VIA ELECTRONIC MAIL

February 14, 2025

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Subject: Response to Comments – Remedial Action Work Plan
Former Emerson Power Transmission Facility, Ithaca, New York

Dear Karen:

WSP USA Inc. (WSP), on behalf of Emerson Electric Co., has prepared this letter to respond to the comments provided by the New York State Department of Environmental Conservation (NYSDEC) regarding the Remedial Action Work Plan (RAWP; dated October 2, 2023) for the Former Emerson Transmission Facility in Ithaca, New York. Each comment is reproduced in its entirety followed by WSP's response in bold formatted text.

1 Section 5.4.3 AOC-1 Expansion Well Vaults, Piping, and Pumping Equipment:

— The sixth paragraph states that the piping between EW-8-62C, EW-11-43C, and EW-14 will be replaced, however, Cross Section 9B indicates that the piping between EW-8-62C and the replacement junction box exists. Please clarify.

That is correct. The existing junction box and the immediate piping/connections currently in place will be modified to allow for ease of pre-cast concrete vault installation and better access for system maintenance. Most of the piping shown in cross section 9B will remain with the exception of approximately 2 to 3 feet of piping at the top of the slope, near the foundation wall, which will be cut and replaced to allow for the installation of a larger junction box and new piping connections.

— The seventh paragraph states that conveyance piping will be installed within trenches excavated to approximately 52 inches below ground surface and excavated materials will be used as backfill. The approximate width of the trenches must be specified, and any impacted soils excavated below the low permeability cover demarcation layer in AOC-1 must be sampled per Section F-7 of the Excavation Work Plan (EWP) if this soil is proposed for reuse as backfill.

The trench width will be 24 to 36 inches wide. Procedures and requirements for material reuse on-site as detailed in the Excavation Work Plan shall be followed during remedial work activities; including but not limited to sampling, material handling, notification, and approvals.

2 The cap in AOC-1 consisting of a demarcation layer, imported backfill (NYSDOT Item 4 gravel), a geosynthetic clay liner, and a 6-inch asphalt layer, must be restored subsequent to well vault and conveyance piping installation.

WSP is in agreement with this statement. WSP's oversight personnel will assure that the contractor replaces/restores all cap components as identified above.

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3 If excavation areas require dewatering, groundwater must be handled in accordance with Section F-8 of the EWP.

WSP plans to use the existing OU-1 DPE System for treatment of water if dewatering of excavations becomes necessary. The collected water will be transferred to containers and sampled to confirm the DPE System performance is adequate to treat the water. If sampling results indicate that fluids generated are incompatible with the OU-1 DPE System, procedures and requirements for fluid management as detailed in the Excavation Work Plan shall be followed during remedial action work activities; including but not limited to material handling, off-site transportation and disposal, notification, and approvals.

4 Soil or other materials proposed for import to the site must be approved per Section F-10 of the EWP.

Procedures and requirements for importing of soil or other materials for backfill as detailed in the Excavation Work Plan shall be followed during remedial action work activities; including but not limited to sampling and comparison to the standards established in 6 NYCRR 375-6.7(d) and DER-10 Appendix 5.

Upon NYSDEC's concurrence with these responses, WSP will revise the applicable sections and resubmit the RAWP. Please contact me at 412-375-0282 should you have any additional questions.

Kind regards,

David Rykaczewski, P.E.
Vice President

Lisa Kelly
Vice President

DAR/rlo

cc: Stephen Clarke, Emerson (electronic copy)

EMERSON ELECTRIC CO.

REMEDIAL ACTION WORK PLAN REVISION 1

FORMER EMERSON POWER TRANSMISSION ITHACA, NEW YORK (NYSDEC SITE NO. 755010)

MARCH 03, 2025

REMEDIAL ACTION WORK PLAN REVISION 1

FORMER EMERSON POWER TRANSMISSION
ITHACA, NEW YORK (NYSDEC SITE NO. 755010)

EMERSON ELECTRIC CO.

PROJECT NO.: 31405608.001
DATE: MARCH 3, 2025

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This plan was prepared by WSP for the account of Emerson Electric Co., in accordance with the professional services agreement. The disclosure of any information contained in this report is the sole responsibility of the intended recipient. The material in it reflects WSP's best judgement in light of the information available to it at the time of preparation. Any use which a third party makes of this plan, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. WSP accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this plan. This limitations statement is considered part of this plan.

The original of the technology-based document sent herewith has been authenticated and will be retained by WSP for a minimum of ten years. Since the file transmitted is now out of WSP's control and its integrity can no longer be ensured, no guarantee may be given with regards to any modifications made to this document.

PROFESSIONAL ENGINEER CERTIFICATION

I, David Alan Rykaczewski, certify that I am currently a New York State Registered Professional Engineer as defined in 6 NYCRR Part 375 and that this Remedial Action Work Plan for the former Emerson Power Transmission facility in Ithaca, New York, 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).

March 3, 2025

David Alan Rykaczewski, P.E.
Senior Technical Manager
New York State P.E. No. 099287

Date

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1 INTRODUCTION

On behalf of Emerson Electric Co., WSP has prepared this Remedial Action Work Plan (RA Work Plan) for the former Emerson Power Transmission (EPT) facility (Site No. 755010) in Ithaca, New York (Figure 1). The RA Work Plan describes the activities necessary to implement the Remedial Designs for the selected non-aqueous phase liquid (NAPL) and groundwater remedies addressed in the Feasibility Study conditionally approved by the New York State Department of Environmental Conservation (NYSDEC) on October 5, 2020 (WSP USA. 2020b). The RA Work Plan designs and activities include:

1. NAPL Recovery
   - Continued quarterly, passive product recovery and surveillance at groundwater wells identified to contain free product
   - Implementation of quarterly product surveillance and as applicable, passive product recovery at observation wells installed at the bedrock interface between the foundations of Building 9 and Buildings 3 and 4
2. Groundwater Monitoring (to be completed in accordance with the Interim Site Management Plan [ISMP, WSP USA. 2022c])
   - Barium and Cyanide in Groundwater
   - Chlorinated Volatile Organic Compounds (CVOCs) in Groundwater
3. AOC 1 Groundwater Remedial Action
   - Continued operation, maintenance, and monitoring of the Operable Unit (OU) 1 Dual Phase Extraction (DPE) System installed in the area of the former fire water reservoir (FWR)
   - Enhancements to the OU 1 DPE System to facilitate continued operation and effectiveness of the DPE System
   - Expansion of the DPE System with the inclusion of two new extraction wells in AOC 1, near Building 4

This RA Work Plan has been prepared pursuant to the July 1988 Order on Consent (Index No. A7-0125-87-09) between New York State Department of Environmental Conservation (NYSDEC) and Emerson Power Transmission Co. and Emerson Electric Co. (NYSDEC. 1988), the amended Record of Decision (ROD) dated September 2021 (NYSDEC. 2021), and the procedures outlined in the Division of Environmental Remediation Technical Guidance for Site Investigation and Remediation (DER-10) (NYSDEC. 2010a).

Other remedial elements included in the amended ROD including actions to address groundwater seeps and vapor intrusion in site buildings that remain following site redevelopment. While the NYSDEC approved the Pre-Design Report for the seeps on September 12, 2023, the design of the selected remedy for the seeps will be addressed in a RA Work Plan addendum to be prepared during the fall of 2023 (see Section 6 – Project Schedule). Similarly, the design for the vapor intrusion in buildings that remain will be addressed in a future RA Work Plan addendum based on the results of future pre-design studies.

1.1 WORK PLAN ORGANIZATION

The RA Work Plan has been organized as follows:

SECTION	DESCRIPTION
Section 1 – Introduction	Introduction to the Remedial Action Work Plan
Section 2 – Background and Regulatory History	Presents site background and regulatory history information

SECTION	DESCRIPTION
Section 3 – NAPL Remedial Action	Presents a summary of investigations/evaluations regarding NAPL, rationale and results of pre-design activites to support the development of actions to address NAPL at buildings 3 and 4.
Section 4 – Groundwater Monitoring	Presents the groundwater monitoring for barium and cyanide, and CVOCs; which will be completed in accordance with the ISMP.
Section 5 –AOC 1 Groundwater Remedial Action	Presents a summary of investigations/evaluations and existing conditions regarding CVOCs in AOC 1 groundwater, rationale for pre-design activites to support the development of Remedial Designs and the basis of these designs. Design will include ancillary components which pertain to worker and community health, ISMP engineering controls, and implementation of green remediation concepts (Section 5.7).
Section 6 – Project Schedule	Discussion on ancitipated schedule for the performance of remedial activities
Section 7 - Reporting	Description of anticipated remedial action deliverable in the form of a final engineering report or construction completion report

2 BACKGROUND AND REGULATORY HISTORY

The subject facility is an inactive industrial facility, located at 620 South Aurora Street in Ithaca, New York. The former EPT facility consisted of three main buildings (further subdivided and labeled as individual buildings) along the northeast and southwest portions of 'South Hill' (Figure 1). The former EPT facility buildings are at an elevation of approximately 600 feet above mean sea level (amsl) and comprise approximately 312,000 square feet in footprint cumulatively.

The former EPT facility was founded in 1906 by Morse Industrial Corporation, manufacturer of steel roller chain for the automobile industry. Morse operated the facility until approximately 1928 when it was bought by Borg-Warner Corporation, manufacturer of automotive components and power transmission equipment. In 1983, Emerson acquired Morse from Borg-Warner. As a result, the Ithaca facility eventually became part of the former EPT, a wholly owned subsidiary of Emerson Electric Co. and part of Emerson's Power Transmission Solutions business.

Up until the late 1970s, Borg-Warner used trichloroethene (TCE), a common solvent at the time, for cleaning and degreasing metal parts. In 1987, groundwater containing elevated concentrations of volatile organic compounds (VOCs), specifically CVOCs, was discovered, originating from the FWR in the western portion of the property. Subsequent to reporting these findings to NYSDEC, Emerson Electric Co. and EPT entered into a Consent Order with the NYSDEC (Index # A7-0125-87-09; NYSDEC 1988) requiring Emerson to develop and implement a Remedial Investigation and Feasibility Study (RI/FS) followed by a remedial program to address the release of hazardous substances to the environment. The RI Report was completed by Radian Corporation (later Radian International LLC) in 1990 (Radian. 1990). A groundwater pump and treat system was installed as an Interim Remedial Measure (IRM) to address VOC-affected groundwater near the FWR; operation began in late 1991. In 1994, the FS completed by Radian proposed a DPE System as the remedial alternative based on testing that indicated such a system would outperform the existing IRM (Radian. 1994). The alternative was approved by NYSDEC and detailed in a ROD (NYSDEC. 1994). The DPE System, began operating in 1996.

Based on the results of a supplemental remedial investigation (SRI) and Alternatives Analysis performed between 2004 and 2008 (WSP USA. 2007), NYSDEC issued a ROD Amendment (2009) addressing three areas presently classified as OUs: the former FWR (OU-1), the remainder of the property (OU-2), and the South Hill neighborhood to the north (OU-3) (NYSDEC. 2009). The limits of OU-1 and OU-2 are shown in Figure 2. The facility was subsequently decommissioned and has been vacant since 2011. In December 2014, Emerson transferred ownership of the property to EMERSUB 15, LLC in anticipation of the sale of its Power Transmission Solutions business, of which EPT was a part. In December 2022, ownership of OU-2 was transferred to L Enterprises, LLC with plans for redevelopment of property that will incorporate a mix of residential, commercial, and industrial uses.

2.1 OU-1 AND OU-2

Subsequent to the ROD Amendment, a variety of activities have occurred in OU-1 including: decommissioning the reservoir; evaluating the potential presence of light, non-aqueous phase liquid (NAPL) below the reservoir; removal of NAPL since 2010; and upgrading the DPE and treatment system. Under the terms of the sale agreement, EMERSUB 15 LLC retains ownership of that portion of the property coterminous with OU-1.

OU-2 includes several areas of concern (AOCs), including AOC 1, the Former Department 507 Degreaser in Building 4 as well as the immediate area outside the building to the west, where soil and groundwater affected by CVOCs were identified and delineated over the course of several investigations. At the request of NYSDEC, the Phase II SRI Report (WSP USA. 2018a) included summary information on this area. Much of the remainder of OU-2 was subject to soil, soil vapor, and groundwater investigations as part of the Phase II SRI.

Following the 2015-2016 Phase II SRI, an IRM Work Plan was submitted and approved by the NYSDEC and New York Department of Health (NYSDOH) on August 22, 2018 (WSP USA. 2018b and 2018c) to address the excavation of shallow soil in the former degreaser area as well as other areas of the OU-2 to reduce potential migration to groundwater. The primary objective of the IRM was to remediate soil in accordance with soil cleanup objectives (SCOs) and engineering controls (e.g., the use of clean fill as a cover for soil contamination) to facilitate redevelopment of the property by L Enterprises, LLC.

In accordance with the NYSDEC-approved IRM Work Plan, VOC-impacted soils at concentrations above the SCOs for Protection of Groundwater (PoG) in AOC 1 were excavated from October 15 through 30, 2018. During implementation of the IRM, approximately 225 tons of non-hazardous waste soil and concrete and 98 tons of F001 listed hazardous waste soil was excavated from AOC 1 and transported and disposed of offsite (WSP USA. 2020a). Overall, during implementation of the IRM, between October 15, 2018, and September 11, 2019, a total of 8,513.25 tons of non-hazardous waste soil and concrete and 355.54 tons of F001 and D005 listed hazardous waste soil and concrete was transported offsite for disposal. Areas addressed include both those upgradient and downgradient of AOC 1.

3 NAPL REMEDIAL ACTION

3.1 BUILDING 3 AND 4 NAPL RECOVERY SYSTEM PRE-DESIGN

A pre-design study was conducted, in accordance with the Building 3 and 4 NAPL Observation Wells Work Plan submitted to the NYSDEC on February 24, 2023 and approved March 8, 2023, to evaluate the bedrock/fill interface and presence of NAPL along the eastern wall of Buildings 3 and 4. On February 27 and February 28, 2023, four observation wells were installed behind the walls of Buildings 3 and 4, spaced between boring locations B4 WALL and B6 WALL to evaluate the full extent of the impacted area. Due to the terraced construction of the buildings, the eastern wall of Buildings 3 and 4 extends above the floor of Building 9. Figure 3 shows the location of the four observation wells (OW-01 through OW-04).

After coring the Building 9 concrete slab, observation wells boreholes were advanced through the subsurface fill material to refusal at the bedrock surface (approximately 11 to 13.75 feet below grade) using an 8-inch outer diameter hollow stem auger. The wells were then constructed using nominal 4-inch inside diameter, Schedule 40 polyvinyl chloride (PVC) risers and 0.010-inch slot screens, 10 feet in length. At each location, No. 2 sand was placed in the annular space between the PVC and outer borehole to approximately 2 feet above the top of the screen; a cement-bentonite mix was placed from the top of the sand to the bottom of the existing concrete slab. The wells were completed with flush mount well covers equipped with a lockable watertight cap and the concrete slab around the covers was restored in-kind.

Following well development, wells were monitored on a weekly basis for 1 month using an interface probe to determine the thickness of NAPL, if present. As of July 2023, no NAPL has been present in OW-1 through OW-4. Groundwater is present in all of the observation wells and groundwater levels behind the Building 3 and 4 walls have fluctuated between 7.9 to 11.5 ft below the Building 9 floor.

3.2 NAPL - REMEDIAL GOALS AND SELECTED REMEDY

The remedial goal for site-wide NAPL (as presented in the amended ROD) is to reduce or eliminate the presence of NAPL identified onsite, to the extent practicable.

To achieve this remedial goal, an appropriate remedy was selected for the site based on the results of several RIs and FS. The primary components of the selected remedy are depicted on Figure 3 and are summarized as follows:

- Recovery and removal of potentially mobile petroleum product along the base of the eastern wall in Building 4 through the installation and operation of a petroleum recovery collection trench and sump or wells. The spacing of the recovery trench or number of wells to be determined during remedial design. Petroleum to be collected periodically from the trench sump or wells passively with the potential for conversion to automated collection if large quantities are present.
- WSP initiated product recovery in HISTWELL-1 in January 2016. The HISTWELL-1 was abandoned due to its deteriorating condition and replaced with MW-50-160D on June 21, 2021. NYSDEC granted approval to stop free product monitoring in MW-50-160D on January 23, 2023. Groundwater monitoring for CVOCs will continue at this location in accordance with the ISMP.

3.3 NAPL REMEDIAL DESIGN

3.3.1 FREE PRODUCT MONITORING AND PASSIVE RECOVERY

The proposed design to address site-wide NAPL will be quarterly monitoring and passive recovery conducted at groundwater wells that are known to contain free product which include MW-8B, LBA-MW-35, LBA-MW-39, and MW-47A. Additionally, monitoring and as applicable, passive recovery, will be implemented at the four observation wells OW-1 through OW-4 installed behind the wall of Buildings 3 and 4. Additional recovery wells may be installed based on the results

of NAPL monitoring further measurements, current wells' radius of influence, and the perceived lateral migration along the wall which is thought to act as a barrier to NAPL migration.

Passive recovery design consists of installation of absorbent media socks into each well at a depth which correlates with its anticipated groundwater elevation. An appropriate length sock will be selected to ensure continued recovery if the groundwater elevation increases or decreases. Socks will be removed from the wells on a quarterly basis and replaced as necessary. Socks which are removed will be weighed to estimate the volume of NAPL removed over time. Measurements will be collected at this time to gauge water levels and NAPL thickness. Measurements of water level from the observation wells OW-1 through OW-4 will be collected quarterly, for a minimum of 1 year beginning March 1, 2023.

Other ancillary components will include quarterly performance monitoring, data evaluation and reporting, and waste management. Captured NAPL and associated sorbents are placed in 55-gallon Department of Transportation (DOT) compliant steel drums for offsite disposal. Product recovery coupled with implementation of institutional controls, including environmental easements with a prohibition against onsite groundwater use, will further reduce or limit exposure to groundwater and NAPL.

4 GROUNDWATER MONITORING

4.1 BARIUM AND CYANIDE IN GROUNDWATER - REMEDIAL GOALS AND SELECTED REMEDY

The remedial goal for site-wide barium and cyanide (as presented in the amended ROD) is to restrict the use of groundwater and monitor barium and cyanide in groundwater.

To achieve this remedial goal, an appropriate remedy was selected for the site based on the results of several RIs and FS. The primary components of the selected remedy are summarized as follows:

- Imposition of an institutional control in the form of an Environmental Easement restricting the use of groundwater without treatment and approval.
- Long-term monitoring of barium and cyanide to evaluate the stability of the plume over time, identify trends, and evaluate overall conditions will be completed in accordance with the ISMP.

4.2 CVOCS IN GROUNDWATER - REMEDIAL GOALS AND SELECTED REMEDY

The remedial goal for CVOCs is to reduce, control, or eliminate the concentrations of COCs present in groundwater above the respective standards, to the extent practicable

To achieve this remedial goal, an appropriate remedy was selected for the site based on the results of several RIs and FS. The primary components of the selected remedy are depicted in the design package included in Appendix A and are summarized as follows:

- Continued operation of the existing DPE treatment system in OU-1 to extract, and treat CVOC groundwater in the B and shallow C hydrogeologic zones within fractured bedrock near the former FWR.
- Expansion of the existing DPE treatment system to extract and treat CVOCs in groundwater and vapor phase in AOC 1. The DPE system extension will be designed and installed so that the capture zone is sufficient to intercept the CVOC groundwater plume in the AOC 1 area and stop further migration. The expansion will consist of the installation of two B-zone extraction wells and a conveyance system from AOC 1 to the DPE treatment system.
- Extraction and treatment will be coupled with groundwater monitoring to evaluate the stability of the plume over time, identify trends, and evaluate overall conditions resulting from groundwater extraction and the excavation of shallow CVOC source area soil.
- Long-term monitoring of CVOCs to evaluate the stability of the plume over time, identify trends, and evaluate overall conditions will be completed in accordance with the IMSP.

