs need to be implemented.		

Sitewide Protectiveness Statement (if applicable)	
For sites that have achieved construction completion, enter a sitewide protectiveness determination and statement.	
Protectiveness Determination: Short-term Protective	*Addendum Due Date (if applicable):* Click here to enter date.
Protectiveness Statement: The remedies at OU1 and OU2 protect human health and the environment in the short-term. In order to be protective in the long-term, the source control remedy and ICs needs to be implemented.	

Based on the current and reasonably anticipated use of the Site, the EPA has determined that the sitewide remedy protects human health and the environment in the short-term. There are no current risks present at the Site in either groundwater or soils and none are expected, as long as the engineered and access controls are properly operated, monitored and maintained.

VII. NEXT FIVE-YEAR REVIEW

The next FYR for the Vestal Water Supply Well 1-1 site is required five years from the completion date of this review.

APPENDIX A

TABLES

Table 1
Chronology of Site Events

Event	Date
Volatile organic contamination detected at Vestal Well 1-1 and taken off- line	1980
NPL listing	9/8/1983
Remedial Investigation/Feasibility Study completed - OU1	5/1986
EPA issued OU1 Record of Decision	6/27/1986
Remedial design approved for air stripper - OU1	9/29/1987
Superfund State Contract signed	11/2/1988
Start of construction of air stripper – OU1	5/31/1989
Remedial Investigation/Feasibility Study completed - OU2	5/1990
Completion of construction of air stripper - OU1	6/10/1990
EPA issued OU2 Record of Decision	9/27/1990
Unilateral Administrative Order issued - OU2, Area 4	3/29/1991
Remedial design completed for Well 1-1A - OU1	5/1992
Start of construction of Well 1-1A – OU1	9/10/1992
Completion of construction of Well 1-1A - OU1	12/31/1993
Remedial design completed - OU2, Area 2 & Area 4	9/30/1994
Remedial Action Report for groundwater remedy approved - OU1	3/30/1995
Start of construction of soil vapor extraction system - OU2, Area 2	10/11/1996
Start of long term response action for OU1	10/15/1996
Completion of construction of *in-situ* vacuum extraction – OU2, Area 2	1/18/1997
First Five-Year Review Report signed	9/30/1998
Cost Recovery Consent Decree entered - OU2, Area 4	5/26/1999
pletion of *in-situ* vacuum extraction remediation - OU2, Area 2	11/20/2000
Remedial Action Report for *in-situ* vacuum extraction approved - OU2, Area 2	5/15/2001

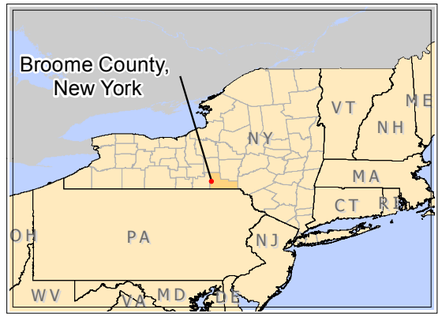
Event	Date
Start of construction of *in-situ* vacuum extraction - OU2, Area 4	4/1/2003
Completion of construction of *in-situ* vacuum extraction - OU2, Area 4 signifying completion of all Site construction activities	6/27/2003
Preliminary Close-Out Report signed	9/11/2003
Second Five-Year Review Report signed	9/30/2003
Shut down of *in-situ* vacuum extraction system – OU2, Area 4	1/20/2006
Operation of the groundwater treatment facility transferred to NYSDEC-OU1	10/16/2006
Groundwater and soil sampling conducted in Area 4	8/2/2006 – 9/8/2006
Vapor intrusion sampling at Area 4	4/2007
Soil sampling conducted in Area 4	11/26/2007 – 12/7/2007
Groundwater and soil sampling conducted in Area 4	7/22/2008 and 3/3/2009
Third Five-Year Review Report signed	9/4/2008
Vapor intrusion sampling at Area 4	2/2009
Vapor intrusion sampling at Area 4	2/2011
Groundwater and soil sampling conducted in Area 4	12/3/2012 – 12/10/2012
EPA issued OU2 Record of Decision Amendment	September 2016

