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To: Mr. George Momberger
Division of Environmental Remediation
New York State Department
of Environmental Conservation

Date: August 1, 2019

WE ARE SENDING YOU THE FOLLOWING ITEMS:

X Attached __ Under separate cover via _____ the following items:

__ Shop Drawings __ Prints __ Plans __ Samples __ Specifications

__ Copy of Letter __ Change Order _____

COPIES	DESCRIPTION
1	FINAL 100% Design Report, Former Canada Dry Plant, 2 Badger Avenue, Endicott, NY

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__ For approval __ For Checking __ Resubmit __ copies for approval

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Signed: Heather R. Budzich

Heather R. Budzich

cc: Project File: 450480

FORMER CANADA DRY PLANT
FINAL 100% DESIGN REPORT
2 AND 7 BADGER AVENUE
ENDICOTT, NEW YORK

NYSDEC Site # 704050

Prepared For:

NEW YORK STATE OF OPPORTUNITY | Department of Environmental Conservation

New York State Department of Environmental Conservation
Division of Environmental Remediation
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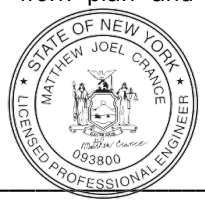
August 2019

CERTIFICATION STATEMENT
FORMER CANADA DRY PLANT
FINAL 100% DESIGN REPORT
ENDICOTT, NEW YORK

I, Matthew Crance, certify that I am currently a NYS registered professional engineer and that this Remedial Design Report was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10) and that all activities were performed in full accordance with the DER-approved work plan and any DER-approved modifications.



08/01/2019

_____ _____

Date

Matthew Crance
NYS Engineering License No. 093800

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Acronyms and Abbreviations

acfm	actual cubic feet per minute
AGC	Annual Guideline Concentrations
bgs	below ground surface
DAR	Division of Air Resources
DER	Division of Environmental Remediation
ft^2	square feet
HDPE	high density polyethylene
HSVE	horizontal soil vapor extraction
IDW	investigation derived waste
IRM	Interim Remedial Measure
in. WC	Inches of water column
kW	kilowatt
LEL	lower explosive limit
$\mu g/m^3$	micrograms per cubic meter
ng	nanograms
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
NYSDOT	New York State Department of Transportation
O&M	Operations and Maintenance
OM&M	Operations, Maintenance and Monitoring
OSWER	Office of Solid Waste and Emergency Response
PDI	Pre-Design Investigation
P&ID	process and instrumentation diagram
PVC	Polyvinyl chloride
PVER	pore volume exchange rate
RAO	Remedial Action Objectives
ROD	Record of Decision
ROI	radius of influence
scfm	standard cubic feet per minute
SGC	Short-term Guideline Concentrations
Site	Former Canada Dry Plant
SVE	Soil Vapor Extraction
TCE	trichloroethylene
TCL	Target Compound List
TOGS	Technical and Operational Guidance Series
USEPA	United States Environmental Protection Agency
VMP	vapor monitoring points
VOC	volatile organic compound

1.0 PROJECT BACKGROUND AND OBJECTIVES

This section provides a general description of the project background and a discussion of the project objectives.

1.1 PROJECT BACKGROUND

The Former Canada Dry Plant (site) is located at 2 and 7 Badger Avenue in the Village of Endicott, NY on a 0.3-acre parcel currently utilized as a bottle redemption center (Figure 1). The site is a Class 2 inactive hazardous waste disposal site located in a relatively flat stretch of land between the Susquehanna River and Nanticoke Creek. A small office and redemption space occupy the southeast corner of the building with the remainder dedicated to bottle and can sorting and storage. The portion of 7 Badger Avenue lying within the site bounds is paved parking used by redemption center trucks and patrons. The Norfolk-Southern Railroad bounds the site on the north side.

Both 2 and 7 Badger Ave. were formerly owned by the Canada Dry Bottling Company and/or its successors. Canada Dry used the structures on both the 2 and 7 Badger Ave. properties for the production and bottling of carbonated beverages. The surrounding paved areas were used for trucking and storage of palletized accouterments. While the production of carbonated beverages would not have been the source of chlorinated solvents observed in groundwater, the maintenance of production machinery and transport vehicles in close proximity to the floor drains and drywells is most likely the contributing source of contaminants.

Several Interim Remedial Measures (IRMs) have been completed at 2 and 7 Badger Avenue including multiple excavations and prior operation of an air/sparge vapor extraction system. In 1991, two dry wells and associated floor drains (west floor drain and east floor drain) were excavated and removed inside the Building at 2 Badger Avenue. The floor drains and dry well are suspected of being the primary source of subsurface contamination in this area per the Remedial Investigation Report (HRP Associates, 2012, with original reference listed as Buck Engineering Soil Excavation and Remedial System Installation Report dated August 1993). A second excavation was located off the northeast corner of the 2 Badger Avenue building surrounding the current location of DEC-06-MW-06. An air-sparge/vapor extraction system was installed at this location in 1993 and operated for approximately 18 months. This area is part of the 7 Badger Avenue parcel. A third excavation was completed immediately to the east of the 2 Badger Avenue building where miscellaneous debris was found. Lastly, two underground storage tanks were removed from the 2 Badger Avenue site (Tanks #1 and 5) immediately east of the 2 Badger Avenue structure. The location of these excavation areas is shown on Figure 2.

A Remedial Investigation conducted in 2011 delineated a trichloroethene (TCE) plume (including breakdown products) in the groundwater on-site due to historic activities. The groundwater contamination plume reportedly flows predominantly east-northeast towards a New York State Department of Transportation (NYSDOT) dewatering sump located at the Norfolk Southern railroad underpass on North Nanticoke Avenue. Groundwater beneath the site ranges between approximately 9 feet and 13 feet below grade (HRP Associates, 2012 and Parsons, 2018). Concentrations of TCE were detected in groundwater and soil vapor samples at levels exceeding New York State Department of Environmental Conservation (NYSDEC) Ambient Water Quality Standards presented in Technical and Operational Guidance Series (TOGS) 1.1.1 (6 NYCRR Part 703) and New York State Department of Health (NYSDOH) Soil Vapor Guidance for Evaluating Soil Vapor Intrusion in the State of New York (October 2006). An assessment of exposure pathways indicated volatile organic compounds (VOCs) including TCE in groundwater may move into the soil vapor (air spaces within the soil), which may move into enclosed areas in overlying buildings affecting the indoor air quality through soil vapor intrusion.

A Record of Decision (ROD) was issued for the site in May of 2013. A component of the selected remedy in the ROD called for the installation of a Soil Vapor Extraction (SVE) system to address the Remedial Action Objectives (RAOs) for public health protections from ongoing vapor intrusion at the Canada Dry site. Furthermore, the selected remedy requires implementation of an Operation, Monitoring and Maintenance Plan to assess the performance and effectiveness of the remedy and to ensure continued operation, maintenance, optimization, monitoring, inspection and reporting of any mechanical or physical components of the remedy. Other elements of the selected remedy, which are not described herein include Institutional Controls, a Site Management Plan and a Cover System.

Parsons was contracted by NYSDEC to conduct a Pre-Design Investigation (PDI) and pilot-scale blower study in accordance with NYSDEC guidelines outlined in the Division of Environmental Remediation (DER)-10 Technical Guidance document to collect the information necessary to complete an SVE System Remedial Design. The PDI and blower study were completed between July 2017 and September 2018. The overall program consisted of a subsurface investigation, a groundwater investigation, installation of SVE wells, and an SVE system pilot study. Results from the pilot study were used to determine the radius of influence (ROI), vacuum and flow rates of the SVE well points; the primary design parameters needed to design the full-scale system (Parsons, 2018) and are used as the basis for this Final 100% Design Report.

1.2 REMEDIAL ACTION OBJECTIVES

Installation of an SVE system at the 2 Canada Dry site will be designed to address specific RAOs for protection of public health and the environment as stated in the ROD. Other RAOs addressed by implementation of a site management plan or institutional controls are not addressed herein. Applicable RAOs for SVE at the Canada Dry site are listed below.

Groundwater RAOs for Protection of Public Health

- Prevent contact with, or inhalation of volatiles, from contaminated groundwater.
- Restore groundwater aquifer to pre-disposal/pre-release conditions, to the extent practicable.
- Prevent the discharge of contaminants to surface water.
- Remove the source of ground or surface water contamination, to the extent practicable.

Soil

- Prevent inhalation of or exposure from contaminants volatilizing from the soil.
- Prevent migration of contaminants that would result in groundwater or surface water contamination.

Soil Vapor

- Mitigate impacts to public health resulting from existing, or the potential for soil vapor intrusion into buildings at the site.

1.3 REMEDIAL DESIGN COMPONENTS

The selected treatment remedy for the Former Canada Dry Plant includes design and installation of an SVE system to mitigate TCE in the vadose zone beneath the building at 2 Badger Avenue and the area immediately north and east of the building and is the focus of this Final 100% Design Report. An SVE System is designed to remove VOCs by introducing a vacuum in the vadose zone (area below the ground surface but above the groundwater table). The applied vacuum draws air through the soil matrix and extracts VOCs within the soil and

those volatizing from groundwater to the SVE extraction point. The SVE system is designed to mitigate soil vapor intrusion into the building at 2 Badger Avenue. It is anticipated the SVE system may operate until groundwater standards have been met (TOGS 1.1.1) and, if deemed appropriate, the potential for soil vapor intrusion has been reduced to a point where monitoring or no further action is acceptable and is in compliance with the May 2017 NYSDOH Guidance for Soil Vapor Intrusion, Soil Vapor/Indoor Air Matrix A. Achievement of RAOs will be determined through development of an Operation, Monitoring and Maintenance Plan to track SVE performance and progress towards achieving cleanup goals.

1.4 ORGANIZATION OF THE DOCUMENT

This Final 100% Design Report is organized into four sections and five attachments as follows (figures and tables are located at the end of the document):

- Section 1.0 Introduction – Presents the project background, the RAOs, the regulatory framework for the remedial design components, and report organization.
- Section 2.0 Design Basis for Remediation – Presents an overview of soil gas concentrations measured previously; the design ROI for the proposed remediation area; utility and geophysical investigation requirements; and basis of design, assumptions, and summary of major components of the SVE system.
- Section 3.0 Operations, Maintenance, and Performance Monitoring – Presents proposed performance monitoring activities during SVE system startup and during the first six months of operation. Also, presents routine system operation and maintenance activities.
- Section 4.0 Construction Schedule and Cost Estimate – Presents the Final 100% Design schedule and associated cost estimate for constructing the proposed remedial system.
- Section 5.0 References – Presents references cited in this report.
- Attachment A Remedial Design Drawings
- Attachment B Specifications
- Attachment C Pre-Design Investigation Waste Manifest
- Attachment D Design Cost Estimate and Construction Schedule
- Attachment E AERSCREEN Modeling Output

2.0 DESIGN BASIS FOR REMEDIATION

This section describes the Final 100% Design approach for the components of the selected remedy at the site that involve an engineered remedial system (i.e., SVE). The SVE system was designed to remove VOCs, primarily TCE from the subsurface, throughout the vadose zone within the footprint of the building at 2 Badger Avenue and the area immediately east and northeast of this building in accordance with the May 2013 ROD. Results from the SVE pilot test were used as the basis of design and are summarized in the *Former Canada Dry Plant Pre-Design Investigation Report* (Parsons, 2018).

2.1 SOIL GAS SAMPLE RESULTS

The area targeted for SVE treatment is the vadose zone beneath the 2 Badger Ave. building. A qualitative passive soil gas survey for TCE was completed during the Remedial Investigation between April 18, 2011 and May 2, 2011. The survey detected TCE between 26 nanograms (ng) (PSV-13) at the northern portion of the

paved area between 2 and 7 Badger Avenue and 94,933 ng (PSV-28) inside the bottle storage room at 2 Badger Avenue, near the former eastern and western floor drains. The latter location is suspected of being the primary source of subsurface contamination in this area (HRP Associates, 2012). The qualitative results of the passive soil gas survey have been recreated and are shown on Figure 3.

Two sub-slab soil vapor samples, one outdoor ambient air sample and one ambient indoor air sample were collected December 14 and 15, 2011 during the Remedial Investigation. The highest sub-slab soil vapor concentration was detected at SSV-1 at 70 micrograms per cubic meter (µg/m^3) adjacent to the highest passive soil gas survey location, PSV–28. The second sub-slab soil vapor sample was collected southeast of SSV-1 but still within the 2 Badger Avenue footprint with a concentration of 18 µg/m^3. The results at both of these locations exceed the August 2015 NYSDOH Guidance Value of 2 µg/m^3 for TCE and SSV-1 exceeds the United States Environmental Protection Agency (USEPA) Guidance Value for target shallow soil gas concentrations (22 µg/m^3) as provided in the Office of Solid Waste and Emergency Response (OSWER) Draft Guidance for Evaluating Intrusion in Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance) – November 2002, Table 2A. The outdoor ambient air (SSV-3, 0.47 µg/m^3) and indoor ambient air (0.29 µg/m^3) concentrations were below the NYSDOH and USEPA Guidance Values and correspond to lower concentration areas shown on Figure 3 (HRP Associates, 2012).

Five soil vapor samples were collected from each extraction test well during the September 29 and September 30, 2018 PDI Pilot Test (Parsons 2018). The concentration of TCE detected was generally consistent between extraction wells SVE-01 (3,000 µg/m^3), SVE-03 (4,200 µg/m^3), SVE-05 (4,600 µg/m^3) and SVE-07 (4,000 µg/m^3) and exceeded both the NYSDOH and USEPA Guidance Values. The soil vapor results for TCE from DEC-06-MW–06 were significantly less at 1.5 µg/m^3 and are attributed to the well screen being completely submerged or otherwise blinded off.

The concentrations of soil vapor and indoor air from the Remedial Investigation and pilot test soil vapor samples were compared to the current NYSDOH Guidance for Soil Vapor Intrusion, Soil Vapor/Indoor Air Matrix A (May 2017) for TCE. The concentration of TCE measured from SSV-1 and from pilot test extraction points SVE-01, SVE-03, SVE-05 and SVE-07 exceeded the NYSDOH guidance of 60 µg/m^3, the concentration above which, the recommended remedial action is to mitigate regardless of the corresponding indoor air concentration. The SVE system designed herein will ameliorate the potential for vapors to accumulate in enclosed areas of Building 2.

2.2 RADIUS OF INFLUENCE

Results from the September 2018 PDI SVE pilot test indicated the ROI varied at the site and was influenced by the position of the vacuum location relative to previous excavation areas and proximity to building foundations/footers and utility corridors. In general, the ROI was reduced in the presence of these factors but was expanded under higher blower vacuums. A summary of specific findings from each pilot test are presented in the PDI Report (Parsons, 2018); however, the results suggest at least three zones of influence should be considered to design the full-scale system: 1) zone near SVE-07 (outside eastern edge of building); 2) zone near SVE-03 (inside far west bottle sorting room) and 3) zone near SVE-05 (northeast of previous excavation area around DEC-06-MW-06).

The most significant ROI measured during the PDI was at SVE-07 where pneumatic influence was detected at 60 horizontal feet from the extraction location under each of the three blower tests (20 inches water column (in WC), 40 in. WC and 60 in. WC). The ROI around SVE-01 was a bit lower measuring between 40 and 48 horizontal feet during the 40 in. WC and 80 in. WC blower tests, respectively. The ROI was further reduced at SVE-03 and no successful pneumatic influence (>0.1 in. WC) was detected at the closest monitoring point, 38

horizontal feet away. The lack of influence is likely attributed to the limited vertical screen length at this location and influence from adjacent building foundations/footers. Pneumatic influence (0.1 in. WC) was detected at SVE—03 during the 80 in. WC extraction test at SVE-01 under an average well flow rate of approximately 120 standard cubic feet per minute (scfm) confirming pneumatic communication between the bottle sorting room and the bottle storage room despite differences in construction of these two rooms.

To ensure coverage in the southwest corner of the building, a maximum design (ROI) of 30 feet was selected assuming a flow rate of 120 scfm is needed based on pilot test data (Parsons, 2018). This flow rate is the volume of air pulled from one vertical extraction well. The vertical flow rate was extrapolated to a horizontal flow rate by calculating the equivalent volume to be extracted beneath the building footprint. The building is approximately 100 feet long by 80 feet wide (8,000 square feet, ft^2). With a ROI of 30 feet, one equivalent area is 2,827 ft^2 for a total of 2.83 equivalent areas inside the building footprint. The total flow was calculated by multiplying 2.83 equivalent areas by the design flow rate (120 scfm) for a combined flow of approximately 340 scfm (170 scfm per well).

Two horizontal soil vapor extraction wells (HSVE)-09 and HSVE-10 are recommended for installation to address the area beneath the building footprint. However, since the ROI measured at SVE-07 was 60 horizontal feet, placement of the third horizontal well need not be within the building footprint, but rather east of the building to expand the zone of capture. The anticipated flow rate for this well is also approximately 170 scfm. The ROI in this area should extend beyond the eastern edge of the 2 Badger Avenue TCE plume (including PSV-21, 10,814 ng, see Figure 3) measured from the passive soil gas survey during the RI. As such, the spacing of the wells will increase moving west to east with the corresponding ROI generally increasing from 30 feet to 60 feet across the southern end of the site and ranging between 40 and 48 feet in the northern section of the building. The design flow rate (170 scfm per well) was conservatively designed to ensure complete vacuum coverage and allows for overlap of the ROI from each respective horizontal well. The approximate limits of the ROI for each horizontal well are shown on Drawing C--001 in Attachment A.

The ROI measured at SVE-05 was limited to 23 horizontal feet with an average well flow of 60 scfm during the 80 in. WC blower test. The ROI was limited in this area likely due to the well points proximity to the previous excavation area surrounding DEC-06-MW-06. Furthermore, a positive pneumatic influence was not measured at SVE-05 during tests at other extraction wells. As such, treatment for this area is considered separately as it appears to be pneumatically isolated from other areas of the 2 Badger Avenue site despite the highest soil vapor concentrations measured during the pilot test (4,600 $\mu g/m^3$). Analysis of results from the passive soil gas survey in collaboration with the fairly consistent geologic conditions at the site suggest it is possible the ROI at this location is greater than 23 feet but merely wasn't detected in the western/southwestern direction as the vacuum was short circuited by the former excavation. If there is no pneumatic connection towards 2 Badger Avenue, it seems unlikely the vapors measured at SVE-05 were sourced from areas extending 50 feet to the west near PSV-11 (3,954 ng) on the west side of the excavation area around DEC-06-MW-06 due to the fact the former excavation area stands between SVE-05 and PSV-11. The highest passive gas TCE data measured 50 ft south of SVE-05 was 67 ng at PSV-19 and was 50 ng (PSV-14) 35 feet north of SVE-05. It seems unlikely the soil vapors measured at SVE-05 during the September 2018 pilot test were sourced from 2 Badger Avenue but rather may be from beneath the building at 7 Badger Avenue. As such, the ROI at this location is probably more consistent with the ROI measured at SVE-07 (60 feet) and would suggest an SVE system at SVE-05 would be pulling vapors from the green isocontour on Figure 3 where concentrations ranged between 6,273 ng (PSV-29) and 9,225 ng (PSV-30).

Treatment of the SVE-05 area will be achieved via trenching and connection of the remedial system to this existing well. The approximate limits of the ROI for SVE-05 are shown on Drawing C-001 (Attachment A).

Another metric considered during design was the preferred remediation time based on a predetermined pore volume exchange rate (PVER), which is the number of air-filled pore volumes from the treatment zone removed per unit of time (i.e., day). The United States Army Corps of Engineers June 2002 *Soil Vapor Extraction and Bioventing Engineer Manual* indicates, a typical number of pore volumes to be exchanged is 5,000 and to complete a remediation in one to two years, the system requires a flow rate capable of achieving 10 pore volumes per day. To calculate a flow rate needed to achieve this treatment time frame, the PVER is multiplied by the air-filled pore volume:

$$Q = PVER*[A*H \times n_a]/(1440)$$

Where:

Q= flow rate (ft^3/min, scfm)

n_a = air filled porosity, estimated at 0.35

A= area of treatment zone (ft^2)

H = height of treatment zone above water table (ft)

(10 pore volumes/day) * [(22,500 ft^2*9.5 ft) x 0.35] = 519.5 scfm

The total flow rate needed to remove 5,000 pore volume exchanges at a rate of 10 pore volumes per day (1.4 years) is estimated at 520 scfm. With three wells in place, this equates to approximately 173 scfm per well and supports the flow rate determined during the pilot test. It is anticipated that the majority of the contaminants will be removed after 1,000 to 2,000 pore volumes (approximately six months). At that point, remediation will transition to a diffusion rate limiting step. When this occurs, the extraction rate will be reduced to about 173 scfm (3.3 pore volumes per day) for the entire site and may be achieved by turning one or two blowers off.

2.3 UTILITY AND GEOPHYSICAL INVESTIGATION

A desktop utility investigation is recommended as part of pre-mobilization activities prior to initiating subsurface construction activities (e.g., drilling and trenching). Two utility lines were marked out at the site during the PDI: sanitary sewer and gas as shown on Figure 2; however, an extensive survey of the property was not completed. Electric service to the site is via overhead utility poles located east of the building at 2 Badger Avenue. It is recommended the desktop utility investigation include contacting local utility companies currently servicing the site in attempt to confirm the pathway and depth for the sanitary sewer and gas utilities located during the PDI (Parsons, 2018). As part of this effort, historical reports, drawings, and figures maintained in the site repository (George F. Johnson Memorial Library in Endicott, New York) should be reviewed to collect information on the presence of subsurface utilities or other subsurface obstructions in the vicinity of 2 Badger Avenue.

Additionally, a geophysical investigation will be performed at the site to field locate subsurface utility lines in areas proposed for subsurface investigation. Data obtained from the investigation will include the accurate location, size (diameter), depth and type of subsurface utilities as described herein. Three new HSVE wells are proposed for installation with each well (including SVE-05) connected to the SVE system via trenching. The entry point of the horizontal wells is proposed for the north side of the 2 Badger Avenue building with the exit points along the south side of the building as shown on Drawing C-001 (Attachment A). At a minimum, a 16-square foot grid will be marked at each proposed well entry and exit points and a 4-foot wide swath will continue along the proposed pipeline installation pathway (bore path) for any pipe installed at a depth less than 5 feet below grade. For horizontal wells HSVE-09 and HSVE-10, it is recommended the geophysical survey extend at a minimum from

the system enclosure to the point where the well enters and exits beneath the building foundation at an anticipated depth no less than 6 feet below ground surface (bgs). It is not likely utilities would have been installed at depths greater than 6 feet beneath the building; however, lack of historical records makes this determination uncertain. Hand clearing methods may be used prior to mobilization to confirm the depth of the building foundation and/or footers and the presence/absence of utilities at the point where the proposed bore path intersects the building on the north and south ends.

Additional efforts (alternative geophysical investigation techniques) may be employed to attempt to delineate utilities that may have been installed within the footprint of the building taking into consideration surveying through a reinforced concrete floor. However, due to the large volume of bottles and cans frequently present in the building, large portions of the building will be inaccessible. To ensure the safety of the workers and to preclude the potential for service disruption, it is recommended the geophysical survey be completed within the open spaces of the building, if practical, along the proposed bore path as well as around the exterior perimeter of the building. The purpose of the exterior survey is to identify utilities that may be entering the building at inaccessible interior locations and may potentially intersect the proposed bore path. Hand clearing methods will be implemented at locations where a utility is suspected of entering the building and potentially intersecting the proposed well bore path.

For horizontal well HSVE-11, the geophysical survey will be completed along the entire length of the proposed bore path. Underground storm/sanitary sewer utilities and natural gas distribution lines were identified east of the building during the PDI (Parsons, 2018) in the immediate vicinity of this well. The sewer utilities and natural gas lines were oriented north-to-south, with an additional gas line oriented east-to-west near the southeast corner of the building. The depth of these utilities below grade is unknown. The proposed location for HSVE-11 will likely cross over/under the natural gas line located near the southeast corner of the building.

An additional geophysical survey will be needed to address the piping to be installed via trenching methods between the system enclosure and SVE-05. Any underground site utilities or obstructions will be marked in the field and documented in a marked-up field plan sheet. The depth of any identified utilities will be documented as well and used to confirm the proposed well installation pathway. The results of the geophysical site survey, along with the available information obtained from previous site investigations, will be used when selecting drilling locations. The results of the geophysical survey will be reviewed with the horizontal driller including the location of existing utilities, identified subsurface abnormalities and respective subsurface depths. The depths of any utilities which cross the bore path are to be verified using hand clearing methods prior to well installation.

An additional geophysical investigation will be performed in the vicinity of groundwater monitoring wells HRP-MW-01, HRP-MW-04 and HRP-MW-10. The location of these wells has not been confirmed; however, it is likely HRP-MW-10 has been paved over and MW-04 may be buried beneath several inches of gravel (see Section 2.8). HRP-MW-01 is believed to be located beneath loaded pallets. At a minimum, a 16-square foot grid will be marked at each location to allow some surface digging, if necessary, based on the coordinates in the NYSDEC EDD for these wells. The NYSDEC will provide any necessary access/approval requirements to complete this task.

2.4 HORIZONTAL WELL DESIGN AND CONSTRUCTION

The full-scale SVE system design for 2 Badger Avenue includes the installation of three new horizontal wells roughly oriented north-to-south; two beneath the building and one east of the building parallel with Badger Avenue. The wells will be installed so the well screen is set to a depth between six and eight feet below ground surface. This will be approximately two feet above available historic depths to groundwater. Relative groundwater elevations (depth below grade) measured during the RI from the closest monitoring wells to the HSVE wells

ranged between 10.79 feet (HRP-MW-2) and 12.09 feet (HRP-MW-05, June 13, 2011) and 9.87 feet (HRP-MW-04) and 11.09 feet (HRP-MW-05, October 4, 2011). Relative groundwater elevations measured during the September 2018 PDI ranged between 11.61 feet (HRP-MW-11) and 12.77 feet (HRP-MW-05, Parsons November 2018). Groundwater upwelling was considered insignificant during the pilot test and is not expected to be an issue during SVE operation.

The wells will be trenched to a system enclosure located on the northern side of the building. The system enclosure will house the system's operational components including the blower and condensate tank. The proposed location of the three wells and the system enclosure are shown on Drawing C-001 (Attachment A). The actual position and orientation of the wells may be modified in the field to accommodate well installation. Horizontal wells are preferred over using the SVE wells installed in September 2018 to minimize disruption to the operating business within the building.

2.4.1 DESCRIPTION OF HORIZONTAL WELLS

Prior to drilling, the bore-path of each horizontal well including the proposed entry and exit points will be pre-planned and laid out (e.g., spray painted) by the driller. Target locations and depths will be established for the start and end of the well screen and the location of the exit point. A walk-over locator may be used to screen the bore path for potential sources of signal interference and adjust the receiver's frequency if required. The walk-over locating system may be used to track the position and depth (pitch) of the drilling sonde from the point of entry, along the proposed bore-path to the point of exit. The technology transmits real-time data from the drill bit to the drilling operator. This tracking data will be logged and used to adjust the direction and depth of the bore-path as needed.

Since placement of the well screen is depth dependent, a benchmark elevation will be established before drilling commences at the rig location or at the beginning of the well screen. The walk-over locating system may be used as drilling progresses to check the depth of the drilling sonde in relation to ground elevation and the benchmark elevation.

The typical approach for installation of horizontal wells is accomplished in three phases: installation of a pilot hole (entry point); reaming to enlarge the well diameter; and pull-back of the well pipe and screen through the bore-hole. The remainder of this section details the approach for installing HSVE wells.

Installation of Pilot-Hole

Prior to installation of the pilot-hole, the driller will excavate an approximately three-foot (length) by three-foot (width) by three-foot (depth) entrance point and exit point at the locations shown on Drawing C-001 and C-002 (Attachment A). The entrance/exit points will be used to contain and manage the drilling fluids (e.g., drilling mud such as fluid bentonite clay). Soils from excavation of the entry/exit points will be staged on poly sheeting and reused for backfill upon completion of well installation, if approved by the Engineer. Excavation will be performed in accordance with applicable sections of the Excavation Specification (00200) found in Attachment B. If inconsistencies are identified, information provided on the drawings and within the report text shall supersede conflicting information provided in the specifications. Surface restoration for the entry/exit points is described in Section 2.6.

A drill rig (e.g., Ditch Witch 2720) and a vacuum trailer will be set-up immediately adjacent to the entrance pit. A drill bit (size to be determined by driller) will be used to advance the horizontal drilling at the prescribed entry point at an angle of entry likely between 10 and 14 degrees (25 percent). The entry angle will be selected to

optimize the drill path of the riser section to achieve the desired well screen depth and account for the presence of utilities or subsurface abnormalities. The drill string will be advanced using the pushing, rotation and drilling fluid forces of the drill rig. Best management practices may be used to manage the suspended load during drilling operations.

Drilling fluids will be developed by the driller based on site specific conditions and the composition will be adjusted as needed in the field to allow for maximum efficiency. The driller will establish a drilling fluids management program to address all aspects of horizontal drilling to address subsurface conditions, well bore stability, filtration control, cuttings removal, continuous circulation and lubrication. The drilling fluid may be comprised of a biodegradable mud added in measured quantities during the drilling process.

A walk-over locating system (or equivalent) will be used to track the position and pitch of the drilling bit as it progresses along the proposed bore path. A sonde (or transmitter) will be attached immediately behind the drill bit to record the angle, rotation, direction and temperature data. The information is sent by an electromagnetic signal through the ground to a receiver (e.g., a hand-held locator) at the ground surface. Information is communicated to the drilling operator through a computer program using real-time as-built information to continually adjust the drill bit as needed along the proposed path. Whenever possible, walk-over readings will be taken every 10 to 15 feet along the proposed path and more frequently in the vicinity of utilities, subsurface obstructions and for screen placement accuracy. Consistent readings will be more easily achieved outside the building. For the horizontal wells installed beneath the building, readings will be taken along the proposed path at locations free of bottles and cans, bottle sorting equipment or other obstructions. Once the drill bit reaches the exit location the drill head and related tooling will be removed to allow for reaming and pull-back.

Reaming

Reaming is the process by which the drilling hole is enlarged (if needed) by passing a larger cutting tool (a reamer) back through the hole. Under certain installation conditions, the completion pipe can be pulled directly into the pilot hole after it is drilled though this is typically field determined. If reaming is necessary, the diameter will depend on the size of the well screen and riser to be pulled-back through the hole. Typically, the final well bore diameter should be 1.5 times the outside diameter of the well completion materials to allow an annular void for the return of drilling fluids, soil cuttings and to allow for the bend radius of the well materials. The reamer is attached to the drill string following removal of the drill bit and is pulled back through the existing bore path to enlarge the diameter of the hole. Reaming may take a couple passes to achieve the desired final bore diameter.

Pull-Back

Pull-back of the well materials commences upon completion of reaming. Drilling fluid will be pumped into the bore path to completely fill the reamed diameter. Well construction materials may be assembled and laid out at the exit point. A pulling head and swivel may be used to connect the drill string to the well casing materials. Use of the swivel prevents rotational torque from spinning the well material during pull-back through the existing bore path. A reamer may also be placed between the pulling head and the drill string to ensure the bore path remains open during pull-back. Use of the reamer also allows additional lubricating and stabilizing drilling fluid to be pumped into the annular void during pull back. This stage of drilling is complete when the well casing material is pulled through the entrance pit to the surface at the drill rig. The pulling head will be disconnected and well installation complete.

Well Construction Details

Each horizontal well will be constructed with 3-inch diameter high density polyethylene (HDPE) pipe (butt fusion welded) for the well riser and screen. The well screens are anticipated to start approximately six feet horizontally inside the building footprint on the north and south ends at an approximate vertical depth between 6 and 8 feet bgs. The well screen slot size and spacing may be designed to ensure uniform flow along the entire screen length while maintaining the design ROI. For planning and estimating purposes, the estimated angle of installation will likely be between 10 and 14 degrees (25 percent, one vertical foot for every four horizontal feet). A horizontal cross-section is depicted on Drawing C-002 (Attachment A).

2.4.2 WELL DEVELOPMENT

Immediately following completion of well pull-back, each horizontal well will be developed by pumping freshwater (e.g., hydrant) into the well bore anulus. The freshwater displaces the drilling fluid into the entrance/exit point until visual observation indicates the bulk of the drilling fluids and cuttings have been removed. Then the well bore anulus is flooded with a clay dispersant solution to saturate the formation immediately adjacent to the bore hole. The solution is given enough residence time to allow any remaining drilling fluid to de-flocculate to allow remaining solids to be flushed out using fresh water. A vacuum trailer will transfer the soil cuttings/drilling fluid and well development water to a lined roll-off container (or equivalent) for storage prior to characterization and disposal.

2.4.3 GROUTING AND SURFACE COMPLETION

Following well development, a cement/bentonite grout seal will be installed along the well riser only. The amount of grout needed is based on the annular volume of the riser pipe to the ground surface. The purpose of the grout is to prevent short-circuiting between the well screen and the ground surface and to preclude surface waters from entering. The grout is typically installed in the annular space around the solid casing riser by inserting a 10--foot section of perforated pipe (e.g., 1-inch or ¾-inch) and pumping the grout until the desired volume is achieved. The grout will be placed approximately two feet above the well screen on the north and south ends to the point where the pipe enters the entrance point at a depth of 3 feet bgs. Each HSVE entry point will be completed with a 12-inch diameter flush mount steel protective cover set in a two foot minimum concrete curb as shown on Drawing C-002 (Attachment A), while the HSVE exit point will be restored to pre-drilling conditions (e.g. asphalt) as described in Section 2.6. Further detail on well construction is provided in the Horizontal Drilling and Well Installation Specification (02017) found in Attachment B.

2.4.4 INVESTIGATION DERIVED WASTE

Investigation derived waste (IDW) anticipated to be generated during installation of the HSVE wells includes soil cuttings, drilling fluids, well development water, decontamination water, plastic sheeting and personal protective equipment. Well development and decontamination water will be staged in a poly storage tank (or equivalent) in the waste staging area (location to be determined). Soil cuttings and drilling fluids will be staged in a lined roll--off container, dewatering sludge box (or equivalent).

Following completion of drilling activities, the drilling fluids will be allowed sufficient time for the solids to settle out. A trash pump (or equivalent) will be used to transfer the water on-top to the poly storage tank. Bentonite,

cement, or other type of drying agent will be added to the settled solids, as needed for stabilization. The plastic sheeting and personal protective equipment may be staged in 55-gallon drums or equivalent.

One waste characterization sample will be collected from the stabilized, settled solids and one waste characterization sample will be collected from the well development/decontamination water in the poly storage tank. The waste characterization samples will be sent for laboratory analysis. A waste profile for subsequent disposal will be developed for each waste stream (liquid and solid). All IDW will be disposed of in accordance with applicable NYSDEC regulations. Waste generated during the September 2018 PDI was characterized as non-hazardous. The waste manifest for the disposal of this material is included in Attachment C.