5 AOC 1 GROUNDWATER REMEDIAL ACTION

5.1 AOC 1 GROUNDWATER CONDITIONS (CVOCS)

Groundwater in AOC 1 is present within the fill and unconsolidated overburden and the upper zone of fractured bedrock (i.e., the B hydrogeologic zone). The presence of water within the fill/unconsolidated overburden is typically in the range of 14 to 18 feet below ground surface (bgs), characterized as "wet" rather than saturated, and is primarily encountered at the base of a relatively extensive zone of fill dominated by clay and silt which resulted from weathering of the underlying bedrock. A relatively continuous gravel fill zone overlies the clay and silt. Thus, the presence of water near the interface between the gravel fill and underlying lower-permeability clay and silt suggests that it is perched in this area. The slope of bedrock and buildup of the ground surface west of the buildings, suggests that water accumulates behind the adjacent retaining wall, resulting in a more significant saturated zone in the unconsolidated material.

Across the Site, the direction of groundwater flow within the overburden and underlying shallow bedrock B hydrogeologic zone is to the northwest, generally mimicking the surface and bedrock interface topography. Based on historical groundwater elevation measurements, the overburden groundwater is in hydraulic communication with the B hydrogeologic zone, with these two units acting as a single hydraulic zone. The concrete retaining wall west of AOC 1 impedes lateral flow within overburden and B-zone groundwater. Based on facility drawings, it appears that a portion of groundwater accumulating behind (i.e., east of) the wall was historically captured and conveyed to a drain system on the downgradient (i.e., west) side of the wall and from there to the Retaining Wall Sump and finally to the sanitary sewer. The collection and conveyance system appears to have been dismantled; consequently, groundwater behind the wall either migrates laterally around the wall or vertically downward and beneath the wall. Water intermittently seeps/weeps from along the retaining wall. TCE was present above the evaluation criterion in the sample collected from a seep/weep along the retaining wall, LD-SEEP-3, in 2013.

CVOCs were identified at concentrations above the NYSDEC evaluation criteria within the B hydrogeologic zone, west of Building 4. The affected wells include: MW-9B, MW-10B, MW-11B, MW-24B, MW-25B, and MW-26B, EW-13, EW-14, and former pumping test well PTW-1, which was abandoned in 2018 (Figures 2 and 4). The highest concentrations were present along a narrow southeast- to northwest-trending fracture set at MW-10B, MW-26B, and PTW-1, with total CVOC concentrations of over 22,000 micrograms per liter (µg/l) at MW-10B and concentrations of less than 5,000 µg/l at MW-26B and former PTW-1. The impact is relatively well defined by the significantly lower concentrations reported laterally at MW-25B and MW-11B, upgradient at MW-24B, and downgradient at MW-4B. Although the vertical extent of potential impact in this area was not evaluated, no CVOCs were detected in the sample collected from C-zone well LBA-MW-28 to the west, or in downgradient, C-zone well EXB-10.

As part of quarterly groundwater monitoring conducted in December 2022, groundwater samples were collected at the newly installed EW-13 and EW-14 to evaluate groundwater quality in the proposed DPE expansion area (WSP USA. 2023). Sampling results showed VOC concentrations at EW-13 and EW-14 exceeded the New York State Guidance Values for Glass GA groundwater for the following analytes and their corresponding evaluation criteria values: chloroform (7 µg/l), cis-1-2-dichloroethene (cis-1,2-DCE) (5 µg/l), TCE (5 µg/l), and vinyl chloride (2 µg/l). At EW-13, VOC concentrations exceeded for chloroform (21.6 µg/l), cis-1,2-DCE (23.3 µg/l), and vinyl chloride (36 µg/l). At EW-14, VOC concentrations exceeded the same evaluation criteria for chloroform (12.5 µg/l), cis-1,2-DCE (25.6 µg/l), TCE (13.6 µg/l), and vinyl chloride (29.8 µg/l). Groundwater depth measurements taken during the sampling event as well as the calculated groundwater elevations for B-zone and C-zone wells are shown on Figures 4 and 5.

The results for various soil investigations completed in this area indicated the presence of CVOCs, primarily TCE, at concentrations above the PoG SCOs in surface soil samples (i.e., underlying the pavement which is primarily asphalt) and in some subsurface samples within the driveway and utility corridor. Because the subsurface samples were collected in areas of perched water overlying bedrock, the results are more likely indicative of contaminant migration from the surface and accumulation along the lower permeability silt and clay zone than an actual CVOC source in soil at depth. The IRM addressed shallow soil within this AOC by excavating to a maximum depth of approximately 3.5 feet (where not affected by active utilities) with offsite disposal, confirmation sampling, and backfilling with clean fill. Although deeper excavation was

physically limited by the presence of building foundations and gas, water, storm water, and sanitary sewer lines across this area, the IRM is expected to have significantly reduced the mass of CVOCs available to migrate to groundwater. In addition, a low-permeability cap consisting of a geosynthetic clay liner (GCL) and asphalt cap was installed to minimize infiltration of precipitation and subsequent migration to groundwater. After backfilling with clean compacted fill to a depth of 1-foot bgs, the GCL was placed over the entire footprint of the AOC 1 excavation, followed by 6 inches of aggregate sub-base and 6 inches of asphalt.

5.2 OU-1 DPE SYSTEM HISTORY AND DESCRIPTION

Groundwater Treatment System (1991-1996)

In 1991, in response to the NYSDEC request to conduct a limited IRM prior to the preparation of a formal feasibility study, a groundwater extraction and treatment system was designed and installed. This system consisted of three extraction wells EW-1, EW-2, and EW-3, installed downgradient of the FWR within the C zone. Groundwater was removed from extraction wells via submersible, pneumatic pumps. Extracted groundwater was treated using granular activated carbon to remove CVOCs present. The system began operation in August 1991 and was shut down in 1996 prior to implementation of the DPE system as part of the groundwater remedy for the site.

DPE System (1996-2008)

The remedy selected for the FWR detailed in the Record of Decision (December 1994) was DPE System, which removes both groundwater and vapors from wells. This system consisted of five extraction wells, EW-1, EW-3, EW-4, MW-2, and MW-31, installed downgradient of the FWR. The extraction wells were completed at depths of approximately 50 to 65 feet bgs within the C zone. Groundwater was removed by the extraction wells using a high efficiency vacuum blower. Extracted groundwater and vapors were piped to an air/water separator to separate the air and water streams. Groundwater was subsequently treated using activated carbon to remove the CVOCs. The air stream was vented to the atmosphere and the treated water was discharged to a permitted Outfall #001 located on the western portion of the facility. The system was started in July 1996 and operated until August 28, 2008, when it was shut down to facilitate construction of the enhanced groundwater extraction and treatment system.

DPE System (2008-Present)

Beginning in September 2008, the system was upgraded and modified as an IRM. The groundwater extraction system consisted of 10 extraction wells, including four new B-zone wells (EW-4-25B, EW-5-25B, EW-7-25B, and EW-10-25B), modifications of three existing extraction wells (EW-2-62C, EW-3-60C, and EW-6-60C; formerly EW-1, EW-2, and EW-3, respectively), and converting three existing borings (EW-1-62C, EW-8-62C, EW-9-86C) to extraction wells. In the system 9 wells were aligned in a north-south direction downgradient of and below the FWR to the west and 1 well was immediately south of the FWR (EW-9-86C). Four DPE wells (EW-4-25B, EW-5-25B, EW-7-25B, and EW-10-25B) were installed in the highly fractured B hydrogeologic zone and the upper C zone. The remaining six DPE wells (EW-1-62C, EW-2-62C, EW-3-60C, EW-6-60C, EW-8-62C, and EW-9-86C) were installed in the C hydrogeologic zone primarily to intercept and contain impacted groundwater in the lower portion of the C hydrogeologic zone.

New treatment equipment was installed for treating aqueous and vapor phase streams extracted from the wells, along with a new treatment building to house the equipment. Groundwater was removed from extraction wells using submersible, pneumatic pumps and vapors were extracted from well heads using a positive displacement rotary lobe blower. Extracted groundwater and vapors were piped to an air/water separator to separate the air and water streams. Following bag filtration, groundwater was subsequently treated using an air stripper and activated carbon to remove CVOCs. Extracted vapors including those recovered from the air stripper effluent vapor stream, were treated with activated carbon to remove CVOCs. The air stream was vented to the atmosphere and the treated water was discharged to a permitted Outfall #001.

DPE System Modifications (2015)

Following the 2009 ROD Amendment (NYSDEC. 2009), several additional investigations were completed in OU-1. The findings indicated that the highest concentrations of CVOCs in groundwater occurred within two bedding plane fractures underlying the reservoir at 550 and 544 feet amsl. These bedding plane fractures, as well as a deeper bedding plane fracture at 515 feet amsl, were identified as the primary migration pathways for affected groundwater. The pre-2009 system largely addressed these same intervals. The DPE system was subsequently modified and enhanced to include 12 extraction points in

June 2015 (WSP USA. 2009). EW-9R-72C (replaced EW-9-86C), EW-11-43C, and EW-12-45C were installed to intercept groundwater in one or more of these fracture zones in the immediate vicinity of the FWR.

5.3 CURRENT SYSTEM CONFIGURATION

The current System consists of 12 DPE wells. Nine DPE wells are aligned in a north-south direction downgradient of, and below, the FWR to the west, two wells are immediately south of the FWR, and one well is located to the east of the FWR. Four DPE wells (EW-4-25B, EW-5-25B, EW-7-25B, and EW-10-25B) are installed in the highly fractured B-hydrogeologic zone (B zone) and the upper C zone. Six DPE wells (EW-1-62C, EW-2-62C, EW-3-60C, EW-6-60C, EW-8-62C, and EW-9-86C) are installed in the C zone primarily to intercept and contain impacted groundwater in the lower portion of the C zone. Extraction wells EW-9R-72C (replaced EW-9-86C), EW-11-43C, and EW-12-45C were installed to intercept groundwater in one or more specific fracture zones identified in the immediate vicinity of the FWR (515, 544, or 550 feet amsl).

The DPE wells are connected by a piping network including compressed air supply to the well pumps, soil vapor extraction (SVE), and groundwater conveyance piping which extends to a building housing the treatment equipment. The treatment system equipment consists of an air compressor, equalization tank, bag filtration units, air stripper, SVE vacuum blower, SVE air-water separator, liquid- and vapor-phase carbon units, and a programmable logic controller.

Groundwater is pumped from the extraction wells into a 1,000-gallon polyethylene equalization tank, which is intended to equalize the influent flows and minimize downstream cycling of system components. The bag filter feed pump, controlled by the equalization tank level, discharges water from the equalization tank through the bag filter system, and into the air stripper. Under the current operations, the bag filter feed pump processes water in approximate 850-gallon batches, at a flow rate of approximately 6 gallons per minute (gpm). A low-profile, shallow-tray air stripper unit, is used to remove liquid-phase CVOCs from the groundwater stream as it passes through the trays to the sump below (integral to the unit). The air stripper is equipped with a sump pump which discharges water from the air stripper sump, through the liquid-phase granular activated carbon (GAC) units, and to the outfall (Outfall 001) in a single step. The air stream from the stripper is discharged to the vapor-phase GAC units, which eventually discharges through the building stack to the atmosphere.

Soil vapor is drawn from the DPE wells through a 120-gallon air/water separator, using a positive displacement rotary lobe blower. The blower is equipped with a discharge silencer which reduces the noise coming from the discharge stack. Separated liquids that accumulate in the air/water separator are batch-pumped back to the equalization tank for aqueous treatment. The combined vapor stream (from the vacuum blower and the air stripper) is treated by two 1,000-pound vapor-phase GAC vessels in series before discharge to the atmosphere through the discharge stack.

5.4 AOC 1 EXPANSION DESIGN AND MODIFICATIONS TO DPE SYSTEM

The objectives of the proposed expansion of the system as detailed in the Feasibility Study is to limit further migration via hydraulic management and further reduce toxicity and volume of CVOCs through mass removal in AOC 1. Additionally, modifications to the System will enhance its reliability and allow for improved ease of operation and maintenance (O&M). Appendix A includes the full set of design drawings, including the proposed extraction wells and piping network on Sheet 2. Appendix B includes design discussions related to the capacity of the existing system and the impact of the additional water and liquid and vapor phase contaminant mass. Additional information on the operation of the system can be found in the Operation and Maintenance Plan (WSP USA. 2022c). The elements of the proposed expansion and enhancements are described below.

5.4.1 DESIGN CONSIDERATIONS – EXTRACTION WELL YIELD AND TOTAL SYSTEM FLOW EVALUATION

There are several design parameters involving extraction well yield and total system flow capacity that have been evaluated to determine the effect of the addition of two new wells to the existing DPE treatment system. The areas that have been evaluated in Appendix B, Table 1 include:

- compressor and the compressed air supply piping and capacity;
- groundwater force main capacity;
- groundwater treatment equipment;
- vacuum system capacity; and
- well vaults.

For compressor and groundwater conveyance capacity evaluation, the calculations included in Appendix B are based on startup conditions where all of the wells have recovered to static levels. For both parameters, the design is expected to satisfy anticipated capacity. For groundwater force main capacity, a head loss of 70 feet or 30 pounds per square inch (psi) is anticipated. This head loss (pressure drop) is considered acceptable and the short duration high flow is not a significant operational issue for the groundwater force main. Under normal startup, shallow wells and wells that are in close proximity to the DPE equipment building would see lower back pressure and would simply dewater sooner than the deeper and more distant wells.

TREATMENT SYSTEM

For the 12-month period between December 2021 and December 2022 when the system was operating, the normal steady state water flow rate through the groundwater treatment system was approximately 0.44 gpm. Based on 850-gallon volume batch treatment, the system is conservatively designed and will easily manage the additional flows from the two proposed DPE wells. Average flow rates for system specific processes include: 4 gpm through the bag filters, 6.7 gpm through the air stripper, and 11.7 gpm through the liquid carbon.

Chemical concentration of the influent air and water streams can be an important treatment consideration, as higher concentrations generally require higher retention time in the air stripper and carbon canisters for proper treatment. Aqueous and vapor phase sampling results from the most recent three-year period (2020-2022) for CVOCs in DPE System wells, including new extraction wells EW-13 and EW-14, are presented in Tables 2 and 3 and performance sampling of aqueous and vapor phases influent, midstream, and effluent are present in Appendix B, Tables 4 and 5. Appendix B, Table 8 includes CVOC trend monitoring graphs (i.e., micromoles versus time) that present groundwater results from current conditions to prior to implementation of the DPE system. The concentrations are within the range of the current treatment system influent.

Contaminant mass flow rate through the treatment system (combined groundwater and soil vapor) is also an important treatment consideration, as higher mass flow may cause excessive carbon changes, periodic breakthrough, and possible outfall or air discharge exceedances. The current state aqueous and vapor phase loading based on the most recent three-year average (2020-2022) is presented in Appendix B, Table 7. Table 7 also summarizes anticipated aqueous loading from the addition of two new wells. As vapor phase sampling has not yet been performed on EW-13 and EW-14, anticipated loading from these wells is difficult to ascertain. Based on comparative groundwater VOC concentrations, these wells are likely to contribute less than a 5 percent (%) increase in additional vapor loading. Anticipated aqueous and vapor mass flow rates are not anticipated to exceed initial 2008 design rate (approximately 3 pounds per day cumulative CVOCs), therefore the DPE System will manage additional contaminant mass.

VACUUM SYSTEM CAPACITY

There are several locations where makeup air may be added to the DPE system to ensure that the blower continues to operate at optimum vacuum and air flow (minimizes blower temperature and extends the blower operational life). However, since the make-up air is not metered, an exact measurement of the flow from the DPE wells versus the make-up flow is not possible. Rather, DPE well vacuum force is measured at each individual DPE well head, ensuring that vacuum is being applied to the wells at the design level.

The current SVE blower was selected based on the design requirements to provide a maximum of 10 inches mercury (in. Hg) vacuum which based on 2008 B-zone pilot testing, would produce an air flow rate of 30 scfm from each well. Well vacuum is the primary design constraint and was limited to 10 in. Hg to minimize the potential for groundwater mounding in the well. As designed, the vacuum forces measured at each DPE well typically range between 5 and 20 in. Hg. Vacuum gauges will be installed in the new DPE well vaults to ensure that vacuum ranges are similar.

Based on manufacturer's data, the current rotary lobe blower is capable of producing 450 scfm at an applied vacuum of 14 in. Hg. This data indicates that the blower has adequate capacity to accommodate the addition of the two new DPE wells.

WELL VAULTS

Due to the likelihood of heavy traffic during both redevelopment and post-development of the property in AOC 1, each of the proposed well vault lids will be suitable for incidental AASHTO H20 highway loading. The proposed vaults are larger than the existing vaults to facilitate O&M tasks.

5.4.2 AOC 1 EXTRACTION WELLS

The DPE System expansion design will utilize two new, open-hole bedrock extraction wells, EW-13 and EW-14, which were installed in November 2022. In preparation for drilling activities, a 3-foot by 3-foot section of the asphalt cover was removed at each location in AOC 1, the geosynthetic clay liner was exposed by hand at both locations and "pulled back" to allow for drilling without damage to the liner. Both wells were completed with 4-inch outer well casings installed to maximum depths of 20 feet bgs to seal off the unconsolidated materials from shallow bedrock.

Bedrock cores were collected from below the casings to maximum depths of 40 feet bgs. The cores were used to identify the presence and depths of bedding planes and fractures which may be indicative of similar features observed in nearby monitoring wells. EW-13 was installed in proximity to former monitoring well MW-10B, in which elevated CVOC concentrations were historically reported. EW-14 was installed northwest of this location in an area where a near-vertical fracture was previously encountered between 20 and 40 feet bgs. As noted in the Dye Tracer Study Report dated December 28, 2020 (WSP USA. 2022d), this fracture is believed to convey CVOCs from the AOC 1 area to the seeps found behind the Weir Box during implementation of the soil IRM in OU-1.

The boreholes for EW-13 and EW-14 were advanced to depths of approximately 40 feet bgs and reamed out to permit construction of the wells using 4-inch diameter stainless steel with 15-foot lengths of screen and appropriate lengths of riser pipe. The geosynthetic clay liner was repaired in accordance with the ISMP. The wells were completed with flush mount well covers equipped with a lockable watertight cap. Around the annulus of the flush mount cover, a 3-foot by 3-foot concrete pad was poured to replace the 3-foot by 3-foot cut out section. Boring logs for extraction wells EW-13 and EW-14 can be found in Appendix C.

5.4.3 AOC 1 EXPANSION WELL VAULTS, PIPING, AND PUMPING EQUIPMENT

The anticipated limits of trenching and soil excavation are shown in Appendix A, Sheet 2. Soils in these areas will be excavated and managed to facilitate the installation of conveyance piping, well vaults, and in vault equipment. Intrusive work conducted within the AOC 1 cap and cover system will be performed in accordance with the Excavation Work Plan (EWP) (Appendix D).

Underground utility lines (water, electric, gas, and sewer) are known to be present within the planned excavation/trenching areas (Appendix A, Sheet 2). Dig Safely New York, New York's one-call system, will be contacted at least three days before starting work to mark all public utilities at the Site. A private utility locator will also be contracted to locate and mark all utilities within the proposed work areas. Utility lines within the work areas may be temporarily de-energized, drained, or removed during excavation work, then restored in kind following completion of the work. Identified utilities that are outside the proposed remediation areas and all overhead utilities will be protected throughout the work.

As necessary, asphalt pavement for the access roadway in these areas will be removed to access soils beneath. Pavements to be removed will be saw-cut to produce smooth edges. Care will be taken to note the locations of marked utilities before the pavements are removed. Utility locations will be repainted after pavement removal. After saw-cutting, pavements will be broken up using hydraulic hammers, then removed using conventional earthmoving equipment and stockpiled pending proper characterization and recycling or disposal. Pavements to be restored will be replaced in kind.