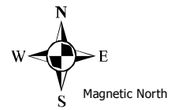
Table 2
Documents Reviewed

Author	Date	Title/Description
U.S. Environmental Protection Agency	June 1986	Record of Decision OU1 Vestal Water Supply Well 1-1
U.S. Environmental Protection Agency	June 1990	Record of Decision OU2 Vestal Water Supply Well 1-1
U.S. Environmental Protection Agency	May 1999	Consent Decree: American Board Companies, Inc.; C.I. Liquidators of New York, Inc. and Great American Industries, Inc.
U.S. Environmental Protection Agency	September 2003	Preliminary Close-Out Report
ARCADIS Malcolm Pirnie, Inc.	Quarterly reports (20013 to 2018)	Vestal Water Supply Site Quarterly Reports
U.S. Environmental Protection Agency	September 2013	Fourth Five-Year Review Report
ARCADIS Malcolm Pirnie, Inc.	Annual reports (2014 to 2018)	Vestal Water Supply Site Quarterly Report and Annual Groundwater Monitoring Summary
Lockheed Martin Technology Services	August 2016	Focused Feasibility Study
U.S. Environmental Protection Agency	September 2016	OU2 Record of Decision Amendment
U.S. Environmental Protection Agency – Environmental Response Team	May 2015/ June 2015	Final Trip Reports - Soil Vapor Intrusion Study – for Area 4 and Unit 104 – January 2015
U.S. Environmental Protection Agency – Environmental Response Team	May 2017	Final Trip Reports - Soil Vapor Intrusion Study Area 4 and Unit 104 - January 2017
U.S. Environmental Protection Agency	January 2018	Final Design Report for Active Soil Depressurization Systems

APPENDIX B

FIGURES





Legend

- Well Location
- Flow Direction

Map created using orthoimagery data from NY state website, sample result data in 2010.

Map Creation Date: 11 April 2016

Coordinate system: New York State Plane (Central)
FIPS: 3102
Datum: NAD83
Units: Feet

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Feet

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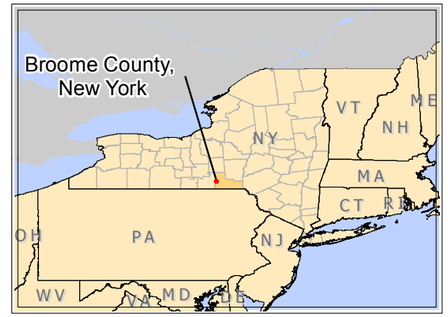
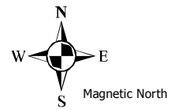
MXD file: g:\arcinfoprojects\SERAS01\SERA00064_Vestal_Chlorinated\FS_Report_2016/064_FS2016_f1_SIteLocation_SurroundingAreas_f1.mxd

U.S EPA Environmental Response Team
Scientific Engineering Response and Analytical Services
EP-W-09-031
W.A.# SERAS-064

Figure 1
Site Location Map
Vestal Water Supply Well 1-1
Vestal, New York





Legend

- Well Location
- Flow Direction

Map created using orthoimagery data from NY state website, sample result data in 2010.

Map Creation Date: 11 April 2016

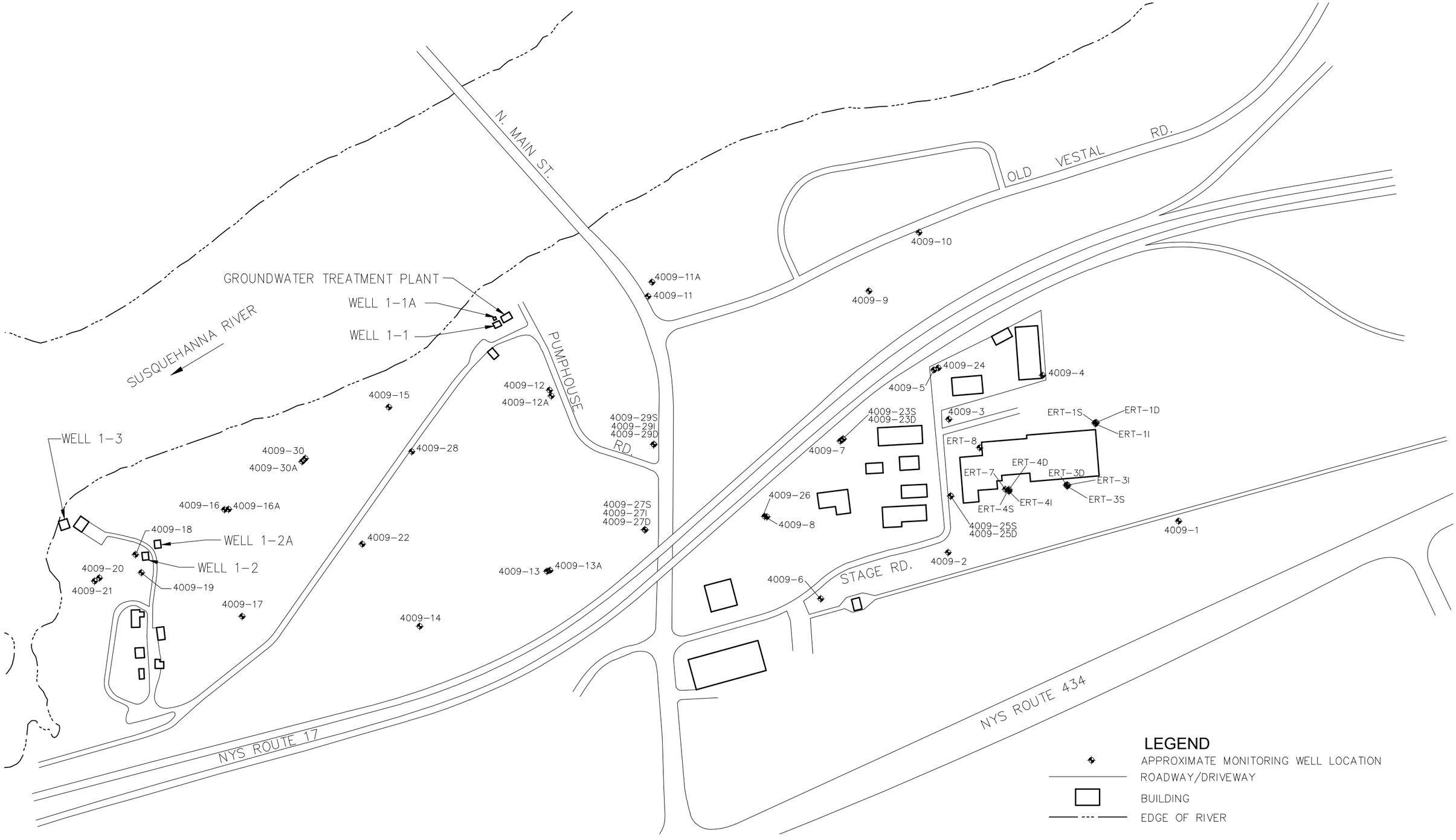
Coordinate system: New York State Plane (Central)
FIPS: 3102
Datum: NAD83
Units: Feet