Off-site transportation and disposal of IDW and procedures to transport all items specified for off-site treatment and disposal are included Specification 0015 in Attachment B.

2.5 PIPING AND CONVEYANCE SYSTEM DESIGN

Each horizontal well will be connected to the SVE system through trenching laterals between the entrance point of each well and the system enclosure allowing direct well access through the surface completion methods described in Section 2.4.3. Separate access points for each well is advantageous because it allows for a separate well clean-out location so that disconnection from the SVE System is unnecessary. Additionally, ports can be installed at these locations to allow for operational system monitoring. The general piping and conveyance system design is described below.

As shown on the Drawings in Attachment A, one separate lateral will extend from each horizontal well (HSVE-09, HSVE-10 and HSVE-11) and connect to a primary manifold located inside the system enclosure. The lateral for SVE-05 will be plumbed into HSVE-11 prior to the primary manifold. Each lateral will be equipped with a flow indicator, control valve, vacuum gauge, temperature gauge, and sample port.

At the HSVE wellheads, 3-inch HDPE to 3-inch poly vinyl chloride (PVC) SCH 40 transition fittings will be installed as shown on Drawing C-002. The conveyance piping for SVE-05 will consist of 2-inch diameter PVC SCH 40 as shown on Drawing C-003. Subsurface piping shall be sloped back towards the extraction well with a minimum slope of 0.5% to promote drainage of accumulated liquids. If it is infeasible to continuously slope the piping to the extraction wells, low point drains should be provided for removal of condensate or entrained water from the subsurface. The piping will transition to PVC SCH 80 prior to leaving the subsurface as seen in the stub-up detail on Drawing C-003. The stub ups shall be directly connected to the system blower piping via PVC SCH 80 piping.

The Engineer will inspect all conveyance piping and associated fittings prior to installation. Defective material will not be permitted for use. Additionally, any sections of pipe placed which are found to be out of alignment, defective, or damaged will be replaced. All piping will remain uncovered until inspected by the Engineer following installation.

The conveyance piping from the HSVE wells and SVE-05 to the primary manifold stub outs at the system enclosure will be trenched using conventional equipment to a depth of three feet below ground surface. Trenching will be performed in accordance with the Trenching Specification (00206) found in Attachment B. Pipe Testing will be completed prior to backfilling the trenches as detailed in Section 2.5.1. A minimum of six inches of bedding sand will be installed above and below the conveyance piping followed by tracer wire and six-millimeter poly or filter fabric. Bedding sand shall conform to the material requirements of NYSDOT 703-07 – Concrete Sand or 3/8–inch pea gravel. The bedding sand pack will be compacted with a minimum of three passes with a vibratory plate tamper. Trenching spoils will be staged adjacent to the excavation area and used as backfill, if approved by the Engineer, above the pipe bedding to a depth 12 inches below surrounding grade.

The trenching spoils used as backfill material shall be free of stones larger than 3-inches and shall be compacted with a minimum of 3 passes with a vibratory plate compactor in 6-inch lifts. Surface restoration requirements are described in Section 2.6 and are shown on Drawing C-003.

Any manufacturer supplied materials (e.g., bedding sand) will require certification demonstrating the materials proctor value meets the requirements of ASTM D1557 and gradation meets ASTM D422. In place compaction testing will be performed for native soils used as backfill as specified in ASTM D2922 using nuclear test methods. Backfill material will be compacted to 95 percent maximum modified Proctor density. Minimum compaction requirements are included in the Backfill Specification (00201) included in Attachment B.

2.5.1 PIPE TESTING

Pipe testing using vacuum or pressure testing methods (based on pipe type) will be completed on all installed piping prior to backfilling. Testing will consist of proof testing portions of piping and a complete line performance test after the entire line is installed connecting each HSVE well and SVE-05 to the stub up location. During both tests, piping will not be handled or backfilled, nor shall personnel be in close proximity to the piping. Written documentation of the pipe integrity testing will be required for each pipe and all testing will be witnessed and verified by the Engineer.

Pipe proof testing will be conducted on portions of piping to confirm piping joints were properly made and will not be a substitute for final pipe performance testing. Proof testing will be conducted under vacuum or pressure (pressure less than 5 pounds per square inch gauge, psig). No vacuum (0 in. WC) or pressure (0 psi) loss should be observed during proof testing.

Pipe performance testing will be conducted after completion of all well head connections. A 3-inch or 2-inch pneumatic pipe plug will be installed inside the HSVE/SVE wells at the connection from the subsurface line to the well. The pneumatic pipe plug will be inflated according to manufacturer instructions prior to applying an 80 in. WC vacuum to each vacuum line. A minimum of one vacuum gauge of appropriate range (e.g., 0 – 100 in. WC) will be used to measure the vacuum. Piping will be considered tight if there is a maximum of 0.01 in. WC of vacuum drop after 30 minutes

2.6 SURFACE RESTORATION

Surface restoration will be required at the entry/exit points for the HSVE well installation and along the proposed trenching alignment for the conveyance piping. Each surface will be restored to pre-excavation conditions, either asphalt or gravel. Surface restoration will include installation of 6-inches and 12-inches of number 2A aggregate for asphalt and gravel restoration, respectively. The aggregate will be placed over geotextile or 6-mil poly as shown on Drawing C-003 and compacted with a minimum of 3 passes with a vibratory plate compactor in 6-inch lifts. Generally, asphalt covers the site south of Building 2, at the proposed HSVE exit points and east of Building 2 along Badger Avenue. Gravel is the primary surface cover on the north side of the 2 Badger Avenue building near the proposed HSVE entry points and where the majority of the trenching is planned.

In areas where asphalt resurfacing is required, a 4-inch thick bituminous base course and a 2-inch thick bituminous wear course with a Tack Coat between the base and wear courses shall be installed above the number 2A aggregate. The asphalt material shall be hot laid by qualified personnel. Trenching, backfill and surface restoration requirements are described in the related specifications in Attachment B. If inconsistencies

are identified, information provided on the drawings and within the report text shall supersede conflicting information provided in the specifications.

2.7 VAPOR MONITORING POINTS

The existing SVE well locations will be utilized as vapor monitoring points (VMPs). Each well point will be equipped with a sanitary well seal. At least five sanitary well seals with a vacuum gauge and ¼-inch monitoring port shall be provided for use during system operation.

2.8 LOCATE MISSING GROUNDWATER WELLS

Groundwater monitoring wells HRP-MW-01, HRP-MW-02, HRP-MW-04 and HRP-MW-10 were not located during the groundwater sampling event completed in September 2018 (Parsons, 2018). Recently, Parsons obtained a NYSDEC provided EDD file which contained the coordinates of these wells. The position of each well was overlain in Google Earth to confirm the well location and position with respect to site buildings, roadways, fence lines, etc. Results from this effort found the position of HRP-MW-02 was incorrectly shown on historical drawings as the EDD coordinates confirm the well's location on the south side of the building at 2 Badger Avenue in front of the single man-way door near the far west end of the building.

On December 27, 2018, Parsons completed a site reconnaissance in an effort to confirm the location of the three remaining wells. A hand-held GPS device was used to locate the general proximity of each well using the NYSDEC EDD coordinates. A cable locator/metal detector was used to scan the area to detect for signs of each well. The location of HRP-MW-01 was not confirmed as the location of the well is believed to be underneath a pallet loaded with three to four feet of stacked shelving. Other debris and vegetation surround this area. The location of HRP-MW-04 was not confirmed. The location of the well appears to be covered with gravel/fill material used to make a ramp leading up to the west side of the building. Parsons field team used a shovel to hand dig approximately 6 inches down over a 5-foot by 2-foot area but were not able to locate the well despite positive signals from the metal detector indicating something may be present in the vicinity of the GPS coordinates. Monitoring well HRP-MW-10 was not located either and is believed to be paved over. The coordinates for this well are located in a parking lot east of 7 Badger Avenue. A car was parked over the GPS location during the site visit precluding use of the metal detector for locating the well.

During the construction phase, a geophysical survey will be completed in a 16-square foot grid around the NYSDEC EDD coordinates for HRP-MW-1, HRP-MW-4 and HRP-MW-10 as described in Section 2.3. A skid steer or equivalent may be used to move surface materials (e.g. gravel, vegetation, minor debris) and the loaded pallets away from the likely location of monitoring well HRP-MW-01 prior to the geophysical survey in this area. Results of the geophysical survey will be reviewed to see if the data suggests the presence of the wells at each location. If the survey does identify a subsurface abnormality near HRP-MW-01 and HRP-MW-04, hand clearing methods will be used to clear the surface and dig down as needed to uncover the well. For HRP-MW-10, if the survey confirms a subsurface abnormality, a demo saw will be used to cut-out a 2-fooot by 2-foot section of asphalt and hand clearing methods will be used to dig further down to locate the top of well. If the wells can be located, extension collars will be added to each well to bring them up to grade following the Specification for monitoring wells (00012) included in Attachment B.

2.9 SVE SYSTEM DESIGN

As described in Section 2.2, the desired flow rate for each HSVE well is 170 scfm with a total flow rate for the entire system of approximately 520 scfm. The SVE system design includes three regenerative blowers equipped with variable frequency drives. Use of multiple blowers will add operational flexibility and allow operation of a single blower to operate if flow requirements decrease as site remediation progresses. Each conveyance lateral will be plumbed to individual condensate knock-out tanks (three tanks total) before passing through respective blowers. After the blowers, airflow will discharge through a single manifold connected to an exhaust stack The SVE system will be pre-fabricated off-site, including instrument and control systems, by a vendor that specializes in fabrication of remediation systems. An electrical disconnect switch will be provided on the exterior of the enclosure for connection to the on--site power supply. The SVE system details are shown on the process and instrumentation diagram (PI&D), Drawing I-001 (Attachment A).

2.9.1 SVE PUMP REQUIREMENTS

Based upon the pilot test results, the design flow rate for the system blower is 520 scfm (based on 170 scfm for simultaneous extraction from three HSVE wells) and the design vacuum is 60 in. WC at each HSVE well. To account for head loss in the conveyance piping a design vacuum at the blower of approximately 80 in. WC has been estimated. Based on the design vacuum and flow rate requirements, regenerative blowers, each equipped with a variable frequency drive will be selected for the system. Pricing included in Attachment D assumes the operating range of each blower is between 200 scfm and 300 scfm, allowing for a design factor of safety.

2.9.2 INSTRUMENTATION AND CONTROLS REQUIREMENTS

A P&ID drawing showing piping, instrumentation, and controls for the SVE system is provided as Drawing I-001 (Attachment A). The instrumentation and controls for the SVE system are described in Specification 11394 included in Attachment B.

The instrumentation and control package for a typical SVE system are shown on Drawing I-001 (Attachment A) and are listed below.

- Vacuum relief valve;
- Vacuum, pressure, and temperature gauges and transmitters;
- Condensate high-level switches and transmitters;
- Vapor flow indicators;
- Manual flow control valves; and
- Blower high-temperature and low-vacuum shut-off.

Selected system instrumentation will be integrated with a programmable logic controller incorporated in a control panel. The system will include a telemetry system to communicate system status and transmit alarm conditions to the system operator, including system low vacuum, condensate storage tank high level, high differential pressure, high temperature, blower motor fault, and system shutdown (manual from local switch). The SVE communication system will include a computer controlled remote system to allow for remote monitoring and adjustments as needed.

2.9.3 EFFLUENT VAPOR TREATMENT

The SVE system proposed for the site is exempt from air permits under Part 201-3.3(29) as the discharge stack is considered a soil vent and will be operated at a state superfund site. Effluent vapor treatment was evaluated to ensure effluent concentrations would not exceed NYSDEC Division of Air (DAR) emission contaminant guidelines prior to discharge to the atmosphere.

AERSCREEN Modeling software described in the NYSDEC DAR-1 was used to predict the "fence line" air concentrations for VOCs detected during the September 2018 pilot test. Inputs to the model included discharge stack height and diameter; discharge flow rate and temperature; population density; adjacent building dimensions and orientation; stack distance and orientation with respect to building center; terrain parameters; and receptor distances. Acceptable air concentrations are listed for annual emission rates (Annual Guideline Concentrations, AGC) and for hourly emission rates (Shor-term Guideline concentrations, SGC) in Appendix A of DAR-1 (last revised in 2016).

A stack height of 35 feet was used to model down-gradient concentrations (impacts). The model was run based on the design flow rate of 520 scfm (576 actual cubic feet per minute, acfm, 125 degrees Fahrenheit) and a unit emission rate of 1 gram per second (g/s). A unit emission rate was used to facilitate modeling multiple VOC compounds from the discharge stack since the impacts will be proportional to the emission rates. Under the unit emission scenario, the maximum short term (one-hour) and long-term (annual) down-gradient impacts were 1,922 µg/m^3 and 192.2 µg/m^3, respectively. The maximum impact by compound was derived by multiplying the unit emission concentration from the AERSCREEN model by the compound's calculated emission rate. The individual compound's emission rate was calculated using the design flow rate identified above and the maximum (short-term) and average (long-term) soil vapor concentrations measured during the September 2018 pilot test, respectively. The pilot test data and the maximum and average concentrations used for detected VOC compounds are presented in Table 1. The calculated short-term and long-term emission rates for each compound are presented in Tables 2 and 3, respectively.

The model's predicted impacts using a 35-foot stack height indicated the maximum down-gradient short-term impact (2.2 µg/m^3) and long term impact (0.19 µg/m^3) for TCE were lower than the SGC (20 µg/m^3) and AGC (0.2 µg/m^3), respectively. Model predicted down-gradient concentrations for all other VOCs were also below the SGC and AGC. A stack height of 30 feet was evaluated; however, maximum long-term down-gradient concentrations for TCE (0.25 µg/m^3) exceeded the AGC (0.2 µg/m^3). Effluent vapor treatment will not be needed with a 35-foot stack height since the predicted impacts are all less than the AGC and SGC. The SVE system discharge will be direct to the atmosphere using a minimum 35-foot stack with no additional pre-treatment. Model output results using the 35-foot stack height are included in Attachment E.

2.9.4 DIRECT DISCHARGE EXHAUST STACK

The SVE system discharge will be direct to the atmosphere through an exhaust stack mounted to a utility pole adjacent to the SVE system. The utility pole will be a typical 40-foot pole installed 6-feet bgs. The stack piping will be 4-inch SCH 80 PVC and will extend as far as possible above the utility pole to maximize the discharge height of the exhaust (35-foot minimum).

2.9 ELECTRICAL SERVICE REQUIREMENTS

The SVE System design requires a 240 volt, 3-phase power drop service (125-130 amps). The closest overhead electric utility pole (4 V-1, Endicott Municipal Light) is located at the northeast corner of the building at 2 Badger Avenue as shown on Drawing C-001. The electrical load design includes:

- Three (3) 6.3 kilowatt (kW) motors (8.44 horsepower, HP)
- One (1) 5 kW heater (winter months)
- One (1) 1 kW auxiliary equipment (e.g., fan, lights, control panel)

Prior to construction, Endicott Municipal Light will need to confirm if the current bank at this utility pole is sufficient to feed the SVE system based on the power requirements above. If sufficient, Endicott Municipal Light will provide an overhead connection to the SVE System shed using triplex. The utility meter will be installed on the exterior wall of the system shed. Provide grounding and bonding per NEC Article 250. A licensed electrician will provide the required materials to trim the meter and connect the SVE system. The proposed electrical connection must be submitted to the engineer for approval prior to installation.

2.10 SITE PREPERATION

There are no site preparation activities anticipated prior to construction including removal of vegetation, clearing and grading.

2.11 SURVEY REQUIREMENTS

A topographic field survey will be completed by a licensed professional land surveyor registered to practice in the state of New York to encompass the Remediation Area shown on Figure 2. Land surveying services will be completed in three phases under three separate mobilizations as described in the subsections below. Surveying activities will be performed in compliance with the Survey Specification (00004) found in Attachment B.

2.11.1 PRE-CONSTRUCTION SURVEY

A pre-construction (topographic) field survey will be completed prior to installation of the HSVE wells (Section 2.4) and conveyance piping (Section 2.5) to provide existing conditions terrain data within the limits of the remediation area shown on Figure 2. Horizontal (coordinates) and vertical (elevation) controls will be established during this phase and will be based on the New York State Plane Coordinate System Central Zone North American Datum of 1983 (NAD 83) and the North American Vertical Datum of 1988 (NAD 88), respectively. Approximate property lines and existing street boundaries will be placed within the mapping limits using available Broome County tax mapping.

Any utilities (overhead or underground) or potential obstructions identified during the geophysical investigation (Section 2.3) will be included in the survey mapping effort. Additionally, surface evidence of underground utility systems including valves, meters, release valves, manholes, shutoffs, etc. will also be included. Invert elevations will be surveyed for storm and sanitary sewer drainage systems within the remediation area.

A well location survey will be completed to locate up to ten monitoring wells (HRP-MW-1, HRP-MW-2, HRP-MW-3, HRP-MW-4, HRP-MW-5, DEC-06-MW-06, HRP-MW-7, HRP-MW-9, HRP-MW-10 and HRP-MW-11) and eight SVE wells (SVE-01, SVE-02, SVE-03, SVE-04, SVE-05, SVE-06, SVE-07 and SVE-08) as shown on Figure 2. The well location survey will include the horizontal and vertical position at ground, riser and casing.

2.11.2 INTERMEDIATE SURVEY

An intermediate topographic field survey will be completed following excavation of the entrance and exit points associated with each HSVE well (Section 2.4) and following excavation of the trenching laterals connecting the well entry points to the SVE system enclosure from each HSVE Well and from SVE-05 (Section 2.5). Additionally, a well location survey will be completed to locate the three HSVE wells (HSVE-09, HSVE-10 and HSVE-11) as shown on Drawing C-001. The well location survey will include the horizontal and vertical position at ground, riser and casing.

2.11.3 POST-CONSTRUCTION SURVEY

A final topographic as-built survey will be will conducted following completion of all construction activities including final backfill materials and restoration of all disturbed surfaces.

3.0 OPERATIONS, MAINTENANCE, AND PERFORMANCE MONITORING

The following sections discuss general SVE system startup requirements (Section 3.1), SVE Operations and Maintenance (O&M) requirements (Section 3.2), SVE performance monitoring and optimization (Section 3.3), and SVE system shut down (Section 3.4).

3.1 STARTUP

3.1.1 BASELINE SOIL VAPOR SAMPLING

Baseline data for soil vapor will be collected before the SVE system is activated. Baseline sampling will be conducted a minimum of one week after installation of the new HSVE wells and trenching to SVE-05 to allow soil vapor to equilibrate with VOCs in soil surrounding these wells.

Each soil vapor sample will be field analyzed for the following parameters using field instrumentation:

- VOCs;
- Percent oxygen;
- Percent carbon monoxide;
- Percent lower explosive limit (LEL); and
- Percent hydrogen sulfide.

Additionally, samples will be collected for laboratory analysis of VOCs (TO-15) from six SVE wells installed in September 2018 (SVE-01, SVE-03, SVE-04, SVE-05, SVE -06, and SVE-07) and from the three proposed HSVE wells (HSVE-09, HSVE-10 and HSVE-11). These time integrated soil vapor samples will be collected for laboratory analysis in laboratory-supplied stainless-steel canisters (e.g., Summa®) fitted with dedicated sampling trains including regulators and vacuum gauges. One duplicate sample will also be collected. Dedicated polytetraflouroethylene (e.g., Teflon®) tubing will be used to connect sampling equipment to each sample port. All samples will be delivered to the laboratory under chain-of-custody protocol within their specified holding times. Samples will be analyzed for VOCs by USEPA Method TO-15.

3.1.2 SYSTEM STARTUP

During startup of the SVE system the following parameters will be field monitored and recorded at each HSVE and SVE well daily (Monday – Friday) for the first week:

- VOCs;
- Percent oxygen, percent carbon monoxide, percent LEL and percent hydrogen sulfide;
- Flow conditions including the vacuum, temperature, and flow rate at each well head;
- Balance system flow, as needed;
- System operating conditions including:
  - Vacuums, pressures, and temperatures before and after major components; and
  - Total influent flow rate before the dilution airline.

Additionally, one sample will be collected within the first week, from the combined soil vapor effluent to provide a baseline data point for the operating system. This time integrated soil vapor sample will be collected for laboratory analysis in a laboratory-supplied stainless-steel canister (e.g., Summa®) as described in Section 3.1.1. This sample will be collected during the first week of operation and will provide baseline data for the system.

3.2 SVE SYSTEM OPERATIONS AND MAINTENANCE

SVE system O&M will also be performed to ensure the SVE system is operating as designed. Performance monitoring (Section 3.3), such as vacuum response and soil vapor concentrations will be measured daily during the first week, twice per week during the second week, once per week during the third and fourth weeks and once per month for the next five months. This schedule may be modified, in concurrence with NYSDEC if field data indicates a more/less frequent schedule is warranted. Monitoring for changes in VOCs, oxygen, carbon monoxide, LEL and hydrogen sulfide in soil vapor at the SVE and HSVE wells while the SVE system is operating will identify areas influenced by the SVE system. Soil vapor monitoring after startup will be used to determine if SVE is impacting targeted areas by observing changes in field soil vapor concentrations. The proposed schedule for the first six months of operations is shown in Table 4.

O&M will be performed initially for a six-month duration after which the system will be evaluated for effectiveness and a long-term strategy assessed. Consideration will be given to continue operating the system at full-scale or if pulsed operation would be more appropriate. Pulsed operation is a flow optimization strategy that can reduce energy costs particularly if VOC removal has become diffusion limited. For example, the system may be operated for a month, turned off for a month to allow concentrations of VOCs in soil vapor to rebound, and then operated for another month. Alternatively, pulsed operation could involve rotating extraction through the HSVE wells, for example from one well for a month then the other two wells for the following month. Another option would be to operate only one blower for all three legs of the system. Variable frequency drives are also being installed for additional control of the system components.

In support of pre-construction activities, a comprehensive O&M manual will be prepared in accordance with the requirements of NYSDEC DER-10 and the SVE System specification in Attachment B. The SVE system O&M manual will include the following:

- As-built construction drawings for the SVE system;
- Operating manual for instrumentation and control systems;

- Manufacturer maintenance guidance for equipment including but not limited to the blowers, pumps, filters, instrumentation;
- Field forms to be used to record system operating conditions (vacuums, pressures, temperatures, flow rates, system status, etc.);
- Contingency protocols in the event of system failure;
- Waste management plan detailing procedures for handling of process wastes (e.g., condensate waste, PPE);
- System optimization procedures;
- System close-out procedures to evaluate when the system should be turned off; and
- Health, safety, security and environmental requirements to ensure safe operating and working conditions.

3.2.1 BLOWER SYSTEM O&M

Routine O&M for the SVE system will be at the frequency specified in Table 4 for performance monitoring for the first six months of operation. During the routine O&M visits the operator will perform the inspections/maintenance tasks listed below. Routine sampling requirements for monitoring system performance are discussed in the following section. Monitoring of flow conditions at the vapor extraction wells is discussed in Section 3.3.1.

- Measurement and recording of operating parameters including vacuums, pressures, temperatures, and system flow rates;
- Recording the elapsed hours of operation;
- Inspection of SVE well heads and extraction pipes for leaks or signs of wear/degradation and repair and replacement as necessary;
- Inspection of SVE well heads for signs of damage;
- Inspection of condensate tank to verify liquid level;
- Troubleshoot and repair problems resulting in system shutdown (e.g., low vacuum, high pressure, heat exchanger high differential pressure, or water level shutdown); and
- System monitoring, and optimization as described in Section 3.3.

O&M activities that will be required periodically include:

- Restarting the system after a low vacuum, high pressure, heat exchanger high differential pressure, high-temperature, or high-water level shutdown;
- Transfer of condensate water; and
- Replacement of faulty components.

3.2.2 CONDENSATE MANAGEMENT

The condensate storage tank will be inspected during the SVE system monitoring events at the frequency specified for performance monitoring in Table 4. During these visits the liquid levels will be recorded to track production rates and aid in forecasting disposal frequency. During the inspections, the condensation storage tank high level switch will be tested to ensure proper operation. When required, condensate will be pumped from the disposal tank into a 55-gallon drum for disposal or may be disposed of on-site following discharge through carbon treatment.

3.3 PERFORMANCE MONITORING AND OPTIMIZATION

3.3.1 SVE PERFORMANCE MONITORING

The objectives of the SVE performance monitoring and optimization include the following:

1. Monitoring remedial system operational performance (i.e., VOC mass removal rates).
2. Monitoring remedial system effectiveness at reducing contaminant concentrations in system effluent.
3. Optimize system flow rates to maximize removal rates relative to soil vapor flow rates.
4. Maintain compliance with air emission limits.
5. Maintain protection of human health through compliance with exposure limits.

Performance monitoring and optimization for the SVE system will entail periodic monitoring of flow rates and vacuums and concentrations of VOCs in extracted soil vapor, and optimization of flow rates. In addition to optimizing removal rates, the performance monitoring will be designed to estimate and track the mass of VOCs removed through the SVE system.

SVE performance monitoring procedures are described in the following sections. A detailed performance monitoring schedule including sampling details, quantities, frequencies and analytical methods is presented in Table 4.

3.3.1.1 HSVE Well Performance Monitoring

During operation of the SVE system, flow rates and VOC concentrations will be measured using field instruments at each HSVE and SVE well at the frequency listed in Table 4. During each monitoring event, the following parameters will be monitored using direct-reading field instruments and recorded for the system discharge and the influent line from each HSVE well at the well entry point:

- VOCs;
- Percent oxygen;
- Percent carbon monoxide;
- Percent lower explosive limit (LEL);
- Percent hydrogen sulfide;
- Temperature; and
- Pressure.

Field monitoring VOCs in the influent flow from each HSVE well (during extraction operations) will help identify areas where VOC contamination remains and make decisions regarding system optimization. A time integrated soil vapor sample will be collected for laboratory analysis from each HSVE well after three months of system operation and again after six months of operation. The data will be used to calculate mass removal rates. Time integrated soil vapor samples will be collected in laboratory-supplied stainless-steel canisters (Summa®, or equivalent) as described in Section 3.1.1. Samples will be analyzed for VOCs by USEPA Method TO-15.

3.3.1.2 System Removal Performance Monitoring

Field monitoring for flow parameters and VOC concentrations in the combined soil vapor will be used to calculate total VOC mass removal. During the first six months of system operation, the following parameters will be measured using field instruments at the schedule specified in Table 4.

- VOCs;
- Percent oxygen;
- Percent carbon monoxide;
- Percent lower explosive limit (LEL);
- Percent hydrogen sulfide;
- Temperature; and
- Pressure.

A time integrated soil vapor sample will be collected for laboratory analysis from the system discharge once per month during the first six months of operation. The data will be used to calculate mass removal rates. Soil vapor samples for laboratory analysis will be collected in laboratory-supplied stainless-steel canisters (Summa®, or equivalent) as described in Section 3.1.1. Samples will be analyzed for VOCs by USEPA Method TO-15.

3.3.2 STATIC SOIL VAPOR SAMPLING

Static soil vapor sampling will be performed to monitor remedial system effectiveness at reducing contaminant concentrations in soil by tracking changes in contaminant concentrations in soil through changes in VOC concentrations in soil vapor. Static soil vapor samples will be collected periodically to determine concentrations of VOCs in soil vapor as well as determining static oxygen and carbon monoxide concentrations. Static soil vapor sampling will help identify areas where VOC contamination remains and may be used for comparison with previous sampling data as an indication of the removal of VOCs. Static soil vapor sampling results will be used along with groundwater monitoring (section 3.3.3) results to determine when to terminate SVE operation.

Static soil vapor sampling will be performed once following six months of system operation. Data from this event will be compared to the baseline sampling event (Section 3.1.1) and used to evaluate and optimize system performance. The frequency at which soil vapor samples will continue to be collected will also be evaluated. Prior to static soil vapor sampling, the SVE system will be shut down for a minimum of seven (7) days to allow soil vapor concentrations to reach equilibrium. The system will be restarted after completion of static soil vapor sampling.

The frequency at which static soil vapor samples will be collected for laboratory analysis of VOCs (TO-15) will be based on an evaluation of data from field instruments at the monitoring schedule specified in Table 4. As the VOC concentrations (based on PID readings) approach asymptotic conditions, collection of static soil vapor samples using summa canisters (Section 3.1.1) will be considered in consultation with NYSDEC. Static soil vapor samples will be collected from the same wells chosen for laboratory analysis during baseline sampling to allow for comparison. Additionally, the following parameters will be monitored and recorded using direct-reading field instruments:

- VOCs;
- Percent oxygen;
- Percent carbon monoxide;
- Percent lower explosive limit (LEL); and
- Percent hydrogen sulfide.

3.3.3 GROUNDWATER MONITORING

Groundwater monitoring results will be used along with SVE system performance monitoring and static soil vapor sampling to evaluate the effectiveness of SVE at removing VOCs. Groundwater monitoring results will provide the most direct measure of the ability of SVE to limit the migration of TCE from the vadose zone to groundwater. If SVE system performance monitoring data suggest VOC concentrations are not approaching asymptotic conditions within the first six months of SVE system operation, collection of groundwater monitoring samples may be postponed.

Existing monitoring wells HRP-MW-02, HRP-MW-03, HRP-MW-05, HRP-MW-07, HRP-MW-09, HRP-MW-11, and DEC-06-MW-06 will be used to monitor groundwater conditions at the site. Monitoring wells HRP-MW-01, HRP--MW-04 and HRP-MW-10 will be added to this list if they can be located as outlined in Section 2.8. The monitoring well locations are shown on Figure 2.

The groundwater monitoring wells will be sampled using a peristaltic pump and 3/8" x 1/4" high-density polyethylene tubing using low-flow methodology (less than one liter per minute, L/min). Groundwater quality field parameters (temperature, pH, conductivity, oxidation reduction potential, dissolved oxygen, and turbidity) will be measured in 5-minute intervals during purging with a Horiba U-52 water quality meter. Static water levels will be maintained and purging continued until select water quality parameters stabilized.

Once field parameters stabilize, groundwater samples will be collected for analysis. Samples will be collected and secured in laboratory-provided bottle-ware, packaged with ice, and shipped via chain-of-custody procedures to the analytical laboratory. One round of groundwater samples will be collected following six months of system operation. The groundwater samples will be analyzed for Target Compound List (TCL) VOCs by EPA 8260C.

3.3.4 SVE SYSTEM SHUTDOWN

The objective of SVE treatment is to reduce concentrations of VOCs, namely TCE, in the source area to levels that can be addressed by polishing or monitored natural attenuation processes in a reasonable time frame. It is not expected that the SVE system will be operated until the cleanup goals in groundwater are reached.

Extracted soil vapor will be monitored and sampled to calculate VOC removal rates from each extraction well. If the mass removal rate from a specific well becomes asymptotic (based on field readings), extraction from that well may be terminated, either temporarily or permanently based on subsequent monitoring. SVE at all wells will be terminated after mass recovery rates from all SVE wells have become asymptotic. If soil vapor monitoring data indicate high concentrations of VOCs in areas not being impacted by the SVE system, installation of additional SVE wells will be evaluated. Operation of the SVE system may also be terminated based on a cost benefit analysis (i.e., cost per pound of VOC recovered is greater than lifecycle costs of a longer period of monitored natural attenuation).

A declining curve analysis may be a useful tool for evaluating when to terminate SVE operation. The use of declining curve analysis assumes there is a finite (i.e., maximum) mass of recoverable VOCs in the formation surrounding the HSVE wells. The maximum mass of recoverable VOCs can be estimated by plotting the rate of VOC (y-axis) versus the cumulative VOC mass recovered (x-axis). Over time, as the cumulative mass of VOCs recovered increases, the rate of VOC recovery is expected to decrease. The point at which the best-fit line of the data crosses the x-axis is the maximum recoverable mass of recoverable VOCs.

4.0 CONSTRUCTION SCHEDULE AND COST ESTIMATE

This section presents the Final 100% Design Construction Schedule and Cost Estimate for installation of the SVE system and operation of the system through the first six months. Major milestones include the geophysical survey; installation of three HSVE wells; trenching of conveyance laterals to the system enclosure; installation of the pre-fabricated SVE system; connection with local utility service; and management of investigation derived waste. A copy of the 100% Design Construction Schedule and Cost Estimate are included in Attachment D.

5.0 REFERENCES

HRP Associates, Inc., May 2012. Remedial Investigation Report. Former Canada Dry Bottling Facility.

NYSDEC, May 2013. Record of Decision. Former Canada Dry Plant State Superfund Project. Endicott, Broome County. Site No. 704050.

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NYSDOH, May 2017. Updates to Soil Vapor/Indoor Air Decisions Matrices.

Parsons, September 2018. Former Canada Dry Plant Pre-Design Investigation Report.

USACE, 2002. Soil Vapor Extraction and Bioventing Engineer Manual. EM 1110-1

USEPA, November 2002. Office of Solid Waste and Emergency Response (OSWER) Draft Guidance for Evaluating Intrusion in Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance). Table 2A.