All soil will be excavated using conventional earthmoving equipment including hydraulic excavators and skidsteer equipment. Excavated soil, based on location and field screening, will be either staged in temporary stockpiles on a 10-mil layer of polyethylene sheeting or placed into lined roll-off containers for offsite disposal. Any outdoor staging area where stockpiles are present will be bermed to prevent precipitation runoff and the stockpiles covered with polyethylene sheeting during precipitation events and at the end of each workday. Polyethylene covers shall be draped over the berms to prevent precipitation accumulation within the staging area. Before beginning excavation, WSP may petition the NYSDEC for a Contained-In Determination under Technical and Administrative Guidance Memorandum TAGM 3028 to allow spoils, both inside and out of AOC 1, to be managed as a non-hazardous waste.

Once intrusive work has been completed, each new well (EW-13 and EW-14) and existing junction box will be fitted with a 48-inch x 48-inch x 48-inch H-20 traffic-rated, pre-cast concrete vault, installed flush with the existing surface and equipped with a water-tight, securable, gas spring-hinged steel lid. Each vault will be placed on a gravel layer. The lid will be unlocked and opened using a Roadbox Wrench/Handle Combo supplied by Global Drilling Suppliers in Cincinnati, Ohio. Each vault lid will be numbered in the lower right corner of each hinged lid for identification purposes. The existing, 36-inch by 24-inch by 24-inch deep junction box which ties together the lower and upper wellfields will be demolished, and a new junction box will be installed. Connections will be made inside the new junction box to add the new wells to the existing system. Appropriate adapters for PVC to high density polyethylene (HDPE) and nylon-12 to HDPE will be made inside the junction box to establish air, water, vapor, and electric tie-ins to the new AOC 1 expansion wellfield. To the extent practical Sika® WT-200P or similar water resisting and crystalline waterproofing concrete admixture will be used to seal vault penetrations and/or patch concrete around the extraction well vaults. This concrete is specifically design for self-healing abilities. If cracks form in the concrete used to seal penetrations or small patches, the concrete will self-heal, closing the cracks.

Piping for conveying water and compressed air will be run through a 6-inch diameter SDR 13.5 HDPE containment pipe with butt-fused joints installed underground running between the vaults. The existing PVC containment pipe will be cut at the existing junction box, fitted with a PVC to HDPE transition, and extended to the new well locations. The piping will enter the side of the vaults via holes cut into the vault's pre-cast concrete. The replacement conveyance piping between EW-8-62C, EW-11-43C, and EW-14 consists of 1.25-inch diameter SDR 11 HDPE pipe for groundwater and 1-inch diameter Duratec™ aluminum composite for compressed air piping without the use of underground fittings. If the existing groundwater force main and compressed air conveyance lines shrink during disassembly and tie-in, these lines will be removed back to either EW-8-62C or EW-11-43C, and replaced with new materials without using underground fittings if tie-ins cannot be established with the existing lengths of piping. The containment pipe will run in series to EW-14 followed by EW-13. Pipe dimensions and trench locations will be constructed as shown on the drawings in Appendix A. Field changes may be made to piping routes based on site conditions such as unanticipated active utilities or foundations remaining from the demolish of Buildings 20 and 25.

Conveyance piping will be installed within 24- to 36-inch wide trenches excavated to approximately 52 inches bgs and smoothly transitioned to each subgrade vault. Excavated materials will be sampled and analyzed in accordance with Section F-7 of the EWP before reuse onsite as backfill. If the excavated materials are not suitable for reuse, the soils will be characterized for offsite disposal. Imported fill, other that virgin aggregate from a quarry, shall be sampled and managed in accordance with Section F-10 of the EWP. Any groundwater that accumulates within the pipe trenches shall be sampled and evaluated for DPE system compatibility before being treated by the system or otherwise managed as described in Section F-8 of the EWP.

The trenches will be backfilled with a minimum of 2 inches of pipe bedding material surrounding the pipes on all sides (i.e., clean sand material, etc.). The remainder of the trench will then be backfilled with excavated materials in 6-inch lifts and compacted as shown on the drawings (Appendix A, Sheet 8). Pipe bedding material and native soil will be compacted to achieve 95% of the maximum dry density and within 5% (plus or minus) the optimal moisture content, based on a proctor compaction test. A 4-inch layer of larger gradation, free-draining aggregate will be placed beneath each well vault to allow for water to drain from each well's weephole. All conveyance piping (groundwater force main and compressed air tubing) will be pressure tested in accordance with manufacturer's instructions following installation. The 6-inch diameter containment pipe will be carefully inspected during installation and will not be subject to pressure testing.

Existing underground vapor conveyance piping from EW-8-62C to EW-11-43C is 2-inch diameter, SDR 11 HDPE piping. This HDPE pipe will be extended to each of the new wells (using butt fused joints), and will transition to 316 grade stainless steel once entering each vault. Inside the vault, the vapor conveyance pipe will transition to stainless steel and connect directly to the well casing via a 4-diameter 316 grade stainless steel saddle clamp. Valves, fittings, and saddle connections will be installed on the vapor conveyance piping as shown on the drawings (Appendix A, Sheets 7 and 8). All clamps, valves, fittings, connections, wetted parts of the vacuum gauge shall be 316 grade stainless steel.

The water conveyance header will transition from 1.25-inch diameter SDR 11 HDPE to 1-inch 316 grade stainless steel pipe, using a threaded transition, once inside EW-13 and EW-14 vaults. Within each vault, a check valve, ball valve, sample port, pressure gauge, and reducer with quick connect will be installed on the groundwater force main. An isolation valve, pressure indicator with regulator, and cycle counter will be installed within each vault for isolation, control, and monitoring purposes. All clamps, valves, fittings, connections, sample ports, wetted parts of the pressure gauge shall be 316 grade stainless steel. All newly installed piping and tubing will undergo hydrostatic pressure testing prior to placement of final backfill. Testing

will include fittings, valves, and instruments (with the exception of the well head fittings) and the medium, pressure, and duration will be in accordance with manufacturer's instructions, as approved by the WSP onsite engineer.

Self-regulated, 220V heat trace tracing (Emerson® Appleton Group® Nelson™ LT25-J or similar) will also be extended from the existing junction box location to the two new well vaults to protect against freezing during winter months. Heat tracing will be attached according to manufacturer's specifications to piping and fittings in each vault. Heat tracing at EW-13 termination shall feature an end-of circuit indicating light assembly utilizing a low temperature LED lamp.

Stainless steel 2-inch diameter, bottom inlet, short pneumatic pumps manufactured by QED Environmental Systems (Model Short-AP2B) and stainless steel fittings will be installed in each of the new DPE wells. The down-well water discharge tubing will be 5/8-inch diameter HDPE, the air supply tubing will be 3/8-inch diameter HDPE, and the air exhaust line will be 1/2-inch diameter HDPE tubing. To allow for ease of maintenance, locking cam-lok fittings will be installed for water conveyance and quick disconnect air fittings on the drop tube assembly. The cam-lok and air fittings will be 316 grade stainless steel. Each new vault will be equipped with a QED™ Auto-Pump Air Powered Data Module (Model 303117) mounted inside each extraction well vault. A QED™ well cap will be installed to allow the appropriate data module to be connected to the pump and conveyance piping. The exhaust line will be vented inside the casing at each location. All of the down well equipment is expected to be provided by the pump manufacturer (QED) and completely compatible with the pump operation. The bottom of each pump will be positioned approximately 1 foot off the base of each well to minimize suspended solids and sediments from entering the pump intake. Stainless steel, vacuum-rated well caps will be provided by the pump manufacturer to fit the well casing and adapt to the 5/8-inch diameter groundwater tube, the 3/8-inch diameter compressed air tube, and a third 1-inch port for instrumentation and monitoring.

Following installation, the cap layers within the limits of AOC 1 will be restored to the preexisting conditions including the demarcation barrier, NYSDOT Item 4 backfill, GCL, aggregate base course and 6 inches of asphalt (see Section 6.5.3 for additional details). The elevation and location of the ground surface at each corner of the new well vaults, as well as the top of the well casing at each location will be surveyed by a New York State-licensed land surveyor. The horizontal locations will be determined to the nearest +/- 0.1 foot and the elevations to the nearest +/- 0.01-foot. All survey data will be referenced to the state plane coordinate system and tied into the existing base map for the site.

5.4.4 MODIFICATIONS TO EXISTING CONVEYANCE AND TREATMENT EQUIPMENT

FLOOR SUMP AND PUMP

The DPE System building is equipped with a secondary containment area and a building floor sump with a high-level alarm. Currently, there is a building floor sump pump that is not integrated with the control panel, therefore it is not known if the sump pump is being used. The current sump pump will be replaced with a K2® (SPS05004TPK) 1/2 HP Sump Pump or similar stainless-steel pump. The sump pump will be plumbed (Schedule 80 PVC pipe) with a Schedule 80 PVC serviceable check valve and discharged to the equalization tank for treatment; therefore, all sump water will be treated through the DPE System. The sump pump will be equipped with high and low-level switches for automatic pump operation, and a manual override switch to turn the pump on (located at the control panel). The sump pump will be integrated with the control panel to show the status (i.e., on or off) of the pump operation and runtime hours.

CONTROL PANEL UPGRADES

In an effort to improve operation efficiency, several modifications will be made to the DPE System control panel. These changes include:

- Currently, the air compressor is integrated into every system alarm. If any DPE System alarm activates then the air compressor shuts down, requiring a manual restart of the DPE System. This lock will be modified, to allow remote restart of the air compressor.
- The DPE System control panel alarms will be upgraded so that the DPE System does not require user input to acknowledge a logic control alarm in order for the System to resume function. Once the alarm condition is no longer active, the alarm automatically clears and the System restarts if all switches are in the AUTO position. The "Alarm Reset" is for resetting other types of alarms that don't automatically reset (i.e., transfer pump motor fault). The DPE System remote restart locks will be removed allowing the DPE System to be restarted remotely. If active alarms are still present (i.e., equalization tank is completely full, floor sump is full, etc.), then the DPE System will not operate requiring a manual restart.

- Currently the air stripper blower operates regardless of flow, the control panel will be modified so that the blower turns on before the equalization tank transfer pump (P-211) and the blower turns off 10 minutes after P 211 turns off. The blower during time after the P-211 pump turns off will be user changeable on the HMI screen.
- The DPE System ventilation will be upgraded using an Emerson® Seni-ST75W Smart Thermostat which will be integrated into the building heaters and exhaust fan.
- A heat trace sub-panel will be installed next to the control panel, and the current heat trace circuits will be moved from the control panel to the new sub-panel. This move will allow for easier and safer operation of the heat trace controls.

TREATMENT PROCESS UPGRADES

Due to the age and need for many repairs associated with the piping within the DPE System treatment building, the interconnecting piping will be replaced between the equalization tank and carbon vessels. The interconnecting piping is currently low to the floor and susceptible to damage from routine O&M activities. Piping from the equalization tank to the bag filters, from the bag filters to the air stripper, and discharge air stripper piping will be replaced with 316 grade stainless steel. In addition, the ball valves, check valves, gate valves, wye strainers will be replaced. All piping, valves, strainers, will be replaced with 316 grade stainless steel.

Specifically, as shown on Sheet 5A (Appendix A), the following upgrades will be completed:

- 2-inch PVC pipe between T-211 and PF-221/PF-224 will be replaced with 2-inch 316 grade stainless steel.
- 2-inch PVC pipe between PF-223/PF-226 and AS-601 will be replaced with 2-inch 316 grade stainless steel.
- 2-inch/1-inch PVC pipe between AS-601 and FI/FT-601 will be replaced with 2-inch 316 grade stainless steel.
- A pipe manifold will be installed above the carbon units to allow for quick carbon vessel, lead-lag reconfiguration. The pipe manifold will include an influent, effluent, and between carbon vessel connection. The intention of the manifold is to reduce stress on the hose connections, reducing the likelihood of leaks.
- 1-inch T509OE – 240 psi, Alfachem® ultra-high-molecular-weight polyethylene (UHMWPE) or similar grade hose between FI/FT-601 and FI-602 (using 316 grade stainless steel locking cam-lok connections).
- Ball valves BV-611 and BV-612 (to be renamed BV-613) will be replaced with 1-inch stainless steel, two additional ball valves, BV-612 and BV-614, will be added on each side of these ball valves.
- Ball valves BV-211, BV-221, BV-223, and BV-601 will be replaced with 2-inch stainless steel valve.
- Wye Strainer WS-211 and WS-601 will be replaced with 2-inch stainless steel strainer.
- Check valve CV-211 will be replaced with 2-inch stainless steel valve.
- Check valve CV-602 will be replaced with 1-inch stainless steel valve.
- Check valve CV-603 will be added after the discharge flow meter and CV-604 will be added after the sump pump.
- Gate Valve GV-211 will be replaced with 2-inch stainless steel valve.
- Gate Valve GV-602 will be replaced with a 1-inch stainless steel valve.
- All new flow control valves will be equipped with a lock-out device to ensure the valves are not adjusted once the DPE system flow rate is balanced.
- Pressure indicator PI-222, PI-223, PI-224, PI-225, PI-611, and PI-612 will be replaced with wetted parts 316 grade stainless steel.
- BV-601 will be replaced with a 2-inch gate valve (GV-601), immediately before the air stripper (placed approximately 6-inch above the air stripper).
- Pressure indicators PI/PT-100, PI/PT-100, PI-211, PI-221, PI-226, PI-603, PT-601 will be replaced with Emerson® Rosemount™ 2088 pressure transmitters and integrated with the control panel for remote viewing. Remote readout of these pressures will allow for more frequent visual operation of the DPE System which should decrease DPE System downtime due to fouling of the bag filters, air stripper, and carbon units.
- Flow indicator/flow transmitter FI/FT-201 will be replaced with an ERDCO® Armor-Flo™ 3600 flow transmitter in place of the existing, inoperable Armor-Flo™ 3600 to allow for accurate, remote measurement of vapor-phase flow through the treatment system.
- Flow indicators/flow transmitters FI/FT-221 (2-inch) and FI/FT-601 (1-inch) will be replaced with Georg Fischer Signet 2580 FlowtraMag Meters. The flow indicators/transmitters will be installed to allow for upstream and downstream uninterrupted pipe flow. The flow device will be placed in a horizontal stretch of piping, before a vertical rise in pipe to

ensure full pipe flow. Each magnetic flowmeter incorporates partially filled pipe detection to account for partially filled piping, stagnant water, or water splattering. The transmitters will be integrated into the control panel for remote discharge flow rate and total flow viewing.

- Flow indicator FI-602 will be replaced with a flow indicator/transmitter (Emerson® Rosemount® 8750W Magnetic Flowmeter) and integrated with the control panel for remote discharge flow rate and total flow viewing.
- An air vacuum/pressure release valve will be placed after the FI/FT-602. The pressure release valve will be a 1-inch VAL-MATIC® VM-300-S or similar valve. This valve will reduce the siphoning of water from the air stripper sump to the discharge location.
- A new pressure indicator/transmitter (Emerson® Rosemount™ 2088) will be installed on the current air compressor tank (PI-100 location) to remotely view the air compressor tank pressure. Pressure indicator/transmitter PI/PT-101 will be replaced with an Emerson® Rosemount™ 2088 to remotely view the well field pressure.
- The air compressor solenoid valve will be replaced with an Emerson® ASCO® RedHat™ (8210G007) Solenoid Valve.
- The equalization tank transfer pump (P-211) will be upgraded to an Ebara 2 HP 2CDX Model: 2CDXU70/206T2.
- The air stripper sump pump (P-601) will be upgraded to an Ebara 2 HP 2CDX Model: 2CDXU70/206T2 (inlet 1-1/4" and outlet 1").

TREATMENT SYSTEM BUILDING

After the piping and ancillary components are installed, the floor and sump of the treatment building will be cleaned using biodegradable Simple Green® and a pressure washer. After sufficient drying, the floor and sump will be coated with a Sherman Williams® flooring system that includes Steel-Seam FT910 crack repair (as needed), Armorseal® 33, and Armorseal® 1000 HS. The existing equipment and skids will remain in place during cleaning and coating.

5.5 STARTUP AND OPERATION

The DPE system will be restarted in accordance with the Operation and Maintenance Plan (WSP USA. 2022c). Each of the new DPE wells will be brought on-line by applying compressed air and system vacuum.

The pressure regulator within each of the new well vaults will be set to provide pressure to each pump according to the manufacturer's specifications. Pressure indicators within the newly installed well vaults will be monitored continuously for several minutes to ensure proper air delivery and water discharge. Groundwater flow will be confirmed by observing the air line's cycle counter. Once the wells have reached full drawdown, vacuum will be applied by opening the isolation valves (one in each well vault). Operation of vacuum gauges will be verified as functional during this process, and initial vacuum readings will be recorded. If necessary, the isolation valves will be used to balance flow and vacuum throughout the system.

With both the groundwater and vapor extraction systems operating, the total groundwater extraction rate will be estimated by monitoring the flow totalizer located downstream of the aqueous phase carbon units. This flow rate, together with system analytical data, will be compared against previous monitoring events to determine the increase flow provided by the two new DPE wells.

Upon completion of startup activities, the O&M Plan for the system operation will be revised to include the upgrades and expansion of the DPE system.

5.6 WORKER AND COMMUNITY HEALTH AND SAFETY

5.6.1 HEALTH AND SAFETY PLAN

WSP has prepared a site-specific Health and Safety Plan (HASP), in compliance with 29 Code of Federal Regulations (CFR) 1910.120, the Hazardous Waste Operations and Emergency Response regulations. All subcontractors will be required to prepare and adhere to their own HASP that is substantially consistent with WSP's HASP and is commensurate with the work and activities that will be completed. WSP's site-specific HASP is included as Appendix E.

The primary anticipated hazards include potential worker and public exposure to construction hazards and potential chemical exposure. Worker and public safety hazards will include those typically found at a construction site using heavy equipment. Potential chemical exposures are anticipated to derive from inhalation of VOC vapors and direct dermal contact with soil containing CVOCs and semi-volatile organic compounds (SVOCs). The following engineering controls will be established to minimize these exposures:

- Excavations shall be created and maintained in accordance with the Occupational Safety and Health Administration's (OSHA's) excavation safety regulations (29 CFR 1926.650-652).
- The excavation spoils will be stockpiled on polyethylene tarps and covered to minimize the volatilization of chemicals and rainfall runoff.
- Any ground intrusive work conducted within a cap or cover system at the site, such as in AOC 1, will be performed in accordance with the EWP provided as Appendix D. NYSDEC and NYSDOH will be notified a minimum of 15 prior to the anticipated encounter with remaining contamination or breach of the AOC 1 cap system per subsection F-1 of the EWP.
- Continuous air monitoring will be conducted while work is being performed to reliably measure CVOCs and other airborne contaminants to delineate areas where respiratory protection is required, and to verify that control measures are adequate.
- Work zones will be established, including exclusion zones, contaminant reduction zones, and support zones, and workers will wear personal protective equipment as specified in the HASP.

A copy of WSP's HASP will be made available at the Site during the conduct of all activities to which it is applicable.

5.6.2 COMMUNITY AIR MONITORING PLAN

WSP has prepared a site-specific CAMP, in accordance with DER-10 and the ISMP, for the proposed work outlined in this RA Work Plan. The CAMP identifies measures and/or actions to ensure that the public living and working near the Site as well as employees or visitors to any facility located on the Site are protected from exposure to site contaminants during intrusive activities. In general, the CAMP requires for the following air monitoring programs to be implemented:

- VOC Air Monitoring: A photoionization detector (PID) will be used for periodic monitoring of total VOCs on the upwind (background) and downwind sides of the work area.
- Particulate Air Monitoring: Particulate monitoring will be performed using a TSI DustTrak™ II (or equivalent) direct sensing, real-time monitor (or equivalent), with data logging capabilities.