300 0 300
Feet

Data: g:\arcviewprojects\SERAS01\00-064
MXD file: g:\arcinfoprojects\SERAS01\SERA00064_Vestal_Chlorinated\FS_Report_2016/064_FS2016_f1_SIteLocation_SurroundingAreas_f1.mxd

U.S EPA Environmental Response Team
Scientific Engineering Response and Analytical Services
EP-W-09-031
W.A.# SERAS-064

Figure 2
Stage Road Industrial Park Investigation
Vestal Water Supply Well 1-1
Vestal, New York



SOURCE: BASE MAP DIGITIZED USING AERIAL ORTHIMAGERY FROM NYS GIS CLEARINGHOUSE, DATED 2011

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NYSDEC STANDBY CONTRACT NO. D007618-7
NYSDEC SITE NO. 7-04-009

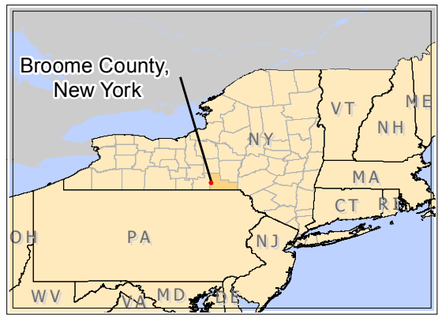
VESTAL WATER SUPPLY
VESTAL, NEW YORK

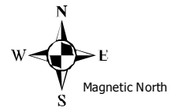
MONITORING WELL LOCATION MAP

SCALE: AS SHOWN

MARCH 2018

FIGURE 3





Legend

Potential Excavation Areas

- West Parking Lot Area (9,300 sq.ft., 386 ft.)
- East Parking Lot Area (9,950 sq.ft., 413 ft.)
- Northeast Corner of Building (15,619 sq.ft., 537 ft.)

Contaminated Areas

- West Parking Lot Area (8,457 sq.ft.)
- East Parking Lot Area (9,419 sq.ft.)
- Northeast Side of Building (12,839 sq.ft.)
- Beneath Northeast Corner(1,984 sq.ft.)
- Beneath Building (9,010 sq.ft.)
- Defined Extent of PCB Contamination > 3 mg/kg (1,517 sq.ft.)

Map created using orthoimagery data from NY state website, sample result data in 2012.

Map Creation Date: 30 March 2016

Coordinate system: New York State Plan (Central)
FIPS: 3102
Datum: NAD83
Units: Feet

60 0 60
Feet

Note:
sq.ft. = square feet

The above areas represent the extent of all contaminants of concern (COCs) that are discussed in the FS narrative.