TABLES

Table 1

Soil Vapor Analytical Data from Pilot Test - Average and Maximum Concentrations of Detected Compounds

Former Canada Dry Plant
2 & 7 Badger Ave., Endicott, New York

NYSDEC-Former Canada Dry Plant 2018 Site Investigation Soil Vapor Pilot Analytical Data September 2018 SDG: 1810093 Detected Compound Summary		Location ID: Sample ID: Lab Sample Id: Source: SDG: Matrix: Sampled: Validated:	DEC-06-MW-06 TEST # 1 1810093-01A AIRTOXICS 1810093 AI 9/29/2018 8:34	SVE-07 TEST # 2 1810093-02A AIRTOXICS 1810093 AI 9/30/2018 9:08	SVE-01 TEST # 3 1810093-03A AIRTOXICS 1810093 AI 9/30/2018 11:22	SVE-03 TEST # 4 1810093-04A AIRTOXICS 1810093 AI 9/30/2018 12:34	SVE-05 TEST # 5 1810093-05A AIRTOXICS 1810093 AI 9/30/2018 13:56	**AVERAGE CONC. OF DETECTED VALUES (LONG-TERM AIR MODELING)**	**MAX. CONC. OF DETECTED VALUES (SHORT-TERM AIR MODELING)**
CAS NO.	COMPOUND	UNITS:							
	VOLATILES								
71-55-6	1,1,1-Trichloroethane (TCA)	µg/m3	ND	26.00	10.00 J	11.00 J	24.00	17.75	26.00
95-63-6	1,2,4-Trimethylbenzene	µg/m3	ND	6.80 J	4.70 J	4.20 J	4.60 J	5.08	6.80
108-67-8	1,3,5-Trimethylbenzene (Mesitylene)	µg/m3	ND	2.50 J	1.80 J	ND	1.60 J	1.97	2.50
71-43-2	Benzene	µg/m3	1.40 J	ND	1.10 J	ND	ND	1.25	1.40
67-66-3	Chloroform	µg/m3	ND	6.70 J	3.20 J	6.20 J	15.00	7.78	15.00
74-87-3	Chloromethane	µg/m3	2.30 J	ND	3.80 J	ND	ND	3.05	3.80
156-59-2	Cis-1,2-Dichloroethylene	µg/m3	ND	300.00	64.00	45.00	75.00	121	300.00
110-82-7	Cyclohexane	µg/m3	ND	ND	6.20 J	ND	ND	6.20	6.20
75-71-8	Dichlorodifluoromethane	µg/m3	2.10 J	2.90 J	2.90 J	ND	3.40 J	2.83	3.40
64-17-5	Ethanol	µg/m3	23.00	48.00	35.00	28.00	34.00	33.6	48.00
100-41-4	Ethylbenzene	µg/m3	0.88 J	1.90 J	ND	ND	ND	1.39	1.90
XYLMP	M,P-Xylene (Sum Of Isomers)	µg/m3	1.80 J	8.30 J	3.90 J	2.90 J	3.50 J	4.08	8.30
78-93-3	Methyl Ethyl Ketone (2-Butanone)	µg/m3	ND	7.50 J	ND	ND	ND	7.50	7.50
75-09-2	Methylene Chloride	µg/m3	ND	13.00 J	ND	ND	ND	13.00	13.00
110-54-3	N-Hexane	µg/m3	ND	ND	7.40 J	ND	ND	7.40	7.40
95-47-6	O-Xylene (1,2-Dimethylbenzene)	µg/m3	1.10 J	5.40 J	2.40 J	2.20 J	ND	2.78	5.40
127-18-4	Tetrachloroethylene (PCE)	µg/m3	ND	39.00	43.00	42.00	25.00	37.25	43.00
108-88-3	Toluene	µg/m3	2.40 J	9.60	1.60 J	2.00 J	1.40 J	3.4	9.60
156-60-5	Trans-1,2-Dichloroethene	µg/m3	ND	30.00	5.00 J	ND	ND	17.5	30.00
79-01-6	Trichloroethylene (TCE)	µg/m3	1.50 J	4000.00	3000.00	4200.00	4600.00	3950	4600.00
75-69-4	Trichlorofluoromethane	µg/m3	1.40 J	ND	ND	ND	ND	1.40	1.40
75-01-4	Vinyl Chloride	µg/m3	ND	ND	ND	ND	9.60	9.60	9.60
	Total Detected VOCs		**37.88**	**4507.6**	**3196.0**	**4343.5**	**4797.1**		

Notes:

- Indicates a concentration above the standard/guidance value.

NS- No Standard
(G) - Guidance Value
ND - Not Detected
J - Estimated Value

Table 2
Calculation of Short-Term Maximum Emissions and Comparison to SGCs with 35-Foot Stack

Former Canada Dry Plant
2 & 7 Badger Ave., Endicott, New York

Compound	Stack Height feet	Emission Rate g/sec	Unit Emission Rate g/sec	Max. Short-Term Impact Using AERSCREEN and Unit ER µg/m³	Max. Short-Term Impact by Compound µg/m³	SGC µg/m³	Predicted Impact Greater than SGC
Trichloroethene	35	1.13E-03	1	1,922	**2.17**	**20**	**No**
1,1,1-Trichloroethane (TCA, Methyl Chloroform)	35	6.38E-06	1	1,922	**0.012**	**9,000**	**No**
1,2,4-Trimethylbenzene	35	1.67E-06	1	1,922	**0.003**	**---**	**No**
1,3,5-Trimethylbenzene (Mesitylene)	35	6.14E-07	1	1,922	**0.001**	**---**	**No**
Benzene	35	3.44E-07	1	1,922	**0.001**	**1,300**	**No**
Chloroform	35	3.68E-06	1	1,922	**0.007**	**150**	**No**
Chloromethane	35	9.33E-07	1	1,922	**0.002**	**22,000**	**No**
Cis-1,2-Dichloroethylene	35	7.36E-05	1	1,922	**0.142**	**---**	**No**
Cyclohexane	35	1.52E-06	1	1,922	**0.003**	**---**	**No**
Dichlorodifluoromethane	35	8.34E-07	1	1,922	**0.002**	**---**	**No**
Ethanol	35	1.18E-05	1	1,922	**0.023**	**---**	**No**
Ethylbenzene	35	4.66E-07	1	1,922	**0.001**	**---**	**No**
M,P-Xylene (Sum Of Isomers)	35	2.04E-06	1	1,922	**0.004**	**22,000**	**No**
Methyl Ethyl Ketone (2-Butanone)	35	1.84E-06	1	1,922	**0.004**	**13,000**	**No**
Methylene Chloride	35	3.19E-06	1	1,922	**0.006**	**14,000**	**No**
N-Hexane	35	1.82E-06	1	1,922	**0.003**	**---**	**No**
O-Xylene (1,2-Dimethylbenzene)	35	1.33E-06	1	1,922	**0.003**	**22,000**	**No**
Tetrachloroethylene (PCE)	35	1.06E-05	1	1,922	**0.020**	**300**	**No**
Toluene	35	2.36E-06	1	1,922	**0.005**	**37,000**	**No**
Trans-1,2-Dichloroethene	35	7.36E-06	1	1,922	**0.014**	**---**	**No**
Trichlorofluoromethane	35	3.44E-07	1	1,922	**0.001**	**9,000**	**No**
Vinyl Chloride	35	2.36E-06	1	1,922	**0.005**	**180,000**	**No**

Notes:

g/sec: gram per second µg/m3: microgram per cubic meter ---: No Standard SGC: NYSDEC Short-term Guideline Concentration

Unit ER: AERSCREEN model was run using 1 g/s for the emission rate. This conversion factor was used to calculate the max. short-term Impact for each compound.

Table 3
Calculation of Long-Term Maximum Emissions and Comparison to AGCs with 35-Foot Stack

Former Canada Dry Plant
2 & 7 Badger Ave., Endicott, New York

Compound	Stack Height feet	Emission Rate g/sec	Unit Emission Rate g/sec	Max. Long-Term Impact Using AERSCREEN and Unit ER ug/m^3	Max. Long-Term Impact by Compound ug/m^3	AGC ug/m^3	Predicted Impact Greater than AGC
Trichloroethene	35	9.69E-04	1	192.2	**0.1863**	**0.2**	**No**
1,1,1-Trichloroethane (TCA, Methyl Chloroform)	35	4.36E-06	1	192.2	**0.0008**	**5000**	**No**
1,2,4-Trimethylbenzene	35	1.25E-06	1	192.2	**0.0002**	**6**	**No**
1,3,5-Trimethylbenzene (Mesitylene)	35	4.83E-07	1	192.2	**0.0001**	**6**	**No**
Benzene	35	3.07E-07	1	192.2	**0.0001**	**0.13**	**No**
Chloroform	35	1.91E-06	1	192.2	**0.0004**	**14.7**	**No**
Chloromethane	35	7.49E-07	1	192.2	**0.0001**	**90**	**No**
Cis-1,2-Dichloroethylene	35	2.97E-05	1	192.2	**0.0057**	**63**	**No**
Cyclohexane	35	1.52E-06	1	192.2	**0.0003**	**6000**	**No**
Dichlorodifluoromethane	35	6.95E-07	1	192.2	**0.0001**	**12000**	**No**
Ethanol	35	8.25E-06	1	192.2	**0.0016**	**45000**	**No**
Ethylbenzene	35	3.41E-07	1	192.2	**0.0001**	**1000**	**No**
M,P-Xylene (Sum Of Isomers)	35	1.00E-06	1	192.2	**0.0002**	**100**	**No**
Methyl Ethyl Ketone (2-Butanone)	35	1.84E-06	1	192.2	**0.0004**	**5000**	**No**
Methylene Chloride	35	3.19E-06	1	192.2	**0.0006**	**60**	**No**
N-Hexane	35	1.82E-06	1	192.2	**0.0003**	**700**	**No**
O-Xylene (1,2-Dimethylbenzene)	35	6.82E-07	1	192.2	**0.0001**	**100**	**No**
Tetrachloroethylene (PCE)	35	9.14E-06	1	192.2	**0.0018**	**4**	**No**
Toluene	35	8.34E-07	1	192.2	**0.0002**	**5000**	**No**
Trans-1,2-Dichloroethene	35	4.29E-06	1	192.2	**0.0008**	**63**	**No**
Trichlorofluoromethane	35	3.44E-07	1	192.2	**0.0001**	**5000**	**No**
Vinyl Chloride	35	2.36E-06	1	192.2	**0.0005**	**0.1**	**No**

Notes:

g/sec: gram per second µg/m3: microgram per cubic meter ---: No Standard AGC: NYSDEC Annual Guideline Concentration
Unit ER: AERSCREEN model was run using 1 g/s for the emission rate. This conversion factor was used to calculate the max. long-term Impact for each compound.

Table 4
Performance Monitoring Schedule

Activity	Objectives	Monitored Parameter	Method	Frequency	Location	Laboratory Qty.	QA/QC Samples	Comments
STARTUP (Section 3.1)								
Baseline Soil Vapor Sampling (Section 3.1.1)								
Monitor soil vapor for baseline conditions	6	VOCs, % O_2, % CO, % LEL, % H_2S	Field Instrumentation: PID and 4-Gas Meter	Once	SVE-01 through SVE-08, HSVE-09 through HSVE-11	---	---	Minimum one week after completion of HSVE and conveyance piping installation
Monitor soil vapor for baseline conditions	6	VOCs	Laboratory Analysis: Method TO-15	Once	SVE-01, SVE-03, SVE-04, SVE-05, SVE-06, SVE-07, HSVE-09, HSVE-10 and HSVE-11	9	1	Minimum one week after completion of HSVE and conveyance piping installation.
System Startup (Section 3.1.2)								
Week 1: Monitor soil vapor during system startup	3	VOCs, % O_2, % CO, % LEL, % H_2S	Field Instrumentation: PID and 4-Gas Meter	Daily (Monday-Friday)	SVE-01 through SVE-08, HSVE-09 through HSVE-11 and system discharge	---	---	
Week 1: Monitor extraction flow conditions at each well head and system discharge	3	Flow rates, vacuum and temperature	Field Instrumentation: Pitot tube with manometer or magnehlic gauge; temperature gauge and vacuum gauge	Daily (Monday-Friday)	HSVE-09, HSVE-10, HSVE-11 and system discharge	---	---	Check vacuums, pressures, and temperatures before and after major components. Use data to balance system flow. Take measurement at system discharge.
Week 1: Measure VOC concentrations in combined soil vapor	1,3 and 4	VOCs	Laboratory Analysis: Method TO-15	Once	System discharge	1	---	Baseline data point for the operating system. Collect sample at system discharge.
PERFORMANCE MONITORING (Section 3.3.1)								
Week 2: Monitor soil vapor during system operation	1, 4	VOCs, % O_2, % CO, % LEL, % H_2S	Field Instrumentation: PID and 4-Gas Meter	2 x per week	SVE-01 through SVE-08, HSVE-09 through HSVE-11 and system discharge	---	---	Performance monitoring to ensure SVE System is operating as designed. Evaluate changes from previous measurements.
Week 2: Monitor extraction flow conditions at each well head and system discharge	3	Flow rates, vacuum and temperature	Field Instrumentation: Pitot tube with manometer or magnehlic gauge; temperature gauge and vacuum gauge	2 x per week	HSVE-09, HSVE-10, HSVE-11 and system discharge	---	---	Check vacuums, pressures, and temperatures before and after major components. Use data to balance system flow. Take measurement at system discharge.
Weeks 3 & 4: Monitor soil vapor during system operation	1, 4	VOCs, % O_2, % CO, % LEL, % H_2S	Field Instrumentation: PID and 4-Gas Meter	1 x per week	SVE-01 through SVE-08, HSVE-09 through HSVE-11 and system discharge	---	---	Performance monitoring to ensure SVE System is operating as designed. Evaluate changes from previous measurements.
Weeks 3 & 4: Monitor extraction flow conditions at each well head and system discharge	3	Flow rates, vacuum and temperature	Field Instrumentation: Pitot tube with manometer or magnehlic gauge; temperature gauge and vacuum gauge	1 x per week	HSVE-09, HSVE-10, HSVE-11 and system discharge	---	---	Check vacuums, pressures, and temperatures before and after major components. Use data to balance system flow. Take measurement at system discharge.
Week 4: Measure VOC concentrations in combined soil vapor	1,3 and 4	VOCs	Laboratory Analysis: Method TO-15	Once	System discharge	1	---	Monthly data point for the operating system. Collect sample at system discharge.
Months 2 - 6: Monitor soil vapor during system operation	1, 4	VOCs, % O_2, % CO, % LEL, % H_2S	Field Instrumentation: PID and 4-Gas Meter	1 x per month	SVE-01 through SVE-08, HSVE-09 through HSVE-11 and system discharge	---	---	Performance monitoring to ensure SVE System is operating as designed. Evaluate changes from previous measurements.

Activity	Objectives	Monitored Parameter	Method	Frequency	Location	Laboratory Qty.	QA/QC Samples	Comments
Months 2-6: Monitor extraction flow conditions at each well head and system discharge	3	Flow rates, vacuum and temperature	Field Instrumentation: Pitot tube with manometer or magnehlic gauge; temperature gauge and vacuum gauge	1 x per month	HSVE-09, HSVE-10, HSVE-11 and system discharge	---	---	Check vacuums, pressures, and temperatures before and after major components. Use data to balance system flow. Take measurement at system discharge.
Months 2-6: Measure VOC concentrations in combined soil vapor	1,3 and 4	VOCs	Laboratory Analysis: Method TO-15	1 x per month	System discharge	5	---	Collect one sample per month from system discharge.
Month 3: Measure VOC concentrations in combined soil vapor	1,3 and 4	VOCs	Laboratory Analysis: Method TO-15	Quarterly	HSVE-09, HSVE-10 and HSVE-11	3	---	Collect one sample per quarter from each Vapor extraction well point.
Month 6: Measure VOC concentrations in combined soil vapor	1,3 and 4	VOCs	Laboratory Analysis: Method TO-15	Quarterly	HSVE-09, HSVE-10 and HSVE-11	3	---	Collect one sample per quarter from each Vapor extraction well point.
STATIC SOIL VAPOR SAMPLING (Section 3.3.2)								
Monitor soil vapor for baseline conditions	1	VOCs, % O_2, % CO, % LEL, % H_2S	Field Instrumentation: PID and 4-Gas Meter	Once	SVE-01 through SVE-08, HSVE-09 through HSVE-11	---	---	Monitor using field instrumentation after 6 months of operation as the system approaches asymptotic conditions. System should be shut-down for a minimum of 7 days prior to collecting
Measure vacuums	2	Vacuum	Field Instrumentation: Pitot tube with manometer or magnehlic gauge	Once	HSVE-09, HSVE-10 and HSVE-11	---	---	One event to be completed prior to shutting off the SVE system for static soil vapor sampling.
Static Soil Vapor Sample	2	VOCs	Laboratory Analysis: Method TO-15	Once	SVE-01, SVE-03, SVE-04, SVE-05, SVE-06, SVE-07, HSVE-09, HSVE-10 and HSVE-11	9	1	Collect samples after 6 months of operation as the system approaches asymptotic conditions. System should be shut-down for a minimum of 7 days prior to collecting samples.
Other								
Measure VOC concentrations in ambient air around the system and downwind from the discharge stack	5	VOCs	Field Instrumentation: PID	During Startup and Performance Monitoring	Ambient air around SVE System and downwind from discharge stack	---	---	

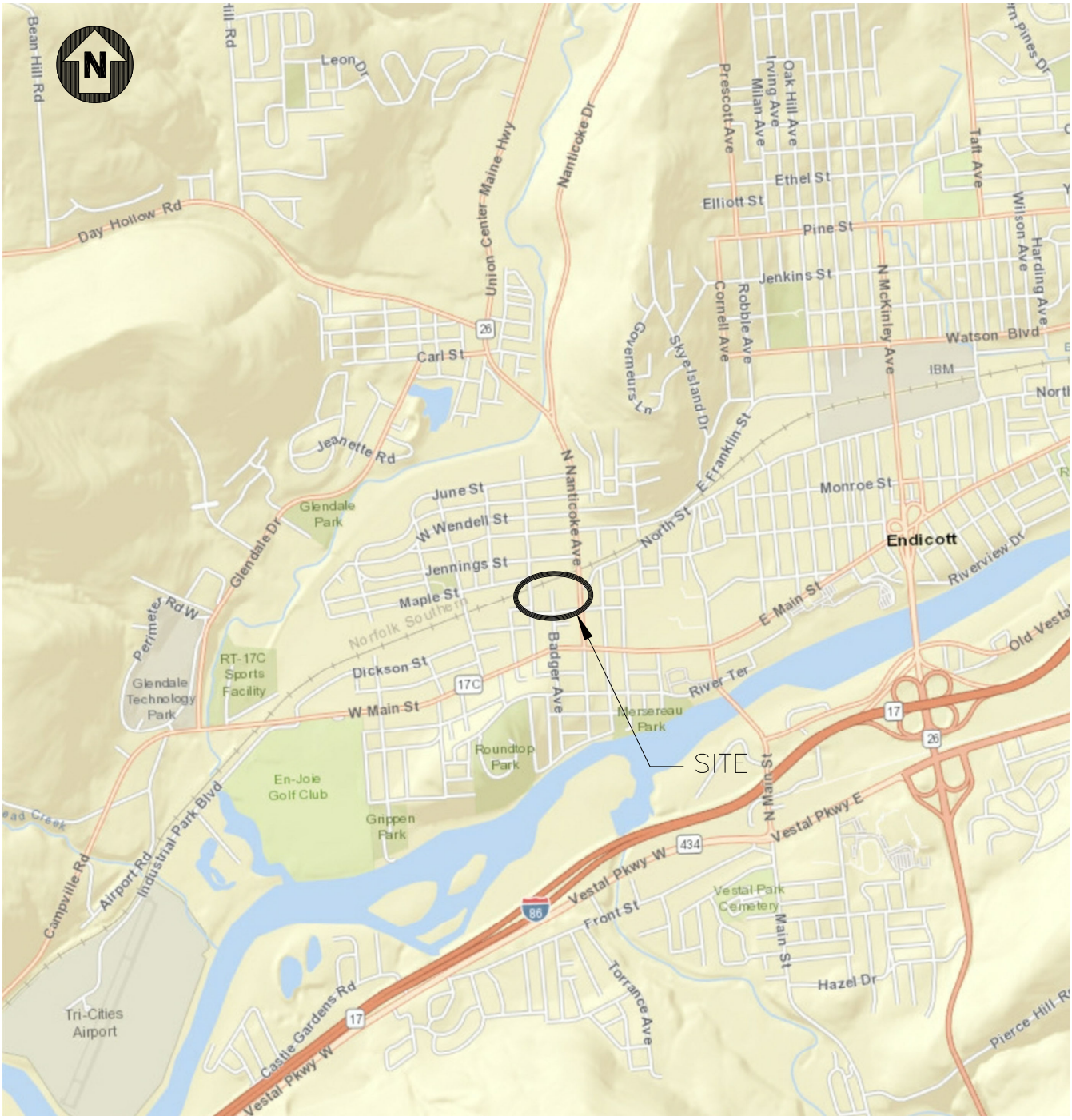
Objectives:

1) Monitor remedial system operational performance (i.e., VOC mass removal rates)
2) Monitor remedial system effectiveness at reducing contaminant concentrations in soil
3) Optimize system flow rates to maximize removal rates relative to soil vapor flow rates
4) Ensure compliance with air emission limits
5) Ensure protection of human health through compliance with exposure limits
6) Establish baseline conditions

Acronyms:

CO_2 = carbon dioxide
CO = carbon monoxide
H_2S = hydrogen sulfide
HSVE = horizontal soil vapor extraction
LEL = lower explosive limit
O_2 = oxygen
PID = photoionization detector
QAQC = Quality Assurance/Quality Control Samples
VMP = vapor monitoring point
VOC = volatile organic compound

FIGURES



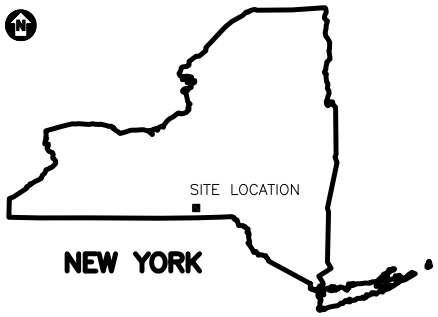


FIGURE 1

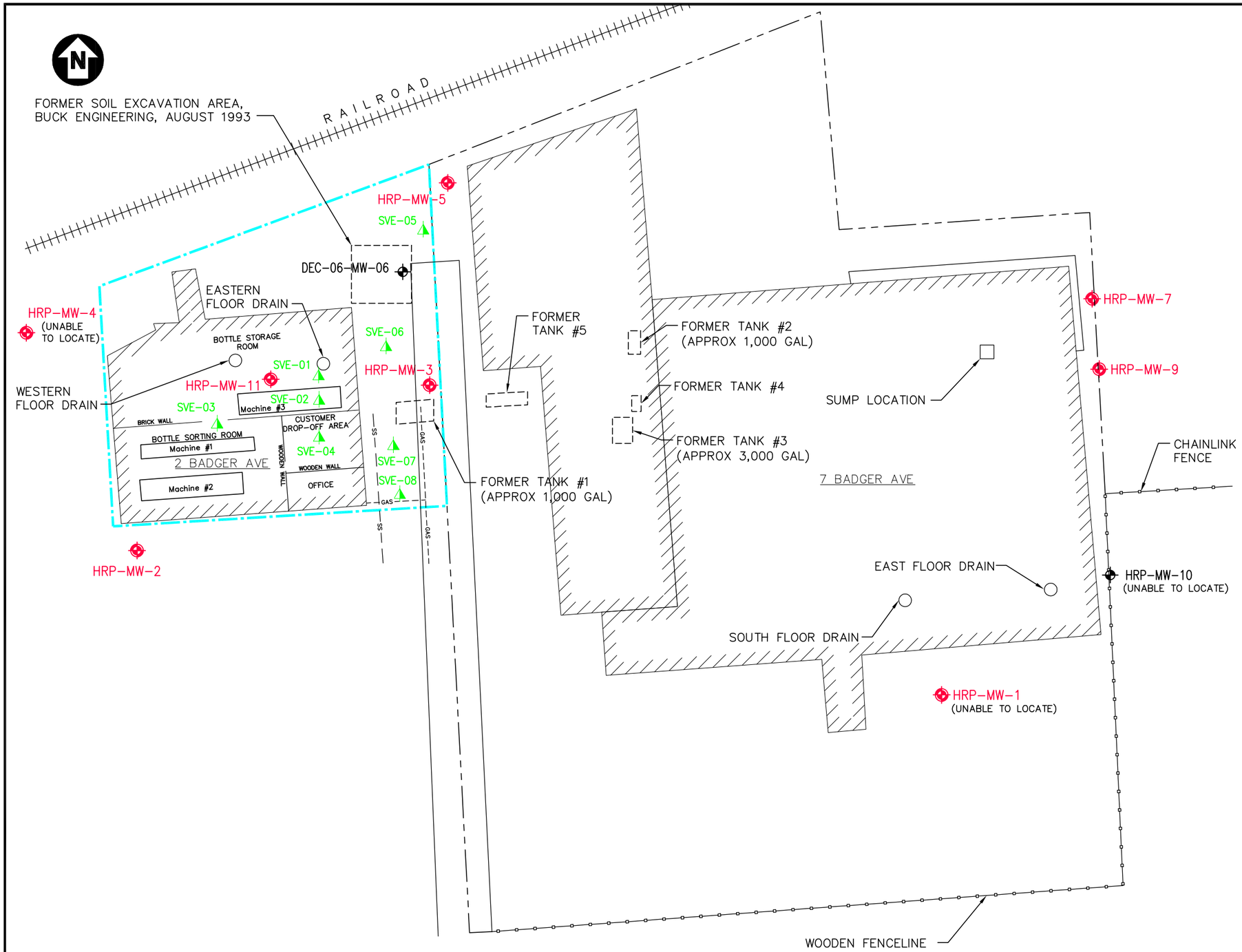
NEW YORK STATE OF OPPORTUNITY | Department of Environmental Conservation

Former Canada Dry
2 & 7 Badger Ave
Endicott, NY

SITE LOCATION MAP

PARSONS
301 PLAINFIELD ROAD, SUITE 350, SYRACUSE, NY 13212 * 315-451-9560

FILE NAME: P:\NYSDEC PROGRAM\450480 - WA #30 - FORMER CANADA DRY PLANT\10.0 TECHNICAL CATEGORIES\CAD\450480-SLM.DWG
PLOT DATE: 10/18/2018 3:48 PM PLOTTED BY: RUSSO, JILL



LEGEND:

- MONITORING WELL LOCATION INSTALLED JUNE, 1991
- MONITORING WELL LOCATION INSTALLED MAY, 2011
- SOIL VAPOR EXTRACTION LOCATIONS INSTALLED SEPT 2018
- PROPERTY LINE
- REMEDIATION AREA

NOTES:

1. BASE MAP BASED ON HRP ASSOCIATES, INC. DRAWING #NEW9616.P2 AND SURVEYED COORDINATES IN EDD FOR MONITORING WELLS.

40 20 0 40 80

SCALE: 1"=40'

FIGURE 2

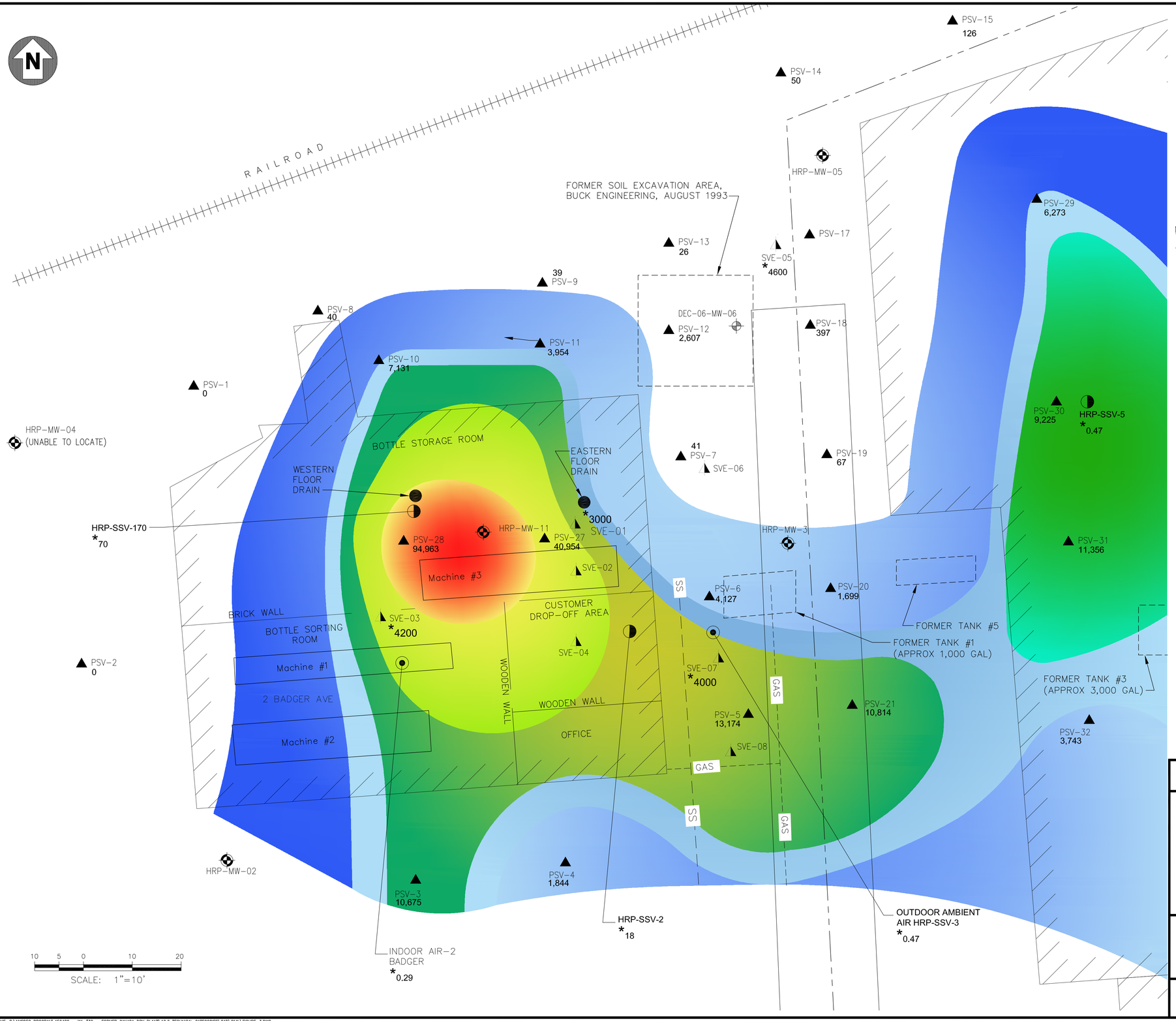
NEW YORK STATE OF OPPORTUNITY | Department of Environmental Conservation

Former Canada Dry
2 & 7 Badger Ave
Endicott, NY

SITE PLAN

PARSONS
301 PLAINFIELD ROAD, SUITE 350, SYRACUSE, NY 13212 * 315-451-9560

FILE NAME: P:\NYSDEC PROGRAM\450480 - WA #30 - FORMER CANADA DRY PLANT\10.0 TECHNICAL CATEGORIES\CAD\FIGURE 2.DWG
PLOT DATE: 1/16/2019 12:22 PM PLOTTED BY: GOLDTHWAIT, JAMES



LEGEND:

- MONITORING WELL LOCATION INSTALLED JUNE, 1991
- MONITORING WELL LOCATION INSTALLED MAY, 2011
- SOIL VAPOR EXTRACTION LOCATIONS INSTALLED SEPT 2018 UNITS ARE $\mu g/m^3$
- PSV-1 PASSIVE SOIL-GAS SAMPLE LOCATION (UNITS ARE ng PER PASSIVE AIR SAMPLER)
- HRP-SSV-170 SUB SLAB SOIL VAPOR LOCATION (UNITS ARE $\mu g/m^3$)
- AIR HRP-SSV-3 INDOOR/OUTDOOR VAPOR LOCATION (UNITS ARE $\mu g/m^3$)
- PROPERTY LINE
- * DIFFERENT UNITS: SAMPLES NOT INCLUDED IN COLOR SCALE GRADATION. THEY ARE MEASURED IN $\mu g/m^3$

NOTES:

1. BASE MAP BASED ON HRP ASSOCIATES, INC. DRAWING #NEW9616.P2 AND SURVEYED COORDINATES IN EDD FOR MONITORING WELLS.

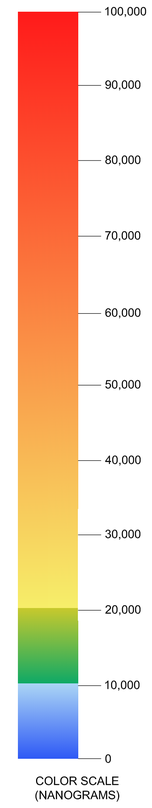


FIGURE 3

NEW YORK STATE OF OPPORTUNITY | Department of Environmental Conservation

Former Canada Dry
2 & 7 Badger Ave
Endicott, NY

SOIL GAS SAMPLE RESULTS – TRICHLOROETHENE

PARSONS
301 PLAINFIELD ROAD, SUITE 350, SYRACUSE, NY 13212 * 315-451-9560

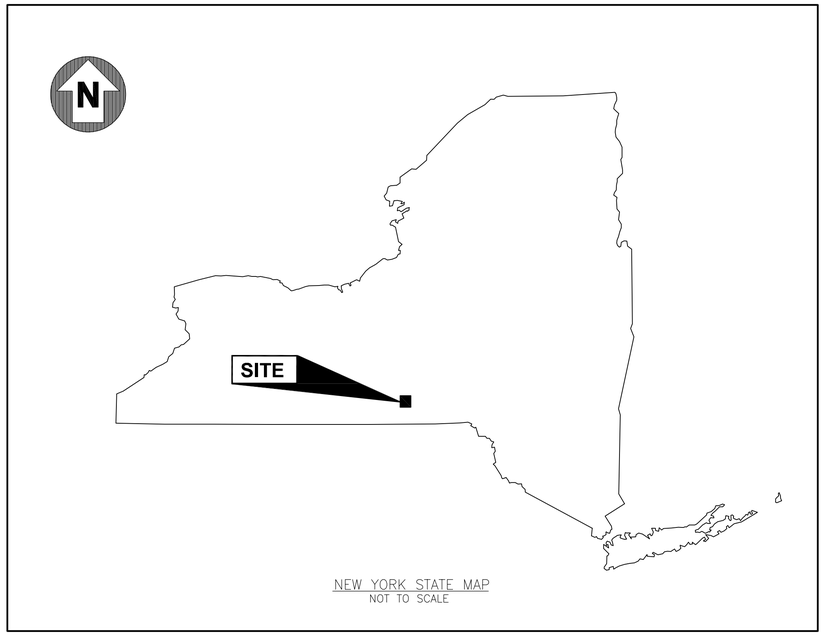
FILE NAME: P:\NYSDEC PROGRAM\450480 - WA #30 - FORMER CANADA DRY PLANT\10.0 TECHNICAL CATEGORIES\CAD\CIVIL\FIGURE-3.DWG
PLOT DATE: 1/16/2019 12:24 PM PLOTTED BY: GOLDTHWAIT, JAMES

ATTACHMENT A

FINAL 100% REMEDIAL DESIGN DRAWINGS

100% REMEDIAL DESIGN
FORMER CANADA DRY PLANT

2 & 7 BADGER AVENUE
ENDICOTT, NEW YORK



NEW YORK STATE MAP
NOT TO SCALE

SITE VICINITY MAP

INDEX TO DRAWINGS	
DRAWING No.	**TITLE**
450480-G-001	TITLE SHEET AND DRAWING INDEX
450480-C-001	SITE PLAN SHOWING REMEDIATION SYSTEM LAYOUT
450480-C-002	HORIZONTAL SOIL VAPOR EXTRACTION WELL PROFILE AND DETAIL
450480-C-003	DETAILS AND SECTIONS
450480-I-001	PROCESS & INSTRUMENTATION DIAGRAM P&ID-1

NO.	DESCRIPTION	DATE	DRAWN	CHK'D	APPV'D
C	ISSUED FINAL 100% DESIGN	8/1/19	JR	HRB	MJC
B	ISSUED FOR 100% REVIEW	5/28/19	JR	HRB	MJC
A	ISSUED FOR 60% REVIEW	1/16/19	JHG	HRB	MJC

DRAWN BY: JHG	DATE: 12/12/18	SEAL: STATE OF NEW YORK · MATTHEW JOEL CRAIGE · 093800 · LICENSED PROFESSIONAL ENGINEER
CHECKED BY: LJT	DATE: 12/12/18	
APPROVED BY: –	DATE: –	
PROJECT MGR.: –	DATE: –	

PARSONS

OFFICE: 301 PLAINFIELD ROAD, SYRACUSE, NY 13212, (315) 451-9560
JOB: 450480
WBS: 03000

PROJECT TITLE
NEW YORK STATE OF OPPORTUNITY. Department of Environmental Conservation
FORMER CANADA DRY PLANT
2 & 7 BADGER AVENUE
ENDICOTT, NY

DRAWING TITLE
TITLE SHEET
AND
DRAWING INDEX

SCALE: AS SHOWN

DRAWING NO.: 450480-G-001
REV.: C

FILE NAME: P:\NYSDEC PROGRAM\450480 – WA #30 – FORMER CANADA DRY PLANT\10.0 TECHNICAL CATEGORIES\CAD\GEN\450480-G-001.DWG
PLOT DATE: 7/30/2019 1:59 PM PLOTTED BY: RUSSO, JILL

NOTES:

1. BASE MAP BASED ON HRP ASSOCIATES, INC. DRAWING #NEW9616.P2 AND SURVEYED COORDINATES IN EDD FOR MONITORING WELLS.
2. BETWEEN EACH HSVE ENTRY/EXIT POINTS CONSISTS OF SOLID AND SLOTTED HDPE PIPE AS SPECIFIED.
3. BETWEEN ENTRY POINT AND SYSTEM ENCLOSURE PVC TRENCHED PIPE AS SPECIFIED.