The Site-specific CAMP is included in Appendix F.

5.6.3 ENGINEERING CONTROLS – AOC 1 CAP

Exposure to remaining contamination at the site is prevented by a cover and cap system placed over soil/fill materials with COC concentrations above applicable SCOs. A low-permeability cap was installed in AOC 1 where soil remained at concentrations above the protection of groundwater SCO for CVOCs after excavation to a depth of 3.5 feet. The cap was designed to minimize infiltration and potential migration of CVOCs in deeper soils that could not be safely excavated during the Soil IRM activities due to the presence of active utilities (water, gas, electric, and storm/sanitary sewers). Following completion of excavation and sampling, a demarcation layer (Propex Geosolutions GEOTEX® 401) was installed across the base of the excavation in AOC 1 at a depth of 3.5 feet bgs. The excavation was backfilled with imported backfill (NYSDOT Item 4 gravel) that was placed and compacted to a depth of 1 foot bgs, followed by installation of a low-permeability cap consisting of a GCL (Cetco® BENTOMAT ST®), 6 inches of aggregate base, and a 6-inch thickness of asphalt pavement. The asphalt consisted of 4 inches of asphalt base course and 2 inches of asphalt wearing course separated by a geotextile interlay (Propex Geosolutions Petromat® 4598) to minimize the potential for cracking.

5.7 WSP FUTURE READY®

NYSDEC's DER-31 Green Remediation requires that green remediation concepts and techniques be considered during all stages of the remedial program including site management, with the goal of improving the sustainability of the cleanup and

summarizing the net environmental benefit of any implemented green technology. As stated in the guidance, DER is not requiring that the green remediation documentation conforms to a particular format at this time. Therefore, WSP used its internal Future Ready™ screening and documentation approach.

Future Ready® is WSP's approach to thinking beyond the conventional so that we can design and deliver projects that are ready for the changes and challenges our world will face in the future. By understanding future trends, we can develop solutions to protect our client's interests, future-proof the work we do and positively impact the communities in which we live and work.

As part of this evaluation, WSP analyzed future trends across broad categories that include climate, society, technology, and resources. In total, the WSP Future Ready® matrix evaluated a total of 73 trends and identified 21 potential trends that may apply to this scope of work. The trends were further reduced to only include the major (5 trends identified) and moderate (3 trends identified) trends. The major and moderate trends that impact this project and how WSP designed for the trends include:

MAJOR

- Climate Change – Chronic Hazards - Extreme Temperatures - Extreme cold temperatures may also increase due to climate-induced disruptions in the jetstream. This design includes ensuring water conveyance piping is properly buried and heat trace is utilized to prevent conveyance pipe freezing.
- Society – Economy - Automation - Automation in jobs and processes will increase worker productivity, allowing better work products with a smaller workforce. This design includes modifications to the control panel to make the DPE System more automatic reducing the frequency of DPE System shutdowns and reducing onsite O&M.
- Resources – Materials - Supply Chain - Supply chains have become complex and interconnected throughout the world with many individual steps in many supply chains centralized to one or a few manufacturers. Natural disasters, conflicts, and political disruption to individual regions and countries will have a greater impact on global supply chains. During the design phase, WSP evaluated the type and availability of equipment selected to reduce supply chain issues.
- Resources – Materials - Modular Design and Adaptive Reuse - Modular design will allow for structures to be reconfigured as needs change. To reduce resource consumption and greenhouse gas emissions, existing buildings will need to be adapted to new uses rather than completely rebuilt. The DPE System is laid out using equipment on skids, allowing the reconfiguration of each skid and equipment to be reused if a change in the treatment process is required.
- Resources – Nature – Groundwater Quality - Groundwater pollution is making the water unusable. The Remedial Action Objective of the DPE System is to restore the groundwater.

MODERATE

- Climate Change – Chronic Hazards – Precipitation Changes - Some regions of the U.S. are experiencing increased precipitation while others are experiencing less. In many instances, precipitation intensity factors are regularly exceeded by shifts in precipitation cycles. In addition, a greater proportion of precipitation will come in the form of rain vs snow. For this scope of work, WSP evaluated the current treatment capacity of the DPE System including the expanded extraction wells and ensured there was enough contingency capacity for the DPE System if precipitation rates increase the DPE System flow rate.
- Climate Change – Decarbonization – Low-Carbon Materials - Low-carbon materials will reduce the amount of embodied carbon in infrastructure. New ways of using concrete, recycled materials, or timber with lower embodied carbon require new types of tools and interdisciplinary expertise to plan, implement, and validate carbon impacts. During the design phase of the work, lower carbon materials were compared to higher carbon materials to ensure lower carbon materials and equipment were selected.
- Resources – Materials – Biomaterials - materials that are derived from, or produced by, biological organisms will be used in the built environment to reduce resource consumption and pollution. Examples include self-healing concrete, mycelium insulation, and products made from food waste. WSP included the usage of self-healing concrete to patch around the new extraction well vaults.

6 PROJECT SCHEDULE

With the recent approval of the Pre-Design Report for the Seeps on September 12, 2023, WSP anticipates combining the NAPL, AOC 1 Groundwater, and Seeps Remedial Actions into one construction mobilization beginning in the spring of 2025. To this end, WSP will design the seep rerouting remedy and prepare a RA Work Plan addendum during the fall of 2024. Request for Proposal preparation and bidding will be performed in the winter of 2025.

The estimated schedule for key tasks and deliverables is summarized below:

- RA Work Plan submittal (AOC 1 remedy) – October 2023
- Design and RA Work Plan Addendum submittal (Seeps remedy) – September 2024
- Bid specifications and Request for Proposal – February 2025
- Pre-bid site meeting, bidding, and contract award – March 2025 (site meeting is weather permitting)
- Pre-remediation planning – March 2025
- Implementation of remedial action activities – April to June 2025Final Engineering Report or Construction Completion Report submittal – Fall 2025
- Vapor Intrusion Mitigation and Monitoring – To be determined based on redevelopment schedule
- Quarterly NAPL monitoring and recovery (to be completed in accordance with the ISMP)
- Groundwater monitoring (to be completed in accordance with the ISMP)

7 REPORTING

Upon completion of the remediation activities, WSP will incorporate the remedial design implementation into a final engineering report or construction completion report, in accordance with the requirements of DER-10. The report will include, at a minimum, a detailed description of all remedial design implementation activities completed, tabulated analytical results and system testing results, well construction logs, and as-built drawings. The text of the report will describe the well installations, and civil and mechanical construction completed, and will highlight any field modifications made to the design contained in the approved RA Work Plan and addenda. The final engineering report or construction complete report will be prepared and submitted within 4 months after all remedial actions at the site have been completed.

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FIGURES

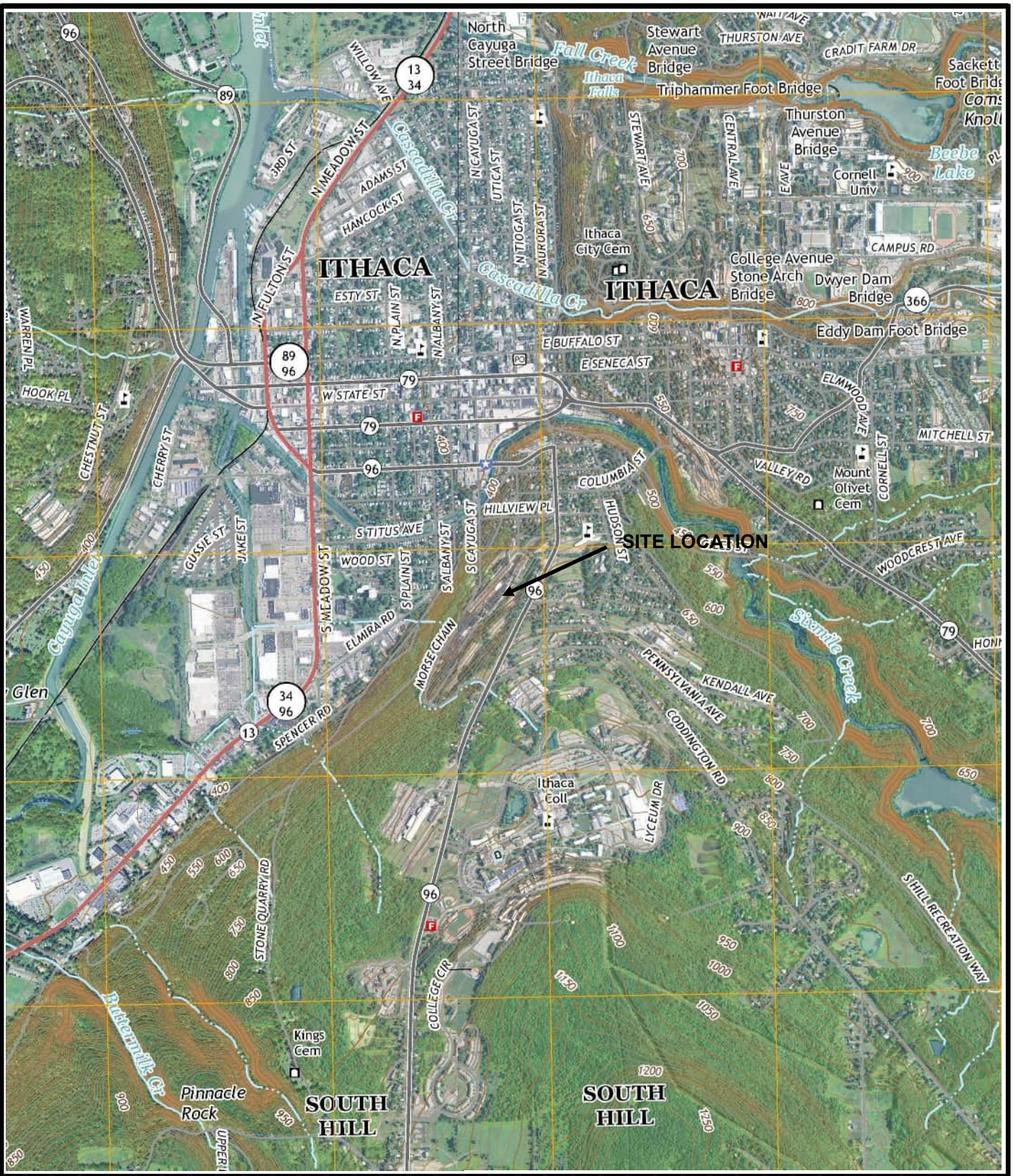
DWG Name: 314P1545.001_Figure 1-1_A01.pub

Checked:

Approved:

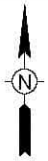
A

Drawn By: emk 03/14/19



REFERENCE:
7.5 MINUTE SERIES TOPOGRAPHIC QUADRANGLE
ITHACA EAST AND WEST, NEW YORK 2016
SCALE 1:24,000

QUADRANGLE LOCATION



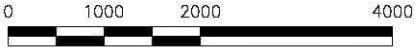


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FIGURE 1

SITE LOCATION

FORMER EMERSON POWER TRANSMISSION
ITHACA, NEW YORK
PREPARED FOR
EMERSON
ST. LOUIS, MISSOURI

E

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SITE LAYOUT

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FIGURE 2

Drawing Number
314P5608.001-E01

SEWER NETWORK 1

SEWER NETWORK 2

ABANDONED; FILLED WITH CONCRETE IN 2011

TRENCH 13A – CONCRETE–LINED TRENCH (TRENCH IS CAPPED WITH CONCRETE; MATERIAL REMOVED BY VACUUM IN 2017)

TRENCH 15 – CONCRETE–LINED TRENCH (STEEL PLATE REMOVED; POWER WASHED IN 2017)

13B

13A

14

15

16 HARDENING BUILDING

35

TUMBLERS

TUMBLER SYSTEM

FORMER FIRE WATER SUPPRESSION SYSTEM

MH-A1

MH-A20

MH-A2

MH-A3

MH-06

TP-1

TP-2

TP-3

TP-4

TP-5

TP-6

LBA-MW-18

LBA-MW-35

SUMP

MH-07

FD

TOILETS

ELEVATOR

SB-512

SB-514

SB-515

LBA-MW-15

RD

HOLE OBSERVED IN TOP OF LINE

FORMER OPEN CYANIDE DRAINAGE TRENCH

TRAP

TP-7

TP-9

MH-C1

MH-C3

MH-C2

(1) MH-B1

BASEMENT WATER ROOM

PVC PIPE IN FLOOR

LBA-MW-43S

LBA-MW-43N

SB-513

TP-10

MH-10

TP-8

MH-08

MANHOLE BELOW GRADE

DOWNWARD VERTICAL PIPE

(4)

COLLAPSED AT 1 FOOT

SB-524

LBA-MW-08

TP-18

LBA-MW-36

FIELD TILE BUTT JOINT

FIELD TILE LINED TUNNEL

MH-02

MH-04

MH-05

BASEMENT WALLS

MH-03

MH-A4

DOWNSPOUT TO TROUGH IN BLDG. 9

TP-11

MH-A5

MH-21

TP-12

TP-13

MH-22

MH-23

CONCRETE–LINED TUMBLER PITS FILLED WITH CONCRETE IN 2011

9

8

TP-15 &17

4" VCP

FORMER OPEN CYANIDE DRAINAGE TRENCH

LBA-MW-07

MH-26

TP-14

6" VCP (DISCONNECTED IN 1981)

WSP-MW-07C

WSP-MW-07B

TP-22

MH-A6

PLUGGED 1958

TRENCH DRAIN

RD

MH-C4

TP-16

DRAINS FROM BUILDING 15

MH-D1

WATER LINE

12" VCP OUTLET/INLET

4" ORANGBURG IN CONC.

CB

OW-01

OW-02

OW-03

OW-04

BLOCKED 1958

TUNNEL

TUNNEL

MH-24

MH-20

MH-19

MH-17

MH-16

MH-15

MH-B2

MH-02

FD

B5 WALL

B4 WALL

B1 WALL

LB-WB-1 WALL

B2 WALL

B3 WALL

B6 WALL

3

4

5

TP-19

TP-23

6" VCP (DISCONNECTED IN 1958)

MW-18B

CO2 LINE

6" BLACK PVC PIPE IN FLOOR

MW-17B

TP-20

8" TRANSITE

MH-40

MH-39

MH-37

MH-38

MH-B3

MH-35

WSP-MW-03B

TP-21

SGVP

CB

MW-13C

MW-9B

(5)

SRI-SN-01

MW-47A

(5)

MH-42A

MH-42B

SRI-SN-02

8" VCP

DISCONNECTED CIRCA 1943

(6)

SRI-SN-03

(7)

SRI-SN-03A

MW-8B

RW-24B

MW-05-25

MW-37B

MW-14C

MW-36B

MW-7B

MW-11B

RETAINING WALL

LBA-MW-39

MH-53

(FROM WASHRO

LBA-MW-26

MW-15-40

SRI-SN-04

(8)

SRI-SN-04A

WSP-MW-02B

WSP-MW-02C

(FROM MH

MW-35B

MW-12B

MH-56

FORMER IRM

MH-55

RETAINING WALL

RETAINING WALL SUMP

FOOTBALL

EW-5-25B

EW-6-60C

MW-3-150

MW-3B

MW-3-100

MW-5B

MW-3-13

EW-7-25B

EW-8-62C

EW-10-25B

MW-4B

EXB-10

MW-6B

D

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LEGEND

- BUILDING 3 AND 4 NAPL OBSERVATION WELL
- A/B HYDROGEOLOGIC ZONES
- B HYDROGEOLOGIC ZONE
- PRODUCT SURVEILLANCE WELL
- B/C HYDROGEOLOGIC ZONES
- C HYDROGEOLOGIC ZONE
- EXTRACTION WELL
- SOIL BORING
- HORIZONTAL BORING LOCATION
- TEST PIT (2019)
- PIPE TRENCH EXCAVATION/CLEANOUT AREA (2019)
- MH-D2 SANITARY MANHOLE/MANWAY
- MH-C1 CLEANED SANITARY MANHOLE/MANWAY
- NON–SANITARY MANHOLE/MANWAY
- SEALED MANHOLE/MANWAY
- VIDEO SURVEYED SEWER LINES
- SEWER LINES BASED ON FACILITY DRAWINGS
- INDICATES PREVIOUS INTERPRETATION
- OBSERVED DIRECTION OF FLOW
- PRESUMED DIRECTION OF FLOW (REFER TO NOTE 2)
- FD, RD FLOOR DRAIN/ROOF DRAIN
- SGVP SEWER GAS VENT
- CB CATCH BASIN
- 34 BUILDING NUMBER
- PROPERTY BOUNDARY

NOTES:

1. THE PRESUMED DIRECTIONS OF FLOW ARE BASED ON THE INVERT ELEVATIONS OF THE PIPES OBSERVED IN EACH OF THE MANHOLES.

2. MH–B1 INCLUDES TWO HORIZONTAL 4–INCH DIAMETER PIPES (PVC AND CAST IRON) THAT ARE CAPPED. THE LINES WERE EXPOSED WHEN THE ASSOCIATED MANHOLE AND ADJACENT CONCRETE FLOOR WERE REMOVED.

3. THE VERTICAL PIPE EXTENDS TO 10 FEET; THE LINE IS THEN OPEN TO BEDROCK, BUT COLLAPSED AT 14 FEET.

4. THE INVERT ELEVATIONS INDICATE TYPICAL FLOW TO THE NORTHEAST (TOWARD MH–48) AND OVERFLOW TO THE SOUTHWEST (TOWARD SRI–SN–02).

5. THE PIPE WHICH CONVEYED MATERIAL FROM MH–38 TO MH–B3 AND FROM MH–B3 TO SRI–SN–02 WAS DISCONNECTED CIRCA 1943. THE FLOW WAS THEN DIRECTED TO SRI–SN–03.

6. MH–B3 VIDEO SURVEY INDICATED A POTENTIAL BREAK IN THE PIPE BETWEEN 17 AND 20 FEET WHICH ROUGHLY COINCIDES WITH THE SRI–SN–03 VAULT SHOWN ON HISTORICAL DRAWINGS, BUT WHICH WAS NOT LOCATED IN THE FIELD. THE LOCATION SHOWN WAS NOT SURVEYED AND IS, THEREFORE, APPROXIMATE.

7. SRI–SN–04 COULD NOT BE LOCATED AT THE GROUND SURFACE. DURING THE VIDEO SCOPING OF MH–53, A BRICK–LINED VAULT, WHICH IS NOW OVERLAIN BY A CONCRETE PAD, WAS OBSERVED AT THE APPROXIMATE LOCATION OF SRI–SN–04. THE LOCATION SHOWN WAS NOT SURVEYED AND IS, THEREFORE, APPROXIMATE.

8. THESE DASHED LINES REFLECT THE LIMITS OF AN OPEN (TRENCH) OR CLOSED (PIPE) DRAIN SYSTEM USED FROM CIRCA 1917 TO CIRCA 1970.