U.S. EPA Environmental Response Team
Scientific Engineering Response and Analytical Services
EP-W-09-031
W.A.# SERAS-064

Figure 4
Extent of Remediation for Area 3 and Area 4

Vestal Water Supply Well 1-1
Vestal, New York

Data: g:\arcviewprojects\SERAS01\00-064
MXD file: g:\ArcInfoProjects\SERAS01\SER00064_Vestal Chlorinated\FS_Report_2016\064_FS2016_f9_MaxI_Extents_ofContamination_ExceedingSecondaryRemediationGoals_f9V2.mxd

4009-16A VOCs (ug/L)	NYSDEC GA Standard	April - 2017	June - 2017	Oct. - 2017	Dec. - 2017	Mar. - 2018	June - 2018
Benzene	1	**1.8**	1.0 U	0.23 J	1.0 U	1.0 U	0.56 J

4009-11A VOCs (ug/L)	April - 2017	June - 2017	Oct. - 2017	Dec. - 2017	Mar. - 2018	June - 2018
	ND	ND	ND	ND	ND	ND

4009-7 VOCs (ug/L)	NYSDEC GA Standard	April - 2017	June - 2017	Oct. - 2017	Dec. - 2017	Mar. - 2018	June - 2018
cis-1,2-Dichloroethene	5	**42**	**41**	**36**	**53**	**26**	**38**
Vinyl chloride	2	**22**	**4.6**	**4.3**	**10**	1.0 U	**5.6**

4009-10 VOCs (ug/L)	April - 2017	June - 2017	Oct. - 2017	Dec. - 2017	Mar. - 2018	June - 2018
	ND	ND	ND	ND	ND	ND

4009-9 VOCs (ug/L)	NYSDEC GA Standard	April - 2017	June - 2017	Oct. - 2017	Dec. - 2017	Mar. - 2018	June - 2018
cis-1,2-Dichloroethene	5	**8.2**	**10**	**21**	**11**	2.6	**8.2**

4009-13A VOCs (ug/L)	April - 2017	June - 2017	Oct. - 2017	Dec. - 2017	Mar. - 2018	June - 2018
	ND	ND	ND	ND	ND	ND

4009-30A VOCs (ug/L)	April - 2017	June - 2017	Oct. - 2017	Dec. - 2017	Mar. - 2018	June - 2018
	ND	ND	ND	ND	ND	ND

N. MAIN ST.
OLD VESTAL RD.
GROUNDWATER TREATMENT PLANT
WELL 1-1A
WELL 1-1
SUSQUEHANNA RIVER
PUMPHOUSE RD.
WELL 1-3
WELL 1-2A
WELL 1-2
STAGE RD.
NYS ROUTE 17
4009-1
4009-2
4009-3
4009-4
4009-5
4009-6
4009-7
4009-8
4009-9
4009-10
4009-11
4009-11A
4009-12
4009-12A
4009-13
4009-13A
4009-14
4009-15
4009-16
4009-16A
4009-17
4009-18
4009-19
4009-20
4009-21
4009-22
4009-23S
4009-23D
4009-24
4009-25S
4009-25D
4009-26
4009-27S
4009-27I
4009-27D
4009-28
4009-29S
4009-29I
4009-29D
4009-30
4009-30A
ERT-1S
ERT-1D
ERT-1I
ERT-3S
ERT-3D
ERT-3I
ERT-4S
ERT-4I
ERT-4D
ERT-7
ERT-8

0 150' 300' 600'

LEGEND

- APPROXIMATE MONITORING WELL LOCATION
- ROADWAY/DRIVEWAY
- BUILDING
- EDGE OF RIVER

ND – Not detected above NYSDEC GA Standard
U – Compound was not detected at the indicated concentration
J – Indicates an estimated value.
NYSDEC GA GW Standard – New York State Department of Environmental Conservation Groundwater Standard
VOC – Volatile Organic Compounds
ug/L – micrograms per liter
– Shaded values exceed the corresponding NYSDEC GA GW Standard

SOURCE: BASE MAP DIGITIZED USING AERIAL ORTHIMAGERY FROM NYS GIS CLEARINGHOUSE, DATED 2011

USER: HAUSMANN FILENAME: G:\ACAD\PROJ\00266401.0000\FIGURES\FIGURE 2-2 VOC SHALLOW JUN 2018.DWG SAVE DATE: 7/30/2018 4:19 AM PLOT DATE: 7/30/2018 4:19 AM