LEGEND:

- MONITORING WELL LOCATION INSTALLED JUNE, 1991
- MONITORING WELL LOCATION INSTALLED MAY, 2011
- SOIL VAPOR EXTRACTION LOCATIONS INSTALLED SEPT 2018
- PROPERTY LINE
- HSVE WELL SCREEN (SCREEN INTERVAL TBD)
- PIPING FOR HSVE WELLS
- HSVE-09 SVE HORIZONTAL EXTRACTION WELL ENTRY/EXIT POINTS
- ESTIMATED ROI (COLORS TO DIFFERENTIATE BETWEEN WELLS)

10 5 0 10 20
SCALE: 1"=10'

NO.	DESCRIPTION	DATE	DRAWN	CHK'D	APPV'D
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B	ISSUED FOR 100% REVIEW	5/28/19	JR	HRB	MJC
A	ISSUED FOR 60% REVIEW	1/16/19	JHG	HRB	MJC

DRAWN BY: JHG — DATE: 12/12/18
CHECKED BY: HRB — DATE: 12/12/18
APPROVED BY: – — DATE: –
PROJECT MGR.: – — DATE: –

SEAL: STATE OF NEW YORK · MATTHEW JOEL CRACE · LICENSED PROFESSIONAL ENGINEER · 093800

PARSONS

OFFICE: 301 PLAINFIELD ROAD, SYRACUSE, NY 13212, (315) 451-9560
JOB: 450480
WBS: 03000

PROJECT TITLE
NEW YORK STATE OF OPPORTUNITY. Department of Environmental Conservation
FORMER CANADA DRY PLANT
2 & 7 BADGER AVENUE
ENDICOTT, NY

DRAWING TITLE
SITE PLAN SHOWING REMEDIATION SYSTEM LAYOUT

SCALE: AS SHOWN

DRAWING NO.: 450480-C-001
REV.: C

FILE NAME: P:\NYSDEC PROGRAM\450480 – WA #30 – FORMER CANADA DRY PLANT\10.0 TECHNICAL CATEGORIES\CAD\CIVIL\450480-C-001.DWG
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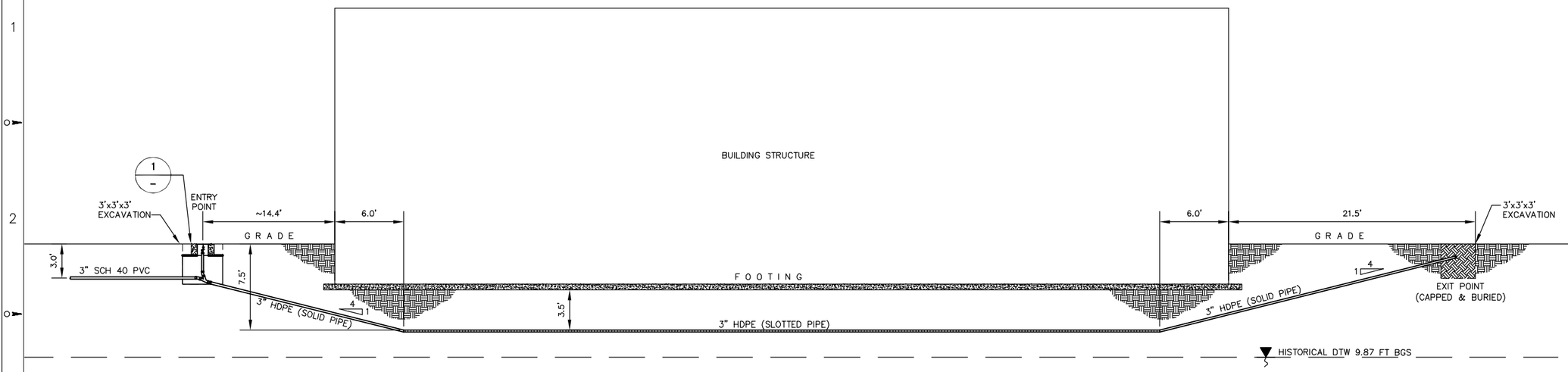
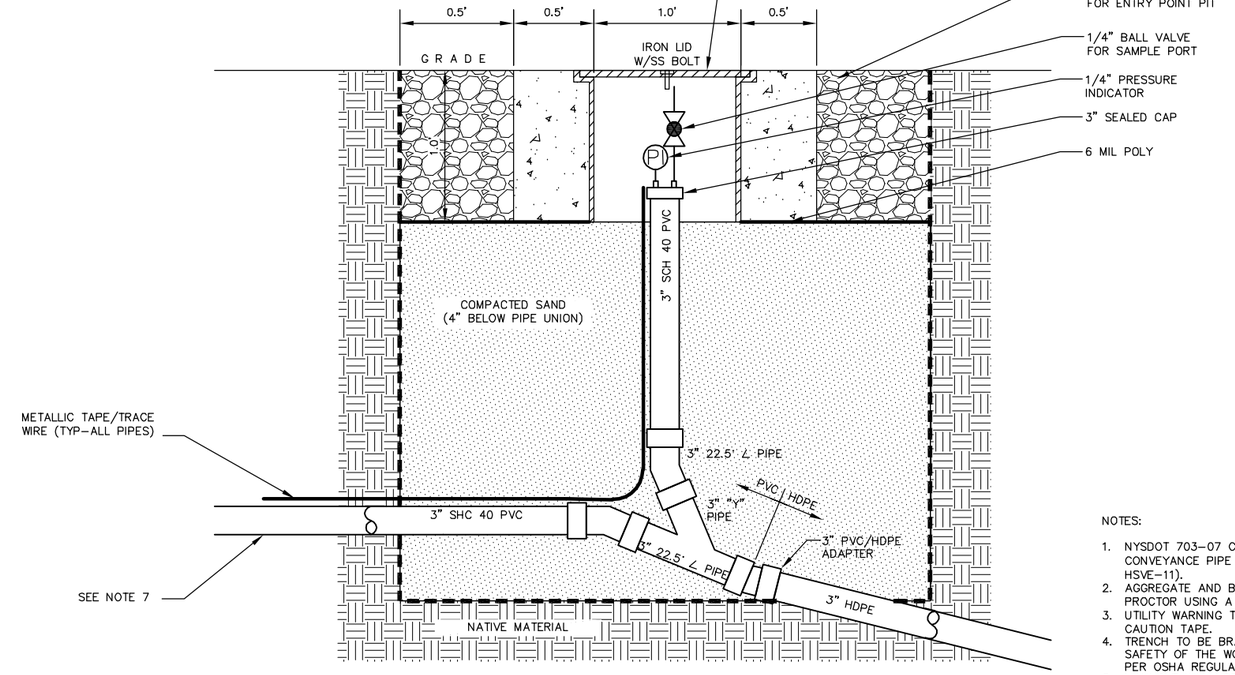


HORIZONTAL SVE WELL PROFILE

NOT TO SCALE



TYPICAL ENTRY POINT DETAIL 1 / –

SCALE: NTS

NOTES:

1. NYSDOT 703–07 CONCRETE SAND OR 3/8" PEA GRAVEL AROUND CONVEYANCE PIPE (3" DIA SCH 40 PVC–HSVE–09, HSVE–10, HSVE–11).
2. AGGREGATE AND BACKFILL TO BE COMPACTED TO 95% STANDARD PROCTOR USING A MAXIMUM OF 6" LIFTS.
3. UTILITY WARNING TAPE TO BE A MINIMUM OF TRACER/WIRE AND CAUTION TAPE.
4. TRENCH TO BE BRACED OR SHEETED AS NECESSARY FOR THE SAFETY OF THE WORKMAN AND PROTECTION OF OTHER UTILITIES PER OSHA REGULATIONS.
5. MANHOLE WILL USE 12" DIAMETER WATERTIGHT MANHOLE MORRISON FIG 519.
6. CONCRETE FLAGS TO BE SAW CUT AROUND WELL LOCATION TO ACCOMMODATE FOR CONCRETE PAD.
7. NO 90° ELBOWS OR GREATER SHALL BE USED TO LAY THE PIPE. IF A 90° OR GREATER TURN IS REQUIRED, TWO OR MORE 45° ELBOWS SHALL BE USED TO MAKE THE FINAL STUB UP CONNECTION INTO THE SYSTEM ENCLOSURE.

NO.	DESCRIPTION	DATE	DRAWN	CHK'D	APP'D
C	ISSUED FINAL 100% DESIGN	8/1/19	JR	HRB	MJC
B	ISSUED FOR 100% REVIEW	5/28/19	JR	HRB	MJC
A	ISSUED FOR 60% REVIEW	1/16/19	JHG	HRB	MJC

DRAWN BY	JHG	DATE	12/12/18
CHECKED BY	HRB	DATE	12/12/18
APPROVED BY	–	DATE	–
PROJECT MGR.	–	DATE	–

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PARSONS
OFFICE
301 PLAINFIELD ROAD
SYRACUSE, NY 13212
(315) 451–9560

JOB 450480

WBS 03000

PROJECT TITLE

NEW YORK STATE OF OPPORTUNITY. Department of Environmental Conservation

FORMER CANADA DRY PLANT
2 & 7 BADGER AVENUE
ENDICOTT, NY

DRAWING TITLE

HORIZONTAL SOIL VAPOR EXTRACTION WELL PROFILE AND DETAIL

SCALE: NOT TO SCALE

DRAWING NO. 450480–C–002

REV. C

FILE NAME: P:\NYSDEC PROGRAM\450480 – WA #30 – FORMER CANADA DRY PLANT\10.0 TECHNICAL CATEGORIES\CAD\CIVIL\450480–C–002.DWG
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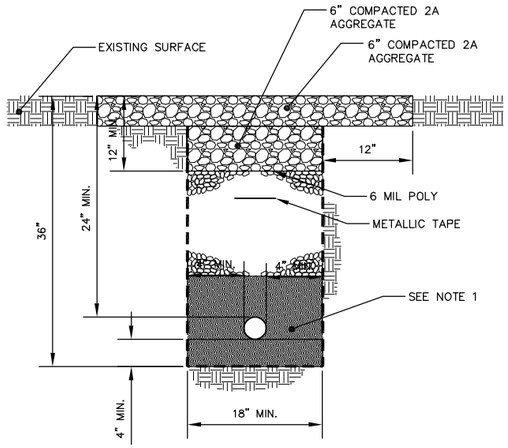


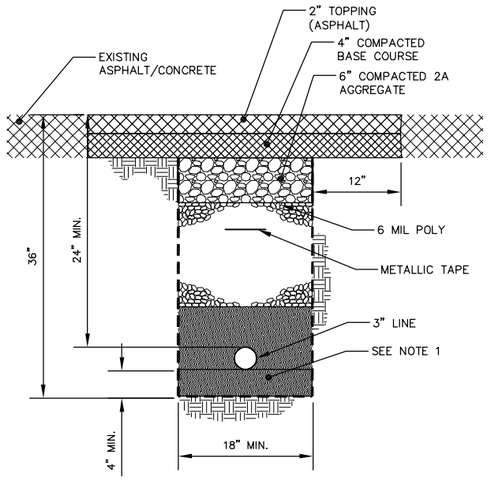
TYPICAL SINGLE LINE TRENCH

B
C-001

SCALE: NTS

TRENCHING:

1. 6" OF NYSDOT 703-07 CONCRETE SAND OR 3/8" PEA GRAVEL AROUND CONVEYANCE PIPE (3" DIA SCH 40 PVC – HSVE-09, HSVE-10, HSVE-11; 2" DIA SCH 40 PVC SVE-05) ABOVE AND BELOW PIPING.
2. AGGREGATE AND BACKFILL TO BE COMPACTED TO 95% STANDARD PROCTOR USING A MAXIMUM OF 6" LIFTS.
3. UTILITY WARNING TAPE TO BE A MINIMUM OF TRACER/WIRE AND CAUTION TAPE.
4. TRENCH TO BE BRACED OR SHEETED AS NECESSARY FOR THE SAFETY OF THE WORKMEN AND PROTECTION OF OTHER UTILITIES PER OSHA REGULATIONS.
5. RESTORE TO PRE-EXISTING CONDITIONS (ASPHALT OR GRAVEL)

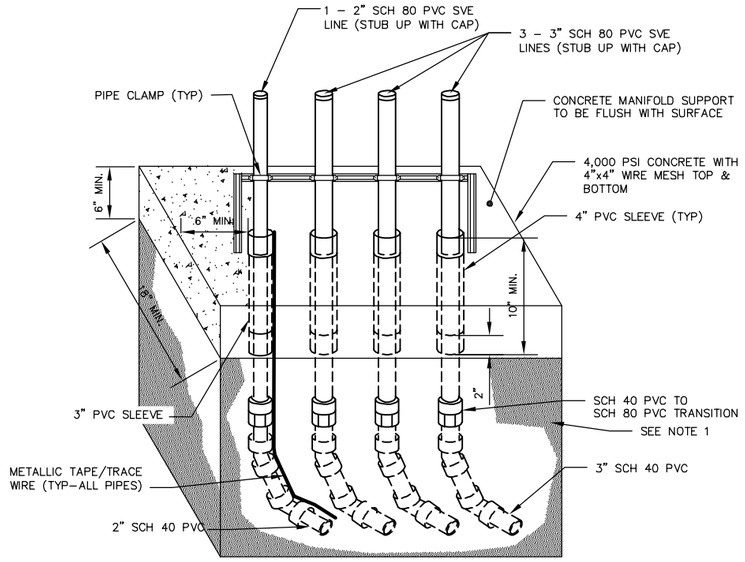


TYPICAL EXIT POINT

C
C-001

SCALE: NTS

NOTES:
1. 6" OF NYSDOT 703-07 CONCRETE SAND OR 3/8" PEA GRAVEL AROUND CONVEYANCE PIPE (3" DIA SCH 40 PVC – HSVE-09, HSVE-10, HSVE-11) ABOVE AND BELOW PIPING.
2. AGGREGATE AND BACKFILL TO BE COMPACTED TO 95% STANDARD PROCTOR USING A MAXIMUM OF 6" LIFTS.
3. 4" ASPHALT PAVEMENT (COMPACT THICKNESS) TO MATCH EXISTING GRADE AND SLOPE. APPLY ASPHALT PAVEMENT IN 2 LIFTS WITH A TACK COAT BETWEEN LIFTS AS PER SPECIFICATIONS.
4. UTILITY WARNING TAPE TO BE A MINIMUM OF TRACER/WIRE AND CAUTION TAPE.
5. DISPOSE OF ASPHALT AND CONCRETE PER APPLICABLE STATE AND LOCAL CODES.
6. TRENCH TO BE BRACED OR SHEETED AS NECESSARY FOR THE SAFETY OF THE WORKMEN AND PROTECTION OF OTHER UTILITIES PER OSHA REGULATIONS.

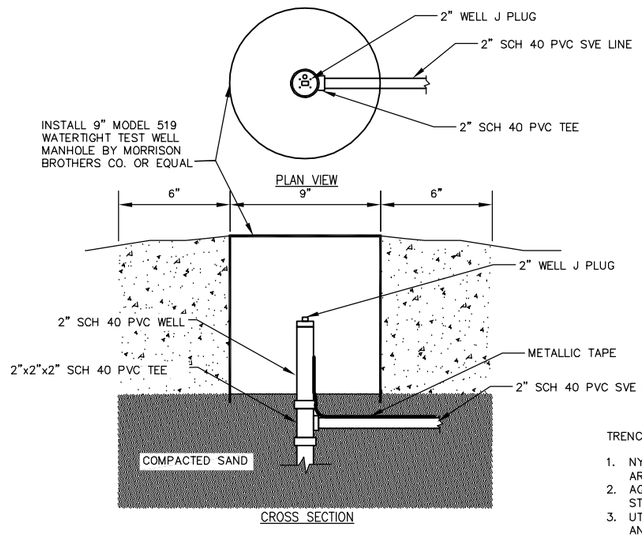


ABOVE GROUND PIPING STUB UP CONSTRUCTION DETAIL

DET
–

SCALE: NTS

NOTES:
1. NYSDOT 703-07 CONCRETE SAND OR 3/8" PEA GRAVEL AROUND CONVEYANCE PIPE (3" DIA SCH 40 PVC – HSVE-09, HSVE-10, HSVE-11; 2" DIA SCH 40 PVC SVE-05)
2. AGGREGATE AND BACKFILL TO BE COMPACTED TO 95% STANDARD PROCTOR USING A MAXIMUM OF 6" LIFTS.
3. UTILITY WARNING TAPE TO BE A MINIMUM OF TRACER/WIRE AND CAUTION TAPE.
4. TRENCH TO BE BRACED OR SHEETED AS NECESSARY FOR SAFETY OF THE WORKMAN AND PROTECTION OF OTHER UTILITIES PER OSHA REGULATIONS.
5. DRAWINGS PROVIDE TYPICAL PIPE SIZE, SPACING AND BRACING SPECIFICATIONS. FINAL STUBUPS MANIFOLD MAY VARY.
6. PIPING SEQUENCE/ORDER TO BE SUBJECT TO CHANGE BASED ON THE FINAL EQUIPMENT LAYOUT.
7. NO 90' ELBOWS OR GREATER SHALL BE USED TO COMPLETE THE STUB UP. IF A 90' OR GREATER TURN IS REQUIRED BASED ON THE FINAL LAYOUT, TWO OR MORE 45' ELBOWS SHALL BE USED TO MAKE THE FINAL STUB UP CONNECTION INTO THE SYSTEM ENCLOSURE.



TYPICAL SVE 2" WELL CONSTRUCTION DETAIL

A
C-001

SCALE: NTS

TRENCHING:

1. NYSDOT 703-07 CONCRETE SAND OR 3/8" PEA GRAVEL AROUND CONVEYANCE PIPE (2" DIA SCH 40 PVC SVE-05).
2. AGGREGATE AND BACKFILL TO BE COMPACTED TO 95% STANDARD PROCTOR USING A MAXIMUM OF 6" LIFTS.
3. UTILITY WARNING TAPE TO BE A MINIMUM OF TRACER/WIRE AND CAUTION TAPE.
4. TRENCH TO BE BRACED OR SHEETED AS NECESSARY FOR THE SAFETY OF THE WORKMAN AND PROTECTION OF OTHER UTILITIES PER OSHA REGULATIONS.
5. MANHOLE WILL USE 9" DIAMETER WATERTIGHT MANHOLE MORRISON FIG 519.
6. CONCRETE FLAGS TO BE SAW CUT AROUND WELL LOCATION TO ACCOMMODATE FOR CONCRETE PAD.

GENERAL NOTES:
1. CONTRACTOR TO SUPPLY SKETCH WITH DRAWINGS SHOWING PROPOSED CONNECTIONS, TO BE APPROVED BY ENGINEER.

NO.	DESCRIPTION	DATE	DRAWN	CHK'D	APP'D
C	ISSUED FINAL 100% DESIGN	8/1/19	JR	HRB	MJC
B	ISSUED FOR 100% DESIGN	8/1/19	JR	HRB	MJC
A	ISSUED FOR 100% REVIEW	5/28/19	JR	HRB	MJC

DRAWN BY: JHG	DATE: 12/12/18	SEAL: STATE OF NEW YORK · MATTHEW JOEL CRANCE · LICENSED PROFESSIONAL ENGINEER · 093800	
CHECKED BY: HRB	DATE: 12/12/18		
APPROVED BY: –	DATE: –		
PROJECT MGR.: –	DATE: –		

PARSONS

OFFICE: 301 PLAINFIELD ROAD, SYRACUSE, NY 13212, (315) 451-9560

JOB: 450480

WBS: 03000

PROJECT TITLE

NEW YORK STATE OF OPPORTUNITY. Department of Environmental Conservation

FORMER CANADA DRY PLANT
2 & 7 BADGER AVENUE
ENDICOTT, NY

DRAWING TITLE

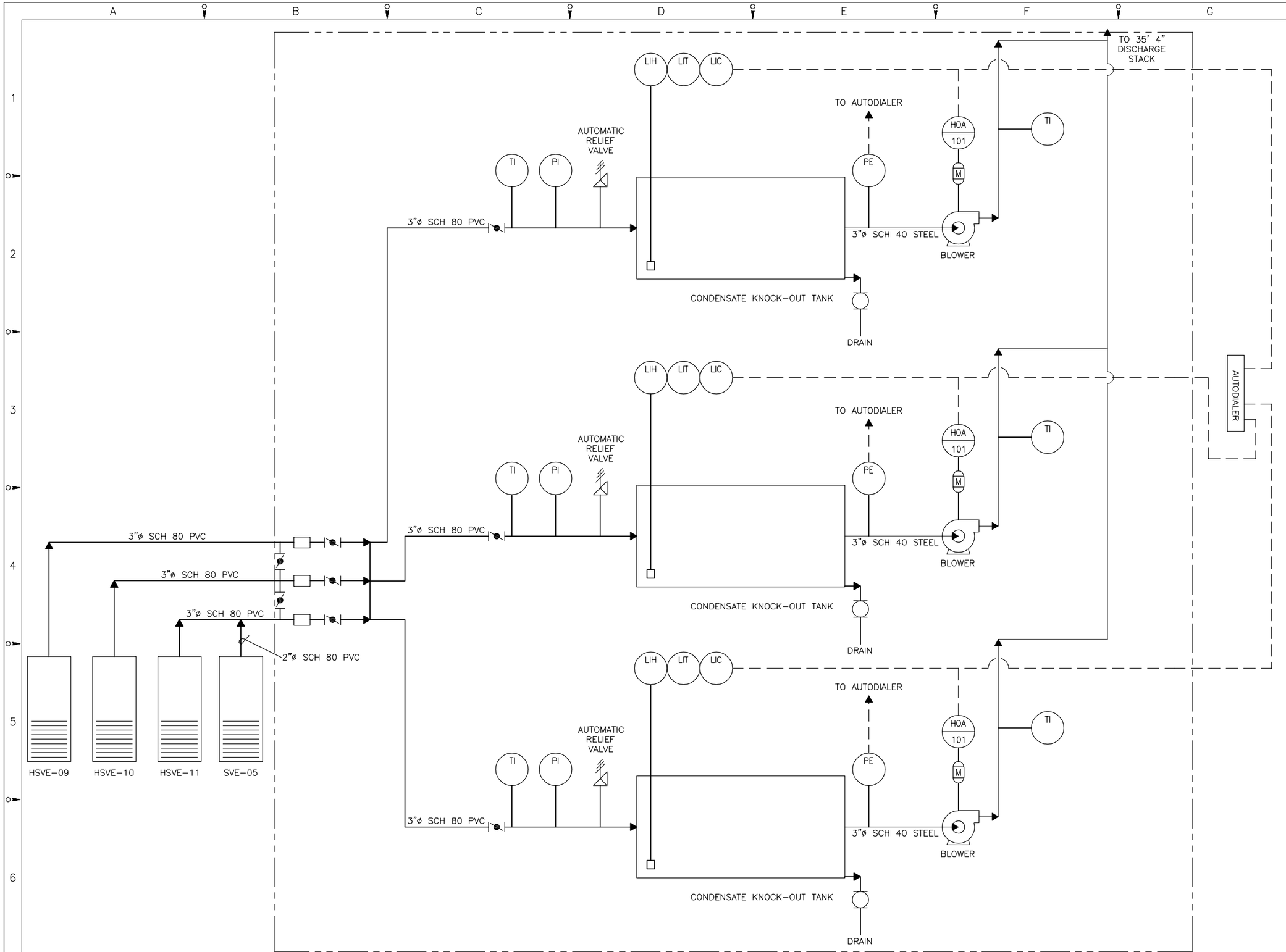
DETAILS AND SECTIONS

SCALE: NOT TO SCALE

DRAWING NO.: 450480-C-003

REV.: C

FILE NAME: P:\NYSDEC PROGRAM\450480 – 180 & 50 – FORMER CANADA DRY PLANT\10.0 TECHNICAL CATEGORIES\CAD\CIVIL\450480-C-002.DWG
PLOT DATE: 7/30/2019 9:41 AM PLOTTED BY: RUSSO, JILL



LEGEND:

- UNION
- BALL VALVE
- BUTTERFLY VALVE
- PITOT TUBE
- MOTOR
- AUTOMATIC VACUUM VALVE
- TI — TEMPERATURE INDICATOR
- PI — PRESSURE INDICATOR
- PE — PRESSURE ELEMENT

LIH LEVEL INDICATOR HIGH
LIT LEVEL INDICATING TRANSMITTER
LIC LEVEL INDICATING CONTROLLER

SYSTEM ENCLOSURE

NO.	DESCRIPTION	DATE	DRAWN	CHK'D	APPV'D
C	ISSUED FINAL 100% DESIGN	8/1/19	JR	HRB	MJC
B	ISSUED FOR 100% REVIEW	5/28/19	JR	HRB	MJC
A	ISSUED FOR 60% REVIEW	1/16/19	JHG	HRB	MJC

DRAWN BY	JHG	DATE	12/12/18
CHECKED BY	LJT	DATE	12/12/18
APPROVED BY	–	DATE	–
PROJECT MGR.	–	DATE	–

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PARSONS

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301 PLAINFIELD ROAD
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JOB 450480
WBS 03000

PROJECT TITLE

NEW YORK STATE OF OPPORTUNITY. Department of Environmental Conservation

FORMER CANADA DRY PLANT
2 & 7 BADGER AVENUE
ENDICOTT, NY

DRAWING TITLE

PROCESS & INSTRUMENTATION DIAGRAM

P&ID 1

SCALE
AS SHOWN

DRAWING NO. 450480-I-001

REV. C

FILE NAME: P:\NYSDEC PROGRAM\450480 - WA #30 - FORMER CANADA DRY PLANT\10.0 TECHNICAL CATEGORIES\CAD\INST\450480-I-001.DWG
PLOT DATE: 7/30/2019 9:39 AM PLOTTED BY: RUSSO, JILL

ATTACHMENT B

SPECIFICATIONS

Prepared by Parsons:

Specification 02017 – Horizontal SVE Wells

Specification 11394 – SVE Equipment Specifications

Provided by NYSDEC:

Specification 00004 - Surveys

Specification 00012 – Monitoring Wells

Specification 00015 – Off-site Transportation and Disposal

Specification 00200 – Excavation

Specification 00201 – Backfill

Specification 00206 – Trenching

SECTION 02017

HORIZONTAL SOIL VAPOR EXTRACTION WELLS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Horizontal Soil Vapor Extraction (HSVE) wells will be installed at the Site in locations shown on the drawings. The wells will be constructed using the appropriate equipment to advance the borehole along the proposed alignment, set the well screen to its completion depth and complete installation of the HSVE well. The drilling equipment and well materials may include the following items: drill rig, drill bit, back reamer, down-hole tools, rig safety system, vacuum trailer, mud mixing truck, support truck, guidance locating system, HDPE well riser, HDPE well screen, drilling fluids, dispersant product for well development, and grout mixture for well sealant.

B. The Drilling Contractor (CONTRACTOR) shall provide all labor, materials, equipment, services, supplies, incidentals and supervision required by this specification to complete the work specified herein that are not specifically stated as being supplied by others. The CONTRACTOR shall be responsible for supplying all materials specified herein; however, NYSDEC shall only be financially responsible for those materials that are used.

C. Mobilization shall include all CONTRACTOR activities required to transport, assemble, and set up on site all CONTRACTOR equipment, personnel, and other services necessary to perform the work.

D. Demobilization shall include all CONTRACTOR activities required to dismantle, package and/or transport from the site all CONTRACTOR equipment and personnel, and to complete the final site cleanup to the satisfaction of the ENGINEER. Such satisfaction generally involves restoration of the site (paved/asphalt) to an equal or better condition than that which was originally encountered. This also includes removal of any CONTRACTOR temporary utilities from the job site, unless the ENGINEER approves otherwise. Any noticeable surface defects to the site attributed to drilling operations shall be repaired by the CONTRACTOR. All excavations shall be backfilled and compacted as specified in the Design Report and other referenced specifications.

1.02 SUBMITTALS

A. Two weeks prior to mobilization, the CONTRACTOR shall prepare a Subcontractor Safety, Health and Environmental Plan (SSHEP) with appropriate Activity Hazard Analysis (AHA) for tasks to be performed. Work cannot commence until AHAs are reviewed and comments have been addressed. The AHAs shall at a minimum, address best management practices for managing and reducing risk associated with suspended loads, pipe handling and storage, and pipe assembly and installation.

B. The CONTRACTOR shall specify the estimated duration for major task elements for each well including mobilization; layout of bore path; installation of pilot hole, reaming; well casing and riser installation; well development; site restoration; and demobilization.

C. The CONTRACTOR shall provide the ENGINEER with product information on well screens and well riser that have been successfully used by the CONTRACTOR on other similar horizontal well applications and are suitable for the proposed application at the Former Canada Dry Plant.

D. The CONTRACTOR shall provide manufacturer's product information for all proposed installation materials to be used in construction of the HSVE well (e.g., casing, screen, grout mixture, drilling fluid, dispersant, etc.) and any procurement lead time requirements. Specifically, for the well screen and riser, the product information shall specify the diameter, screen slot size, screen slot type, material, joint type etc. Product data must include manufacturers name and the source of the material and be submitted prior to use in HSVE well construction. The CONTRACTOR shall submit, for acceptance, supporting calculations and certifications for proposed piping, demonstrating they are adequate for the intended work prior to installation.

E. The CONTRACTOR shall provide the ENGINEER with a Drilling Fluids Management Plan that addresses all aspects of horizontal drilling and ensures wellbore stability, filtration control, cuttings removal, continuous circulation and lubrication. The Drilling Fluids Management Plan shall specify the process for identifying and measuring proposed quantities of necessary drilling additives to ensure critical drilling fluid characteristics are achieved and are designed specific to the site's soil conditions. The Drilling Fluids Management Plan shall specify estimated flow rates, volumes, procedures for minimizing drilling fluids escape; and method/location for staging drilling fluids. The Drilling Fluids Management Plan shall also specify the waste management methods and estimated volume for soil cuttings and well development water. The CONTRACTOR shall provide Material Safety Data Sheet(s) for all drilling additives and for any potentially hazardous substances to be used.

F. During the fieldwork, the CONTRACTOR shall provide Daily Field Reports documenting activities performed and shall include a log of boring progress and guidance system results for each drill string added or removed during drilling of the pilot hole, reaming or pull-back. The Daily Field Reports shall document well completion and material quantities/volumes; down-hole equipment/tools in use; drilling fluid pumping rate; drilling head location. Daily Reports shall be provided within 24 hours following completion of the previous day's activity and should document possible reasons for delays extending more than one hour beyond a normal break time.

G. During the drilling of the HSVE wells, the CONTRACTOR shall provide the ENGINEER with sufficient quantity of cuttings from the well borehole such that the ENGINEER can confirm soil conditions along each installation alignment through observation and potentially sieve analyses.

H. The CONTRACTOR shall specify the installation accuracy, as defined by screen location and alignment compared to designed alignment, and a detailed description of methods to be used to document final well screen location and alignment.

I. The CONTRACTOR shall provide a detailed description of the proposed method of well development. The description must include, at a minimum, the proposed development method, the anticipated volume of waste generated during well development, method of waste containment, and an estimate of time required to complete development.

J. The CONTRACTOR shall provide the ENGINEER calibration records for guidance system equipment.

K. The CONTRACTOR shall submit a resolution plan if a problem is encountered.

L. Within 30 days following installation completion, the CONTRACTOR shall provide for review, an HSVE Completion Report (electronic copy, pdf file) including real-time data from the drilling sonde in tabular format and as-built diagrams detailing the well installation profile, subsurface abnormalities encountered, and other signal interferences detected. The HSVE Completion Report shall document any deviations from the scope of work that result in change of well location, material, type or size based on information communicated between the drilling sonde and the guidance system. Copies of the Daily Field Reports shall be included as an appendix to the HSVE Completion Report.

M. ENGINEER will review and provide comment on the as-built drawings within 14-days of receipt. The CONTRACTOR will incorporate comments and provide electronic (e.g., pdf) and hard copies of final as-built drawings within 14-days of receipt of all comments. As-built drawings must be certified by the CONTRACTOR to be accurate within the tolerance of CONTRACTOR's locating methodology (as specified in the CONTRACTOR's bid) and include, at minimum an accurate, to scale representation of the alignment and a scale bar.

N. Tabulation of coordinates for each station the CONTRACTOR used to locate the horizontal well.

PART 2 - PRODUCTS

2.01 HORIZONTAL DRILLING RIG

A. The CONTRACTOR shall specify the type and size of drill rig capable of rotating the drill bit through the pre-planned bore path (installation of the pilot hole), reaming the hole to the required diameter, and pulling the specified length and diameter of well riser and screen through the reamed bore path. The drill rig shall be capable of delivering drilling fluids to a remotely steered/guided drilling head.

B. The CONTRACTOR shall specify the type and size proposed for the drill bit, rods and pipes.

C. The CONTRACTOR shall supply any power source needed to operate the drill rig and shall maintain a supply of spare parts to address any breakdowns that can be reasonably anticipated.