9. SEE IRM CONSTRUCTION COMPLETION REPORT FOR TEST PIT AND PIPE TRENCH BACKFILL AND RESTORATION DETAILS.

20 10 0 20 40

SCALE, FEET

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FIGURE 3

Drawing Number

314P5608.001–D37

APPENDIX

A DPE SYSTEM AOC 1 EXPANSION DESIGN PACKAGE

INDEX OF DRAWINGS

DRAWING NUMBER	SHEET NUMBER	DESCRIPTION
314P5608.001-D21	1	TITLE SHEET
314P5608.001-D09	2	SITE LAYOUT AND PROPOSED AOC 1 EXPANSION
314P5608.001-D11	3	PIPING SCHEMATIC
314P5608.001-D20	4	REMEDIAL SYSTEM CROSS SECTION
314P5608.001-D16	5A	PROCESS AND INSTRUMENTATION FLOW DIAGRAM
314P5608.001-D16	5B	PROCESS AND INSTRUMENTATION EXTRACTION WELL FLOW DIAGRAM
314P5608.001-D17	6	BUILDING EQUIPMENT LAYOUT
314P5608.001-D12	7	EXTRACTION WELL DETAILS (EW-13 AND EW-14)
314P5608.001-D18	8	EXTRACTION WELL DETAILS (EW-13, EW-14, AND REPLACEMENT JUNCTION BOX)
314P5608.001-D19	9	TRENCHING AND FORMER BUILDING 20 FOUNDATION WALL FACE INSTALLATION CROSS SECTION

TITLE SHEET

DPE SYSTEM AOC 1 EXPANSION DESIGN PACKAGE
FORMER EMERSON POWER TRANSMISSION SITE
ITHACA, NEW YORK

PREPARED FOR

EMERSON
ST. LOUIS, MISSOURI

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TITLE SHEET

DPE SYSTEM AOC 1 EXPANSION DESIGN PACKAGE
FORMER EMERSON POWER TRANSMISSION SITE
ITHACA, NEW YORK

PREPARED FOR
EMERSON – ST. LOUIS, MISSOURI

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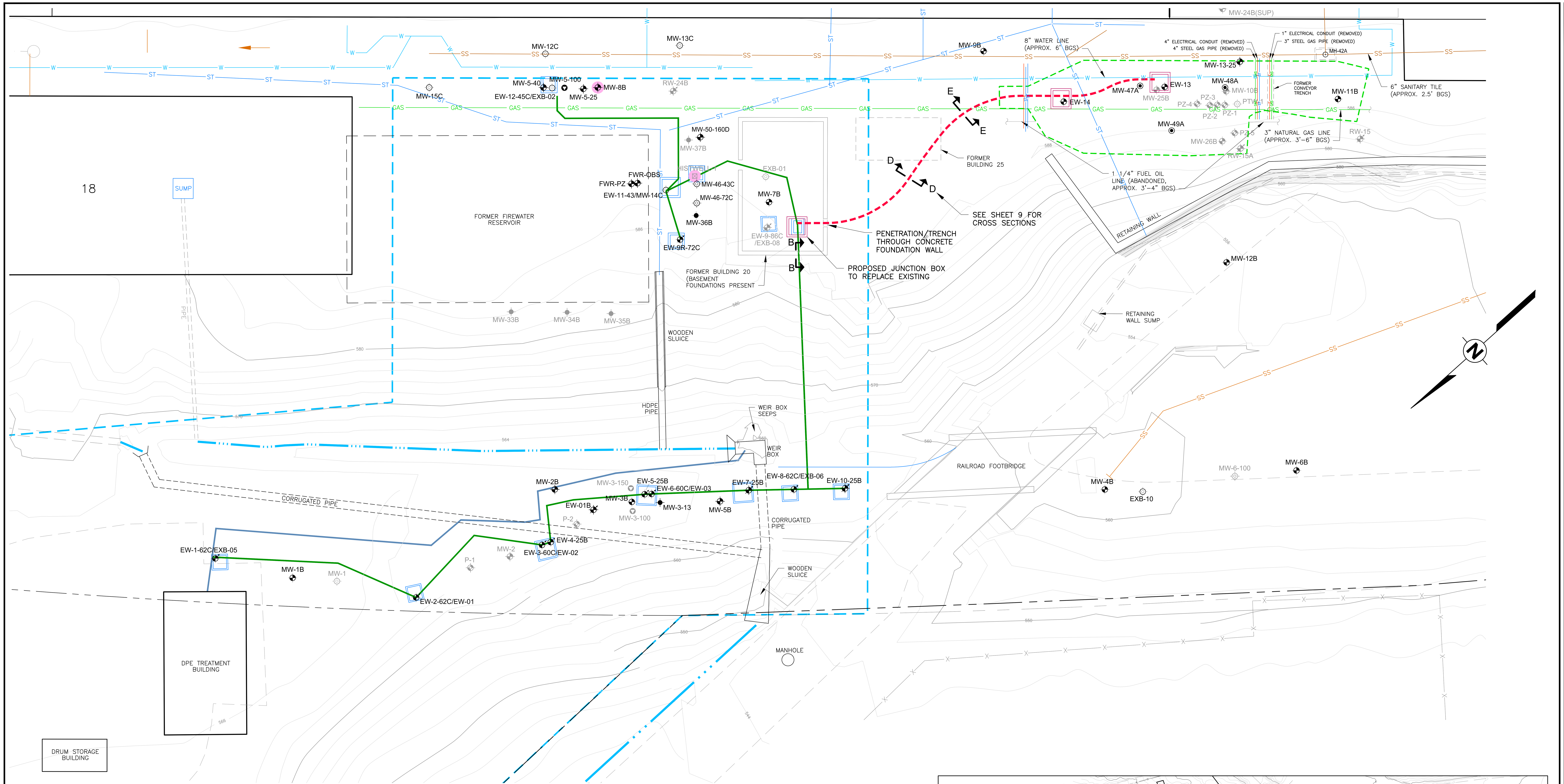
SHEET 1

Drawing Number
314P5608.001–D21



12 6 0 12 24

SCALE, FEET

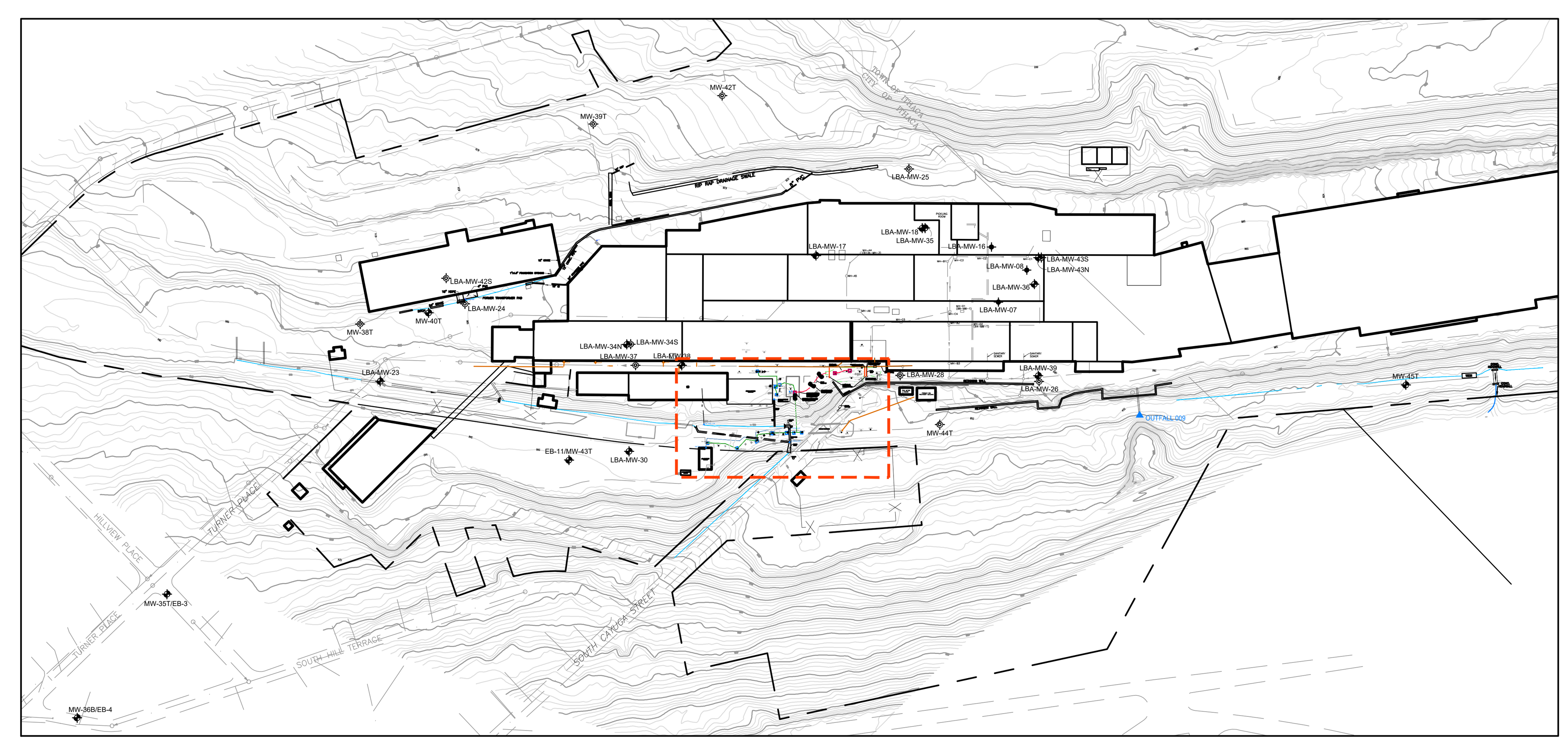
LEGEND

- A/B HYDROGEOLOGIC ZONE
- B HYDROGEOLOGIC ZONE
- B/C HYDROGEOLOGIC ZONE
- C HYDROGEOLOGIC ZONE
- D HYDROGEOLOGIC ZONE
- EXTRACTION WELL
- PIEZOMETER
- HALFTONE INDICATES ABANDONED
- PROPERTY BOUNDARY
- STORMWATER/INTERMITTENT STREAM
- OU-1 BOUNDARY
- EXTENT OF SOIL EXCAVATION AND CAP AOC 1
- W — WATER LINE
- GAS — GAS LINE
- FO — FUEL OIL LINE
- SS — SANITARY SEWER LINE
- ST — STORM SEWER LINE
- UNDERGROUND ELECTRIC LINE

LEGEND

- EXISTING BELOW-GROUND PIPING (2"/4" O.D. HDPE VAPOR, 6" SCH. 40 PVC CARRIER [1.25" O.D. NYLON 12 WATER, 1" DURATEC AIR SUPPLY], 1" O.D. ELECTRICAL CONDUIT)
- EXISTING 4" HDPE DISCHARGE PIPING
- PROPOSED BELOW-GROUND PIPING (2" O.D. SDR 11 HDPE VAPOR, 6" O.D. SDR 13.5 CARRIER [1.25" O.D. SDR 11 HDPE WATER, 1" DURATEC AIR SUPPLY], 1" O.D. ELECTRICAL CONDUIT)
- EXISTING WELL VAULT/JUNCTION BOX
- PROPOSED WELL VAULT/JUNCTION BOX

NOTE: UTILITY LOCATIONS SHOWN ARE APPROXIMATE AND SHALL BE VERIFIED IN THE FIELD.



KEY MAP

0 100 200 400

SCALE, FEET

D

THE ORIGINAL VERSION OF THIS DRAWING IS IN COLOR. BLACK & WHITE REPRODUCTION MAY NOT ACCURATELY DEPICT CERTAIN INFORMATION.

REV	DESCRIPTION		
	REVISIONS		
1	Revised:	Chkd:	Appr.:
2	Revised:	Chkd:	Appr.:
3	Revised:	Chkd:	Appr.:

SEAL

DATE

DRAWN BY RA 02/22/2023

CHECKED DCC 05/1/2023

APPROVED

SITE LAYOUT AND PROPOSED AOC 1 EXPANSION

DPE SYSTEM AOC 1 EXPANSION DESIGN PACKAGE
FORMER EMERSON POWER TRANSMISSION SITE
ITHACA, NEW YORK

PREPARED FOR
EMERSON – ST. LOUIS, MISSOURI

WSP USA Inc.
11 STANWIX STREET, SUITE 950
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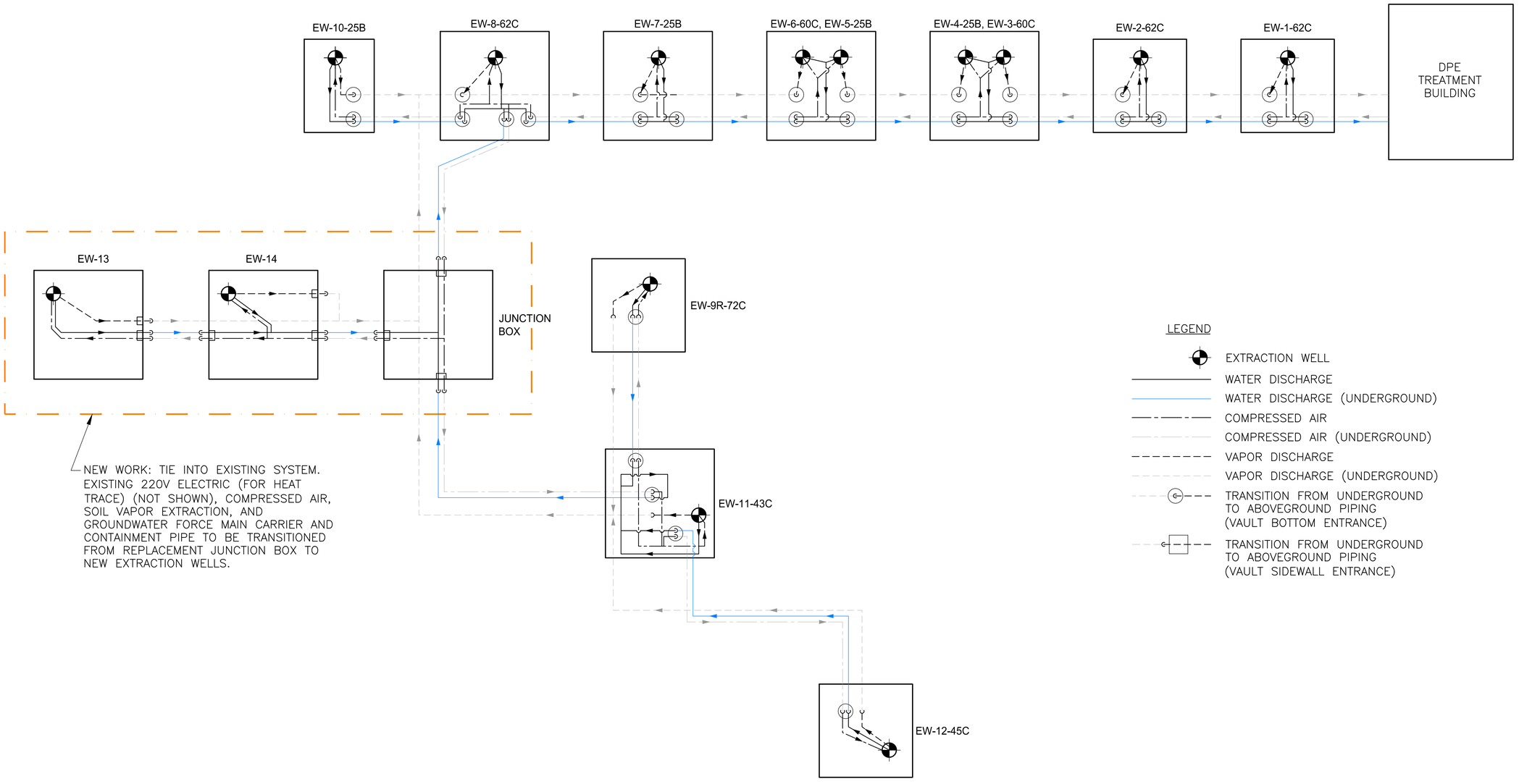
TEL: +1 412.604.1040

SHEET 2

Drawing Number
314P5608.001–D09



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REVISIONS

REV	DESCRIPTION	
1	Revised:	Chkd: Appr.:
2	Revised:	Chkd: Appr.:
3	Revised:	Chkd: Appr.:

SEAL

DATE

DRAWN BY

CHECKED

APPROVED

PIPING SCHEMATIC

DPE SYSTEM AOC 1 EXPANSION DESIGN PACKAGE
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ITHACA, NEW YORK

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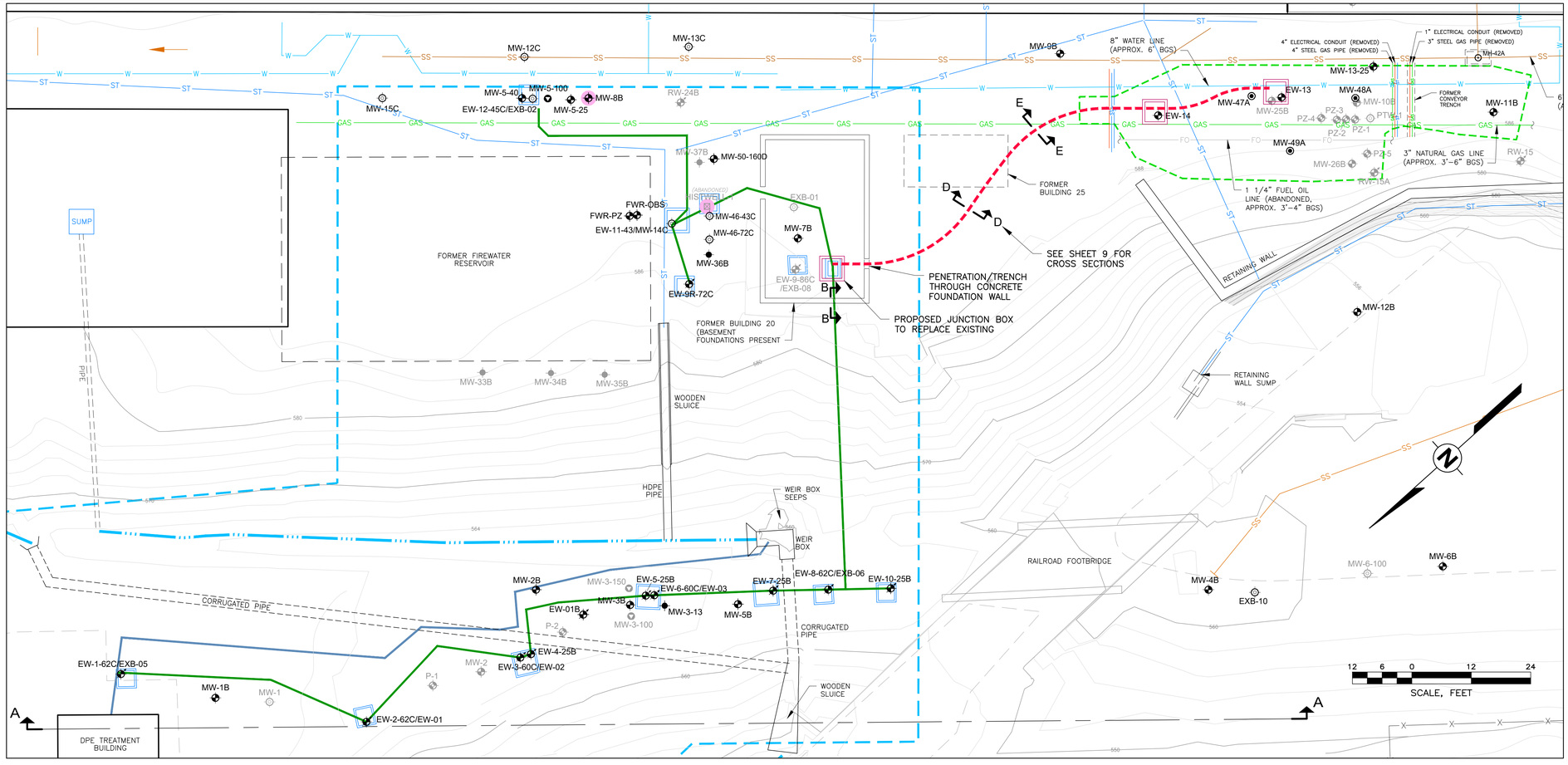
SHEET 3