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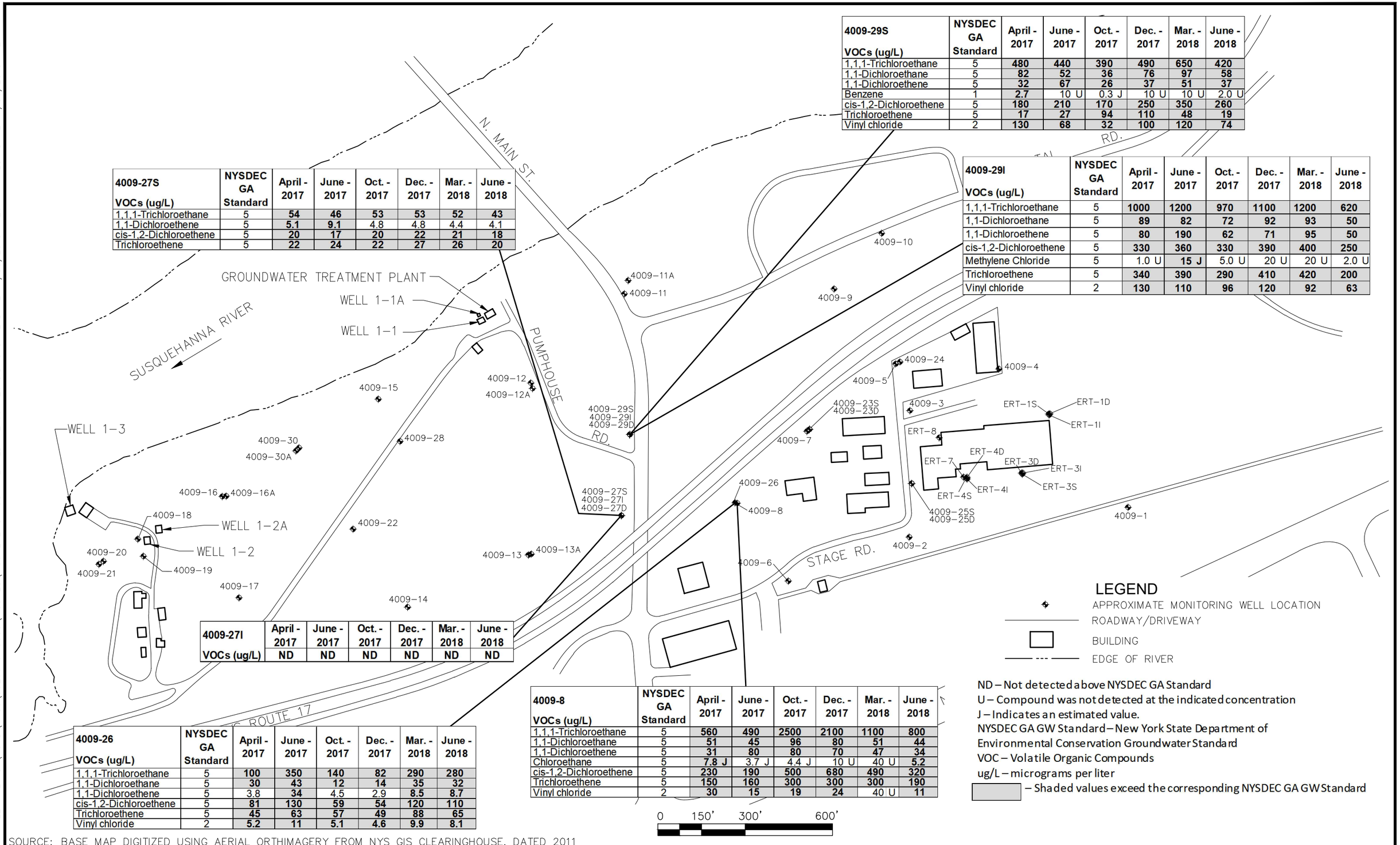
NYSDEC SITE NO. 7-04-009
VESTAL WATER SUPPLY
VESTAL, NEW YORK

SUMMARY OF VOC RESULTS - SHALLOW WELLS
SCALE: AS SHOWN

JULY 2018
FIGURE 5



4009-27S VOCs (ug/L)	NYSDEC GA Standard	April - 2017	June - 2017	Oct. - 2017	Dec. - 2017	Mar. - 2018	June - 2018
1,1,1-Trichloroethane	5	**54**	**46**	**53**	**53**	**52**	**43**
1,1-Dichloroethene	5	**5.1**	**9.1**	4.8	4.8	4.4	4.1
cis-1,2-Dichloroethene	5	**20**	**17**	**20**	**22**	**21**	**18**
Trichloroethene	5	**22**	**24**	**22**	**27**	**26**	**20**

4009-29S VOCs (ug/L)	NYSDEC GA Standard	April - 2017	June - 2017	Oct. - 2017	Dec. - 2017	Mar. - 2018	June - 2018
1,1,1-Trichloroethane	5	**480**	**440**	**390**	**490**	**650**	**420**
1,1-Dichloroethane	5	**82**	**52**	**36**	**76**	**97**	**58**
1,1-Dichloroethene	5	**32**	**67**	**26**	**37**	**51**	**37**
Benzene	1	**2.7**	10 U	0.3 J	10 U	10 U	2.0 U
cis-1,2-Dichloroethene	5	**180**	**210**	**170**	**250**	**350**	**260**
Trichloroethene	5	**17**	**27**	**94**	**110**	**48**	**19**
Vinyl chloride	2	**130**	**68**	**32**	**100**	**120**	**74**