D. The condition of all drilling equipment and support vehicles provided by the CONTRACTOR shall be checked and verified to be in proper working order before mobilizing to the site. The equipment must be properly labeled (e.g. levers, kill switches, etc.), be clean and free of material from other sites; have all backup alarms in working order; have no frayed cables; and each vehicle must have a properly tagged fire extinguisher and first aid kit. Additionally, the drill rig shall not leak any fluids that have the potential to enter the borehole or contaminate down hole equipment. All hydraulic oil or fuel leaks detected by the ENGINEER or CONTRACTOR shall be noted and repaired immediately to the satisfaction of the ENGINEER at no additional cost. All equipment provided by the CONTRACTOR that is at any time deemed to be damaged, inoperative, or otherwise unacceptable by the ENGINEER shall be repaired or replaced as expeditiously as possible and to the satisfaction of the ENGINEER at no additional cost.

E. All vehicles will be inspected by ENGINEER upon arrival at the site and must be registered in their home state. Upon request, CONTRACTOR shall provide ENGINEER with proof of periodic inspection of vehicles. During active drilling operations (after mobilization is complete) ENGINEER will complete daily safety inspections of the CONTRACTOR's vehicles and associated equipment prior to and during field work, in order to assess potentially unsafe conditions which may result from faulty or worn equipment.

F. ENGINEER will reserve the right to stop operations if CONTRACTOR's vehicles and associated equipment are deemed unsafe by ENGINEER. In such cases, CONTRACTOR shall not be reimbursed for delays and other costs associated with CONTRACTOR's failure with this provision.

G. Each piece of equipment shall be inspected by CONTRACTOR and decontaminated prior to leaving the Site.

H. The CONTRACTOR shall specify the electrocution and electric detection system capabilities for the specified drilling rig.

I. The CONTRACTOR shall specify a drilling fluids mixing system that is self-contained and closed (no leaks) and of sufficient size to mix and deliver the required volume of drilling fluids to the drill bit. The mixing system should continuously mix and agitate the drilling fluids during drilling.

2.02 GUIDANCE SYSTEM

A. The CONTRACTOR shall specify a guidance system of proven type and set-up for horizontal drilling. The system shall be operated by personnel trained and experienced with the system.

B. The CONTRACTOR shall supply all components and materials to operate and maintain the guidance system. The system shall be used to screen the bore path for potential sources of signal interference and to track the position and depth (pitch) of the drilling sonde from the point of entry, along the proposed bore-path to the point of exit.

C. The CONTRACTOR shall specify a technology capable of transmitting real-time data (e.g., temperature, angle of the tool face, rotation, azimuth (horizontal direction) and inclination (vertical direction) from the drill bit to the drilling operator such that the data can be used by the CONTRACTOR to adjust the direction and depth of the drilling sonde, as needed.

D. The CONTRACTOR shall mark-out and identify pre-planned positions along the proposed bore path where real-time data will be recorded prior to drilling. The frequency should be every 10 to 15 feet in accessible areas and more frequent in areas of utilities, subsurface obstructions and to place the well screen. In inaccessible (obstructed) areas, the CONTRACTOR shall mark-out pre-planned positions along the proposed bore path immediately before the obstructed area and in the first accessible area immediately following the obstructed area.

2.03 DRILLING FLUIDS

A. The CONTRACTOR shall identify what drilling fluid the CONTRACTOR proposes to use including product name, manufacturer, estimated volume, and any other requirements for mixing mud products (e.g., volume of potable water). Biodegradable mud or liquid polymer emulsions that require the addition of chlorine or other breakdown agents that may adversely affect a microbial population are prohibited. All drilling fluids, breakdown agents, enzymes, or other additives must be approved by the ENGINEER prior to use.

B. The CONTRACTOR shall specify proposed procedures to minimize the volume of drilling fluid introduced into the borehole during borehole advancement and shall provide an estimate of how much drilling mud waste will be produced. CONTRACTOR shall document how much drilling fluid and water is used/lost along the alignment of each horizontal well during installation and development.

C. The CONTRACTOR shall maintain on site a record of drilling fluid additives and drilling fluid properties (four-hour intervals maximum) showing weight, funnel viscosity, water loss, cake thickness and sand content (where applicable), changes in said properties and reason therefore, and need for use of special additives.

2.04 WELL SCREEN AND RISER

A. The HSVE well riser pipe and screen will be 3-inch, inside diameter, HDPE.

B. The riser and screen connections shall be flush and not contain ridges or other obstructions. The construction method will be butt fusion welded.

C. The CONTRACTOR must present a recommended final screen slot size and spacing to the ENGINEER for final approval prior to field mobilization. Soil boring data from installation of SVE wells during the September 2018 pilot test indicate site soils consist primarily of light to dark brown black sands and gravels, with trace silt with the exception of SVE-06. The upper soil layers at SVE-06 (0.33 feet to 5 feet bgs) consisted of pea stone fill.

2.05 CEMENT/BENTONITE GROUT SEAL

A. The CONTRACTOR shall seal the annular space around the solid riser portion of each well in a manner to prevent short circuiting between the well screen and the ground surface and to preclude surface water from entering. This may be accomplished by placing a high solids bentonite seal and/or cement bentonite grout above the well screen to the depth at which the riser enters the entrance/exit points (approximately 3 feet below ground surface (bgs).

B. The CONTRACTOR shall provide ENGINEER the method of placement and the grout mixing proportions for cement, bentonite (specify type) and potable water for approval by the ENGINEER. The grout shall be placed approximately two feet above the well screen.

C. The CONTRACTOR shall specify the method for measuring the amount of grout used during installation. The volume shall be based on the annular volume of the riser pipe to the point where the pipe exits the ground surface, approximately three feet below grade. The CONTRACTOR shall record the volumes used on the Daily Field Report.

1) Locks New plastic coated, weather resistant locks with O-ring seals around shackle and three inch long shackle.
2) Locks shall be American Lock Company Weatherbuilt Plus Series 72, WCC, or equivalent.

PART 3 - EXECUTION

3.01 PREPARATION

A. Protect existing monitoring wells to remain.

B. If integrity of wells to remain is compromised (casing becomes bent or loose or grout cracks) as a result of **Contractor's** operations, the wells shall be replaced in kind at no additional cost to the **Department**.

C. Provide new locks for HSVE wells, keyed alike. Provide four sets of keys.

3.02 HSVE WELL INSTALLATION

A. Installations shall be supervised by the ENGINEER and recorded in a field log book.

B. The CONTRACTOR shall contact Dig Safe New York to mark underground utilities in the proposed project area. The call shall be placed at least two and no more than ten working days in advance of performing work. The CONTRACTOR shall specify a hand clearing method or use a vac truck to soft dig to confirm the physical location and depth of each utility located in an area that intersects the proposed bore path or trench line.

C. The CONTRACTOR shall decontaminate drilling equipment prior to drilling, between boreholes, and before leaving the site, as outlined in this specification.

D. The CONTRACTOR shall install three HSVE wells using horizontal drilling techniques in the subsurface to a depth between six and eight feet bgs (roughly two feet above observed depth to groundwater). The vapor extraction wells will be screened as specified on the drawings. For HSVE wells installed beneath the footprint of the building, the well screens will start six horizontal feet in from the nearest building wall. For the HSVE well located outside the building footprint, the well screen will start six horizontal feet south/north of the nearest building corner.

E. Prior to drilling, the CONTRACTOR will pre-plan and lay-out (e.g., spray paint) the bore path of each well by establishing target locations and depths for the start and end of the well screen and the location of the exit point. Relocation due to utility presence must be approved by the ENGINEER. The CONTRACTOR will be responsible for verifying actual dimensions in the field. The CONTRACTOR shall anchor the drilling rig to the ground to ensure it withstands the pressures of pushing, pulling and rotating during drilling operations.

F. The CONTRACTOR shall use a wet saw to cut neat straight lines in areas of asphalt pavement removal. The CONTRACTOR shall assume a water source/hose spigot is available on-site and shall provide water for saw cutting of asphalt. Saw cutting shall extend to the depth of the asphalt (assumed to be no more than 6-inches).

G. Saw cutting shall extend a minimum of 12-inches beyond the limit of excavation. Where a cut leaves a remaining section of pavement less than four feet wide in any direction, the remaining pavement is to be replaced.

H. Removed asphalt will be segregated for recycling or disposal by the CONTRACTOR.

I. The CONTRACTOR shall establish a bench mark elevation, before drilling commences, at the rig location or at the start of the well screen. Installation of each HSVE well is depth dependent and shall be tracked using a walk over locator (or equivalent) to check the depth of the drilling sonde as drilling progresses in relation to the ground elevation and the benchmark elevation.

J. The CONTRACTOR shall excavate a 3-foot by 3-foot by 3-foot entrance and exit point (drilling pit) for each HSVE well as specified on the design drawings. The drilling pits shall be dug using a rubber-tired backhoe (or equivalent). The CONTRACTOR will stage the spoils at grade on 10-millimeter poly sheeting, at the pit location, and the excavated

spoils shall be re-used as backfill when the well is completed, if approved by the ENGINEER.

K. The CONTRACTOR shall use a drill bit (size to be determined by CONTRACTOR) to advance the horizontal drilling at the prescribed entry point at an angle of entry likely between 10 and 14 degrees (25 percent). The CONTRACTOR shall confirm the angle of installation to optimize the drill path of the riser section to achieve the desired well screen depth and account for the presence of utilities or subsurface abnormalities.

L. The CONTRACTOR shall specify best management practices to manage the suspended load during drilling operations.

M. Following well installation, the CONTRACTOR shall develop the wells using a method proposed by the CONTRACTOR. The proposed method of well development must meet the following objectives:
   - Maximize well efficiency;
   - Removal of fine sediments;
   - Removal of residual drilling fluids/mud; and
   - Minimize water added to the well during development.

N. Well development shall be considered complete when at least three times the borehole volume plus the volume of fluids lost to the borehole within the screen interval has been recovered, water is visually clear of sediment, silt, and sand, specific capacity does not increase, and turbidity does not exceed 50 NTU. If 50 NTU cannot be reached, development operations can be considered complete after the other requirements are met and with written concurrence from the ENGINEER's representative.

3.03 SURFACE RESTORATION

A. The CONTRACTOR shall install 12-inches of Number 2A aggregate in areas where the undisturbed surface is gravel. The aggregate will be placed in 6-inch lifts over geotextile or 6-mil poly as shown on Drawing C-003 and compacted to 95% standard proctor density.

B. For asphalt resurfacing areas, the CONTRACTOR shall follow the specifications below. Asphalt material shall be hot-laid by qualified personnel.
   1) The area shall be dry without standing water and all loose and foreign material shall be removed prior to placement of the 4-inch thick bituminous base course.
   2) The color, composition, and cross-section of all asphaltic pavement shall reasonably match original.
   3) Wear course shall be a 2-inch thick bituminous wear course. Tack Coat should be applied between the base and wear courses.
   4) If the installed depth of either course exceeds 2 inches, it shall be constructed in two or more layers of equal thickness. The maximum compacted thickness of any

one layer shall not exceed 3 inches for heavy self-propelled compactors and 2 inches for hand operated compactors.

5) Surfaces of curbs, vertical faces of existing pavements, and all structures to be in actual contact with the asphalt-aggregate mixture shall be given a thin, even coating of asphaltic material (ASTM D 2399). Care shall be taken to prevent spattering of surfaces that will not be in contact with the asphalt-aggregate mixture. A Tack Coat must be made in all resurfaced areas at all vertical faces.
6) The mix shall be compacted immediately after placement. Final rolling shall eliminate marks from previous rolling. In areas too small for a roller, a vibrating plate compactor or a hand tamper shall be used to achieve thorough compaction.
7) Compaction shall begin at the sides and continue until the required density of 95% of the maximum density has been achieved.
8) The surface grade shall not exceed ¼ inch in 10 feet. Variations exceeding ¼ inch shall be corrected by the Contractor at no additional cost to the Department.
9) There shall be no depressions which will retain standing water. Any depressions shall be corrected by the Contractor at no additional cost to the Department.
10) All mating seams between new and existing asphalt pavement shall be hot tar sealed after such time the asphalt has cured.
11) Cold-patch material shall not be utilized without approval of the ENGINEER.
12) All work shall conform to the BOCA, NFPA, NEC, and IBC requirements as well as local, state, and federal codes. Specific standards referenced in this document include, but are not limited to: ASTM D 2399, Practice for Uses of Cutback Asphalts.

3.04 ACCEPTANCE

A. If at any time during the installation of a HSVE well the ENGINEER determines that the well has not been properly installed, the CONTRACTOR shall abandon the hole and slurry grout its full length as directed by the ENGINEER / and initiate construction of a new HSVE well at a location determined by the ENGINEER at no cost to the Department.

B. Upon completion of a HSVE well, the CONTRACTOR shall demonstrate to the ENGINEER that the full length of the well is free from any obstructions and clear of any formation, or the well shall be deemed unacceptable and shall be abandoned and re-drilled at no cost to the company.

3.05 SURVEYING

A. Vertical and horizontal coordinates of newly installed vapor extraction wells will be determined by a state licensed land surveyor. Vertical measurements (elevations) will be measured to within +/-0.01 feet and horizontal measurements within 0.1 feet. Measurements will be tied into the horizontal and vertical control established for the site.

3.06 DECONTAMINATION

A. Prior to, during, and after drilling each borehole, the CONTRACTOR shall exercise control to prevent cross contamination.

B. Before drilling operations commence, the drill casing, drilling rods, and sampling tools shall be cleaned using a high-pressure steam cleaner supplied by the CONTRACTOR. A decontamination area shall be designated by the ENGINEER. The CONTRACTOR shall provide a portable or temporary decontamination containment pad and all required equipment, materials, and structures to effectively decontaminate the drilling equipment and capture / contain all decontamination fluids and solids. The temporary decontamination containment area shall be constructed such that it is water tight and capable of containing all decontamination liquids and solids generated during decontamination.

C. CONTRACTOR shall be responsible for transferring water contained in the temporary decontamination area into to the ENGINEER supplied storage tank.

3.07 INVESTIGATION DERIVED WASTE

A. All liquid investigation derived wastes (IDW) shall be placed in the CONTRACTOR supplied storage tank located at the staging area. Liquid IDW includes decontamination water, water produced during borehole installation, well development water, and any other liquid IDW generated by the CONTRACTOR. The CONTRACTOR shall be responsible for containment of all water produced during boring installation and all decontamination water and thus shall provide any necessary generators, transfer pumps, transport tanks, and hoses necessary to transfer decontamination liquids to the CONTRACTOR provided storage tank. Once all liquid IDW have been transferred to the storage tank by the CONTRACTOR, the CONTRACTOR will be responsible for collecting samples of the liquid IDW for characterization and subsequent disposal.

B. All drill cuttings, drilling fluids, and decontamination solids shall be containerized by the CONTRACTOR in a covered and lined roll-off container provided by the CONTRACTOR. The drilling fluids will be allowed time to settle and separate into a liquid and solid fraction. The CONTRACTOR will transfer the water fraction to the liquid IDW storage container and the settled solids will remain. The CONTRACTOR shall be responsible for safely transferring drill cuttings and decontamination solids from the borehole and decontamination pads to the storage containers (i.e., roll-off). Once all IDW drill cuttings and decontamination solids have been containerized by the CONTRACTOR, the CONTRACTOR will be responsible for collecting samples of the IDW solids for characterization and subsequent disposal.

PART 4.0 - ITEMS FURNISHED BY CONTRACTOR

A. CONTRACTOR shall designate a Project Representative who is empowered to represent and commit CONTRACTOR for all purposes related to this contract. The

CONTRACTOR's Project Representative must be on site during all field operations pertaining to this contract.

B. CONTRACTOR shall be responsible for providing personnel with the necessary education, certification and training to provide the services specified in the contract. CONTRACTOR shall use only those materials of construction specified herein and substitute materials shall not be used unless permission is granted by ENGINEER in writing.

C. Delays caused by CONTRACTOR's lack of readiness (i.e. use of unqualified personnel, equipment breakdowns, delays caused by failure to bring the proper tools, equipment and/or materials of construction, as measured by the ENGINEER and noted in the ENGINEER'S Field Log Book, shall be classed as "Down Time" and such time shall not be eligible for invoicing to NYSDEC.

PART 5.0 - ITEMS FURNISHED BY ENGINEER

A. ENGINEER will provide a photoionization detector and dust monitoring equipment to monitor worker's breathing zone.

END OF SECTION 02017

SPEC 11394

SVE EQUIPMENT SPECIFICATIONS

PART 1 - GENERAL

1.1 Description

Work included in this Section. The Contractor shall provide all the required labor, project equipment and materials tools, construction equipment, safety equipment, transportation, and test equipment (unless otherwise specified) for furnishing, installation, adjustment, and full test loading of all the mechanical work shown on the Drawings and included in these Specifications.

1.2 Quality Assurance

A. Incorporated Documents. Published specifications, standards, tests, or recommended methods of trade, industry, or governmental organizations apply to these Specifications. In every situation, the latest specifications, standards, tests, etc., shall apply unless otherwise noted. The product offered shall comply with the following code and specification agencies, where applicable.

- American National Standards Institute (ANSI).
- American Society for Testing and Materials (ASTM).
- American Society of Mechanical Engineers (ASME).
- National Electrical Manufacturers Association (NEMA).
- National Fire Protection Association (NFPA).
- Occupational Safety and Health Administration (OSHA).
- National Institute for Occupational Safety and Health (NIOSH).
- Underwriter's Laboratories (UL).
- National Electrical Code (NEC).
- National Electrical Safety Code (NESC).

B. Variances. In instances where two codes are at variance, the restrictive requirements shall apply.

C. Contractor's Expense. The Contractor shall obtain and pay for the required bonds, insurance, licenses, permits, and inspections (unless otherwise specified), and pay all taxes, fees, and utility charges that shall be required for the construction work.

D. Extra Work. Work that is not included in the Contract Documents shall not be performed, except when approved in writing by the Owner.

E. Standard of Quality. Items of equipment are specified herein by the name of a manufacturer for the purpose of establishing a standard of quality and acceptable experience.

F. Data. Unless otherwise specified, all equipment furnished shall have a data plate and embossed preprinted lettering and fastened to the frame with corrosion-resisting pins. Nameplates shall have stamped on them the manufacturer, serial number, model number, type, operating and performance data, and other pertinent data. Letters and numerals shall not be smaller than 3/16 inch high.

G. Taggings. When the size of the equipment prevents the fastening of data plates, name tags shall be provided and attached to the equipment and device items to identify it. The name tags shall have a rectangular configuration with square corners and shall be approximately 1-1/2 inches by 3 inches in size. Letters and numerals shall not be smaller than 3/16-inch in size. The name and number for each item of equipment, as designated on the Drawings, shall appear on the name tag for the item. A 3/16-inch diameter hole shall be provided in the upper left-hand corner of each name tag and shall be used to attach the name tags to the equipment and define items with 1/8-inch stainless steel cable.

1.3 Drawings

A. Project Drawing. The Mechanical Drawings are diagrammatic and show the general layout of the complete construction work. Locations of equipment, inserts, anchors, motors, fixtures, power inlets, unless specifically dimensioned on the Drawings, shall be determined to suit field conditions encountered, and the Contractor shall be responsible for ensuring clearance between pipes, equipment, and similar appurtenances,

without extra cost to the Owner. The Contractor shall review the Drawings and Specifications of other trades and shall include the mechanical work shown thereon that will be required for the installations.

B. Shop Drawings. Prior to fabrication, the Contractor shall obtain, from the manufacturer, shop drawings for all equipment. Shop drawings shall include fabrication, assembly, unit support drawings, installation drawings, and wiring diagrams together with detailed specifications. The Contractor shall submit Certified performance or Certified test curves, as specified for all equipment furnished under this Contract.

1.4 Operation and Maintenance Manuals

The Contractor shall submit to the Engineer operation and maintenance manuals on all mechanical equipment. Two (2) final conformed copies shall be printed and provided. In addition, a digital copy shall be provided.

1.5 Installation Manuals

In addition to operation and maintenance manuals, the Contractor shall submit to the Consultant two (2) copies of all installation manuals for each piece of equipment. This manual shall be submitted at the same time as the operation and maintenance manual. In addition, a digital copy shall be provided.

1.6 Equipment Guarantee

The Contractor shall furnish and replace, without cost to Owner, all equipment parts that are defective or show undue wear within one (1) year from the Owner's acceptable work date unless extended periods of warranty for specific pieces of equipment are specified elsewhere. In addition to performance guarantees, all processes or systems shall comply with the requirements of applicable portions of the Sections of these Specifications describing those systems.

PART 2 - PRODUCTS

2.1 Materials and Workmanship

All equipment furnished under this Contract shall be new and guaranteed free from defects in material, design, and workmanship. These Specifications, to the extent possible, identify service conditions and requirements for all equipment; however, it shall be the manufacturer's responsibility to ascertain, to his satisfaction, the conditions and service under which the equipment will operate and to warrant that operation under those conditions will be successful. All parts of the equipment shall be amply proportioned for all stresses that may occur during fabrications, erection, and intermittent or continuous operation.

All equipment shall be designed, fabricated, and assembled in accordance with the best modern engineering and shop practice. Individual parts shall be manufactured to standard sizes and gauges so that repair parts, furnished at any time, can be installed in the field. Equipment shall not have been in service at any time prior to delivery, except as required by tests.

Except where otherwise specified, structural and miscellaneous fabricated steel used in items of equipment shall conform to the Standards of the American Institute of Steel Construction. All structural members shall be considered as subject to shock or vibratory loads.

2.2 Soil Vapor Extraction Assembly

The soil vapor extraction (SVE) assembly used shall utilize the following components and options:

A (3) Blowers capable of handling 200-300 scfm at a vacuum of 60-80 inches of water each (does not need to be explosion proof). Most likely will be a rotary lobe or regenerative blower. 3 Phase power is available but at an unknown voltage at this time.

B. (3) Variable frequency drives (1 for each blower)

C. (3) Separate knock out tanks with High level alarm switches

D. Vacuum relief valves

E. In-line air filters

F. Two vacuum gauges per blower

G. Temperature gauges and switches as needed

H. Bleed valve with silencer

I. Low vacuum switch

J. Valved system so that all 1, 2, or 3 legs can be operated on only 1 blower if needed.

K. Check valves as needed

L. Mounted on steel frame

M. Water treatment not required but ability to drain the knock outs through a carbon bucket must be included (no pump required)

N. Piping

- Galvanized steel pipes shall be used at the inlet and outlet of the blower assembly. Length requirements to be determined by system manufacturer.
- Schedule 80 PVC pipe shall be used for the remainder of the above grade piping.
- Union fittings shall be integrated as appropriate to aid in the access, removal, and replacement of key components.

O. System enclosure is to be included in the pricing. Connex, shed, or trailer is acceptable.

P. Provide and install all typical heating, ventilation and lighting components in the system enclosure.

Q. Provide and install system process equipment, devices, fittings, pipe support and associated appurtenances.

R. Provide and install all electrical components including wiring, conduit, power distribution panels, transformers and associated appurtenances

S. Control System include but not limited to enclosure, programable logic controller, motor starts, field switches, hour meters, GCFI, transformer for control power only, E-stop, disconnect switch, display screens.

T. Air flow transmitters and a cell phone modem shall be included to allow for remote observation and control in conjunction with the VFD's.

U. Any typical SVE components not listed above.

2.3 Discharge Stack

A. A separate 35 foot 4" stack is to be installed by the Contractor. It is anticipated that this will be attached to a standard 40 foot telephone pole.

PART 3 EXECUTION

3.1 Protection

All equipment shall be boxed, crated, or otherwise completely enclosed and protected during shipment, handling and storage. All equipment shall be protected from exposure to the elements and shall be kept thoroughly dry and clean at all times. Pumps, blowers, motors, electrical equipment, and other equipment having anti-friction or sleeve bearings shall be stored in weather-tight storage facilities such as warehouses. All materials and equipment showing evidence of rust, dirt, contamination, or other surface or subsurface deterioration shall be cleaned and restored to the Consultant's satisfaction prior to installation.

3.2 Equipment Installation

All equipment shall be installed in full accordance with the equipment manufacturer's recommendations and good practice.

3.3 Damaged Products

A. The Contractor shall notify the consultant in the event that any equipment or material is damaged subsequent to receipt at the jobsite and prior to acceptance of installation by the Owner.

B. Repairs to damaged products in lieu of replacement shall not be made without prior approval by the Consultant.

-- END OF SECTION 11394 --

SPEC 00004

SURVEYS

1. GENERAL

1.1 References

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

NEW YORK STATE DEPARTMENT OF TRANSPORTATION - NYSDOT Spec., Standard Specifications --- Construction and Materials (Latest Edition).

1.2 Related Sections

Not used.

1.3 Submittals

Submit the following in accordance with Section VIII, Article 5.23 - 5.29, "Shop Drawings and Samples." The submittals described below are minimum requirements for surveying. Additional surveys needed to document quantities for payment will also be performed as directed by the ENGINEER.

1.3.1 Drawings

A. Initial topographic map

Provide topographic maps of site property, property boundary survey and utilities prior to site disturbance. Elevations will be provided for all control points.

B. Intermediate drawings

Provide an intermediate survey drawing delineating the area and depth of all excavations prior to backfilling and the location of all confirmatory soil and sediment sample points, upon completion of all rough shaping and grading and prior to placement of cover materials. Also show all installed utilities (water, sanitary sewer and storm sewer), including inverts at all changes in vertical alignment.

C. As-built topographic maps

Upon completion of the final backfill materials and restoration of all disturbed surfaces.

1.3.2 Records

A. AutoCad 2000i or higher compatible electronic files of all surveys (provide data in electronic format - CD-ROM).

B. Field Data

Original final survey book (hard bound) upon completion of each phase of survey work. Include all field notes, notations, and descriptions used and compiled during the field survey. Photocopies or carbon copies are not acceptable.

C. Coordinate List

Final coordinate list of all survey points with specific coordinates and elevations.

D. Volume Quantity Calculations

All calculations required to support requests for payments and verifications of volumes and areas involved.

2. PRODUCTS

Provide in accordance with NYSDOT Specification Section 626.

3. EXECUTION

3.1 General

A. The following surveys must be conducted during the project, and will form the basis of measurement for payment of most cubic yard, linear foot, and square foot pay items:

1. An initial site survey to establish and verify existing site conditions, and to properly lay out the work as shown on the Drawings.

2. Spot elevations and locations shall be established and surveyed as necessary to ensure that work is installed to the grades shown on the Drawings, including spot elevations of any drainage structures.

3. Following soil and sediment excavations, the limits shall be surveyed to document the volumes of material that have been removed, as a base survey for measurement of materials. This survey shall include the locations and elevations of all final verification samples which were the basis of limiting further excavations.

4. During construction of any concrete slab, the subbase will be surveyed before installation of the concrete, and the concrete surface will be surveyed.

5. Well locations and there corresponding elevations of the top of casing shall be surveyed in.

B. All work in this section shall be performed by a licensed professional land surveyor registered to practice in the State of New York.

3.2 Horizontal and Vertical Control

Horizontal and vertical control points shall be referenced to the permanent site control monuments to an accuracy of one part in ten thousand. Provide control points at each location of work using closed traverse and leveling loops.

Provide grade and offset stakes to control the location and depth of excavation and fill. Survey the location and elevation of all excavation and fill limits to document the areas remediated.

3.3 As-built Topographic Maps

Reproducible base map at a scale of 1 inch = 40 feet, maximum with 1-foot elevation contours upon which the **CONTRACTOR** shall plot the required survey information for each required submittal.

Mapping shall conform to the National Map Accuracy Specifications and shall bear the seal of a licensed land surveyor registered in New York. Map shall contain a title block with the name and address of the **CONTRACTOR** and the seal and signature of the registered surveyor. As-built drawings shall include labeled contour lines, property line locations, horizontal grid systems, cross-sections and details modified to show “as-built” conditions, details and cross-sections not on original drawings, and any field changes of elevations, dimensions, and details.

Indicate locations of physical features on the site including: utilities, roadways, culverts, manholes, utility poles, fences, gates, drainage ditches, monitoring wells, piezometers, leachate pipes, tanks, bench marks and other significant items.

Indicate on a separate drawing: excavation limits and verification sampling points.

Indicate on a separate drawing final underground structures including: force mains and leachate collection system.

3.4 Coordinate List

Compute the coordinates of each surveyed point on the New York State Plane Coordinate System using the 1983 North American Datum. The elevations shall be on the National Geodetic Vertical Datum.

3.5 Site Control

Provide one permanent site control monument with elevations referenced to a National Geodetic Vertical Datum (NGVD) benchmark and coordinates referenced to the New York State Plane (NAD 83) Datum. The monument locations and elevations shall meet the Federal Geodetic Control Committee Standard for second order (horizontal and vertical). Final locations will be reviewed by the **ENGINEER** for acceptability.

3.6 Survey Notes

Record all field work in a clear, legible, and complete manner. The Field Notes shall contain a complete description of the nature and location of the new and existing points. The record shall also include a sketch of the point locations, and the monument witness points.

3.7 Utilities

Scan the construction site with electromagnetic or sonic equipment, and mark the surface of the ground where existing underground utilities are discovered. Verify the elevations of existing pipe, utilities, and any type of underground obstruction not indicated or specified to be removed but indicated or discovered during scanning in locations to be traversed by piping, ducts and other work to be installed. Verify elevations before installing new work closer than nearest manhole or other structure at which an adjustment in grade can be made.

Record locations and elevations of all utilities.

3.8 Survey Checks

Provide the Engineer with survey, level, tripod, rod and measuring tape to perform survey checks of the work. Provide an individual to assist Engineer in performing survey checks.

*** END OF SECTION ***

SPEC 00012
MONITORING WELLS

PART 1 GENERAL

1.1 Summary

This section includes:

1. The criteria for installing new monitoring wells; and
2. The criteria for decommissioning existing monitoring wells.

1.2 References

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

1. American Petroleum Institute, AP-13 A, American Petroleum Institute Specification 13 A
2. American Society for Testing and Materials, ASTM C150, 1992 Standard Specification for Portland Cement
3. National Water Well Associations, NWWA-EPA, "Handbook of Suggested Practices for the Design and Installation of Groundwater Monitoring Wells."
4. Codes, Rules and Regulations of the State of New York, 6NYCRR Part 360, Solid Waste Management Facilities.
5. New York State Department of Environmental Conservation, GW-MW-10/96, "1996 Groundwater Monitoring Well Decommissioning Procedures.

1.3 SUBMITTALS

Records

Submit the following in accordance with Section VIII, Articles 5.23 through 5.29:

1. New well construction diagrams.
2. New well boring logs.
3. Extend well construction diagrams.

1.4 DELIVERY, STORAGE AND HANDLING

Casing and screens shall arrive on-site clean and in factory cartons.

PART 2 PRODUCTS

2.1 MATERIALS

1. Risers (inner casings)

   a. 2 inch internal diameter (ID), schedule 40, threaded, flush-joint PVC pipe.

   b. The top of the PVC casing shall be equipped with a threaded vent cap.

2. Screen Sections:

   Manufactured slotted well screens with slot size of .010 inch (10 slot), 5

feet in length and equipped with threaded bottom plugs.

3. Sand Pack

   Consisting of graded silica sand with an average grain size and grain size distribution such that only minimal amounts of the sand may pass through slots in the screen.

4. Finer Grained Sand Pack

   100% passing the No. 30 sieve and less than 2% passing the No. 200 sieve.

5. Protective pipe casing

   4 inch I.D. (minimum) steel casing.

6. Bentonite

   Powdered, premium grade sodium montmorillonite conforming to applicable standards set forth in AP-13 A with a minimum barrel yield of 90 barrels/ton.

7. Cement

   Portland cement in accordance with ASTM C 150, Type II.

2.2 EQUIPMENT

Locks

1. New plastic coated, weather resistant locks with O-ring seals around shackle and 3 inch long shackle.
2. Locks shall be American Lock Company Weatherbuilt Plus Series 72 WCC, or equal.

2.3 MIXES

Cement/Bentonite Grout

Water, cement and bentonite mixed as follows:

5 to 7 gallons of water.
94 pounds of cement
1 to 4 pounds of bentonite.

PART 3 EXECUTION

3.1 PREPARATION

Protection

1. Protect existing monitoring wells to remain.
2. If integrity of wells to remain is compromised (casing becomes bent or loose or grout cracks) as a result of **Contractor's** operations, the wells shall be replaced in kind at no additional cost to the **Department**.
3. Equipment and Material Preparation and Cleanup
4. All drilling and sampling equipment that may come in contact with subsurface materials shall be steamed cleaned prior to use.
5. The drilling and sampling equipment shall be steamed before leaving the

site.

6. All PVC materials (screen and riser) shall be steam cleaned prior to well installation.
7. Drilling fluids, including development waters, shall be disposed off-site.
8. Drill cuttings shall be disposed off-site.

3.2 INSTALLATION

1. General
   a. The work shall be carried out in accordance with GW-MW-10/96, NWWA-EPA and 6 NYCRR Part 360.
   b. Provide new locks for all monitoring wells shown on the drawings.
   c. All locks shall be keyed alike.
   d. Provide four sets of keys.
2. Monitoring Wells
   a. New monitoring wells shall be installed in 4 inch I.D. hollow stem auger (ASA) drilled holes.
   b. Attached figures show the typical construction detail for new monitoring wells.
   c. The sand pack shall be introduced gradually inside the 4 inch diameter augers, and shall fill the annular space between the screen and borehole adjacent to the screen.
   d. Prevent collapse of the native formation materials against the well casing or screen.
   e. Frequent and precise measurements shall be provided to ensure the proper placement of all materials.
   f. The grout shall be mixed with a mud pump to a consistency acceptable to the **Engineer**. No organic polymer additives are permitted.
   g. The grout material shall be introduced via a tremie pipe lowered to just above the bentonite layer. As the grout material is pumped into the borehole, the tremie pipe shall be removed, and the augers withdrawn.
   h. Remove augers upon completion of grouting.
   i. The monitoring well shall have a vented and locking cap.
3. Bedrock Monitoring Wells
   Attached figure shows the typical construction detail for new bedrock monitoring wells.
4. Placement
   Install new monitoring wells after placement of backfill and prior to placement of topsoil at locations shown on the plans.

3.3 NEW MONITORING WELL DEVELOPMENT

1. Allow the wells to set a minimum of 48 hours prior to development.
2. Develop until a turbidity of 50 nephelometric turbidity units (NTUs) is reached and the pH and conductivity of the groundwater removed stabilize, or until 2 hours of development time have elapsed, whichever occurs first.

3. A minimum of five well volumes shall be removed.

3.4 MONITORING WELL DECOMMISSIONING

1. General
   a. Decommission wells as indicated on the Drawings in accordance with GW-MW-10/96.
   b. Prevent cross contamination between upper and lower confining layers during decommissioning.
   c. Disposal of all removed components.
   d. All excavated soils shall be handled like drill cutting per 3.01 of this part.
2. Sequence of Operation
   a. Break up, remove and dispose of the surface concrete seal.
   b. Excavate the ground surrounding the protective casing of each well scheduled for decommissioning.
   c. Remove and dispose of the protective casing.
   d. Remove riser and screen by over boring down the outside of the riser pipe with a hollow stemmed auger, then pull the riser and screen. Avoid over boring bottom of hole.
   e. Use a rock bit if the riser and screen cannot be pulled after over boring.
   f. Remove all remaining material from the original annular space and dispose.
   g. Place the cement/bentonite grout by tremie into the borehole using a 1 inch I.D. grout tube as auger is removed.
   h. Allow 24 hours for the grout to cure prior to commencing work in the immediate area.