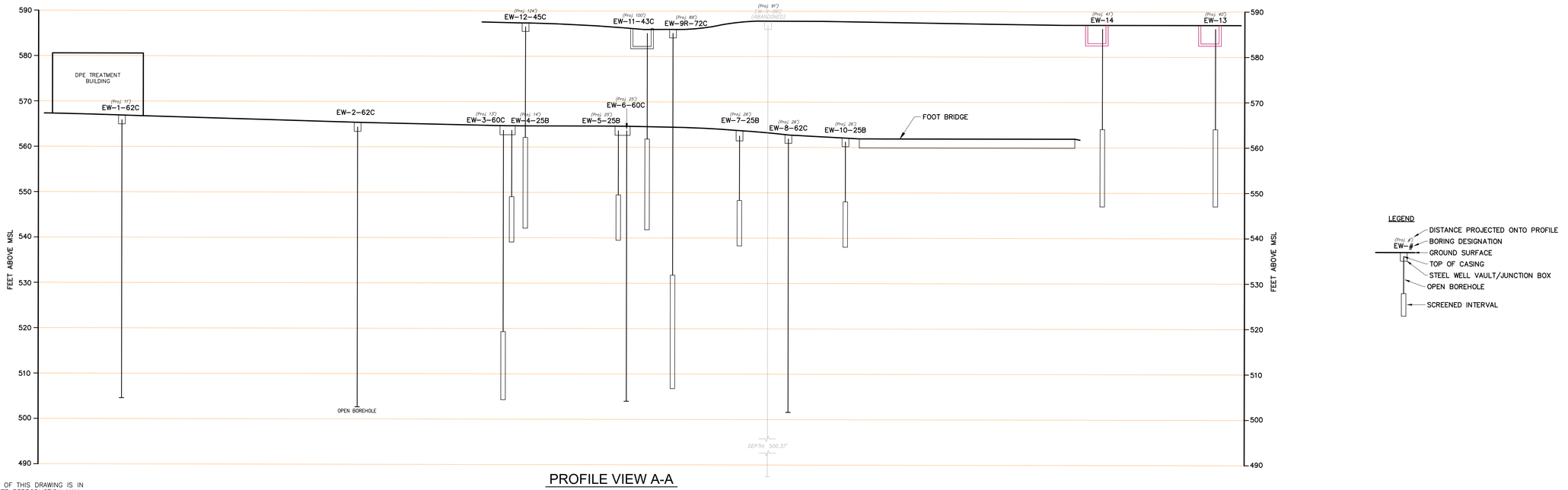
Drawing Number
314P5608.001–D11

LEGEND

- A/B HYDROGEOLOGIC ZONE
- B HYDROGEOLOGIC ZONE
- B/C HYDROGEOLOGIC ZONE
- C HYDROGEOLOGIC ZONE
- D HYDROGEOLOGIC ZONE
- EXTRACTION WELL
- PIEZOMETER
- HALFTONE INDICATES ABANDONED
- STORMWATER/INTERMITTENT STREAM
- OU–1 BOUNDARY
- EXTENT OF SOIL EXCAVATION AND CAP AOC 1
- WATER LINE
- GAS LINE
- FUEL OIL LINE
- SANITARY SEWER LINE
- STORM SEWER LINE
- UNDERGROUND ELECTRIC LINE
- EXISTING BELOW–GROUND PIPING (2"/4" O.D. HDPE VAPOR, 6" SCH. 40 PVC CARRIER [1.25" O.D. NYLON 12 WATER, 1" DURATEC AIR SUPPLY], 1" O.D. ELECTRICAL CONDUIT)
- EXISTING 4" HDPE DISCHARGE PIPING
- EXISTING BELOW–GROUND PIPING (2" O.D. SDR 11 HDPE VAPOR, 6" O.D. SDR 32.5 CARRIER [1.25" O.D. SDR 11 HDPE WATER, 1" DURATEC AIR SUPPLY], 1" O.D. ELECTRICAL CONDUIT)
- EXISTING WELL VAULT/JUNCTION BOX
- PROPOSED WELL VAULT/JUNCTION BOX

NOTE: UTILITY LOCATIONS SHOWN ARE APPROXIMATE AND SHALL BE VERIFIED IN THE FIELD.





PROFILE VIEW A-A

SCALE, FEET 0 10 20

LEGEND

- (Proj. #) EW–#: DISTANCE PROJECTED ONTO PROFILE; BORING DESIGNATION
- GROUND SURFACE
- TOP OF CASING
- STEEL WELL VAULT/JUNCTION BOX
- OPEN BOREHOLE
- SCREENED INTERVAL

D

THE ORIGINAL VERSION OF THIS DRAWING IS IN COLOR. BLACK & WHITE REPRODUCTION MAY NOT ACCURATELY DEPICT CERTAIN INFORMATION.

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REVISIONS

REV	DESCRIPTION	Chkd:	Appr.:
1	Revised:	Chkd:	Appr.:
2	Revised:	Chkd:	Appr.:
3	Revised:	Chkd:	Appr.:

SEAL

DATE

DRAWN BY: RJC 5/12/2023
CHECKED:
APPROVED: DJC 5/12/2023

REMEDIAL SYSTEM CROSS SECTION

DPE SYSTEM AOC 1 EXPANSION DESIGN PACKAGE
FORMER EMERSON POWER TRANSMISSION SITE
ITHACA, NEW YORK

PREPARED FOR
EMERSON – ST. LOUIS, MISSOURI

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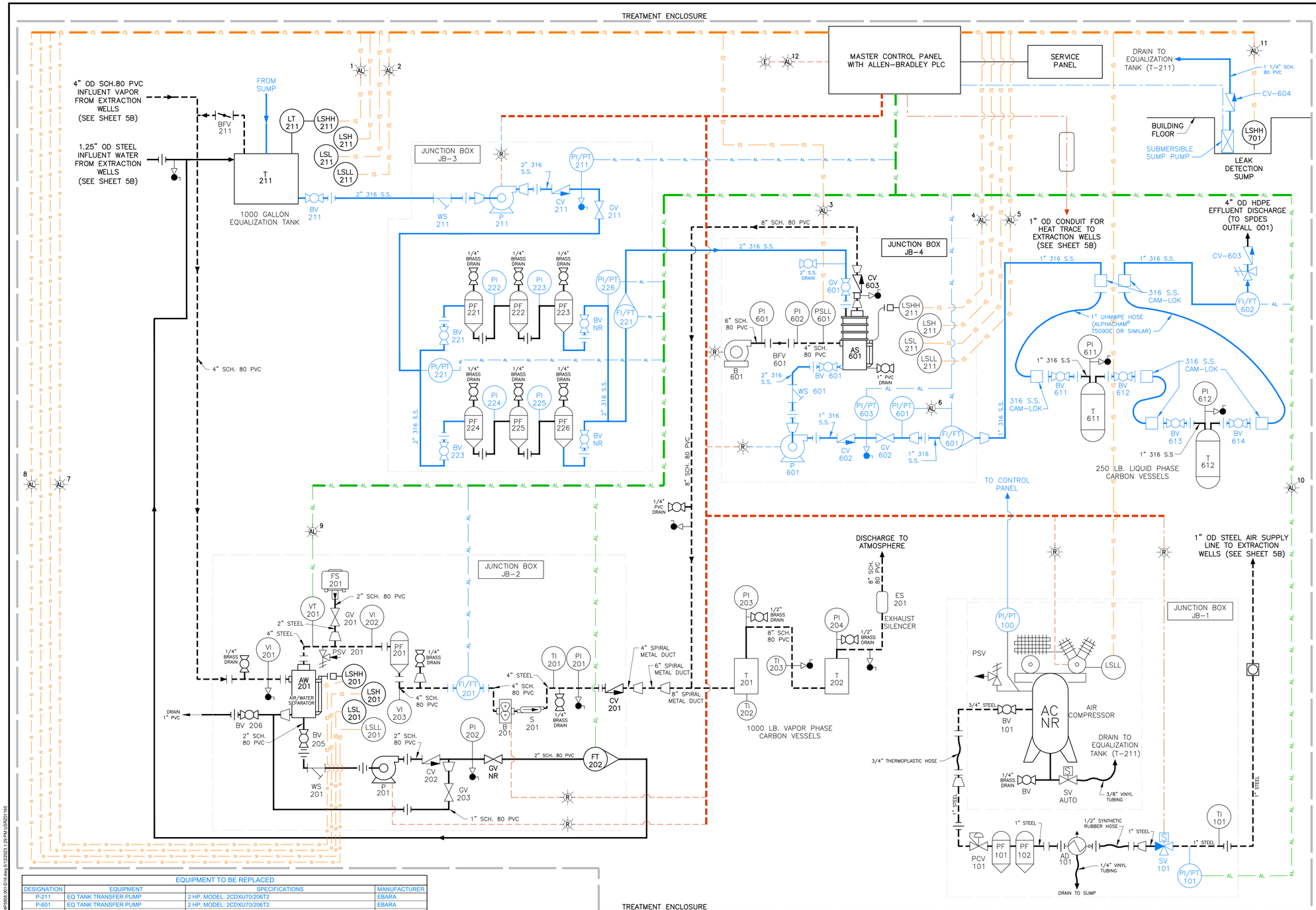
SHEET 4

Drawing Number
314P5608.001–D20



LEGEND	
PIPING/EQUIPMENT TO BE REPLACED	
2" 316 S.S.	REPLACEMENT DIAMETER AND MATERIAL
4" SCH. 80 PVC	EXISTING DIAMETER AND MATERIAL
LT	LEVEL TRANSMITTER
PT	PRESSURE TRANSMITTER
PI	PRESSURE INDICATOR
LSHH	LIQUID SEPARATOR HIGH–HIGH
LSH	LIQUID SEPARATOR HIGH
LSL	LIQUID SEPARATOR LOW
LSLL	LIQUID SEPARATOR LOW–LOW
FI/FT	FLOW INDICATOR/FLOW TRANSMITTER
VI	VACUUM INDICATOR
VT	VACUUM TRANSMITTER
TI	TEMPERATURE INDICATOR
S.S.	STAINLESS STEEL
	BUTTERFLY VALVE
	BALL VALVE
	PRESSURE CONTROL VALVE
	WATER TRANSFER PUMP
	PRESSURE/VACUUM BLOWER
	WYE–STRAINER
	CHECK VALVE
	GATE VALVE
	QUICK–CONNECT FITTING
	UNION
	PIPE TRANSITION
	REDUCER
	EXHAUST SILENCER
S	SOLENOID VALVE
PF	PARTICULATE FILTER
	CLEANOUT
	REFRIGERATED AIR DRYER
	SAMPLE PORT
	PRESSURE/VACUUM RELIEF VALVE
E	EMERGENCY STOP
R	RUN LIGHT
AL	ALARM SIGNAL/LIGHT
IS	INTRINSICALLY SAFE SIGNAL WIRE
AL	INTRINSICALLY SAFE ANALOG WIRE
	480V ELECTRICAL WIRING
	120V ELECTRICAL WIRING
	WATER LINE
	VAPOR/AIR LINE
	EQUIPMENT SKID
JB#	ELECTRICAL JUNCTION BOX ON EACH

EQUIPMENT TO BE REPLACED			
DESIGNATION	EQUIPMENT	SPECIFICATIONS	MANUFACTURER
P-211	EQ TANK TRANSFER PUMP	2 HP, MODEL: 2CDXU70/206T2	EBARA
P-601	EQ TANK TRANSFER PUMP	2 HP, MODEL: 2CDXU70/206T2	EBARA
-	SUMP PUMP	0.5 HP, SPS05004TPK OR SIMILAR	K2 PUMPS

INSTRUMENTATION TO BE REPLACED			
DESIGNATION	INSTRUMENT	SPECIFICATIONS	MANUFACTURER
PI-101	PRESSURE INDICATOR/TRANSMITTER	MODEL: 2088G, -14.7 TO 800 PSI, 4-20mA DC, 316L SST, SILICONE FLUID	ROSEMOUNT
PI-211, PI-221, PI-226, PI-601, PT-603	PRESSURE INDICATOR/TRANSMITTER	MODEL: 2088G, -14.7 TO 150 PSI, 4-20mA DC, 316L SST, SILICONE FLUID	ROSEMOUNT
FI/FT-221	FLOW INDICATOR/TRANSMITTER	2", MODEL: SIGNET 2580 FLOWTRAMAG	GEORG FISCHER
FI/FT-601	FLOW INDICATOR/TRANSMITTER	1", MODEL: SIGNET 2580 FLOWTRAMAG	EBARA
FI/FT-601	FLOW INDICATOR/TRANSMITTER	1", MODEL: 8750W, 4-20mA DC, FLANGED, PTFE, 316L SS ELECTRODE. 2 MEASUREMENT - STANDARD, 1/2-IN LINER, SLIP-ON RAISED-FACE 304 SST, ASME B16.5, CLASS 150	EBARA
-	PRESSURE RELIEF VALVE (AFTER FI/FT-602)	1" MODEL: VM-30-S OR SIMILAR	VAL-MATIC
-	SOLENOID VALVE (AIR COMPRESSOR)	MODEL: REDHAT 8210G007	ASCO
FI/FT-201	FLOW INDICATOR/TRANSMITTER	3661-16F6-214	ARMOR-FLO™

EXISTING EQUIPMENT			
DESIGNATION	EQUIPMENT	SPECIFICATIONS	MANUFACTURER
T-211	EQUALIZATION TANK	1,000 GALLON POLYETHYLENE, DOME TOP, ROUND STORAGE TANK	DEN HARTOG
P-211	EQ TANK TRANSFER PUMP	1.5 HP MODEL: 1ST1F5D4	GOULDS
PF-221 to PF-226	BAG FILTERS	SIX - ALUMINUM WATER FILTER HOUSINGS, MAX 200 GPM/100 PSI, MODEL: GP802AL2	PENTEK
AS-601	AIR STRIPPER	4-TRAY, LOW PROFILE, MODEL: 4.4SS	QED
B-601	AIR STRIPPER BLOWER	5 HP, 210 CFM, STATIC FAN PRESSURE: 40.7" WC, MODEL: 2204	THE NEW YORK BLOWER CO./BALDOR
P-601	AIR STRIPPER TRANSFER PUMP	1.5 HP MODEL: 1ST1F5D4	GOULDS
T-611, T-612	GRANULAR ACTIVATED CARBON	250 LB-EACH, AQUEOUS PHASE GRANULAR ACTIVATED CARBON, MODEL: 2162	ENPRESS
AW-201	AIR/WATER SEPARATOR	120 GALLON MOISTURE SEPARATOR TANK, RATED FOR 29 INHG	ESD
P-201	AIR/WATER SEPARATOR TRANSFER PUMP	1.5 HP, PROGRESSIVE CAVITY PUMP, MODEL: 5VD28	MOYNO/EMERSON
B-201	VAPOR EXTRACTION BLOWER	20 HP, SUTORBILT ROTARY POSITIVE DISPLACEMENT LOBE BLOWER, MODEL: 5LP-DSL BLOWER MODEL: 5LP-DSL, MOTOR MODEL: BJ09	GARDNER DENVER/ TECO WESTINGHOUSE
T-201, T-202	GRANULAR ACTIVATED CARBON	1,000 LB-EACH, VAPOR PHASE GRANULAR ACTIVATED CARBON UNITS	ESD
ES-201	EXHAUST SILENCER	MODEL: RD-8	UNIVERSAL SILENCER
AC-101	AIR COMPRESSOR	7.5 HP, BLOWER MODEL: 2475N7.5, MOTOR MODEL: ELT7E1D	INGERSOLL-RAND/EMERSON
AD-101	REFRIGERATED AIR DRYER	24.7 CFM, MODEL: D42IN	INGERSOLL-RAND

(A): ABBREVIATIONS: HP = HORSEPOWER; GPM = GALLONS PER MINUTE; PSI = POUNDS PER SQUARE INCH
W.C. = INCHES OF WATER COLUMN; LB = POUND; HG = INCHES OF MERCURY; CFM = CUBIC FEET PER MINUTE

ALARMS:
1) EQUALIZATION TANK T–211, HIGH–HIGH ALARM
2) EQUALIZATION TANK T–211, LOW–LOW ALARM
3) AIR STRIPPER AS–601, LOW SUMP PRESSURE
4) AIR STRIPPER AS–601, HIGH–HIGH ALARM IN THE SUMP
5) AIR STRIPPER AS–601, LOW–LOW ALARM IN THE SUMP
6) LIQUID PHASE CARBON INLET T–611, HIGH PRESSURE ALARM
7) AIR/WATER SEPARATOR AW–201, HIGH–HIGH ALARM
8) AIR/WATER SEPARATOR AW–201, LOW–LOW ALARM
9) VAPOR EXTRACTION SYSTEM B–201, HIGH VACUUM ALARM
10) AIR COMPRESSOR AC–101, HIGH OR LOW PRESSURE ALARM
11) TREATMENT BUILDING FLOOR SUMP, LSHH 701, HIGH–HIGH ALARM
12) CONTROL PANEL, EMERGENCY STOP ALARM

NOTES:

1. PIPING MATERIAL AND SIZES WERE INSTALLED AS INDICATED ON THIS DRAWING.
2. ALL PIPING AND FITTINGS WERE PRESSURE–TESTED TO MANUFACTURER SPECIFICATIONS BEFORE FULL SCALE OPERATION.
3. ALL PIPING AND FITTINGS WERE LABELED TO CORRESPOND WITH THE DRAWING. FLOW ARROWS WERE INSTALLED ON ALL PIPING TO SIGNIFY FLOW DIRECTION BEFORE AND AFTER EACH INLET/DISCHARGE CONNECTION.
4. FLOW METERS WERE INSTALLED WITH MANUFACTURER SPECIFIED STRAIGHT PIPE LENGTHS ON THE INLET AND OUTLET.
5. ALL ELECTRICAL WIRING WAS INSTALLED INTRINSICALLY SAFE.
6. BLUE TEXT INDICATES PROPOSED/NEW WORK. BLACK TEXT INDICATES EXISTING.
7. AL BV, CV, GV, AND WS ALONG PIPING TO BE REPLACED SHALL CONSIST OF STAINLESS STEEL (S.S.) UNLESS OTHERWISE NOTED.