4009-29I VOCs (ug/L)	NYSDEC GA Standard	April - 2017	June - 2017	Oct. - 2017	Dec. - 2017	Mar. - 2018	June - 2018
1,1,1-Trichloroethane	5	**1000**	**1200**	**970**	**1100**	**1200**	**620**
1,1-Dichloroethane	5	**89**	**82**	**72**	**92**	**93**	**50**
1,1-Dichloroethene	5	**80**	**190**	**62**	**71**	**95**	**50**
cis-1,2-Dichloroethene	5	**330**	**360**	**330**	**390**	**400**	**250**
Methylene Chloride	5	1.0 U	**15 J**	5.0 U	20 U	20 U	2.0 U
Trichloroethene	5	**340**	**390**	**290**	**410**	**420**	**200**
Vinyl chloride	2	**130**	**110**	**96**	**120**	**92**	**63**

4009-27I VOCs (ug/L)	April - 2017	June - 2017	Oct. - 2017	Dec. - 2017	Mar. - 2018	June - 2018
	ND	ND	ND	ND	ND	ND

4009-26 VOCs (ug/L)	NYSDEC GA Standard	April - 2017	June - 2017	Oct. - 2017	Dec. - 2017	Mar. - 2018	June - 2018
1,1,1-Trichloroethane	5	**100**	**350**	**140**	**82**	**290**	**280**
1,1-Dichloroethane	5	**30**	**43**	**12**	**14**	**35**	**32**
1,1-Dichloroethene	5	3.8	**34**	4.5	2.9	**8.5**	**8.7**
cis-1,2-Dichloroethene	5	**81**	**130**	**59**	**54**	**120**	**110**
Trichloroethene	5	**45**	**63**	**57**	**49**	**88**	**65**
Vinyl chloride	2	**5.2**	**11**	**5.1**	**4.6**	**9.9**	**8.1**

4009-8 VOCs (ug/L)	NYSDEC GA Standard	April - 2017	June - 2017	Oct. - 2017	Dec. - 2017	Mar. - 2018	June - 2018
1,1,1-Trichloroethane	5	**560**	**490**	**2500**	**2100**	**1100**	**800**
1,1-Dichloroethane	5	**51**	**45**	**96**	**80**	**51**	**44**
1,1-Dichloroethene	5	**31**	**80**	**80**	**70**	**47**	**34**
Chloroethane	5	**7.8 J**	3.7 J	4.4 J	10 U	40 U	**5.2**
cis-1,2-Dichloroethene	5	**230**	**190**	**500**	**680**	**490**	**320**
Trichloroethene	5	**150**	**160**	**300**	**300**	**300**	**190**
Vinyl chloride	2	**30**	**15**	**19**	**24**	40 U	**11**

0 150' 300' 600'

LEGEND

- APPROXIMATE MONITORING WELL LOCATION
- ROADWAY/DRIVEWAY
- BUILDING
- EDGE OF RIVER

ND – Not detected above NYSDEC GA Standard
U – Compound was not detected at the indicated concentration
J – Indicates an estimated value.
NYSDEC GA GW Standard – New York State Department of Environmental Conservation Groundwater Standard
VOC – Volatile Organic Compounds
ug/L – micrograms per liter
– Shaded values exceed the corresponding NYSDEC GA GW Standard

SOURCE: BASE MAP DIGITIZED USING AERIAL ORTHIMAGERY FROM NYS GIS CLEARINGHOUSE, DATED 2011

ARCADIS Design & Consultancy for natural and built assets

NYSDEC STANDBY CONTRACT NO. D007618-7
NYSDEC SITE NO. 7-04-009

VESTAL WATER SUPPLY
VESTAL, NEW YORK

SUMMARY OF VOC SAMPLING RESULTS - INTERMEDIATE WELLS

SCALE: AS SHOWN

JULY 2018

FIGURE 6

Well 1-1 VOCs (ug/L)	NYSDEC GA Standard	April - 2017	June - 2017	Oct. - 2017	Dec. - 2017	Mar. - 2018	June - 2018
1,1,1-Trichloroethane	5	NS	360	210	170	230	170
1,1-Dichloroethane	5	NS	32	17	18	21	17
1,1-Dichloroethene	5	NS	57	13	13	16	14
cis-1,2-Dichloroethene	5	NS	96	55	59	69	56
Trichloroethene	5	NS	89	59	61	73	53

4009-11 VOCs (ug/L)	NYSDEC GA Standard	April - 2017	June - 2017	Oct. - 2017	Dec. - 2017	Mar. - 2018	June - 2018
1,1,1-Trichloroethane	5	1.0 U	170	65	1.0 U	88	68
1,1-Dichloroethane	5	2.8	43.0	18	2.1	24	21
1,1-Dichloroethene	5	1.0 U	27	5.0	1.0 U	7.2	6.4
Benzene	1	15	1.0 U	1.0 U	6.5	1.0 U	1.0 U
cis-1,2-Dichloroethene	5	1.0 U	35	15	1.0 U	23	20
Vinyl chloride	2	1.1	37	13	1.0 U	17	19