3.5 MONITORING WELL EXTENSION

1. Sequence of Operation
   a. Remove existing protective casing cap or cover as necessary to extend the well.
   b. If existing inner casing is PVC, install new PVC inner casing with slip on coupling with hose clamps. If existing inner casing is stainless steel, install new stainless steel inner casing by welding to existing casing.
   c. Extend inner casing to 2 inches below the top of the protective well casing.
   d. Extend the steel protective casing by welding to existing protective casing. Steel protective casing shall be welded on plumb and level.
   f. Fill annulus between casing sections with cement/bentonite grout.
   g. Install 1 foot by 1 foot concrete drainage pad.
2. Field Quality Control
   Ensure inner casing is straight between old and new sections by demonstrating that 4 foot long bailer will pass freely through the full length of the well.

3.6 LOCK REPLACEMENT

1. Remove existing locks and replace with new locks on all monitoring wells to remain.
2. Locks shall be keyed to match those provided on new monitoring wells.
3. Provide four copies of well keys to the **Engineer**.

3.7 PIEZOMETER INSTALLATION

1. New piezometers shall be installed using a wireline casing advancer or other appropriate method to advance casing. The method chosen to drill Should minimize disturbance of the fill.
2. Install new piezometers at locations shown on the plans as directed by the Engineer.
3. Drill into native soils. Fill hole to bottom of fill with cement.
4. Steam-clean casings and screens prior to installation.
5. Set top of screen.
6. The sand pack shall be introduced gradually and shall fill the annular formation materials against the well casing or screen. Frequent and precise measurements shall be provided to ensure the proper placement of all materials.
7. Provide a 2-foot-thick (minimum) bentonite pellet seal above the sand pack.
8. Provide cement/bentonite grout above the bentonite seal to 2 feet of proposed final ground surface. No organic polymer additives are permitted. The grout shall be mixed with a mud pump to a consistency acceptable to the Engineer. The grout material shall be introduced via a tremie pipe lowered to just above the top of the bentonite layer. As the grout material is pumped into the borehole, the tremie pipe shall be removed, and the augers withdrawn. Remove augers upon completion of grouting.
9. Provide an outer water-tight protective steel casing cemented in place around the PVC riser pipe. The top of the steel casing shall extend approximately 3 feet above the finished grade and 3 inches above the top of the PVC well casing. Five feet of steel casing shall be below ground. The monitoring well shall have a vented and locking cap. No cement collar shall be provided. Provide additional soil to divert surface runoff from the well.

END OF SECTION

SPEC 00015
OFF-SITE TRANSPORTATION AND DISPOSAL

1. GENERAL

1.1 Scope of Work

A. This section includes procedures for off-site disposal or recycling of wastes and procedures to transport all items specified for off-site treatment and disposal or recycling.

B. The **CONTRACTOR** shall properly transport and dispose of all items, including solid and liquid hazardous and nonhazardous wastes removed from the site, to appropriate disposal facilities. This includes existing wastes as well as the wastes generated by the **CONTRACTOR.** The **CONTRACTOR** shall be responsible and will be held accountable for assuring that all sampling, analysis, transportation, and disposal requirements of the TSDF, SWMF, POTW, reclamation or salvage facilities, federal, state, and local governments are complied with and properly documented.

C. The CONTRACTOR shall video the local roads and subsurface infrastructure (i.e waterlines , storm and sanitary sewers) beneath local roads proposed for use as haul roads to transport waste for offsite disposal prior to initiation of the work and after completion of the work. The video shall be recorded to document the existing condition of all local roads and infrastructure prior to being exposed to project traffic. Infrastructure condition documentation will include the following:

1. Review of available utility maps, utility mark outs, and other available utility location information provided by utility owners.
2. Photographic and/or video documentation of features and appurtenances within the rights-of-way along the proposed truck routes, from the inside (residential) edges of sidewalks on both sides of the road. This will include, but not be limited to, sidewalks, roads, curbs, grass medians, lamp posts, hydrants, pavement, manhole covers, storm grates, and utility poles.
3. Video documentation of subsurface sewer pipe infrastructure (gravity-fed sewer mains, manholes, and catch basins) conditions, where accessible. Invert depths below grade will be noted where possible.

Infrastructure condition documentation will be reviewed to identify visible deficiencies, movement, deformation, cracking, etc. The need for protection or avoidance of specific locations during the course of remedial construction will be discussed with the Department of Public Work's (DPW) Roads, Grounds, and Sewer Supervisor (Supervisor). Protection for sensitive areas such as a shallow water or sewer line crossing the road may be provided using road plates or other suitable methods approved by the DPW Supervisor. Following the completion of each phase of remedial construction, post-construction conditions, using the same procedures described above, will be documented along truck routes used during the work. The photographic and video documentation will be reviewed to identify condition changes that may have resulted from remedial construction activities.

D. Excavated soils shall be amended by the CONTRACTOR with Portland cement or an approved equal, as needed, to meet the moisture content and structural stability requirements of the disposal facility.

1.2 Submittals

A. **Transportation Plan:** The **CONTRACTOR** shall submit a Transportation Plan to the **ENGINEER** prior to the start of work for review. This shall include:

1. Type and number of vehicles used;
2. Travel routes and times; and
3. Copies of transportation permits.

B. **Disposal Facilities:** The **CONTRACTOR** shall submit to the **ENGINEER** information regarding proposed facilities for disposal and/or recycling of each type of waste. All proposed facilities must be permitted. Information submitted shall include, but not be limited to:

- Name;
- Owner;
- Type of facility/permit information;
- Contact person, phone number;
- Location;
- Hours of operation; and Copies of permits.

C. **Infrastructure Protection Plan**: The CONTRACTOR shall submit an Infrastructure Protection Plan to the ENGINEER prior to the start of work for review. Municipal infrastructure protection measures incorporated into this plan shall include, but not be limited to:

1. Methods to perform pre- and post-construction documentation of infrastructure conditions;
2. Selection of haul routes that limit truck traffic on local roads and avoiding local roads where there is an anticipated increase in the risk of damage, to the extent practicable;

1.3 Permits and Regulations

A. The **CONTRACTOR** shall comply with all federal, state, municipal, and local regulations regarding transportation and disposal of hazardous and nonhazardous material. These include, but are not limited to:

- Trucks used for transportation of hazardous material for disposal off site shall have a valid New York State 6 NYCRR Part 364 Waste Transporter Permit and U.S. Environmental Protection Agency (EPA) transporter identification numbers;
- Vehicle operator possession of a commercial driver's license with hazardous materials endorsement (if applicable);
- Registration of vehicle as a hazardous waste carrier (if applicable);
- Utilization of shipping papers and/or hazardous waste manifest (40 CFR 262.20);
- Proper marking and placarding of vehicles;
- Placement of emergency response procedures and emergency telephone numbers in vehicle, and operator familiarity with emergency response procedures (see Minimum Health and Safety Requirements, attached); and
- Compliance with load height and weight regulations.
- Compliance with requirements associated with EPA Hazardous Waste Generator I.D. number.

1.4 References

A. The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

1. U.S. Code of Federal Regulations (CFR)
   a. 40 CFR 262 1993 Standards Applicable to Generators of Hazardous Waste
   b. 49 CFR 172 Tables, Hazardous Material Communication Requirements, and Emergency Response Information Requirements

2. State of New York Codes, Rules, and Regulations (NYCRR)
   a. 6 NYCRR Part 364 Waste Transportation Permits
   b. 6 NYCRR Part 371 Identification and Listing of Hazardous Wastes
   c. 6 NYCRR Part 372 Hazardous Waste Manifest System and Related Standards for Generators, Transporters, and Facilities
   d. 6 NYCRR Part 375 Environmental Remediation Programs

1.5 Disposal Facilities

A. Hazardous and Non-Hazardous Waste

1. Facilities must have valid federal/state permits appropriate for the waste being disposed.

a. Permits must be valid during the entire project period.

2. Facilities must be in good legal standing with no significant violations, corrective actions, or other environmental conditions that could affect satisfactory operation.

3. The disposal facility must comply with policies adopted by the DEPARTMENT, or with applicable regulations.

B. Recycling/Salvage Facilities

1. Facilities must have valid federal/state permits appropriate for the waste(s) being recycled or salvaged.
   a). Permits must be valid during the entire project period.
2. Facilities must be in good legal standing with no significant violations, corrective actions, or other environmental conditions that could affect satisfactory operation.
3. The facility must comply with policies adopted by the DEPARTMENT and with applicable regulations.

1.6 Measurement

A. Each transport vehicle shall be weighed to determine the amount of material being removed from the site.

B. A printed ticket with the time, date, vehicle number, and tare weight and a separate ticket with the same information except with total vehicle weight and net weight of material being transported for disposal shall be obtained from the disposal facility. A copy of both tickets shall be given directly to the ENGINEER as they are produced.

1.7 Special Project Procedures

A. CONTRACTOR shall be responsible for all special use taxes for in-state and out-of-state waste disposal or recycling, including but not limited to host municipality fees and special district user or local taxes.

2 PRODUCTS

2.1 Materials and Equipment

A. All equipment supplied shall be in good working condition. Equipment and machinery delivered to the site, including haul trucks, that have visible oil or hydraulic fluid leaks, will not be allowed on site until satisfactorily repaired. The **CONTRACTOR** is responsible for the cleanup of any oil or hydraulic fluid spills at the **CONTRACTOR'S** expense.

B. The **CONTRACTOR** shall not allow soil to be tracked off site at any time during the Project. Visible soil tracks on streets will not be allowed. The **CONTRACTOR** shall take sufficient precautions to prevent loose soils from adhering to tire treads, wheel wells, etc. Any loose soil spread shall be cleaned up.

C. Trucks used for transportation of material for off-site disposal shall be water tight and permitted pursuant to 6 NYCRR Part 364. All trucks shall be covered prior to leaving the site.

D. The CONTRACTOR shall provide waste containers specific to the individual waste as described in Section __Waste Removal, Handling, and Storage.

2.2 Traffic Control Devices

A. All equipment items, if used during the construction of Project, shall conform to NYSDOT Section 619-2 and Manual on Uniform Traffic Control Devices (MUTCD) requirements:

1. Flashing barricade lights
2. Construction and maintenance signs
3. Channelizing devices
4. Arrow boards
5. Barricades
6. Traffic Cones

2.3 Miscellaneous Equipment

A. Other items, which include orange safety vests, flags or signs for flagmen, and communication devices, shall be standard and adequate for their intended function. They shall be in accordance with the NYSDOT-MUTCD where applicable or as required by NYSDOT Work Permit.

3. EXECUTION

3.1 Disposal Requirements

A. Materials deemed nonhazardous will be disposed of by the CONTRACTOR in the most economical manner that meets applicable regulations acceptable to the DEPARTMENT and satisfies the project deadline.

B. The CONTRACTOR shall be responsible for confirming that the waste meets the approved disposal facility's acceptance criteria, including but not limited to the absence of free liquids. Soil may be amended with lime or other appropriate material as necessary to meet disposal facility requirements. Use of amending materials shall be minimized to limit the addition of weight to the excavated soils.

C. The CONTRACTOR shall be responsible for all costs involved in the handling of all wastes deemed unacceptable by the approved disposal facility.

3.2 Acceptable Facilities

A. Resource Conservation and Recovery Act (RCRA) Wastes

1. The facility must have a current and valid state permit, if applicable.
2. The facility must have a RCRA Permit or RCRA Interim Status for RCRA wastes.
3. The facility must not have any significant RCRA violations or other environmental conditions that could affect its satisfactory operation.
4. Significant violations include Class 1 RCRA violations as defined in EPA's RCRA Enforcement Response Policy dated October 1, 1988, including but not limited to groundwater, closure, post closure, and financial violations.
5. Environmental conditions include those conditions affecting the satisfactory operation of the facility and violations of state and/or federal laws other than RCRA.
6. Under limited circumstances, an EPA Administrator may allow disposal of hazardous substances at a RCRA facility having significant RCRA violations or other environmental conditions affecting satisfactory operation, provided that the facility owner or operator has entered into a consent order or decree to correct the problems, and disposal only occurs within the facility at a new or existing unit that is in compliance with RCRA requirements.
7. Landfill disposal must be in a unit meeting applicable RCRA minimum technical requirements.
8. Current RCRA minimum technical requirements for land disposal include the use of a double liner system.
9. Under limited circumstances (low waste toxicity, mobility, and persistence), the EPA may approve the use of a single-lined land disposal unit for RCRA wastes where use of such a unit adequately protects public health and the environment.
10. As approved by the DEPARTMENT after review and audit of the facility.

B. Nonhazardous Wastes

1. The facility must have a current and valid state permit, if applicable.
2. The facility must be permitted and in good legal standing with applicable agency regulatory requirements.
3. As approved by the DEPARTMENT after review and audit of the facility.

C. Recycling/Salvage

1. The facility must have a current and valid state permit, if applicable.
2. The facility must be permitted in good legal standing with applicable agency regulatory requirements.
3. As approved by the DEPARTMENT after review and audit of the facility.

3.3 Preparation And Securement Of Transport Vehicles/ Containers

A. Comply with applicable federal, state, and local regulations concerning packaging and shipping of materials.

B. Secure materials in transport vehicles/containers in accordance with regulations governing transportation of these materials.

C. Vehicles hauling contaminated soils shall be lined, watertight, and covered to prevent soils from spilling out of the vehicle or potentially fugitive particulate matter from becoming airborne.

3.4 Vehicle Loading And Decontamination

A. Provide all equipment, personnel, and facilities necessary to load waste materials in accordance with the regulatory requirements listed herein, and in accordance with the regulations of those states through which the CONTRACTOR plans to transport materials.

B. Vehicle operators shall be trained in conformance with federal and state regulations for waste haulers (hazardous, special, and nonhazardous).

C. All vehicles coming into contact with waste materials shall be decontaminated to the satisfaction of the ENGINEER prior to leaving the site. Decontamination shall be considered complete when:

1 No soil or other material is adhering to the vehicle body, tires or undercarriage;

2. The vehicle is not leaking or dripping liquids; and

3. The contents of a loaded vehicle are completely enclosed.

D. Vehicles leaking materials or dripping liquids in any amount will not be permitted to leave the site until provisions are made to eliminate the leaking material. The CONTRACTOR shall amend or dry soils as necessary to ensure vehicles do not leak.

E. All waste materials, debris, and contaminated materials shall be completely covered with a solid tarpaulin or otherwise completely enclosed to protect material from precipitation and prevent loss of material or dust during transportation.

1. Mesh covers or mesh tarpaulins will not be allowed. Cover shall be appropriately secured before the vehicle leaves the decontamination station.

F. Decontaminate transport vehicles and containers that have been loaded with nonhazardous materials for off-site disposal/treatment at an on-site equipment decontamination pad after loading and prior to leaving the site. Remove material on the tires and axles of trucks and material on the vehicle resulting from the loading operation.

G. Decontaminate all equipment that has come in contact with the contaminated soil/waste materials prior to the equipment leaving the contamination zone. Remove material from tracks, axles, buckets, tires, and equipment bodies as appropriate.

H. Wash water generated from the decontamination of transport vehicles shall be captured and stored prior to off-site disposal at an approved facility.

3.5 Transportation

A. Materials shall be transported only at the times and by the routes indicated in the CONTRACTOR's Traffic Protection Plan, unless written permission is received from DEPARTMENT to do otherwise. Drivers deviating from the approved route or otherwise not complying with Traffic Protection Plan requirements will not be allowed to return to the project site.

B. CONTRACTOR shall be responsible for all actions to remediate spills in transit.

C. All nonhazardous excavated soils/waste will be transported off-site for disposal at an appropriate facility. The waste should be sampled and segregated in the field prior to transport, as needed.

D. Transport and dispose of off-site any CONTRACTOR-generated Construction & Demolition (C&D) waste and refuse, as required.

E. Hazardous waste shall be contained in an approved roll-off container and stored in a segregated location from all nonhazardous excavated waste. The waste shall be sampled, as needed, to determine the appropriate transport and disposal procedures required if material meets hazardous waste criteria.

F. Prior to shipment of hazardous wastes off the project area, CONTRACTOR shall confirm by written communication from the designated transporter(s) that they are authorized to deliver the manifested waste to the designated Treatment, Storage, and Disposal Facility (TSDF) or Solid Waste Municipal Facility (SWMF) or other receiving facility.

G. CONTRACTOR shall be responsible for obtaining permits and authorizations necessary to use the selected shipping routes. Comply with restrictions imposed by local governmental agencies regarding use of the routes.

H. CONTRACTOR shall minimize truck idling and truck traffic to the greatest extent practicable.

I. The CONTRACTOR shall observe the Local and State (NYSDOT) Route weight limits and speed limits.

J. Do not allow soil to be tracked off-site at any time during the project. The CONTRACTOR shall inspect the streets and roads near the project site each day for soil tracks and spills. Visible soil tracks on streets will not be allowed. Take sufficient precautions to prevent loose soils from adhering to tire treads, wheel wells, and undercarriages of vehicles leaving the site. CONTRACTOR shall be responsible for complete removal of visible soil tracks from streets caused by vehicles entering and leaving the site to the satisfaction of the ENGINEER.

3.7 Waste Profile

A. The CONTRACTOR shall obtain a waste profile approval from the designated disposal facility prior to disposing of waste materials.

B. Toxicity characteristic leaching procedure (TCLP) testing may be required by the designated disposal facility. The ENGINEER shall obtain samples and coordinate

with the DEPARTMENT's call-out laboratory to obtain test results. If TCLP concentrations are exceeded, the material shall be handled and transported in accordance with applicable regulations for hazardous waste.

C. Hazardous waste and nonhazardous waste shall be segregated and stored separately.

3.8 Sampling

A. The **CONTRACTOR** shall be responsible for all cost associated with sampling of wastes to be disposed of as may be required by the disposal facility.

3.9 Reporting

A. Manifests
   1. After the waste has been permanently disposed, the Hazardous Waste Manifests shall be completed in accordance with 6 NYCRR Part 372 and submitted by the CONTRACTOR to the ENGINEER with a copy to be forwarded to the DEPARTMENT.
   2. The CONTRACTOR shall be responsible for providing the generator with the information needed to complete exception reports.

B. Certificates of Disposal
   1. Provide Certificates of Disposal for all waste streams shipped off-site.
   2. The Certificates of Disposal shall be submitted to the ENGINEER within 30 calendar days of the shipment of wastes off-site.

C. Bill of Lading
   1. Items and materials that have been recycled or salvaged shall only require a signed bill of lading or receipt of materials and quantity received.

D. For waste materials not considered hazardous waste, provide certificates of disposal from a properly permitted disposal facility, as accepted by the DEPARTMENT.

E. Weight tickets must be obtained from the disposal facility and submitted to the ENGINEER after disposal.

F. Since there is no responsible party to act as the generator at this inactive hazardous waste disposal site, the **DEPARTMENT** has obtained the EPA-required generator identification number and the **ENGINEER** or its representative will sign all manifests for proper shipping as an agent for the DEPARTMENT. However, the **CONTRACTOR** shall be responsible and will be held accountable for assuring that all sampling, analysis, transportation, and disposal requirements of the TSDF, SWMF, POTW, federal, state, and local governments are complied with and properly documented. The EPA-required Generator Identification Number for the _____site is as follows:_____.

*** END OF SECTION ***

SPEC 00200
EXCAVATION

1. GENERAL

1.1 Scope of Work

A. The **CONTRACTOR** shall furnish all labor, tools, materials, equipment, and incidentals to provide all work necessary to excavate and handle the soils and materials as shown on the Plans and specified herein. The excavation work to be done and paid for shall not be limited to the extent described herein, but shall include all incidental work necessary for the completion of this item

B. Protection of all work to remain.

1.2 Description of Work

A. The extent of soil excavation and handling is as specified and shown on the Plans. Supplemental instructions may be furnished by the **ENGINEER** in the field.

B. The work shall include, but not necessarily be limited to, the excavation and handling of contaminated soils at the site.

C. The wells within the excavation limits shall be removed and disposed of as contaminated debris in accordance with applicable rules and regulations. Wells which extend into bedrock shall be decommissioned in accordance with the specifications.

D. Any slope cutbacks, sheeting or shoring necessary to perform the Work shall be designed and sealed by a Professional Engineer retained by the Contractor. Contractor shall submit the design for Engineer's review, prior to start of Work.

E. If the bottom or side walls of any excavation needs to be taken out beyond limits indicated in the Contract Documents, the contractor must obtain prior approval from the Engineer. The Contractor shall be responsible for handling the additional soils excavated without the prior approval to the Engineer.

F. Contractor shall be responsible for the protection of all property features, utilities and structures both on and off site.

G. Contractor shall be responsible for locating and verifying the locations of all underground utilities, and for protection of all utilities which may be encountered during the Work.

H. The quantity of contaminated soils indicated in the Contract Documents is an initial estimate, and may not represent the actual excavated quantities. The initial estimated quantity is based upon the areas shown on the project drawings.

I. Engineer may direct Contractor to leave in place at any time during the progress of the work, any soil, roots, etc. that are not indicated to be left in place.

J. Engineer may direct Contractor at any time to initiate backfilling operations.

K. All existing pipes, wires, property line markers and other structures, which the Engineer decides must be preserved in place without being temporarily

or permanently relocated shall be carefully supported and protected from damage by the Contractor. Repair to pipes, wires or cables shall be performed by the Contractor.

L. In the event that surface water runoff causes existing clean areas, or subsequently cleaned areas, to become contaminated, the affected areas shall be cleaned in accordance with instructions given by the Engineer at the Contractor's expense.

M. Excavation of contaminated soils shall not begin until the Engineer has reviewed the results of the pre-excavation samples and has confirmed the extent of the soil removal to be completed.

N. To the extent practical, the Contractor shall cover excavations with polyethylene at the conclusion of excavation or at the end of the day, whichever is sooner, to protect from the weather. Polyethylene is to be anchored or weighted down as necessary to prevent loosening by wind. The Contractor shall be responsible for minimizing the generation of contaminated water and for keeping excavations free of standing water. The Contractor shall maintain the integrity of and repair the polyethylene as needed.

1.3 Related Sections

Spec 00004 - Surveys
Spec 00010 - Temporary Facilities and Controls
Spec 00019 - Clearing and Grubbing
Spec 00022- Dewatering
Spec 00024 - Excavation Support Systems
Spec 00015 - Transportation and Disposal
Spec 00012 - Monitoring Wells

1.4 Submittals

1. Dust Control Surfactant - submit manufacturer's product literature and MSDSs for Engineer's review and approval if proposed for use at site.
2. Shop drawings showing details of staging areas, if proposed.

2. PRODUCTS

Not applicable.

3. EXECUTION

3.1 General

A. The **CONTRACTOR** shall confine his/her operations to the main portion of site as much as practical. The **CONTRACTOR** shall reduce the potential for cross-contamination of uncontaminated areas with contaminated soils by using appropriate decontamination protocols prior to moving between areas of contamination and minimizing double moving of materials.

B. The excavated soils may be "clean loaded" directly into the containers to be used during transportation, without any stockpiling of excavated materials. The **CONTRACTOR** may propose the use of temporary

stockpiling as a means of dewatering saturated materials or to otherwise expedite the project schedule or lower the overall project cost.

C. The **CONTRACTOR** shall keep materials classified for different types of disposal segregated. Excavation and stockpiling operations for the different materials must not be mixed, unless otherwise approved by the **ENGINEER**.

D. The area to be remediated shall be excavated to the approximate areal extent shown on the Contract Drawings, specified herein, and as directed by the **ENGINEER**.

E. The **CONTRACTOR** shall be required to collect and analyze post excavation samples in selected locations to confirm the extent of contamination. The **ENGINEER** shall review the analytical results and determine if additional excavation of soils is required, and if additional verification sampling is required in specific areas. The **CONTRACTOR** shall not demobilize the excavation equipment until the sampling results are reviewed.

F. Groundwater or standing water in excavations must be removed, treated and properly disposed prior to the collection of verification samples. The **CONTRACTOR** shall be responsible for implementing any run-on controls necessary to minimize run-on from entering excavations. Standing water from precipitation events in excavations must be removed and disposed of appropriately at the **CONTRACTOR's** own expense.

G. The **CONTRACTOR**, to the extent possible in areas where the excavation will be deeper than two feet as shown on the plans or as directed by the **ENGINEER**, shall minimize the time between excavation and backfilling by not excavating until such time as the soil will be sent off site for disposal. The **CONTRACTOR** will be responsible for the cost of dewatering any groundwater from the excavations and treating that additional water after the turnaround time expires from the time confirmatory samples have been collected. This is intended to minimize the area of open excavation and the collection of water within the excavation.

H. The **CONTRACTOR** shall employ dust and odor control methods during handling activities as necessary, in accordance with the Health and Safety Plan and the Odor Control Plan. The **CONTRACTOR** shall use water or water amended with an appropriate surfactant, used in accordance with the manufacturer's recommendations, or other means to control dust and odors acceptable to the **ENGINEER**. No visible dust or significant odors are permitted beyond the limits of the exclusion zone as a result of excavation activities, as determined by the **ENGINEER**.

I. Any excavations that are left unattended for any period of time shall be securely fenced with orange snow fence, and posted with barricade tape to prevent unauthorized entry into the excavation. All temporary fencing is to be removed and properly disposed at the completion of the Contract.

J. The **CONTRACTOR** shall be responsible for all sampling and analyses as may be required by disposal facilities for disposal of soils, sediments

and other material under this Contract. All sampling will be conducted with the **ENGINEER** present.

K. The **CONTRACTOR** shall not load soil and/or other material into the vehicles/containers when it is raining without prior approval from the **ENGINEER**. All soil, sediment and other material shall remain covered during rain.

L. Debris and material properly determined to be hazardous under federal and state regulations by the **ENGINEER** shall be disposed of as hazardous regardless of the **CONTRACTOR's** sampling results. Debris properly determined to be hazardous under federal and state regulations using the **CONTRACTOR's** sampling results shall be disposed of as hazardous regardless of the **ENGINEER's** sampling results.

M. The **CONTRACTOR** shall be responsible for ensuring that the waste meets the approved landfill's acceptance criteria, including but not limited to the absence of free liquids. The **CONTRACTOR** shall be responsible for all costs involved in the handling of any wastes deemed unacceptable by the approved landfill.

N. The **CONTRACTOR** shall be responsible for providing adequate protection of existing structures to remain during execution of **CONTRACTOR** activities, especially excavation and backfilling.

O. **CONTRACTOR** shall be responsible for providing adequate protection against erosion during all field activities.

P. The quantity of soil has been estimated and may not represent the actual quantities. The quantity is based upon the areas shown on the project drawings.

Q. It is the responsibility of the Contractor to perform all excavation work in accordance with all applicable laws including, but not limited to, OSHA Excavation and Trenching Safety Regulations (29 CFR 1926.650).

R. Vehicles used to haul waste materials both on and off-site shall be designed, equipped, operated and maintained to prevent leakage, spillage or airborne emissions during transport. All vehicles shall be decontaminated in the Contamination Reduction Zone prior to leaving the site, and a decontamination certificate, signed by the Contractor's Health and Safety Officer or his designated representative, shall be provided to the Department representative stating the following:

1). No soil or other material is adhering to the vehicle body, tires or undercarriage.

2). The vehicle is not leaking or dripping liquids.

3). The contents of the vehicle are covered or completely enclosed so as to prevent potentially fugitive particulate matter from becoming airborne.

S. Surface water shall be prevented from entering areas of known contamination. The Contractor shall comply at all times with the approved project plans. Surface water from known areas of contamination shall be collected, treated and properly disposed. The Contractor shall not allow surface water to leave areas where it came in contact with contamination.

Surface water from areas of the site which have not been disturbed and which have not been identified as contaminated shall be kept from entering areas where construction involving contaminated work is in progress. Size, layout and construction of any surface water management features shall be in accordance with applicable soil erosion and sediment control standards. In the event surface runoff causes existing clean areas, or subsequently cleaned areas, to become contaminated, the affected areas shall be cleaned in accordance with instructions given by the Department at the Contractor's expense.

T. Excavate to contours, elevations and dimensions indicated. Cut trenches sufficiently wide to enable installation of utilities and allow inspections. Excavate soil disturbed or weakened by Contractor’s operations, soils softened or made unsuitable for subsequent construction due to exposure of weather.

U. Remove hard material and rock to elevations indicated in a manner that will leave foundation material in an un-shattered and solid condition.

*** END OF SECTION ***

SPEC 00201
BACKFILL

1. GENERAL

1.1 Scope of Work

A. Due to the hazardous nature of the site, the **CONTRACTOR** shall confine all backfilling operations within the limits as specified by the **ENGINEER,** including limits of easement lines and right-of-way, and shall not enter any area outside these limits without prior written consent of the **ENGINEER**.

B. The **CONTRACTOR** shall furnish all labor, tools, materials, equipment and incidentals necessary to backfill and compact excavation areas as shown and specified.

C. The **CONTRACTOR** shall be responsible for placing suitable fill and following proper compaction methods to properly fill the specified excavation areas.

D. The **CONTRACTOR** shall be responsible for dewatering of the excavation areas as necessary to provide an unsaturated bottom for placement of backfill as directed by the **ENGINEER**.

1.2 Related Sections

The excavation, backfill, topsoil and other earthwork of this project are interrelated.

1.3 Submittals

The **CONTRACTOR** shall submit:

A. The name and location of each proposed source of backfill.

B. Certification from suppliers that all fill materials to be supplied for use on this Project meet the requirements of this Specification section, and that the materials are clean (meet analytical criteria specified - provide one analytical sample per source of material to be used: the list of analytes must include each compound on the target compound list in the NYSDEC ASP). The **ENGINEER** shall use **DEPARTMENT** TAGM 4046 as the basis for acceptance of the fill materials. Certification must be received and approved by the **ENGINEER** prior to delivery of fill materials to the Site. For on-site soil used as backfill, one analytical sample shall be collected and analyzed as above prior to use as fill.

C. Samples of all fill.

D. A typical grain-size analysis, including hydrometer analysis of all proposed fill materials.

E. The liquid limit of the fill materials.

F. The moisture density curve for the fill material.

G. Compaction testing results.

H. NYSDOT approved source or NYSDEC mining permits.

I. A description of the equipment and methods proposed to be used for compaction.

J. Copies of all compaction test reports. The test reports shall include the test methods used, results, a narrative of tests conducted, locations, elevations material tested, equipment used, the name of the technician

conducting the tests and a signed certification from the laboratory.

K. Certification that soil supplements meet the requirements of the New York State Agriculture and Marketing Law.

1.4 References

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the base designation only.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM C136 Sieve analysis of fine and coarse aggregates
ASTM D422 Particle Size analysis of soils
ASTM D1140 Amount of material in soils finer than No. 200 sieve
ASTM D1557 Laboratory compaction characteristics of soil using modified effort
ASTM D2487 Classification of soils for engineering purposes
ASTM D2850 Standard test method fo unconsolidated, undrained compressive strength of cohesive soils in triaxial compression
ASTM D2922 Density of soil and soil aggregate in place by nuclear methods
ASTM D3017 Water content of soil and rock in place by nuclear methods

USDA - SOIL CONSERVATION SERVICE - NEW YORK (SCS)

SCS 1991 1991 Guidelines for urban erosion and sediment control

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

TAGM 4046 Determination of soil cleanup objectives and cleanup levels

2. PRODUCTS

2.1 Common Fill

A. Common fill shall be well-graded granular material from fine to coarse, obtained from approved natural deposits and unprocessed except for the removal of unacceptable material and stones larger than the maximum size permitted. It shall be substantially free from loam and other organic matter, clay and other fine or harmful substances. Backfill shall not be delivered to the site or used while in a frozen or muddy condition.

B. Common fill shall meet the following gradation:

Sieve	Percent by Weight Passing
2"	100
1½"	45-80
No. 40	20-50
No. 200	15-30

C. Any material containing vegetative or organic matter, such as peat, organic silt, sod, snow, or other deleterious material is not acceptable. Material that contains large voids when placed, which will allow migration of the overlying and surrounding materials and soil, is also not acceptable.

3. EXECUTION

3.1 General

A. The **ENGINEER** must approve all areas for backfill based on results of verification sampling prior to the start of backfilling.

B. Material shall be placed in uniform lifts not greater than six (6) inches in thickness, unless greater thicknesses are allowed by the **ENGINEER** upon demonstration by the **CONTRACTOR** that the materials and compaction efforts are adequate to obtain the required compaction. The fill shall be built up in horizontal layers as evenly as possible. The **CONTRACTOR** will backfill to the pre-excavation elevations unless otherwise shown on the Drawings or directed by the Engineer.

C. Each lift shall be compacted as specified below in Subsection 3.2. Each lift shall be compacted using suitable mechanical compactors as necessary. At the approval of the Engineer, the fill shall be compacted at a moisture content within 2 percent of optimum at the time of placement. Improperly compacted fill materials shall be replaced at the Contractor's expense. Compaction or consolidation achieved by traveling trucks, machines or other equipment is not acceptable.

D. Following any winter shutdown period, before site restoration in the spring the **CONTRACTOR** shall perform the final grading, and, if the fill has settled more than three inches below the desired grade, shall place additional backfill to bring the affected areas back to grade.

E. Where required, the **CONTRACTOR** shall, at his own expense, add sufficient water during the compaction effort to assure proper density. If, due to the rain or other causes, the material exceeds the optimum moisture content acceptable range for satisfactory compaction, it shall be allowed to dry, assisted by dicing or harrowing, if necessary, before compaction or filling effort is resumed.

F. Erosion protection shall be provided to all areas not having topsoil and seed thereon and seeded areas where an adequate grass cover has not been established.

G. Common Fill Material Testing: Test material in accordance with ASTM C 136 for conformance to gradation limits; ASTM D 1140 for material finer than the No. 200 sieve; ASTM D 1557 for moisture density relations, as applicable. Provide testing for each 1,000 cubic yards of material to be used with a minimum of one sample per borrow source for each material.

H. Identify required lines, levels, contours and datum required to perform the work. Reestablish lines, levels and grades if disturbed during all site work. Do not place fill materials when atmospheric temperature is below 35 degrees F or when rainfall or other weather conditions detrimentally affect the quality of the placement or compaction of the fill materials. No backfilling will be allowed in standing water in the excavation areas.

I. The contractor shall seal the working surface at the close of each day's operation and when practical prior to rainfall.