REVISIONS									
REV	DESCRIPTION		Appr.:		Appr.:		Appr.:		Appr.:
1	Revised	Chkd:		Chkd:		Chkd:		Chkd:	
2	Revised	Chkd:		Chkd:		Chkd:		Chkd:	
3	Revised	Chkd:		Chkd:		Chkd:		Chkd:	

SEAL

DATE

DRAWN BY: AK 12/19/2023
CHECKED: DC 12/19/2023
APPROVED:

PROCESS AND INSTRUMENTATION FLOW DIAGRAM

DPE SYSTEM AOC 1 EXPANSION DESIGN PACKAGE
FORMER EMERSON POWER TRANSMISSION SITE
ITHACA, NEW YORK

PREPARED FOR
EMERSON – ST. LOUIS, MISSOURI

WSP USA Inc.
11 STANWIX STREET, SUITE 950
PITTSBURGH, PA 15222
TEL: +1 412.604.1040

SHEET 5A

Drawing Number
314P5608.001–D16

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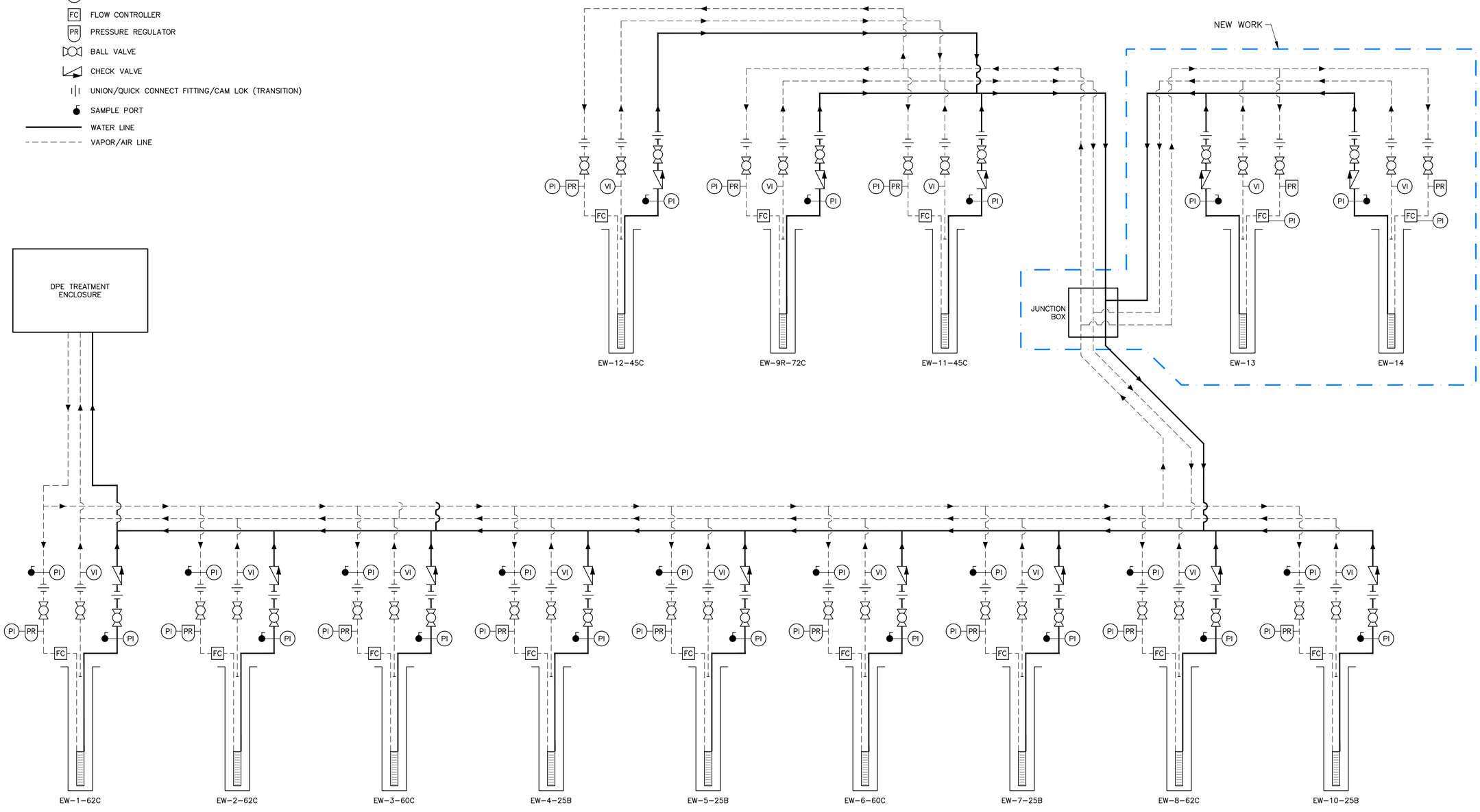
LEGEND

- (PI) PRESSURE INDICATOR
- (VI) VACUUM INDICATOR
- [FC] FLOW CONTROLLER
- (PR) PRESSURE REGULATOR
- BALL VALVE
- CHECK VALVE
- UNION/QUICK CONNECT FITTING/CAM LOK (TRANSITION)
- SAMPLE PORT
- WATER LINE
- VAPOR/AIR LINE



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REVISIONS

REV	DESCRIPTION	Chkd:	Appr.:
1	Revised:	Chkd:	Appr.:
2	Revised:	Chkd:	Appr.:
3	Revised:	Chkd:	Appr.:

SEAL

DATE

DRAWN BY — RK 05/12/2023

CHECKED — DC 05/12/2023

APPROVED

PROCESS AND INSTRUMENTATION EXTRACTION WELL FLOW DIAGRAM

DPE SYSTEM AOC 1 EXPANSION DESIGN PACKAGE
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SHEET 5B

Drawing Number
314P5608.001–D16

LEGEND
VAPOR LINE
WATER LINE
AIR LINE
FENCE LINE
SECONDARY CONTAINMENT DIKE

EXTERIOR LIGHT POLE
EXHAUST STACK
HEATER
FIRE EXTINGUISHER AND FIRST AID KIT
STORAGE SHELVING
HEATER
4" OD EFFLUENT DISCHARGE TO OUTFALL 001
1.25" OD INFLUENT WATER FROM EXTRACTION WELLS
4" OD INFLUENT VAPOR FROM EXTRACTION WELLS
1" ID EFFLUENT AIR TO EXTRACTION WELLS
1,000 GAL. EQUALIZATION TANK
ACCESS LID
ROOF CURB WITH EXHAUST FAN
PUMP
BAG FILTERS
PUMP
BLOWER
AIR STRIPPER
250 LB LIQUID PHASE GRANULAR ACTIVATED CARBON
DESK
AIR COMPRESSOR
DRYER
ELECTRICAL METER ON EXTERIOR WALL
TRANSFORMER
110V, SINGLE PHASE BREAKER PANEL
3'x3' LOUVER
CONTROL PANEL
3'x3' LOUVER
SUMP
SUMP PUMP
TRANSFORMER
EYE WASH STATION
277/480V, THREE PHASE BREAKER PANEL
6" STEPDOWN
20'-0"
PUMP
AIR/WATER SEPARATOR
BLOWER
1,000 LB VAPOR PHASE GRANULAR ACTIVATED CARBON
1,000 LB VAPOR PHASE GRANULAR ACTIVATED CARBON
6'-0"
CONCRETE RAMP
ROLL-UP BAY DOOR
4'x4' PAD
FIRE EXTINGUISHER
STORAGE SHELVING
SECURITY CAMERA
SECURITY SYSTEM KEYPAD
CONCRETE PAD
2'-0"
6" RETAINING BERM ENCOMPESSING THE PERIMETER OF THE BUILDING
SECURITY CAMERA (ABOVE DOORWAY)
19'-6"
10'-0"
1'-6"
3'-0"
35'-0"

BUILDING EQUIPMENT LAYOUT

0 2 4
SCALE IN FEET

NOTE:
EQUIPMENT LOCATIONS ARE APPROXIMATE.

- PROVIDED FOR INFORMATIONAL PURPOSES ONLY -

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1	Revised	Chkd
2	Revised	Chkd
3	Revised	Chkd

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BUILDING EQUIPMENT LAYOUT

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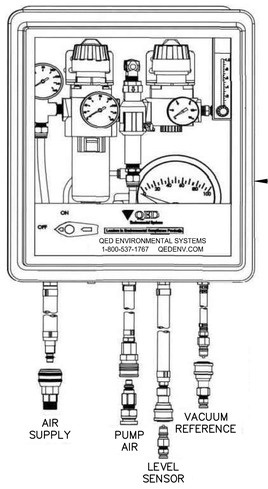
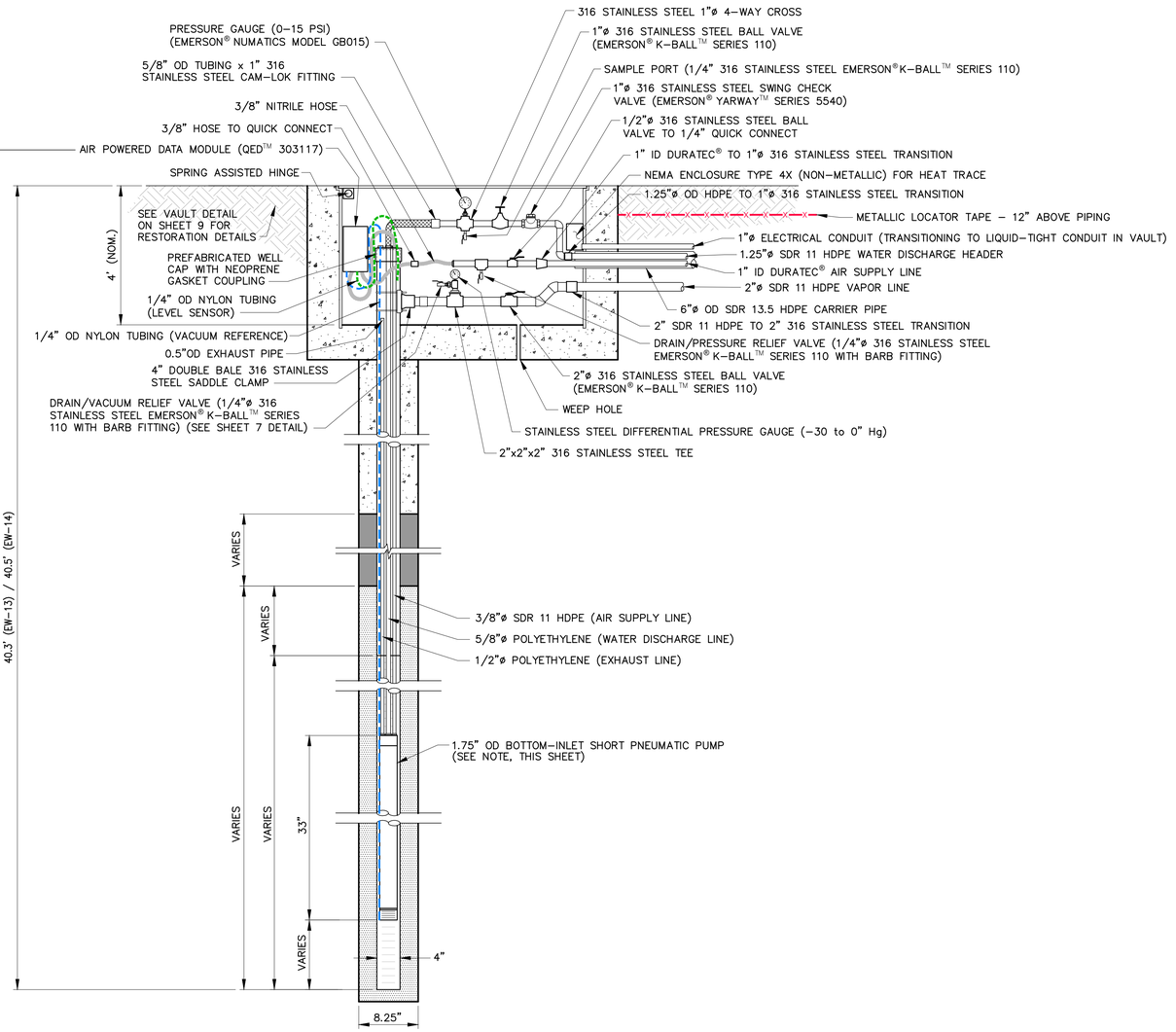
SHEET 6

Drawing Number
314P5608.001-D17



AUTOPUMP DATA MODULE DETAIL
MODEL: 303117



WELL VAULT AND WELL PUMP INSTALLATION DETAIL
FOR EW-13 AND EW-14 (TYPICAL SECTION)

0 6" 1 2
SCALE, FEET

TRENCHING:

1. ALL TRENCHING FOR UNDERGROUND PIPING INSTALLATION SHALL BE EXCAVATED TO THE DEPTHS INDICATED. EXCAVATED NATIVE SOIL AND DEBRIS NOT USED FOR BACKFILL SHALL BE DISPOSED OF OFFSITE PER APPLICABLE STATE REGULATIONS.

2. CONVEYANCE PIPING SHALL BE INSTALLED WITHIN TRENCHES AND EXCAVATED TO A MINIMUM OF 52 INCHES BELOW GROUND SURFACE. THE PIPE SHALL BE BACKFILLED WITH A MINIMUM OF 2 INCHES OF PIPE BEDDING MATERIAL BELOW AND ABOVE THE CONVEYANCE PIPING. THE REMAINDER OF THE TRENCH SHALL BE BACKFILLED WITH NATIVE SOIL. BACKFILL SHALL BE COMPACTED USING A VIBRATORY PLATE WITH MAXIMUM 6" LIFTS. BACKFILLED NATIVE SOIL SHALL BE PLACED AND GRADED FLUSH WITH THE SURFACE ELEVATION OF THE EXISTING NATIVE SOIL SURROUNDING THE TRENCH.

3. REMOVED PARKING LOT SECTIONS SHALL BE REPLACED WITH CONCRETE OR ASPHALT. REPLACED PAVEMENT SHALL BE OF A THICKNESS MATCHING EXISTING MATERIAL SURROUNDING THE CUT. THE SURFACE OF THE REPLACEMENT PAVEMENT SHALL BE FINISHED FLUSH WITH THE SURFACE GRADE OF THE SURROUNDING PAVEMENT.

PIPE INSTALLATION:

1. WATER CONVEYANCE PIPING SHALL BE INSTALLED AS 1.25–INCH OUTER DIAMETER (OD) SDR 11 HIGH DENSITY POLYETHYLENE (HDPE) PIPE. THE COMPRESSED AIR SUPPLY PIPING SHALL BE COMPLETED AS 1–INCH INNER DIAMETER (ID) DURATEC ALUMINUM COMPOSITE WITH MANUFACTURER'S RECOMMENDED FITTINGS. UNDERGROUND VACUUM CONVEYANCE PIPING SHALL BE INSTALLED AS 2–INCH OD SDR 11 HDPE PIPING FROM JUNCTION BOX TO EW–13. ALL HDPE JOINTS AND CONNECTIONS ARE TO BE BUTT FUSED.

2. WATER CONVEYANCE PIPING AND AIR SUPPLY CONVEYANCE PIPING SHALL BE CONTAINED WITHIN A 6–INCH OD SDR 13.5 HDPE CARRIER PIPE. VAPOR CONVEYANCE PIPING SHALL BE BURIED ALONG SIDE THE CARRIER PIPE TO THE DEPTHS SHOWN.

3. PIPING ROUTES SHALL BE COMPLETED AS SHOWN ON SHEET 2 OF THE DRAWINGS.

4. WATER AND COMPRESSED AIR PIPING SHALL ENTER AND EXIT THE WELL VAULTS THROUGH 6–INCH HDPE CARRIER PIPES. PIPING RUNS SHALL BE COMPLETED FROM VAULT TO VAULT AS SHOWN ON SHEET 3.

PUMP AND PUMP EQUIPMENT INSTALLATION:

1. EXTRACTION WELL PUMPS, SHALL BE 1.75–INCH OUTER DIAMETER (OD) CONTROLLERLESS BOTTOM–INLET SHORT PNEUMATIC AUTO PUMPS (AP2B) MANUFACTURED BY QED ENVIRONMENTAL SYSTEMS. PUMPS SHALL BE INSTALLED IN ACCORDANCE WITH THE DETAIL ON THIS SHEET AND THE MANUFACTURER'S SPECIFICATIONS.

2. CONNECTION TUBING SHALL BE INSTALLED AND FITTED IN ACCORDANCE WITH THE DETAIL ON THIS SHEET AND THE MANUFACTURER'S INSTRUCTIONS. CONNECTION TUBING FROM THE PUMP TO THE PREFABRICATED VACUUM WELL CAP IS POLYETHYLENE TUBING MANUFACTURED BY QED ENVIRONMENTAL SYSTEMS. TUBING CONSISTS OF 0.625–INCH OUTSIDE DIAMETER (OD) WATER DISCHARGE LINE, 0.375–INCH OD AIR SUPPLY, AND 0.50–INCH OD EXHAUST PIPE. THE TUBING TRANSITIONS TO 3/8" HOSE FROM THE CAP TO THE DATA MODULE, THEN TO STEEL WITHIN THE WELL VAULT.

3. WELL CAPS FOR THE VACUUM EXTRACTION WELLS SHALL BE PREFABRICATED 4–INCH DIAMETER VACUUM CAPS MANUFACTURED BY QED ENVIRONMENTAL SYSTEMS. WELL CAPS SHALL BE INSTALLED AND FITTED BY CONTRACTOR IN ACCORDANCE WITH THE DETAIL ON THIS SHEET AND THE MANUFACTURER'S INSTRUCTIONS.

4. WELL HEAD PIPING AND VALVES SHALL BE INSTALLED IN ACCORDANCE WITH THE DETAIL ON THIS SHEET. THE AIR SUPPLY LINE IS EQUIPPED WITH A DATA MODULE MANUFACTURED BY QED ENVIRONMENTAL SYSTEMS. THE VAPOR EXTRACTION LINE SHALL BE EQUIPPED WITH A VACUUM GAUGE. THE WATER DISCHARGE LINE SHALL BE EQUIPPED WITH A PRESSURE GAUGE.

5. UPON INSTALLATION, ALL PUMPS AND PUMP EQUIPMENT SHALL BE PERFORMANCE TESTED IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS. WELL HEAD PIPING AND FITTINGS SHALL BE TESTED FOR LEAKS UNDER ANTICIPATED OPERATING PRESSURES. ALL PERFORMANCE TESTING AND LEAK TESTING SHALL BE PERFORMED UNDER THE DIRECT SUPERVISION OF THE ENGINEER.

WELL HEAD PIPING:

1. IN–VAULT WATER DISCHARGE PIPING TRANSITIONS FROM NYLON SDR 11 HDPE TO 316 STAINLESS. CONTRACTOR SHALL INSTALL A SAMPLING SPIGOT AT EACH EXTRACTION WELL BETWEEN THE PUMP AND THE BALL VALVE. CONTRACTOR SHALL INSTALL A QUICK CONNECT FITTING ON THE WATER DISCHARGE PIPING WHERE APPROPRIATE TO ALLOW FOR EASY DISCONNECTION FROM THE WELL CAP.

2. IN–VAULT AIR SUPPLY TUBING IS 0.375–INCH OD TUBING AND TRANSITIONS TO 1–INCH 316 STAINLESS STEEL. ALL AIR SUPPLY CONTROL VALVES AND DRIP LINE VALVES SHALL BE STAINLESS STEEL. CONTRACTOR SHALL INSTALL QUICK CONNECT FITTINGS ON THE AIR SUPPLY PIPING WHERE APPROPRIATE TO ALLOW FOR EASY DISCONNECTION FROM THE WELL CAP AND PRESSURE REGULATOR/INDICATOR/CYCLE COUNTER ASSEMBLY.

WELL HEAD AND VAULT COMPLETION:

1. THE VAULTS FOR EW–13, EW–14, AND THE REPLACEMENT JUNCTION BOX SHALL BE 48–INCH BY 48–INCH BY 48–INCH DEEP, H–20 TRAFFIC–RATED PRE–CAST CONCRETE VAULTS EQUIPPED WITH A WATER–TIGHT, SECURABLE, GAS SPRING–HINGED STEEL LID. THE LID SHALL BE UNLOCKABLE AND OPENED USING A ROAD BOX WRENCH/HANDLE COMBO SUPPLIED BY GLOBAL DRILLING SUPPLIERS OF CINCINNATI, OHIO.

2. ALL PENETRATIONS THROUGH THE WELL VAULT SHALL BE SEALED WITH CONCRETE MIXED WITH SIKA® WT–200P OR SIMILAR WATER RESISTING AND CRYSTALLINE WATERPROOFING CONCRETE ADMIXTURE TO SEAL VAULT FOR WATER–TIGHTNESS AND ENHANCE CONCRETE'S SELF–HEALING CAPABILITY.