4009-15 VOCs (ug/L)	NYSDEC GA Standard	April - 2017	June - 2017	Oct. - 2017	Dec. - 2017	Mar. - 2018	June - 2018
Benzene	1	0.97 J	12	10	9.1	9.3	9.0

4009-16 VOCs (ug/L)	NYSDEC GA Standard	April - 2017	June - 2017	Oct. - 2017	Dec. - 2017	Mar. - 2018	June - 2018
Benzene	1	NS	18.0	1.5	5.8	1.1	5.7

4009-12 VOCs (ug/L)	NYSDEC GA Standard	April - 2017	June - 2017	Oct. - 2017	Dec. - 2017	Mar. - 2018	June - 2018
1,1,1-Trichloroethane	5	100	45	1.0 U	330	45	1.0 U
1,1-Dichloroethane	5	18	9.2	5.6	46	13	6.2
1,1-Dichloroethene	5	3.2	7.7	0.53 J	16	5.0	0.54 J
Benzene	1	3.6	2.8	2.5	0.51 J	2.5	1.7
cis-1,2-Dichloroethene	5	11	8.7	2.0	62	15	2.0
Trichloroethene	5	3.0	10	1.9	69	14	1.6
Vinyl chloride	2	5.7	22	1.3	96	38	2.6

4009-29D VOCs (ug/L)	NYSDEC GA Standard	April - 2017	June - 2017	Oct. - 2017	Dec. - 2017	Mar. - 2018	June - 2018
1,1,1-Trichloroethane	5	270	31	7.6	13	280	41
1,1-Dichloroethane	5	44	8.1	1.8	2.9	38	11
1,1-Dichloroethene	5	26	2.0	0.37 J	0.88 J	42	5.3
cis-1,2-Dichloroethene	5	130	10	1.5	3.3	180	26
Trichloroethene	5	61	7.2	2.0	3.5	120	10
Vinyl chloride	2	73	11	8.4	9.4	72	17

4009-14 VOCs (ug/L)	NYSDEC GA Standard	April - 2017	June - 2017	Oct. - 2017	Dec. - 2017	Mar. - 2018	June - 2018
Benzene	1	NS	9.2	11	12	13	11

4009-19 VOCs (ug/L)	April - 2017	June - 2017	Oct. - 2017	Dec. - 2017	Mar. - 2018	June - 2018
	ND	ND	ND	ND	ND	ND

4009-18 VOCs (ug/L)	April - 2017	June - 2017	Oct. - 2017	Dec. - 2017	Mar. - 2018	June - 2018
	ND	ND	ND	ND	ND	ND

4009-21 VOCs (ug/L)	NYSDEC GA Standard	April - 2017	June - 2017	Oct. - 2017	Dec. - 2017	Mar. - 2018	June - 2018
Benzene	1	24	25	18	18	17	11