J. Control and replacement of any loss of fill due to erosion shall be the responsibility of Contractor.

K. Fill material may be stockpiled on site in an uncontaminated area as approved by the Engineer. The fill shall be adequately covered to prevent

runoff, in a manner satisfactory to the Engineer,

L. Costs involving the containment, analyses and disposal of water that collects within the excavations are the responsibility of the Contractor beyond the required turnaround time for confirmatory soil sampling.

3.2 Compaction

A. Preparation
   1. Proof-roll all subgrade surfaces to accept fill or backfill material
   2. Each layer of fill or backfill shall be compacted to the specified density the same day it is placed. The moisture content of backfill or fill material shall be adjusted, if necessary, to achieve the required degree of compaction.
   3. Compact each lift in accordance with Table 00201-1 (attached at end of section).
   4. Match compaction equipment and methods to the material and location being compacted in order to obtain the specified compaction, with consideration of the following guidelines:
      a) Vibratory compaction is preferred for dry, granular materials.
      b) Hand compaction equipment such as impact rammers, plate or small drum vibrators, or pneumatic buttonhead compactors should be used in confined areas.
      c) Hydraulic compaction by pounding or jetting will not be permitted except in unusual conditions, and then only upon written approval by the **ENGINEER** and after a demonstration of effectiveness.
      d) Backhoe mounted hydraulic or vibratory tampers are preferred for compaction of backfill in trenches over 4 feet in depth. The upper 4 feet shall be compacted as detailed above or with hand-guided or self propelled vibratory compactors or static rollers.

B. Field Quality Control
   1. Material Testing
      a) The **ENGINEER** reserves the right to order testing of materials at any time during the work.
      b) Testing will be done by a qualified, independent testing laboratory. The **CONTRACTOR** shall pay for all compaction testing performed by the testing laboratory.
      c) The **CONTRACTOR** shall aid the **ENGINEER** in obtaining representative material samples to be used in testing.
      d) The **CONTRACTOR** shall anticipate these tests and incorporate the time and effort into his procedures.
   2. Compaction Testing
      a) The **ENGINEER** reserves the right to direct the qualified independent testing laboratory to conduct in-place density tests of compacted lifts.
      b) Testing may be conducted for every 200 cubic yards of fill

or backfill.

c) The **CONTRACTOR** shall dig test holes and provide access to all backfill areas at no additional compensation when requested by the **ENGINEER** if an area has been covered without approval or is suspected of not meeting the specifications.

d) For each test which does not meet the specifications, the **CONTRACTOR** shall pay for the cost of the test and shall replace all material included in that lift or sector with acceptable material and compact to specification, at no additional compensation.

e) The **CONTRACTOR** shall anticipate these tests and incorporate the time and effort into his procedures.

f) Nuclear moisture density testing by "probe" methods will be acceptable for compacted layers not exceeding 8 inches of thickness. Only certified personnel will conduct nuclear testing.

C. Alternate Methods of Compaction - The **CONTRACTOR** may employ alternative methods of compaction if the desired degree of compaction can be successfully demonstrated to the **ENGINEER**'S satisfaction.

3. Protection

A. Prior to terminating work for the day, the final layer of compacted fill shall be rolled with a smooth-drum roller if necessary to eliminate ridges of soil and depressions left by tractors or equipment used for compaction or installing the material.

B. As backfill progresses, the surface shall be graded so as to drain during incidence of rain such that no ponding of water shall occur on the surface of the fill.

C. Unsatisfactory materials, including excessive snow, shall be removed prior to fill placement.

3.3 Measurement

Measurement for payment for backfill of excavated areas shall be based on in place volumes as determined by surveys performed by a N.Y.S. licensed surveyor, unless other wise specified. If surveyed volumes are not required, then **CONTRACTOR** shall provide the following:

A. Upon entering and leaving the site, the transport vehicle shall be weighed on a certified scale under the **ENGINEER's** supervision to determine the amount of material being brought to the site. A printed ticket with the time, date, and net weight of material being transported shall be obtained. A copy of this ticket shall be given directly to the **ENGINEER** as it is produced.

B. Measured gross weight of the vehicle or calculated net weight of material outside the certified capacity of the scale will not be accepted by the **ENGINEER** and the **CONTRACTOR** shall not be reimbursed for the associated costs of material disposal above the certified capacity of scale. The **CONTRACTOR** shall off-load materials above the certified capacity of scale on site at no additional cost to the **DEPARTMENT**.

C. The **CONTRACTOR** shall select use an off-site scale. The scale shall

have capacity and dimensions such that all vehicles to be used for transporting backfill and crushed stone can be weighed on the scale entirely and shall be certified by the Bureau of Weights and Measures. The scale shall be located within 5 miles of the site.

TABLE 00201-1
MINIMUM COMPACTION REQUIREMENTS

Construction Element	Maximum Compaction Layer Thickness (Inches)	ASTM	Minimum Compaction
I. Embankments and Fills			
a. Rough site grading	18	D698	95%
II. Excavation			
a. Fill in excavation	6	D698	95%
b. Top foot of excavation	12	D698	85%

*** END OF SECTION ***

SPEC 00206
TRENCHING

1.1 SECTION INCLUDES

A. Trenches for pipelines and appurtenances
B. Maintaining trenches, temporary sheeting and bracing.
C. Encountering underground facilities.
D. Existing structures and pavements within the trench limits.
E. Trees, bushes and plantings.
F. Surplus material.
G. Dust control.
H. Voids under adjacent structures.

1.2 RELATED SECTIONS

A. Section IX - SUPPLEMENTAL CONDITIONS: Subsurface Investigation.
B. Spec 00201 - BACKFILL
C. Spec 00205 - ROCK REMOVAL

1.3 DEFINITIONS

A. Trenching or Excavation
   1. Grubbing, stripping, removing, storing and rehandling of all materials of every name and nature necessary to be removed for all purposes incidental to the construction and completion of all work under construction;
   2. All dikes, ditches, flumes, cofferdams, pumping, bailing, draining, well points, or otherwise disposing of water;
   3. The removing and disposing of all surplus materials from the excavations in the manner specified;
   4. The maintenance, accommodation and protection of travel and the temporary paving of highways, roads and driveways;
   5. The supporting and protecting of all tracks, rails, buildings, curbs, sidewalks, pavements, overhead wires, poles, trees, vines, shrubbery, pipes, sewers, conduits or other structures or property in the vicinity of the work, whether over or underground or which appear within or adjacent to the excavations and the restoration of the same in case of settlement or other injury;
   6. All temporary bridging and fencing and the removing of the same.

B. Earth - All materials such as sand, gravel, clay, loam, ashes, cinders, pavements, muck, roots or pieces of timber, soft or broken rock, barring, or wedging from their original beds, and specifically excluding all ledge or bedrock or masonry larger than one half cubic yard in volume.

C. Backfill - the refilling of excavation and trenches to the line of filling indicated on the drawings or as directed using materials suitable for refilling of excavations and trenches; and the compacting of all materials used in the filling or refilling by rolling, ramming, watering, puddling, or other means as may be required.

D. Spoil - surplus excavated materials not required or not suitable for backfill or embankments.

E. Embankments - fills constructed above the original surface of the ground or such other elevation as specified or directed.

F. Limiting Subgrade - the underside of the pipe barrel for pipelines.

G. Excavation Below Subgrade

1. Excavation below the limiting subgrade of pipelines.
2. Excavate to such new lines and grades as required when material encountered at the limiting subgrade is not suitable for proper support of pipelines.

PART 2 PRODUCTS

2.1 FILL MATERIALS

A. Type 1 select fill

Type 1 is #1 Crusher Run Stone - NYSDOT Standard Specification Item No. 304.03: hard, durable limestone or approved equal with the following gradation: 100% passing 2 inch sieve, 25-60% passing 1/4 inch sieve, 5-40% passing No. 40 sieve and 0-10% passing No. 200 sieve.

B Type 2 select fill

Type 2 is #2 Crusher Run Stone - NYSDOT Standard Specification Item No. 304.02: Hard durable limestone or approved equal with the following gradation: 100% passing 3 inch sieve, 90-100% passing 2 inch sieve, 30-65% passing 1/4 inch sieve, 5-40% passing No. 40 sieve, and 0-10% passing No. 200 sieve.

C Type 5 select fill

Type 5 is Controlled Density Fill (CDF): “flowable fill” or approved equal with a compressive strength of 50 to 100 psi. Fly ash or other pozzolan-containing materials are not acceptable in the mix design. The consistency shall be suitable for pumping or flowing into the annular space between a casing pipe and the carrier pipe.

PART 3 EXECUTION

3.1 PREPARATION

A. Identify required lines, levels, contours, and datam. Locate all utilities and underground obstructions prior to starting excavations, including cutting pavements.

B. Cut pavement and pavement base over the proposed trench before excavating for pipeline installation. Utilize a jackhammer, wheel cutter (“Pizza Cutter”) or power driven saw. Cut pavement to the required trench width.

C. Relocate, remove and later restore, or replace existing structures in the proposed trench limits and those structures which would be damages or impede progress.

D. Protect the trunks of trees adjacent to the Work that are not to be cut. Tie back overhanging branches and limbs not to be cut to prevent damage from excavating machinery or any other operations related to the work.

E. Do not cut or remove branches, limbs, and roots except for those plantings included in clearing and grubbing areas. In case of unavoidable damage to plantings, neatly trim the damaged portions without splitting or crushing.

F. Remove and temporarily store in soil, any plants and flowers which would be damaged by the work. Replant in their original position if it does not interfere with newly installed pipe line after work has been substantially completed. Maintain until re-established. Replace with plantings of the same kind, quality and size that existed prior to construction when the original plantings die or their growth, beauty or usefulness is diminished as a result of the work.

G. Maintain support of existing power, lighting, telephone, traffic control, and utility poles adjacent to excavations as required by the owners of the poles.

H. Do not operate on paved surfaces equipment which has treads or wheels that would cut or damage the pavement.

I. Avoid damage to existing pavement other than pavement within the limits of the trench. Provide the pads of outriggers with protective covers, or place planks or timbers under the pads to prevent damage to pavements. No payments shall be made for replacement or restoration of pavements beyond the payment limits which are damaged during the work.

J. Strip and stockpile topsoil in areas to be restored as field for eventual redistribution to its original profile location. Strip the entire depth of topsoil to a width of the trench payment limit plus 2 feet or greater as may be required by conditions or other installations. Stockpile topsoil on the parcel of land from which it was stripped at locations approved by the Engineer. Remove 6 inch and larger rocks from the topsoil.

3.2 EXCAVATION

Excavate trenches to the lines and grades specified and as required. Backfill with special granular materials, concrete or other materials as directed by Engineer, any excavated space carried beyond or below the lines and grades shown on the Contract Drawings, or as directed by the Engineer. Backfill unauthorized excavations at the Contractor's expense.

Excavate the tench sides vertically between the centerline of the pipe and an elevation 1 foot above the top of the pipe unless this conflicts with the requirements of OSHA. In the case of rock excavation, excavate to 6 inches below invert elevation of pipe and 12 inches wider than the nominal pipe diameter. Maintain a minimum clearance of 6 inches around the pipe.

Provide and maintain proper and satisfactory means and devices for the removal of all water entering the excavations, and remove all such water as fast as it may collect, in such a manner as shall not interfere with the progression of the work or the proper placing of pipes, or other work.

Prevent damage to surrounding pavement, gutters and structures while excavating.

Furnish, place and maintain such sheeting, bracing and shoring as may be required to support the sides and ends of excavations in such a manner as to prevent any movement which could, in any way, damage the pipe, structures, or other work; diminish the width necessary for construction; otherwise damage or delay the work of the Contract; endanger existing structures, pipes or pavements; or cause the excavation limits to exceed the right of way limits.

All sheeting, bracing and shoring plans must be stamped by a NYS licensed professional engineer and submitted to the Engineer.

In no case will bracing be permitted against the pipes or structures in trenches or other excavations.

Drive sheeting vertically with the edges tight together as the excavation progresses, and in such a manner as to maintain pressure against the original ground at all times.

Design all bracing to maintain sheeting in its proper position.

The adequacy of all sheeting and bracing is the sole responsibility of the Contractor.

Remove and dispose all material which slides, falls or caves into established limits of

excavations due to any cause whatsoever, at the Contractor's expense. No extra compensation will be paid to the Contractor for any materials ordered for refilling the void areas left by the slide, fall or cave in.

Discontinue machine excavation in the vicinity of pipes, conduits and other underground structures and facilities and complete the excavation with hand tools as required by Industrial Code Rule 53.

When determination of the exact location of a pipe or other underground structure is necessary for completing the work properly, excavate test holes to determine such locations.

When the bottom of any excavation is taken out beyond the limits indicated or prescribed, backfill and compact the resulting void with Type 1 or 2 select fill compacted to 95 per cent maximum modified Proctor density.

Remove material which, in the opinion of the Engineer, is found to be unsuitable for foundation of the pipeline and appurtenances during excavation. Payment shall be made under the appropriate item of the bid.

Use suitable surplus material for backfill of excavations in rock or to replace other materials unacceptable for use as backfill except in areas which require select backfill. Surplus excavated materials may be stockpiled at appropriate locations as needed for future use.

Remove from the site all surplus excavated materials not needed.

Replace existing structures (including concrete gutters, concrete sidewalks and curbs that are crossed by the proposed pipeline) and stone shoulders or other stone areas which are damaged or removed during the work.

When existing driveway culverts are encountered, replace with adequate size (minimum 12 inch diameter). Methods, materials and alignment to be determined by the applicable highway department.

Minimize the creation and dispersion of dust. Wash down roads with water daily.

Completely fill all voids which occur under existing sidewalks, curbs, gutters or other structures during the excavation with Type 5 select fill.

Place and maintain a 2 inch thick layer of compacted temporary asphalt over backfilled trenches within roadways until permanent pavement is placed.

3.3 TEMPORARY PAVING

COORDINATION

Coordinate field work, including maintenance of traffic, access to private driveways, and emergency vehicle access.

TEMPORARY PAVING MATERIAL

Temporary paving to consist of one of the following types:

Type 3, Asphalt Concrete - from May through October, or when local bituminous plants are operating, the temporary paving shall be NYSDOT Type 3 asphalt concrete binder plant mix, 2 inch compacted thickness. When temporary pavements are to be maintained through a winter season,

then a four inch compacted thickness shall be placed.

Type 2, cold Mix Bituminous - From November through April only, or when local bituminous plants are not operating, provide cold mix bituminous surfacing NYSDOT Specification Section 405, Type 2, placed to a 2 inch compacted thickness.

INSTALLATION

The temporary paving to match the slope, grade and alignment of the original pavement, driveway, parking area and/or walk.

The temporary paving to match the elevation of the adjacent surface and to continue the existing drainage pattern.

Compact temporary paving to the engineer's satisfaction with tandem rollers or equivalent and of sufficient size and number to compact the asphalt concrete while it is still hot and in a workable condition.

Rolling shall continue until all roller marks and creases are removed.

At the Engineer's discretion, confined area or small sections of pavement may be compacted by mechanical means.

TOLERANCES

Flatness - maximum variation of 3/4 inch measured by a 10 foot straight edge.

Scheduled Compact Thickness - within 1/4 inch.

MAINTENANCE

The temporary pavement to be maintained in a reasonably safe and smooth condition, free from depressions, potholes and rough surface until its removal is required for the installation of permanent paving.

Install additional material to maintain a satisfactory driving, walk, parking areas and driveway surfaces.

If additional material is needed due to settling or constant use, Contractor shall replace or fill at no additional cost to the Department.

END OF SECTION

ATTACHMENT C

PRE-DESIGN INVESTIGATION WASTE MANIFEST

VEOLIA ENVIRONMENTAL SERVICES

SHIPPING DOCUMENT

1. Generator ID Number: N Y V 8 Q G
2. Page 1 of
3. Emergency Response Phone: (877) 8?8-0087
4. Shipping Document Tracking Number: ZZ 00441839

5. Generator's Name and Mailing Address: ED ASHTON
FORMER CANADA DRY PLANT
2 AND 7 BADGER AVENUE
ENDICOTT, NY 13760
Generator's Phone: 315 857-8375

Generator's Site Address (if different than mailing address): SAME

6. Transporter 1 Company Name: VEOLIA ES TECHNICAL SOLUTIONS — U.S. EPA ID Number: N J D 0 8 0 6 3 1 3 6 9

7. Transporter 2 Company Name: FREEHOLD CARTAGE INC — U.S. EPA ID Number: N J D 0 5 4 1 2 6 1 6 4

8. Designated Facility Name and Site Address: VEOLIA ES TECHNICAL SOLUTIONS, L.L.C
4301 INFIRMARY ROAD
WEST CARROLLTON, OH 45449
Facility's Phone: 937 859-6101
U.S. EPA ID Number: O H D 0 9 3 9 4 5 2 9 3

9a. HM	9b. U.S. DOT Description (including Proper Shipping Name, Hazard Class, ID Number, and Packing Group (if any))	10. Containers No.	Type	11. Total Quantity	12. Unit Wt./Vol.	13. Codes
	1. NON-REGULATED MATERIAL PER 40 & 49 CFR, (DECON WATER)	2	D M	800	P	NONE L
	2. NON-REGULATED MATERIAL PER 40 & 49 CFR, (DECON MATERIALS/PPE - NON HAZ)	1	D M	300	P	NONE L
	3. NON-REGULATED MATERIAL PER 40 & 49 CFR, (SOIL CUTTINGS)	5	D M	3000	P	NONE L
	4.					

14. Special Handling Instructions and Additional Information: ES Service Contracted by VESTS + ** Veolia trans. permit# NJ-410** NEED CERTIFICATION OF DISPOSAL + Contract retained by generator confers agency authority on initial transporter to add or substitute additional transporters on generator's behalf + 1) W:406702 A:SRRLFLIQ-NH 2) W:406706 A:SRRLFSOLID-NH 3) W:406704 A:SRRLFSOLID-NH

15. GENERATOR'S/OFFEROR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labeled/placarded, and are in all respects in proper condition for transport according to applicable international and national governmental regulations.

Generator's/Offeror's Printed/Typed Name: Edward J. Ashton — Signature: [signature] — Month/Day/Year: 12 27 18

16. International Shipments: ☐ Import to U.S. ☐ Export from U.S. Port of entry/exit:
Transporter signature (for exports only): Date leaving U.S.:

17. Transporter Acknowledgment of Receipt of Shipment
Transporter 1 Printed/Typed Name: OWEN MOSS — Signature: [signature] — Month/Day/Year: 12 27 18
Transporter 2 Printed/Typed Name: [signature] — Signature: [signature] — Month/Day/Year: 1 3 19

18. Discrepancy
18a. Discrepancy Indication Space: ☐ Quantity ☐ Type ☐ Residue ☐ Partial Rejection ☐ Full Rejection
Shipping Document Tracking Number:
18b. Alternate Facility (or Generator) — U.S. EPA ID Number:
Facility's Phone:
18c. Signature of Alternate Facility (or Generator) — Month Day Year

19. Report Management Method Codes (i.e., codes for treatment, disposal, and recycling systems)

1	2	3	4
H141	H141	H141	

20. Designated Facility Owner or Operator: Certification of receipt of shipment except as noted in Item 18a
Printed/Typed Name: Brittany Blankenship — Signature: [signature] — Month/Day/Year: 1 4 19

DESIGNATED FACILITY'S COPY

VEOLIA
ENVIRONMENTAL SERVICES

SHIPPING DOCUMENT	1. Generator ID Number	2. Page 1 of	3. Emergency Response Phone	4. Shipping Document Tracking Number
	NYV8QG	1	(877) 918-0087	ZZ 00441839

GENERATOR

5. Generator's Name and Mailing Address: ED ASHTON
FORMER CANADA DRY PLANT
1 AND 7 BADGER AVENUE
ENDICOTT, NY 13760
Generator's Phone: 315 857-8375

Generator's Site Address (if different than mailing address): SAME

6. Transporter 1 Company Name: VEOLIA ES TECHNICAL SOLUTIONS — U.S. EPA ID Number: NJD083631369

7. Transporter 2 Company Name: FREEHOLD CARTAGE INC — U.S. EPA ID Number: NJD054126164

8. Designated Facility Name and Site Address: VEOLIA ES TECHNICAL SOLUTIONS, L.L.C.
4301 INFIRMARY ROAD
WEST CARROLLTON, OH 45449
Facility's Phone: 937 859-6101 — U.S. EPA ID Number: OHD093945293

9a. HM	9b. U.S. DOT Description (including Proper Shipping Name, Hazard Class, ID Number, and Packing Group (if any))	10. Containers No.	10. Containers Type	11. Total Quantity	12. Unit Wt./Vol.	13. Codes
	1. NON-REGULATED MATERIAL PER 40 & 49 CFR, (DECON WATER)	2	D M	800	P	NONE / L
	2. NON-REGULATED MATERIAL PER 40 & 49 CFR, (DECON MATERIALS/PPE - NON HAZ)	1	D M	300	P	NONE / L
	3. NON-REGULATED MATERIAL PER 40 & 49 CFR, (SOIL CUTTINGS)	5	D M	3000	P	NONE / L
	4.					

14. Special Handling Instructions and Additional Information: ER Service Contracted by VESTS + **Veolia trans. permit# NJ-410** NEED CERTIFICATION OF DISPOSAL + Contract retained by generator confers agency authority on initial transporter to add or substitute additional transporters on generator's behalf + 1) W:406702 A:SRRLFLIQ-NH 2) W:406706 A:SRRLFSOLID-NH 3) W:406704 A:SRRLFSOLID-NH

15. **GENERATOR S/OFFEROR S CERTIFICATION:** I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name, and are classified, packaged, marked and labeled/placarded, and are in all respects in proper condition for transport according to applicable international and national governmental regulations.

Generator's/Offeror's Printed/Typed Name: Edward J. Ashton — Signature: Edward J. Ashton — Month: 12 — Day: 27 — Year: 18

INT'L

16. International Shipments ☐ Import to U.S. ☐ Export from U.S. Port of entry/exit:
Transporter signature (for exports only): Date leaving U.S.:

TRANSPORTER

17. Transporter Acknowledgment of Receipt of Shipment

Transporter 1 Printed/Typed Name: OWEN MOSS — Signature — Month: 12 — Day: 27 — Year: 18

Transporter 2 Printed/Typed Name — Signature — Month — Day — Year

DESIGNATED FACILITY

18. Discrepancy

18a. Discrepancy Indication Space ☐ Quantity ☐ Type ☐ Residue ☐ Partial Rejection ☐ Full Rejection

Shipping Document Tracking Number:

18b. Alternate Facility (or Generator) — U.S. EPA ID Number
Facility's Phone:

18c. Signature of Alternate Facility (or Generator) — Month — Day — Year

19. Report Management Method Codes (i.e., codes for treatment, disposal, and recycling systems)

1.	2.	3.	4.

20. Designated Facility Owner or Operator: Certification of receipt of shipment except as noted in Item 18a

Printed/Typed Name — Signature — Month — Day — Year

GENERATOR / SHIPPER'S INITIAL COPY

VEOLIA

PACKING SUMMARY

Generator Number: 656667
FORMER CANADA DRY PLANT
2 and 7 Badger Avenue
Endicott, NY 13760
Attn: ED ASHTON
EPA ID: NYVSQG

Manifest Number: ZZ00441839
Field System ID: JM
Work Order Number: 3198601000
Date Shipped: 12/27/2018

Container#: JM-3198601000-001 Waste Area: Manifest Page/Line: 01 / 1

WIP: 406702 DisposalCode: SRRLFLIQ-NH PHY State: L

Date Accumulated: 12/27/2018 Gen Drum ID:

Shipping Name: NON-REGULATED MATERIAL PER 40 & 49 CFR, (DECON WATER)

No. of Commons: 02 Outer Container: 551A1-DM Inner Container:

Primary Waste Codes: NONE,L PCB Serial #: OOS Date: / /

Total Cmns Wt: 800 SIC: 8999 Source: G13 Form: W219 System: H141 Cubic Ft.: 7.50

Individual Common Weights: 400, 400 (POUNDS)

Units	Container Size	Net Weight	Chemical Name	EPA/State Codes
1	55 GAL		WATER [100%]	NONE, L

Container#: JM-3198601000-003 Waste Area: Manifest Page/Line: 01 / 2

WIP: 406706 DisposalCode: SRRLFSOLID-NH PHY State: S

Date Accumulated: 12/27/2018 Gen Drum ID:

Shipping Name: NON-REGULATED MATERIAL PER 40 & 49 CFR, (DECON MATERIALS/PPE - NON HAZ)

No. of Commons: 01 Outer Container: 551A2-DM Inner Container:

Primary Waste Codes: NONE,L PCB Serial #: OOS Date: / /

Total Cmns Wt: 400 300 SIC: 8999 Source: G09 Form: W319 System: H141 Cubic Ft.: 7.50

Individual Common Weights: 1 @ 400 (POUNDS)

Units	Container Size	Net Weight	Chemical Name	EPA/State Codes
1	55 GAL		PPE (GLOVES, CHEM. SUITS, ETC.) [90-95%] PAPER [1-5%] GENERAL DEBRIS (GLASS, PLASTIC, CARDBOARD) [1-5%]	NONE, L

Container#: JM-3198601000-002 Waste Area: Manifest Page/Line: 01 / 3

WIP: 406704 DisposalCode: SRRLFSOLID-NH PHY State: S

Date Accumulated: 12/27/2018 Gen Drum ID:

Shipping Name: NON-REGULATED MATERIAL PER 40 & 49 CFR, (SOIL CUTTINGS)

No. of Commons: 05 Outer Container: 551A2-DM Inner Container:

Primary Waste Codes: NONE,L PCB Serial #: OOS Date: / /

Total Cmns Wt: 2000 SIC: 8999 Source: G39 Form: W301 System: H141 Cubic Ft.: 7.50

Individual Common Weights: 400, 400, 400, 400, 400 (POUNDS)

Units	Container Size	Net Weight	Chemical Name	EPA/State Codes
1	55 GAL		SOIL [99-100%]	NONE, L

FORM# VES-6

VEOLIA

Activity Report

JOB NO: 3198601000 WO NO: 3198601000
BILL DOC NO JM81226704 EPA ID: NYVSQG
GENERATOR NO 656667

BILL TO: PARSONS ENGINEERING OF NY, INC
100 HIGH ST
BOSTON, MA 021102321
(617) 449-1315

JOB SITE: FORMER CANADA DRY PLANT
2 and 7 Badger Avenue
Endicott, NY 13760
(315) 679-1170

CONTACT: MARYBETH PARK

CONTACT: ED ASHTON

MANIFEST NUMBER(S):
ZZ00441839

CUSTOMER P.O. NUMBER	PROJECT NUMBER	SHIP DATE	TERR.
		12/27/2018	NY2

DESCRIPTION	# CONT.	CONT./CODE	QTY	UOM	PG/LN	WASTE AREA
Manifest # ZZ00441839 WP 406702 / Approval SRRLFLIQ-NH WATER EST WEIGHT USED	2	551A1-DM	800	P	1 / 1	
Manifest # ZZ00441839 WP 406706 / Approval SRRLFSOLID-NH NON HAZ PPE, PLASTIC, PAPER, AND DEBRIS EST WEIGHT USED	1	551A2-DM	300	P	1 / 2	
Manifest # ZZ00441839 WP 406704 / Approval SRRLFSOLID-NH NON HAZ SOIL EST WEIGHT USED	5	551A2-DM	3000	P	1 / 3	

Total Hours: 0

Veolia Environmental Solutions is permitted for and has capacity to accept waste listed above in container quantities.

FORM# VES-6

VEOLIA

Activity Report

JOB NO: 3198601000
BILL DOC NO JM81226704
GENERATOR NO 656667

WO NO: 3198601000
EPA ID: NYVSQG

BILL TO: PARSONS ENGINEERING OF NY, INC
100 HIGH ST
BOSTON, MA 021102321
(617) 449-1315

JOB SITE: FORMER CANADA DRY PLANT
2 and 7 Badger Avenue
Endicott, NY 13760
(315) 679-1170

CONTACT: MARYBETH PARK

CONTACT: ED ASHTON

MANIFEST NUMBER(S):
Non-Disposals

CUSTOMER P.O. NUMBER	PROJECT NUMBER	SHIP DATE	TERR.
		12/27/2018	NY2

DESCRIPTION	# CONT.	CONT./CODE	QTY	UOM	PG/LN	WASTE AREA
12/27/2018 Manpwr.- MOBILIZATION FEE		1246	1@1	EACH	/	

Total Hours: 0

Comments:
MOB/DE-MOB: MANIFEST: ON-SITE: OFF-SITE:

Signature: Edward J. Ashton
on the behalf of my crew

Print Name: Edward J. Ashton 12-27-18

Customer authorizes Contractor to make changes on Customer's behalf in regards to transporters used and to perform the Services, including adding or changing transporters listed on manifests. If Customer provides an approved transporter list in writing to Contractor at the time Customer executes this Agreement, Contractor shall select only those transporters on that list when providing transportation services to Customer. If Customer does not provide an approved transporter list in writing to Contractor at the time Customer executes this Agreement, Customer authorizes Contractor to select any permitted transporter to provide transportation services to Customer.

Veolia Environmental Solutions is permitted for and has capacity to accept waste listed above in container quantities.

ATTACHMENT D

COST ESTIMATE AND CONSTRUCTION SCHEDULE

ATTACHMENT D
FORMER CANADA DRY PLANT
COST ESTIMATE AND CONSTRUCTION SCHEDULE
ENDICOTT, NEW YORK

This attachment presents the engineering cost estimate and remedial construction schedule for completion of the elements described in the Remedial Design Report. The total cost for the project is estimated at approximately $318,323 (Table D.1) and is expected to take nearly 10 months to complete including the first six months of operation (Table D.2). The costs have been organized into three categories: 1) Remedial Action (RA) Construction Oversight Costs for the Engineer (Table D.3); 2) RA Construction Costs for the Contractor (Table D.4) and 3) Operations, Maintenance and Monitoring Costs (Table D.5). Assumptions used to develop the cost estimate are included below. Pricing is based on present worth costs and was estimated using published data such as RS Means Construction Cost Data, in-house cost files, recent similar projects, and budgetary phone quotes.

D.1 REMEDIAL ACTION CONSTRUCTION OVERSIGHT

Construction oversight and support costs are intended to account for the engineer's costs during the construction phase of the project. The pre-mobilization labor costs include time for updating the existing site Health, Safety, Security and Environment Plan (HSSEP), preparation of an Operations, Monitoring, and Maintenance (OM&M) Plan and review of RA contractor submittals. Additional labor costs were included as a percentage of the total construction duration for the Project Manager (Level V) and Project Engineer (Level VII). Labor costs were also budgeted for the Engineer to prepare a Construction Completion Report at the end of all construction activities. All unit labor rates were calculated using the current 2019 average reimbursement rates for direct salary costs per the NYSDEC approved CPI Adjustment for Schedule 2.10(a), dated January 11, 2019 (per Contract D007623). Additionally, the labor rates include Parsons indirect labor mark-up (108.67%) and fixed fee (10%) under the existing contract.

The construction oversight costs are based on 11-hour work days (18 days total) and allow for a one-person field crew (Construction Manager, CM, NSPE Level III) to oversee pre-mobilization activities, surveying; horizontal drilling; trenching and conveyance lateral installation; site restoration activities; and soil vapor extraction (SVE) system installation. Construction oversight costs also include time for a one-person field crew, (CM, NSPE Level III) to travel to the site for one day approximately two weeks following construction completion to meet the waste transportation and disposal company for pick-up of the IDW and to sign the waste manifests as an agent for NYSDEC. Costs for management of the IDW, procurement of storage containers, analytical waste characterization, and procurement of an appropriate transportation and disposal company are included under the RA Contractor's costs (Section D.2).

The CM will be responsible for performing air monitoring during intrusive work phases using dust trak desktop monitors, CAMP Enclosures and PIDs. The cost estimate includes rental of the air monitoring equipment assuming one set of each to allow for monitoring one upwind and one downwind location. The CM will also be responsible for maintaining field logs to track daily progress against projected schedule milestones; implementing quality assurance/quality control procedures for compliance with specifications during construction. Costs are also included for travel to and from the site during construction (e.g., per diem, vehicle rental, fuel and low value equipment, LVE).

Construction oversight costs also include construction quality assurance testing to demonstrate compliance with backfill design requirements. The specified laboratory and in field tests will be performed by a subcontractor to the ENGINEER. The quality assurance testing costs include time for a technician to collect a sample of the native material for particle size analysis (ASTM D422) and laboratory compaction testing (ASTM D1557) to establish a proctor value of the on-site material prior to construction. Additional costs are included for a field technician to

complete in-place compaction testing using nuclear methods (ASTM D2922) over a two day period during backfilling operations. Lastly, the engineer's pre-mobilization labor costs include time for a Procurement/Subcontract Administrator (Level V) to establish a contract with the selected company.

The construction oversight costs are estimated at $54,429 as detailed in Table D.3.

D.2 REMEDIAL ACTION CONSTRUCTION

Remedial Action construction costs are intended to account for the CONTRACTOR'S costs during the construction phase of the project. The labor costs include time for preparing a Remedial Action Work Plan (RAWP), a Health and Safety Plan (HASP), and other contract submittals as specified in the specifications. The construction tasks include pre-mobilization activities (e.g., desktop utility investigation and geophysical survey); surveying; installation of three horizontal soil vapor extraction (HSVE) wells; trenching of conveyance laterals to the system enclosure; installation of a pre-fabricated SVE system; and management of IDW. The engineering cost estimate is included in Table D.4. Assumptions used to develop the cost estimate are included below. The RA construction costs are estimated at $210,332 as detailed in Table D.4.

Pre-Mobilization

Pre-mobilization activities (e.g., desktop utility investigation and geophysical investigation) will be completed prior to commencing subsurface activities (e.g., drilling, excavation and trenching). The desktop utility investigation allows 20 hours for contacting the local utilities servicing the site in attempt to obtain information regarding the location, depth and size of present and possibly historical utilities at the site. Costs also include time to visit the George F. Johnson Memorial Library in Endicott, New York to review historical reports, drawings and figures for the Former Canada Dry Plant to obtain information on site utilities or possible subsurface obstructions encountered during previous interim remedial measures. Lastly, costs include time for staff to conduct a site reconnaissance with a specific focus to look for indications of utilities inside and outside of the building, including inside drains and locations with floor cut-outs that may indicate a repair to a subsurface utility. Other direct costs, (ODCs) to travel to the library and site reconnaissance are also considered.

Geophysical investigation costs include personnel, equipment and materials to clear the three horizontal well entry and exit points (16 SF per location) and a four-foot wide swath along the prosed bore path to the point where the well enters beneath the building footprint. For the well located outside the building footprint (HSVE-11), a geophysical investigation will be completed along the entire length of the proposed bore path (110 linear feet (LF). The geophysical investigation will be conducted along the horizontal trench connecting each horizontal well point to the manifold in the SVE system enclosure and between SVE-05 and the system enclosure (145 LF). A geophysical investigation is also proposed around the remainder of the building exterior to look for signs of utilities entering the building, potentially intersecting the proposed HSVE well bore paths. If utilities are identified, additional geophysical investigation methods will be employed inside the building to confirm the intersecting location of the utility. Lastly, geophysical investigation costs include time for the subcontractor to attempt to clear and potentially locate and mark existing monitoring wells HRP-MW-01, HRP-MW-04 and MW-10 not located during the September 2018 pre-design investigation. The cost estimate assumes the geophysical investigation takes two days to complete.