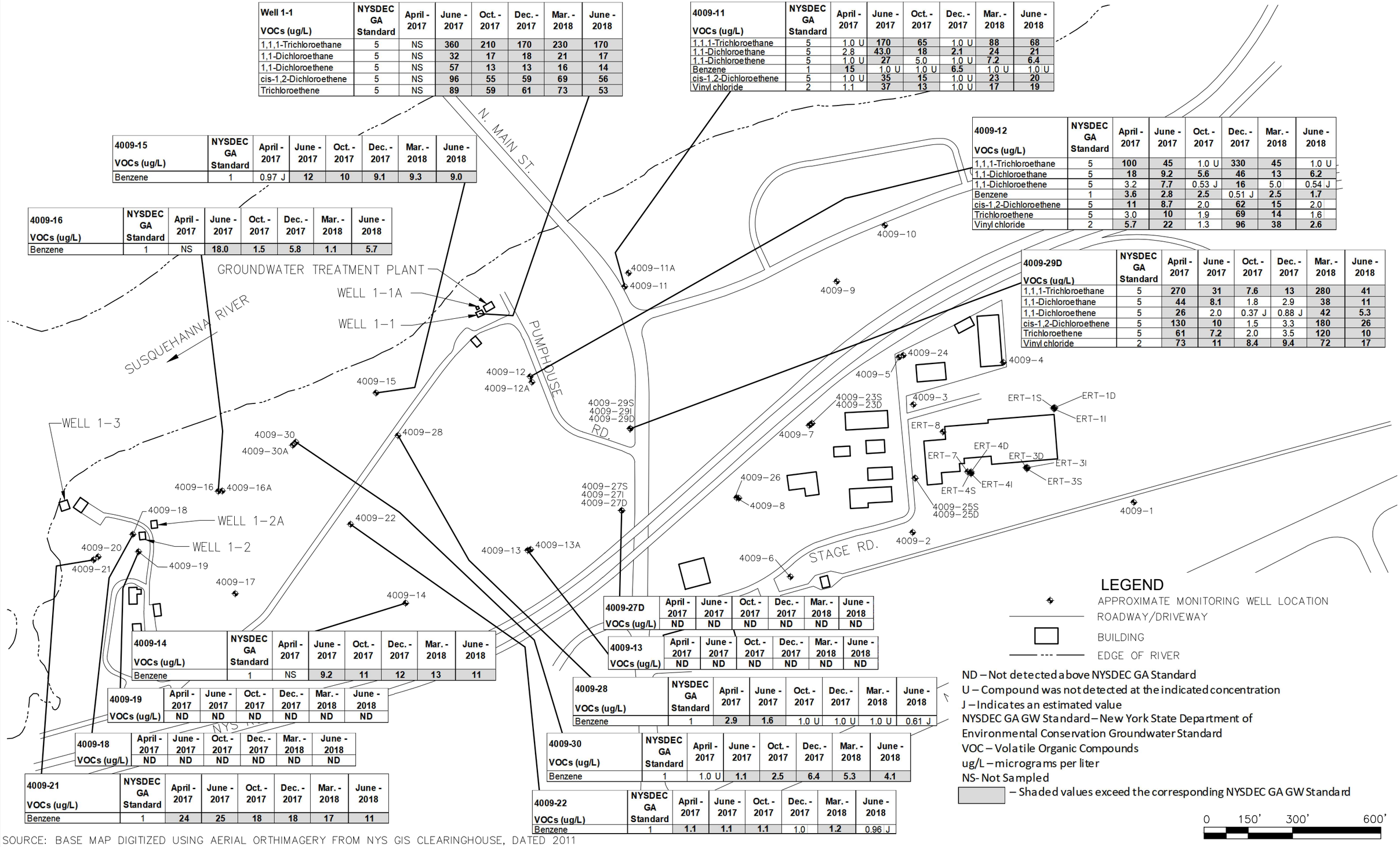
4009-27D VOCs (ug/L)	April - 2017	June - 2017	Oct. - 2017	Dec. - 2017	Mar. - 2018	June - 2018
	ND	ND	ND	ND	ND	ND

4009-13 VOCs (ug/L)	April - 2017	June - 2017	Oct. - 2017	Dec. - 2017	Mar. - 2018	June - 2018
	ND	ND	ND	ND	ND	ND

4009-28 VOCs (ug/L)	NYSDEC GA Standard	April - 2017	June - 2017	Oct. - 2017	Dec. - 2017	Mar. - 2018	June - 2018
Benzene	1	2.9	1.6	1.0 U	1.0 U	1.0 U	0.61 J

4009-30 VOCs (ug/L)	NYSDEC GA Standard	April - 2017	June - 2017	Oct. - 2017	Dec. - 2017	Mar. - 2018	June - 2018
Benzene	1	1.0 U	1.1	2.5	6.4	5.3	4.1

4009-22 VOCs (ug/L)	NYSDEC GA Standard	April - 2017	June - 2017	Oct. - 2017	Dec. - 2017	Mar. - 2018	June - 2018
Benzene	1	1.1	1.1	1.1	1.0	1.2	0.96 J



LEGEND

- APPROXIMATE MONITORING WELL LOCATION
- ROADWAY/DRIVEWAY
- BUILDING
- EDGE OF RIVER

ND – Not detected above NYSDEC GA Standard
U – Compound was not detected at the indicated concentration
J – Indicates an estimated value
NYSDEC GA GW Standard – New York State Department of Environmental Conservation Groundwater Standard
VOC – Volatile Organic Compounds
ug/L – micrograms per liter
NS- Not Sampled
– Shaded values exceed the corresponding NYSDEC GA GW Standard

0 150' 300' 600'

SOURCE: BASE MAP DIGITIZED USING AERIAL ORTHIMAGERY FROM NYS GIS CLEARINGHOUSE, DATED 2011

ARCADIS Design & Consultancy for natural and built assets

NYSDEC STANDBY CONTRACT NO. D007618-7
NYSDEC SITE NO. 7-04-009

VESTAL WATER SUPPLY
VESTAL, NEW YORK

SUMMARY OF VOC SAMPLING RESULTS - DEEP WELLS

SCALE: AS SHOWN

JULY 2018

FIGURE 7

USER: HAUSMANN FILENAME: G:\ACAD\PROJ\00266401.0000\FIGURES\FIGURE 2-4 VOC DEEP JUN 2018.DWG SAVE DATE: 7/30/2018 4:21 AM PLOT DATE: 7/30/2018 4:22 AM