Topographic Survey

Topographic surveying activities will occur under three separate mobilizations: pre-construction, intermediate and post construction. Costs included in Table D.4 include all personnel, equipment and materials needed to complete surveying activities as detailed in the Remedial Design Report.

Construction

Engineering costs developed for the construction phase include HSVE well installation; trenching and installation of conveyance laterals to connect wells to the SVE system enclosure; site restoration activities; management of and disposal for IDW; and well locating and repair of on-site groundwater monitoring wells.

HORIZONTAL WELL DRILLING

Horizontal well drilling costs include personnel, equipment and materials necessary to install three new HSVE wells (110 feet each, with a well screen installation depth between six and eight feet below ground surface (bgs). Costs assume one entry point and one exit point for each HSVE well. The cost estimate allows for hand clearing up to 12 locations to a depth of five feet bgs to confirm the depths of utilities potentially intersecting the proposed bore path and adjacent to buildings to verify the depth of the building foundation and/or footers. The drilling estimate is broken down into costs for mobilization; drilling of the wells (assuming a total of 330 feet); well materials (casing, screen, fittings, grout etc.); well development; possible engineering of the well screen and installation of a flush mount curb box.

TRENCHING AND CONVEYANCE PIPING INSTALLATION

Trenching costs include personnel, conventional equipment and materials to trench and install conveyance piping from the HSVE wells and SVE-05 to the primary manifold stub out at the system enclosure. Costs for trenching assume a 145-foot trench length (30-feet for each of the three HSVE wells and 55-feet to SVE-05), 3 feet deep. Trenching costs also include pricing to backfill the trench following installation of conveyance piping.

MATERIAL SOURCE TESTING

Material source testing costs were included to demonstrate compliance of on-site soils (to be reused as backfill) with DER-10 and 6 NYCRR 375-6.7(d). The costs assume no more than 50 cubic yards of backfill material will be needed, thereby limiting the number of analyses for each parameter to one. Material source testing will not be needed on bedding sand as this is a manufactured product. Additionally, material testing on the fill material referenced in the Trenching specification will not be needed as it is considered exempt under DER-10.

SITE RESTORATION

Site restoration costs include personnel, equipment and materials to restore approximately 60 square yards to pre-existing conditions (asphalt). Site restoration areas include the entry and exit points at each of the three drilling locations and along the trenching surface connecting each well point to the SVE System enclosure.

SVE SYSTEM INSTALLATION

The SVE System installation costs assume the SVE system will be a pre-packaged (pre-assembled, trailer delivery) system fully tested for function, performance and safety prior to delivery and installation at the site. System installation costs are expected to include SVE system components and a drop connection to the existing overhead electrical service. Current pricing for the system components includes:

- 3 blowers (one for each HSVE well) each with variable frequency drives
- 3 knock-out tanks
- All necessary piping and associated valves
- System enclosure shed, (explosion proof not required)
- Typical heating, ventilation and lighting components in system enclosure
- Electrical components including wiring, conduit, power distribution panels and associated appurtenances
- Remote computer controlled communication system
- Discharge exhaust stack mounted to a 40-foot utility pole

INVESTIGATION DERIVED WASTE MANAGEMENT AND DISPOSAL

Costs included for IDW assume transportation and disposal of the waste as non-hazardous following completion of well installation and trenching activities. Costs for transferring wastes to on-site storage containers located in the staging area are included as part of the horizontal well drilling costs. Disposal from installation of the new horizontal wells is estimated to produce approximately 5,000 to 10,000 gallons of water comprised of settled drilling fluids, well development water and decontamination water and three to six cubic yards of soil cuttings from drilling and solids settled from drilling fluids. The CONTRACTOR will be responsible for transferring IDW to on-site storage containers and for arranging for the subsequent disposal. Costs assume the use of a dewatering sludge box to stage the drilling fluids and a poly storage tank to stage the well development and decontamination water. Costs assume rental of the storage containers through construction and allow for drilling fluids to settle out into a liquid and solid fraction (estimated at two weeks). Once the liquids and solids have separated, the liquids will be pumped into the poly storage tank used to contain the well development and decontamination water via a trash pump. The cost estimate includes pricing for collection and laboratory analysis of one solid and one liquid sample for waste characterization.

GROUNDWATER MONITORING WELL REPAIR

Groundwater monitoring well repair costs include personnel, equipment and materials to provide access to monitoring wells HRP-MW-1, HRP-MW-4 and HRP-MW-10. Costs also include bringing the well collars up to grade provided the wells can be located.

D.3 OPERATIONS, MAINTENANCE AND MONITORING

The Operations, Maintenance and Monitoring (OM&M) costs are intended to account for the engineer's costs during the OM&M phase of the project. These costs include personnel, equipment and materials to conduct routine SVE system OM&M and groundwater sampling over an initial six-month period. Electrical consumption costs have been included and assume three months of operation during winter, requiring operation of a heater.

Labor costs assume the SVE System OM&M work will be performed by an NSPE Level III person budgeted for ten hours per trip for a total of 14 trips. The SVE system will be monitored daily during the first week of operation, twice a week during the second week of operation, once a week during the third and fourth weeks, and will continue once per month for the remaining five months of operation. Additional labor costs were included as a percentage of the total OM&M duration for the Project Manager (Level V) and Project Engineer (Level VII). Labor costs were also included for a Procurement/Subcontract Administrator (Level V) to set up contracts with an analytical laboratory and waste transportation and disposal company. Other direct costs include travel related expenses (e.g., auto rental, gas, per diem); and equipment rentals (e.g., multi-gas meter, magnehelic gauges). Finally, analytical laboratory costs are included for 33 soil vapor samples for analysis of VOCs using summa canisters to evaluate system performance. It is assumed, soil vapor sample data will not be validated. The samples include the following:

- Baseline Sampling and System Start-up (Sections 3.1.1 and 3.1.2): Nine samples plus one duplicate collected prior to system being turned on from SVE and HSVE wells; One sample collected from combined system effluent prior to discharge stack;
- System Removal Performance Sampling (Section 3.3.1): Six samples from the combined system effluent (one per month). Three samples collected from the HSVE wells quarterly (six samples total);
- Static Soil Vapor Sampling (Section 3.3.2): Nine samples plus one duplicate collected from same sample locations as baseline sampling, if warranted following review of field readings; and

The OM&M costs also include labor, equipment and materials for conducting one round of groundwater sampling at ten existing monitoring wells, provided the three unlocated wells (HRP-MW—1, HRP-MW-04 and MW-10) are located. Estimated costs include laboratory analysis of TCL VOCs from each well along with one set of quality control samples (duplicate, matrix spike/Matrix spike duplicate), and 4 trip blanks. Estimated costs include labor for a two-person crew (NSPE Level III) assuming four 10-hour days for sampling and one 10-hour day for bottleware and procurement of equipment and materials for sampling. Additional labor costs were included as a percentage of the total groundwater sampling duration for the Project Manager (Level V), Project Engineer (Level VII) and Data Management and Data Validation Specialists (Level V). The cost estimate assumes the groundwater data will be validated.

Lastly, the OM&M costs include pricing for collection and laboratory analysis of one solid and one liquid sample for waste characterization. The off-site disposal costs also include time for the CM (NSPE Level III) to travel to the site, one day, to meet the waste transportation and disposal company for pick-up of the IDW and to sign the waste manifests as an agent for NYSDEC.

The OM&M costs are estimated at $53,563 as detailed in Table D.5.

TABLE D.1
Former Canada Dry Plant
Final 100% Design Cost

PHASE	SUBTOTAL
RA OVERSIGHT	$ 54,429
RA CONSTRUCTION	$ 210,332
OPERATIONS, MONITORING & MAINTENANCE	$ 53,563
TOTAL	$ 318,323

TABLE D.2
Former Canada Dry Plant
Remedial Design Contstruction Schedule

Proposed Start Date: Mon, 7/15/2019

Task Name	Responsibility	Estimated Duration	Proposed Start Date	Proposed End Date
Notice to Proceed	NYSDEC	-	7/15/2019	7/15/2019
Contract with Remedial Action Contractor and Engineer	NYSDEC/RA Contractor and NYSDEC/Engineer	6 weeks	7/15/2019	8/26/2019
Prepare Health and Safety Plans	RA Contractor and Engineer	2 weeks	8/27/2019	9/10/2019
RA Contractor to provide submittals to Engineer	RA Contractor	3 weeks	9/11/2019	10/2/2019
Utility and Geophysical Investigation	RA Contractor	2 days	9/11/2019	9/13/2019
Initial Topographic Survey	RA Contractor	1 day	9/14/2019	9/14/2019
Installation of 3 HSVE Wells	RA Contractor	10 days	10/3/2019	10/13/2019
Mobilization	RA Contractor	1 day	10/3/2019	10/4/2019
Drilling and Installation	RA Contractor	6 days	10/4/2019	10/10/2019
Well Development and Grouting	RA Contractor	2 days	10/10/2019	10/12/2019
Demobilization	RA Contractor	1 day	10/12/2019	10/13/2019
HSVE Completion Report	RA Contractor	30 days	10/13/2019	11/12/2019
Review/address comments and resubmit	RA Contractor/Engineer	28 days	11/12/2019	12/10/2019
Trenching of Conveyance Laterals to System Enclosure	RA Contractor	3 days	10/13/2019	10/16/2019
Intermedial Topographpic Survey	RA Contractor	1 day	10/15/2019	10/15/2019
Site Restoration	RA Contractor	1 day	10/16/2019	10/16/2019
Final Topographic Survey	RA Contractor	1 day	10/17/2019	10/17/2019
Management of IDW	RA Contractor	6 weeks	10/16/2019	11/27/2019
Drilling Fluids to Settle	RA Contractor	10 days	10/16/2019	10/26/2019
Collect Waste Characterization Sample	RA Contractor	1 day	10/26/2019	10/27/2019
Laboratory Analysis	RA Contractor	10 days	10/27/2019	11/6/2019
Subcontractor Bid Solicitation (Waste T&D)	RA Contractor	2 weeks	11/6/2019	11/20/2019
Procurement and Contracts	RA Contractor	1 week	11/20/2019	11/27/2019
Schedule IDW Pick-up	RA Contractor	1 day	11/27/2019	11/28/2019
Installation of SVE System	RA Contractor	3 days*	11/15/2019	11/18/2019
Connection to Local Utility Service	RA Contractor	2 day	11/18/2019	11/20/2019
Operations Monitoring and Maintenance	Engineer	6 months	11/21/2019	5/22/2020

Note: Installation of SVE System duration is based on the assumption that a pre-built system is being installed.

TABLE D.3
Former Canada Dry Plant
Remedial Action: Construction Oversight Costs for Engineer

	No. of Units	Unit of Measure	Unit PX	Extension
CONSTRUCTION OVERSIGHT AND SUPPORT				
Labor - Update HSSE, Prepare OM&M, Review RA Contractor Submittals				
Associate Engineer (NSPE Level II)	80	hour	$64.00	$5,120.00
Project Manager (NSPE Level V)	10	hour	$98.00	$980.00
Project Engineer (NSPE Level VII)	40	hour	$138.00	$5,520.00
Procurement/Subcon. Admin. (NSPE Level V)	6	hour	$138.00	$828.00
Labor - Construction Oversight				
Construction Manager (NSPE Level III)	198	hour	$72.00	$14,256.00
Project Manager (NSPE Level V)	20	hour	$98.00	$1,960.00
Project Engineer (NSPE Level VII)	30	hour	$138.00	$4,140.00
Labor - Construction Completion Report				
Construction Manager (NSPE Level III)	100	hour	$72.00	$7,200.00
Senior Designer (NSPE Level IV)	20	hour	$79.00	$1,580.00
Project Manager (NSPE Level V)	10	hour	$98.00	$980.00
Project Engineer (NSPE Level VII)	20	hour	$138.00	$2,760.00
			Parsons Labor Subtotal	**$45,324.00**
ODCs				
Travel				
Per Diem	18	days	$157.00	$2,826.00
Vehicle Rental	18	days	$75.00	$1,350.00
Fuel for Vehicle	144	gal	$3.00	$432.00
LVE	198	hours	$1.00	$198.00
Air Monitoring				
DustTrak Desktop Monitor x2	3	week	$423.00	$1,269.00
CAMP Enclosure x2	3	week	$37.00	$111.00
PID x3	3	week	$423.00	$1,269.00
			Parsons ODC Subtotal	***$7,455.00***
Subcontractor - Material Source Testing				
In Place Compaction Testing (ASTM D2922)	2	days	536.00	$1,072.00
Particle Size Analysis (ASTM D422)	2	each	112.88	$225.76
Laboratory Compaction (ASTM D1557)	2	each	175.88	$351.76
			Parsons ODC Subtotal	***$1,649.52***
			CONSTRUCTION OVERSIGHT AND SUPPORT	***$54,428.52***

TABLE D.4
Former Canada Dry Plant
Remedial Action Construction Costs for Contractor

	No. of Units	Unit of Measure	Unit PX	Extension
REMEDIAL ACTION CONTRACTOR MANAGEMENT				
Labor - Prepare RAWP, HASP and Other Contract Submittals				
Project Engineer	100	hour	$100.00	$10,000.00
Project Manager	10	hour	$140.00	$1,400.00
REMEDIAL ACTION CONTRACTOR MANAGEMENT TOTAL				***$11,400.00***
PRE-MOBILIZATION				
Desktop Utility Investigation				
Labor				
Environmental Engineering Technician	20	hour	$70.00	$1,400.00
Subtotal				***$1,400.00***
ODCs				
Per Diem	2	days	$157.00	$314.00
Vehicle Rental	2	days	$75.00	$150.00
Fuel for Vehicle	16	gal	$3.00	$48.00
Subtotal				***$512.00***
Geophysical Investigation				
Mobilization/Demob				
Survey Crew and Equipment	1	LS	$500.00	$500.00
Surveying Services Support				
Project Manager	4	hour	$93.00	$372.00
Geophysicist	4	hour	$125.00	$500.00
Technical Secretary	1	hour	$45.00	$45.00
Field Services (as applicable)				
Two Person Field Crew	2	days	$1,700.00	$3,400.00
Field Equipment	2	days	$240.00	$480.00
Miscellaneous				
Materials and Supplies	2	days	$50.00	$100.00
Subtotal				***$5,397.00***
PRE-MOBILIZATION TOTAL				***$7,309.00***
TOPOGRAPHIC SURVEY				
Pre-Construction Topograhic Survey	1	LS	$6,985.00	$6,985.00
Intermediate Topographic Survey	1	LS	$3,550.00	$3,550.00
Post-Construction Topographic Survey	1	LS	$4,220.00	$4,220.00
SURVEYING TOTAL				***$14,755.00***

TABLE D.4
Former Canada Dry Plant
Remedial Action Construction Costs for Contractor

	No. of Units	Unit of Measure	Unit PX	Extension
CONSTRUCTION				
HSVE Well Installation, Trenching, and Conveyance Piping Installation				
Mobilization	1	LS	$9,500.00	$9,500.00
Hand Clearing	36	hour	$178.00	$6,408.00
SVE Well Installation	330	ft	$120.00	$39,600.00
Screen Design	1	LS	$2,500.00	$2,500.00
Well Material	330	ft	$22.00	$7,260.00
Well Development	3	each	$1,500.00	$4,500.00
Flush Mount Curb Box	3	each	$550.00	$1,650.00
Decontamination Pad	1	LS	$300.00	$300.00
Decontamination	12	days	$75.00	$900.00
Saw Cut Existing Asphalt	120	LF	$2.06	$247.20
Trenching	145	LF	$4.27	$619.15
Piping Installation	145	LF	$3.50	$507.50
Pipe Bedding & Compaction	145	LF	$9.72	$1,409.40
Trenching Backfill & Compaction	35	CY	$46.44	$1,625.40
Asphalt Restoration	10	SY	$48.17	$481.70
			Subtotal	***$77,508.35***
Material Source Testing				
Backfill Material (Reuse of on-site soil)				
TCL VOCs	1	per 50 CY	75.42	$75.42
TCL SVOCs	1	per 50 CY	162.30	$162.30
Metals (TAL Inorganics, no mercury or cyanide)	1	per 50 CY	90.13	$90.13
Cyanide	1	per 50 CY	21.27	$21.27
Mercury	1	per 50 CY	20.78	$20.78
TCL PCBs/Pesticides	1	per 50 CY	137.95	$137.95
			Subtotal	***$507.85***
SVE System Installation				
SVE System & Installation	1	LS	52,600.00	$52,600.00
Variable Frequency Drives (3 count)	1	LS	7,515.00	$7,515.00
System Communication - Computer Controlled Remote	1	LS	10,450.00	$10,450.00
Disharge Stack	1	LS	9,089.00	$9,089.00
Electrical - Initial Connection	1	LS	$1,225.00	$1,225.00
			Subtotal	**$80,879.00**
Groundwater Monitoring Well Repair				
Skidsteer	2	day	$299.00	$598.00
Demo saw	2	day	$201.00	$402.00
Repair of well collars/pads	3	each	$188.00	$564.00
			Subtotal	*$1,564.00*
			CONSTRUCTION TOTAL	**$160,459.20**

TABLE D.4
Former Canada Dry Plant
Remedial Action Construction Costs for Contractor

	No. of Units	Unit of Measure	Unit PX	Extension
WASTE TRANSPORTATION AND DISPOSAL				
Transportation and Disposal				
Drop off/Pickup Storage Containers (water and solids)	2	LS	$1,395.00	$2,790.00
10,000 gal Poly Storage Tank Rental	30	days	$40.00	$1,200.00
25 CY Dewatering Sludge Box Rental	30	days	$46.00	$1,380.00
250 Micron Dewatering Liner	1	LS	$335.00	$335.00
3" Trash Pump for Removal of Liquids from Dewatering Box	1	day	$105.00	$105.00
3" x 50' Lay Flat Discharge Hose (x2)	1	day	$18.00	$18.00
Transport Water to Disposal Facility (9,000 gal vac truck)	1	each	$2,950.00	$2,950.00
Disposal of water	8000	gallon	$0.21	$1,680.00
Transport Sludge box to Disposal Facility	1	LS	$1,650.00	$1,650.00
Disposal of Solids (>50%)	13	ton	$60.00	$780.00
Demurrage (1-free hr loading)	2	hr	$205.00	$410.00
State Regulatory Fee	1	LS	$37.50	$37.50
Energy and Security Surcharge (15% of invoice)	1	%	15.00%	$2,000.33
			Subtotal	***$15,335.83***
Waste Characterization Analysis				
Solids Characterization	1	LS	$539.00	$539.00
Liquid Characterization	1	Ls	$534.00	$534.00
			Subtotal	***$1,073.00***
			WASTE TRANSPORTATION AND DISPOSAL TOTAL	**$16,408.83**

TABLE D.5
Former Canada Dry Plant
Operations, Maintenance and Monitoring Costs

	No. of Units	Unit of Measure	Unit PX	Extension
Operations, Maintenance, & Monitoring				
Labor - Engineer				
Field Technician (NSPE Level III) - System OM&M	140	hours	$72.00	$10,080.00
Field Technician (NSPE Level III) - GW Sampling	110	hour	$72.00	$7,920.00
Project Manager (NSPE Level V)	20	hour	$98.00	$1,960.00
Project Engineer (NSPE Level VII)	10	hour	$138.00	$1,380.00
Data Validation (NSPE Level V)	8	hour	$98.00	$784.00
Data Management (NSPE Level IV)	8	hour	$79.00	$632.00
Procurement/Subcon. Admin. (NSPE Level V)	12	hour	$138.00	$1,656.00
			.	**$24,412.00**
ODCs - Engineer				
Travel (SVE System and Groundwater Sampling)				
Per Diem	23	days	$157.00	$3,611.00
Vehicle Rental	23	days	$75.00	$1,725.00
Fuel for Vehicle	184	gal	$3.00	$552.00
			Subtotal	***$5,888.00***
Equipment and materials (System OM&M)				
PID (during first month)	4	week	$141.00	$564.00
PID (after first month)	5	day	$54.00	$270.00
4-gas Meter (during first month)	4	week	$106.00	$424.00
4-gas Meter (after first month)	5	day	$36.00	$180.00
Magnahelic Gauges	3	each	$100.00	$300.00
LVE	140	per person/hr	$1.00	$140.00
			Subtotal	***$1,878.00***
Equipment and materials (Groundwater Sampling)				
Horiba U52 or equivalent	1	week	$211.00	$211.00
Peristaltic Pump	1	week	$53.00	$53.00
Silone Tubing	25	ft	$3.00	$75.00
HDPE Tubing 100'	3	each	$29.00	$87.00
Water Level meter 100'	1	week	$36.00	$36.00
Alconox	1	box	$30.00	$30.00
5-gallon buckets (dedicated disposable)	3	each	$3.25	$9.75
Nitrile Gloves	2	box	$15.00	$30.00
Ice	24	Bags	$3.00	$72.00
LVE	110	per person/hr	$1.00	$110.00
			Subtotal	***$713.75***
			OPERATIONS, MAINTENANCE & MONITORING TOTAL	**$32,891.75**
ELECTRICAL OPERATING COSTS				
Operation - Winter Months (Nov. - Feb.)	3	month	$1,400.00	$4,200.00
Operation - Spring Months (March - May)	3	month	$1,300.00	$3,900.00
			Subtotal	***$8,100.00***

TABLE D.5
Former Canada Dry Plant
Operations, Maintenance and Monitoring Costs

	No. of Units	Unit of Measure	Unit PX	Extension
ANALYTICAL COSTS				
Groundwater Sampling				
TCL VOCs	17	samples	$79.00	$1,343.00
Soil Vapor Sampling				
TCL VOCs	33	samples	$210.00	$6,930.00
Waste Characterization Analysis				
Solids Characterization	1	LS	813.75	$813.75
Liquid Characterization	1	Ls	$813.75	$813.75
			Subtotal	***$9,900.50***
WASTE TRANSPORTATION AND DISPOSAL				
Transportation and Disposal				
Crew/Equipment for Drum Removal	1	LS	$1,634.85	$1,634.85
Disposal of drums with liquid	3	each	$131.25	$393.75
Disposal of drums with PPE	2	each	$157.50	$315.00
Profiling Fee	2	each	$42.00	$84.00
Variable Fuel Recovery Fee	1	10%	$242.76	$242.76
			Subtotal	**$2,670.36**
			OPERATIONS, MAINTENANCE & MONITORING TOTAL	**$53,562.61**

ATTACHMENT E

AERSCREEN MODELING OUTPUT

AERSCREEN 16216 / AERMOD 16216r 03/08/19
09:23:39

TITLE: CANADA DRY SVE STACK - ENDICOTT, NY

********** STACK PARAMETERS **********

SOURCE EMISSION RATE:	1.0000	g/s	7.937	lb/hr
STACK HEIGHT:	10.67	meters	35.01	feet
STACK INNER DIAMETER:	0.102	meters	4.00	inches
PLUME EXIT TEMPERATURE:	324.8	K	125.0	Deg F
PLUME EXIT VELOCITY:	33.530	m/s	110.01	ft/s
STACK AIR FLOW RATE:	576	ACFM		
RURAL OR URBAN:	RURAL			
INITIAL PROBE DISTANCE =	5000.	meters	16404.	feet

********** BUILDING DOWNWASH PARAMETERS **********

BUILDING HEIGHT:	4.1	meters	13.5	feet
MAX BUILDING DIMENSION:	30.5	meters	100.0	feet
MIN BUILDING DIMENSION:	24.4	meters	80.0	feet
BUILDING ORIENTATION TO NORTH:	175.	degrees		
STACK DIRECTION FROM CENTER:	50.	degrees		
STACK DISTANCE FROM CENTER:	18.9	meters	62.0	feet

********** FLOW SECTOR ANALYSIS **********

25 meter receptor spacing: 1. meters - 5000. meters

FLOW SECTOR	BUILD WIDTH	BUILD LENGTH	XBADJ	YBADJ	MAX 1-HR CONC	DIST (m)	TEMPORAL PERIOD
10	31.44	35.75	-32.35	12.15	534.6	50.0	AUT
20	34.98	37.93	-35.33	9.45	384.3	20.0	SUM
30	37.46	38.95	-37.23	6.46	384.3	20.0	SUM
40	38.80	38.79	-38.00	3.28	412.3	75.0	SPR
50	38.96	37.45	-37.62	0.00	412.3	75.0	SPR
60	37.93	34.98	-36.10	-3.28	412.3	75.0	SPR
70	35.75	31.44	-33.47	-6.47	412.3	75.0	SPR
80	32.49	26.94	-29.84	-9.45	412.3	75.0	SPR
90	32.49	26.95	-27.95	-12.15	412.3	75.0	SPR
100	35.75	31.44	-27.87	-14.47	526.4	50.0	AUT
110	37.93	34.98	-26.94	-16.36	1138.	20.0	SUM
120	38.95	37.46	-25.19	-17.76	968.6	25.0	SUM
130	38.79	38.80	-22.68	-18.61	1133.	25.0	SUM
140	37.45	38.96	-19.48	-18.90	1363.	30.0	SUM
150	34.98	37.93	-15.68	-18.61	1345.	30.0	SUM

160	31.44	35.75	-11.41	-17.76	1460.	30.0	SUM
170	0.00	0.00	0.00	0.00	412.3	75.0	SPR
180	26.95	32.49	-4.10	-14.47	1339.	30.0	SUM
190	31.44	35.75	-3.40	-12.15	1836.	40.0	SPR
200	34.98	37.93	-2.60	-9.45	1713.	40.0	SUM
210	37.46	38.95	-1.72	-6.46	1795.	40.0	SPR
220	38.80	38.79	-0.79	-3.28	1829.	40.0	SUM
230	38.96	37.45	0.17	0.00	1834.	40.0	SUM
240	37.93	34.98	1.12	3.28	1782.	40.0	SUM
250	35.75	31.44	2.04	6.47	1658.	40.0	WIN
260	32.49	26.94	2.89	9.45	1570.	40.0	SUM
270	32.49	26.95	1.00	12.15	1501.	40.0	SUM
280*	35.75	31.44	-3.58	14.47	1922.	40.0	WIN
290	37.93	34.98	-8.05	16.36	1759.	30.0	SPR
300	38.95	37.46	-12.27	17.76	1565.	30.0	WIN
310	38.79	38.80	-16.12	18.61	1442.	30.0	SUM
320	37.45	38.96	-19.48	18.90	1363.	30.0	SUM
330	34.98	37.93	-22.25	18.61	997.0	25.0	SUM
340	31.44	35.75	-24.34	17.76	735.6	20.0	SPR
350	0.00	0.00	0.00	0.00	412.3	75.0	SPR
360	26.95	32.49	-28.39	14.47	412.3	75.0	SPR

* = worst case flow sector

********** MAKEMET METEOROLOGY PARAMETERS **********

MIN/MAX TEMPERATURE: 250.4 / 307.0 (K)

MINIMUM WIND SPEED: 0.5 m/s

ANEMOMETER HEIGHT: 10.000 meters

SURFACE CHARACTERISTICS INPUT: AERMET SEASONAL TABLES

DOMINANT SURFACE PROFILE: Urban
DOMINANT CLIMATE TYPE: Average Moisture
DOMINANT SEASON: Winter

ALBEDO: 0.35
BOWEN RATIO: 1.50
ROUGHNESS LENGTH: 1.000 (meters)

SURFACE FRICTION VELOCITY (U*) NOT ADUSTED

METEOROLOGY CONDITIONS USED TO PREDICT OVERALL MAXIMUM IMPACT

YR	MO	DY	JDY	HR
10	05	08	8	12

H0	U*	W*	DT/DZ	ZICNV	ZIMCH	M-O LEN	Z0	BOWEN	ALBEDO	REF WS
15.00	0.284	0.300	0.020	68.	347.	-143.5	1.000	1.50	0.35	1.50

HT REF TA HT

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- - - - - - - - - - -
  10.0   307.0    2.0

WIND SPEED AT STACK HEIGHT (non-downwash):        1.5 m/s
STACK-TIP DOWNWASH ADJUSTED STACK HEIGHT:        10.7 meters
ESTIMATED FINAL PLUME RISE (non-downwash):        4.2 meters
ESTIMATED FINAL PLUME HEIGHT (non-downwash):     14.8 meters


       METEOROLOGY CONDITIONS USED TO PREDICT AMBIENT BOUNDARY IMPACT
       -------------------------------------------------------------

 YR MO DY JDY HR
 -- -- -- --- --
 10 03 18   8 12

    H0     U*     W*  DT/DZ ZICNV ZIMCH  M-O LEN    Z0  BOWEN ALBEDO  REF WS
 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
155.13  0.268  1.200  0.020  381.  320.    -10.7 1.000   2.00   0.16    1.00

    HT  REF TA     HT
- - - - - - - - - - -
  10.0   278.7    2.0

WIND SPEED AT STACK HEIGHT (non-downwash):        1.0 m/s
STACK-TIP DOWNWASH ADJUSTED STACK HEIGHT:        10.7 meters
ESTIMATED FINAL PLUME RISE (non-downwash):        6.9 meters
ESTIMATED FINAL PLUME HEIGHT (non-downwash):     17.6 meters



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********************** AERSCREEN AUTOMATED DISTANCES **********************
                   OVERALL MAXIMUM CONCENTRATIONS BY DISTANCE
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DIST (m)	MAXIMUM 1-HR CONC (ug/m3)	DIST (m)	MAXIMUM 1-HR CONC (ug/m3)
1.00	634.2	2475.00	49.39
10.00	837.2	2500.00	48.99
20.00	1237.	2525.00	48.61
25.00	1441.	2550.00	48.23
30.00	1759.	2575.00	47.85
40.00	1922.	2600.00	47.47
50.00	1834.	2625.00	47.10
75.00	581.9	2650.00	46.73
100.00	507.4	2675.00	46.37
125.00	451.9	2700.00	46.01
150.00	402.5	2725.00	45.66
175.00	353.0	2750.00	45.31
200.00	311.2	2775.00	44.96
225.00	280.2	2800.00	44.64
250.00	258.0	2825.00	44.41
275.00	240.7	2850.00	44.17
300.00	222.5	2875.00	43.93
325.00	214.1	2900.00	43.68
350.00	214.4	2925.00	43.43

375.00	208.9
400.00	202.9
425.00	197.0
450.00	191.2
475.00	185.3
500.00	179.6
525.00	173.9
550.00	168.3
575.00	162.9
600.00	157.9
625.00	153.0
650.00	148.7
675.00	144.7
700.00	140.9
725.00	137.2
750.00	133.6
775.00	130.2
800.00	126.8
825.00	123.6
850.00	120.4
875.00	117.4
900.00	114.4
925.00	111.6
950.00	108.9
975.00	106.2
1000.00	103.6
1025.00	101.2
1050.00	98.80
1075.00	96.51
1100.00	94.29
1125.00	92.15
1150.00	90.09
1175.00	88.09
1200.00	86.17
1225.00	84.31
1250.00	82.51
1275.00	80.77
1300.00	79.09
1325.00	77.47
1350.00	75.90
1375.00	74.38
1400.00	72.91
1425.00	71.48
1450.00	70.10
1475.00	68.79
1500.00	68.50
1525.00	68.18
1550.00	67.81
1575.00	67.40
1600.00	66.95
1625.00	66.47
1650.00	65.96
1675.00	65.42
1700.00	64.85
1725.00	64.26
1750.00	63.65
1775.00	63.01
1800.00	62.36
1825.00	61.68
1850.00	60.99
2950.00	43.17
2975.00	42.90
3000.00	42.63
3025.00	42.35
3050.00	42.07
3075.00	41.79
3100.00	41.50
3125.00	41.22
3150.00	40.99
3175.00	40.75
3200.00	40.51
3225.00	40.26
3250.00	40.01
3275.00	39.76
3300.00	39.50
3325.00	39.24
3350.00	38.98
3375.00	38.72
3400.00	38.48
3425.00	38.28
3450.00	38.08
3475.00	37.89
3500.00	37.69
3525.00	37.50
3550.00	37.30
3575.00	37.11
3600.00	36.92
3625.00	36.73
3650.00	36.54
3675.00	36.35
3700.00	36.17
3725.00	35.98
3750.00	35.80
3775.00	35.61
3800.00	35.43
3825.00	35.25
3850.00	35.07
3875.00	34.89
3900.00	34.71
3925.00	34.54
3950.00	34.36
3975.00	34.19
4000.00	34.01
4025.00	33.84
4050.00	33.67
4075.00	33.50
4100.00	33.33
4125.00	33.16
4150.00	32.99
4175.00	32.83
4200.00	32.66
4225.00	32.50
4250.00	32.35
4275.00	32.19
4300.00	32.04
4325.00	31.89
4350.00	31.73
4375.00	31.58
4400.00	31.43
4425.00	31.28

1875.00	60.29	4450.00	31.13
1900.00	59.57	4475.00	30.99
1925.00	59.02	4500.00	30.84
1950.00	58.55	4525.00	30.69
1975.00	58.07	4550.00	30.55
2000.00	57.60	4575.00	30.41
2025.00	57.13	4600.00	30.26
2050.00	56.67	4625.00	30.12
2075.00	56.21	4650.00	29.98
2100.00	55.75	4675.00	29.84
2125.00	55.30	4700.00	29.70
2150.00	54.85	4725.00	29.56
2175.00	54.40	4750.00	29.42
2200.00	53.96	4775.00	29.29
2225.00	53.53	4800.00	29.15
2250.00	53.09	4825.00	29.02
2275.00	52.66	4850.00	28.88
2300.00	52.24	4875.00	28.75
2325.00	51.82	4900.00	28.62
2350.00	51.40	4925.00	28.49
2375.00	50.99	4950.00	28.37
2400.00	50.58	4975.00	28.26
2425.00	50.18	5000.00	28.14
2450.00	49.78		

********** AERSCREEN MAXIMUM IMPACT SUMMARY **********

CALCULATION PROCEDURE	MAXIMUM 1-HOUR CONC (ug/m3)	SCALED 3-HOUR CONC (ug/m3)	SCALED 8-HOUR CONC (ug/m3)	SCALED 24-HOUR CONC (ug/m3)	SCALED ANNUAL CONC (ug/m3)
FLAT TERRAIN	1922.	1922.	1730.	1153.	192.2

DISTANCE FROM SOURCE 40.00 meters directed toward 280 degrees

IMPACT AT THE AMBIENT BOUNDARY	634.2	634.2	570.7	380.5	63.42

DISTANCE FROM SOURCE 1.00 meters directed toward 110 degrees