3. ALL PIPES ENTERING THE VAULT THROUGH THE CARRIER PIPES SHALL BE HEAT TRACED.

4. EACH VAULT LID SHALL BE NUMBERED IN THE LOWER RIGHT CORNER OF EACH HINGED LID FOR IDENTIFICATION PURPOSES.

REVISIONS

REV	DESCRIPTION	Chkd:	Appr.:	DATE
1	Revised			
2	Revised			
3	Revised			

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APPROVED

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EXTRACTION WELL DETAILS (EW–13 AND EW–14)

DPE SYSTEM AOC 1 EXPANSION DESIGN PACKAGE
FORMER EMERSON POWER TRANSMISSION SITE
ITHACA, NEW YORK

PREPARED FOR
EMERSON – ST. LOUIS, MISSOURI

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SHEET 7

Drawing Number
314P5608.001–D12

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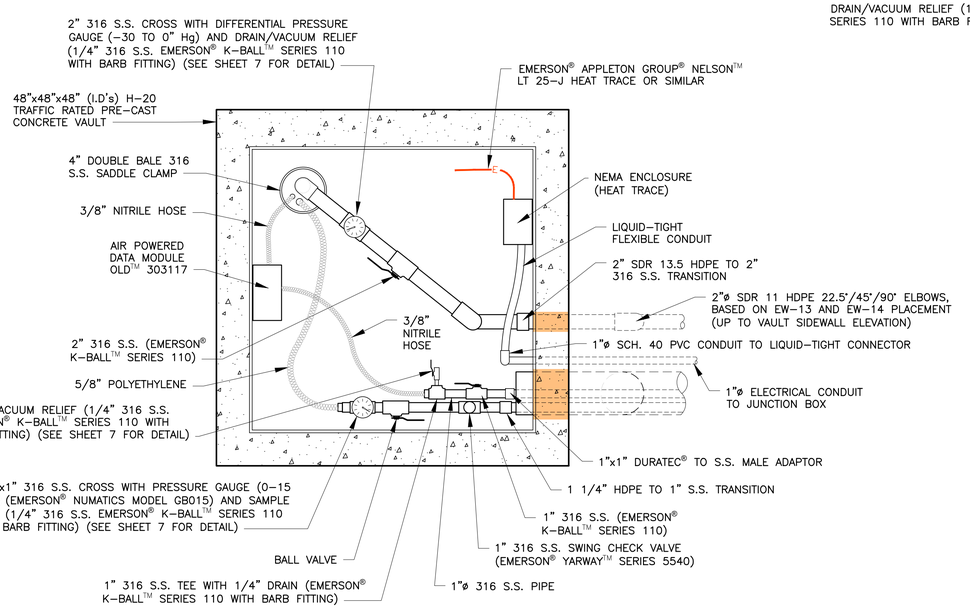


EW-13 EXTRACTION WELL VAULT PLAN VIEW

NOT TO SCALE

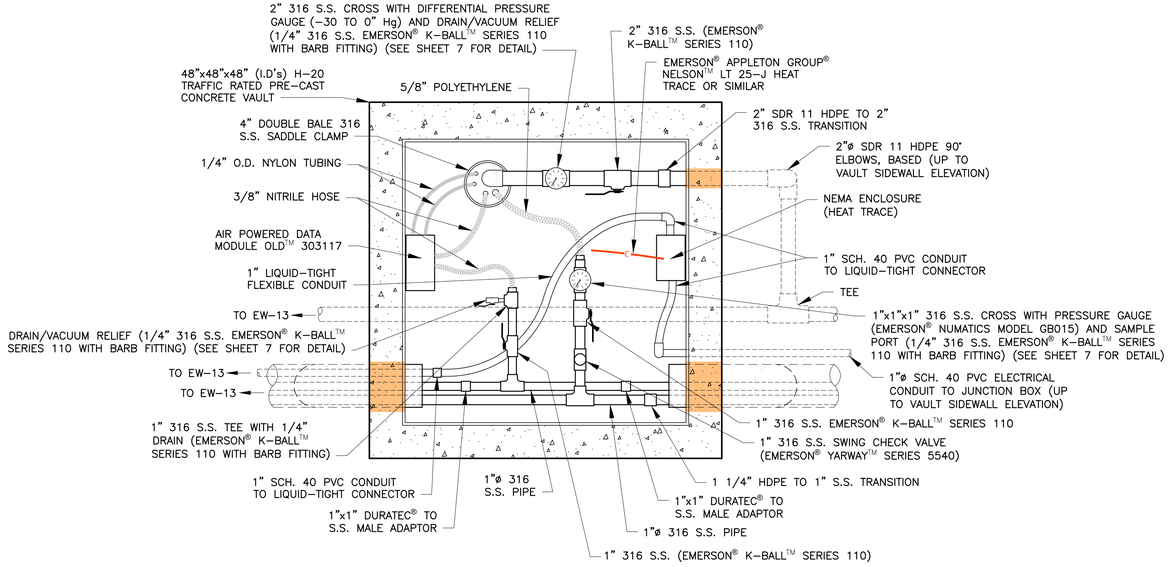
LEGEND

S.S. STAINLESS STEEL

FIELD CORING THROUGH VAULT SIDEWALL SEALED WITH WT–200P SIKA® OR SIMILAR WATER RESISTANT AND CRYSTALLINE WATERPROOFING CONCRETE ADMIXTURE

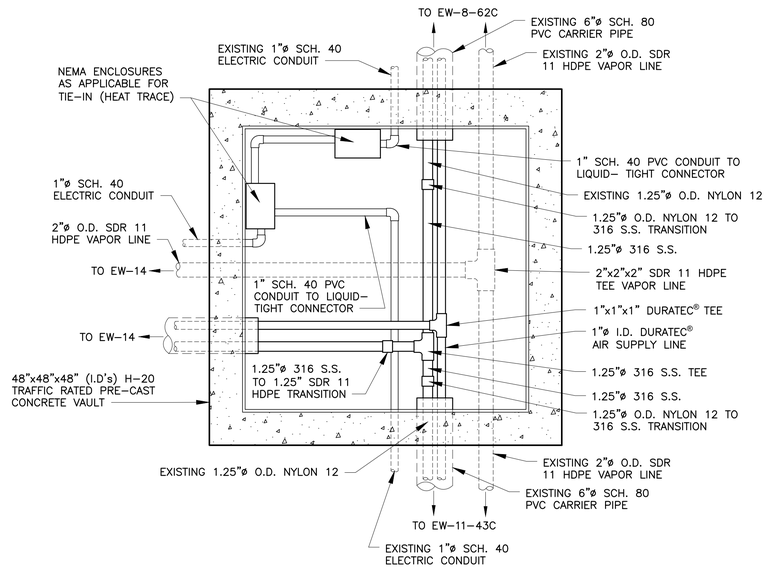
NOTE:

SUBCONTRACTOR SHALL UTILIZE EMERSON APPLETON AND O–Z/GEDNEY PRODUCTS WHERE APPLICABLE FOR HEAT TRACE INSTALLATION.



EW-14 EXTRACTION WELL VAULT PLAN VIEW

NOT TO SCALE



REPLACEMENT JUNCTION VAULT PLAN VIEW

NOT TO SCALE

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REVISIONS

REV	DESCRIPTION	
1	Revised:	Chkd: Appr.:
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3	Revised:	Chkd: Appr.:

SEAL

DATE

DRAWN BY AK 05/22/2023

CHECKED DC 05/25/2023

APPROVED

EXTRACTION WELL DETAILS (EW–13, EW–14, AND REPLACEMENT JUNCTION BOX)

DPE SYSTEM AOC 1 EXPANSION DESIGN PACKAGE
FORMER EMERSON POWER TRANSMISSION SITE
ITHACA, NEW YORK

PREPARED FOR
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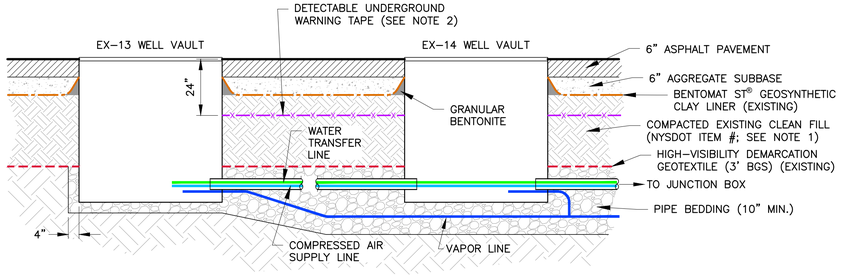
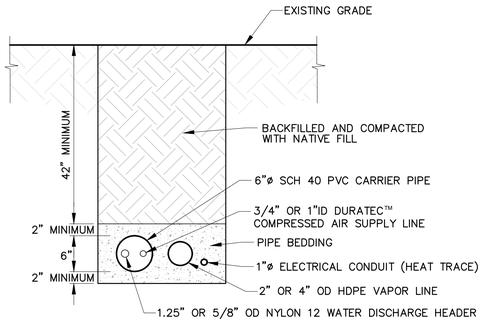
SHEET 8

Drawing Number
314P5608.001–D18



VAULT TRENCH CROSS SECTION DETAIL (AOC 1 EXPANSION)

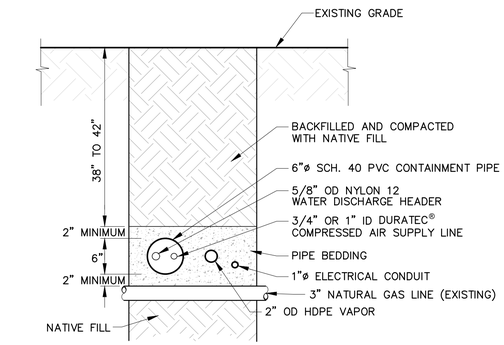
NOT TO SCALE



9/A TYPICAL GROUNDWATER, COMPRESSED AIR, AND VAPOR EXTRACTION PIPE TRENCH DETAIL (EXISTING SYSTEM)

NOT TO SCALE

- PROVIDED FOR INFORMATIONAL PURPOSES ONLY -



9/C GROUNDWATER, COMPRESSED AIR, AND VAPOR EXTRACTION PIPE TRENCH DETAIL AT GAS LINE CROSSING (EXISTING SYSTEM)

NOT TO SCALE

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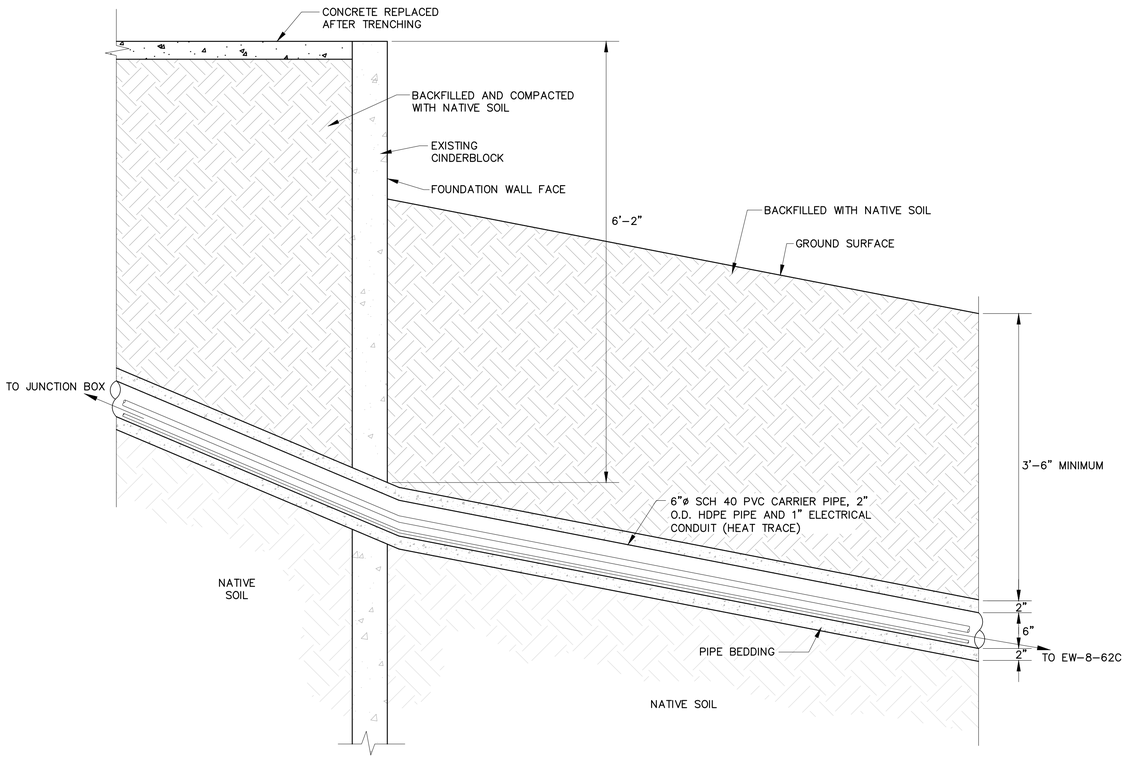
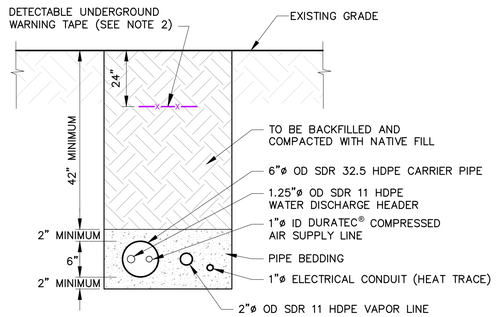


9/B FORMER BUILDING 20 FOUNDATION WALL (NORTH) TRENCH CROSS SECTION (EXISTING)

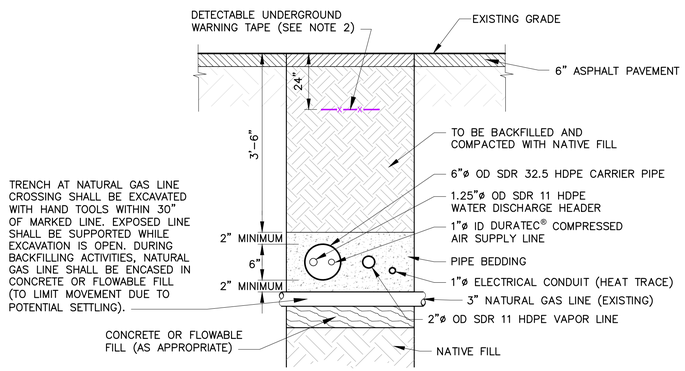
NOT TO SCALE

- PROVIDED FOR INFORMATIONAL PURPOSES ONLY -



9/D TYPICAL GROUNDWATER, COMPRESSED AIR, AND VAPOR EXTRACTION PIPE TRENCH DETAIL (AOC 1 EXPANSION)

NOT TO SCALE



TRENCH AT NATURAL GAS LINE CROSSING SHALL BE EXCAVATED WITH HAND TOOLS WITHIN 30" OF MARKED LINE. EXPOSED LINE SHALL BE SUPPORTED WHILE EXCAVATION IS OPEN. DURING BACKFILLING ACTIVITIES, NATURAL GAS LINE SHALL BE ENCASED IN CONCRETE OR FLOWABLE FILL (TO LIMIT MOVEMENT DUE TO POTENTIAL SETTLING).

9/E NATURAL GAS LINE CROSSING TRENCH DETAIL (AOC 1 EXPANSION)

NOT TO SCALE

NOTES:

1. BACKFILL GRADATION SPECIFICATIONS:

SIEVE SIZE DESIGNATION	NYSDOT ITEM #4 / TYPE 2 PERCENTAGE PASSING BY WEIGHT
3 IN.	-
2 IN.	100
1/4 IN.	25-60
NO. 40	5-40
NO. 200	0-10

2. UNDERGROUND WARNING TAPE SHALL BE RATED FOR A MINIMUM OF 24" BELOW GROUND SURFACE.

D

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REVISIONS

REV	DESCRIPTION	Chkd:	Appr.:
1	Revised	Chkd:	Appr.:
2	Revised	Chkd:	Appr.:
3	Revised	Chkd:	Appr.:

SEAL

DATE

DRAWN BY: AK 05/12/2023
CHECKED: DC 05/12/2023
APPROVED:

TRENCHING AND FORMER BUILDING 20 FOUNDATION WALL FACE INSTALLATION CROSS SECTION

DPE SYSTEM AOC1 EXPANSION DESIGN PACKAGE
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ITHACA, NEW YORK

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SHEET 9

Drawing Number
314P5608.001–D19

APPENDIX

B DESIGN CONSIDERATIONS AND DATA

Appendix B
Table 1

DPE System Well Construction Details and Peak Demand Capacity Requirements
Former Emerson Power Transmission
Ithaca, New York (a)

Well ID	Installation Date	Top of Casing Elevation (ft amsl)	Ground Surface Elevation (ft amsl)	Total Borehole Depth (ft bgs)	Total Borehole Depth (ft btoc)	Cleaned Total Borehole Depth (ft btoc)	Well Type	Well Diameter	Casing Interval (ft bgs)	Grout Interval (ft bgs)	Betonite Plug Interval (ft bgs)	Filter Pack Interval (ft bgs)	Screen Type	Screened Interval (ft-bgs)	Pump depth (ft-btoc)	Pump Type	Compressed Air Supply and Groundwater Force Main Requirements		
																	Scf/Gal (Static Conditions @ Startup)	Peak @ Startup (gpm)	Calculated Max Air Consumption (scfm)
EW-1-62C	8/20/2007	565.34	566.59	62.0	60.8	60.8	4" Open Borehole	4	0-18	-	-	-	-	NA	59.8	1.75" OD Bottom-Inlet Pneumatic Pump (AP2B) - QED Environmental Systems	0.72	1.6	1.15
EW-2-62C	~1990 (Former EW-1)	563.93	565.33	62.7	61.3	61.4	6" Open Borehole	6	0-19	-	-	-	-	NA	60.3	1.75" OD Bottom-Inlet Pneumatic Pump (AP2B) - QED Environmental Systems	0.92	3.3	3.04
EW-3-60C	~1990 (Former EW-2)	563.28	565.12	60.6	58.8	-	6" Open Borehole	6"	0-19	-	-	-	-	NA	57.8	1.75" OD Bottom-Inlet Pneumatic Pump (AP2B) - QED Environmental Systems	0.68	1.6	1.09
EW-4-25B	10/31/2008	562.9	564.04 (b)	25.0	23.9	-	Type 304 Stainless Steel Well and Screen	4"	0 - 15	0 - 11	11 - 13	13 - 25	SS	15 - 25	22.9	1.75" OD Bottom-Inlet Pneumatic Pump (AP2B) - QED Environmental Systems	0.48	2.1	1.01
EW-5-25B	9/16/2008	563.37	564.49 (b)	25.0	23.9	-	Type 304 Stainless Steel Well and Screen	4"	0 - 15	0 - 10	10 - 13	13 - 25	SS	15 - 25	22.9	1.75" OD Bottom-Inlet Pneumatic Pump (AP2B) - QED Environmental Systems	0.48	2.1	1.01
EW-6-60C	~1990 (Former EW-3)	563.84	564.49	60.6	60.0	60.1	6" Open Borehole	6"	0-19	-	-	-	-	NA	59	1.75" OD Bottom-Inlet Pneumatic Pump (AP2B) - QED Environmental Systems	0.71	1.6	1.14
EW-7-25B	9/19/2008	561.76	563.28 (b)	25.0	23.5	23.5	Type 304 Stainless Steel Well and Screen	4"	0 - 15	0 - 11	11 - 13	13 - 25	SS	15 - 25	22.5	1.75" OD Bottom-Inlet Pneumatic Pump (AP2B) - QED Environmental Systems	0.47	2.1	0.99
EW-8-62C	8/29/2007	561.82	562.94	61.5	60.4	60.4	4" Open Borehole	4"	0-23	-	-	-	-	NA	59.4	1.75" OD Bottom-Inlet Pneumatic Pump (AP2B) - QED Environmental Systems	0.72	1.6	1.15
EW-9R-72C	6/2/2015	585.19	586.13	79.3	79.3	79.0	4" Open Borehole	4"	0-54.3	0-53	53-54.3	NA	NA	NA	75.0	1.75" OD Bottom-Inlet Pneumatic Pump (AP2B) - QED Environmental Systems	0.8	1.4	1.12
EW-10-25B	9/18/2008	561.82	563.04 (b)	25.0	23.8	-	Type 304 Stainless Steel Well and Screen	4"	0 - 13	0 - 12	12 - 13	13 - 25	SS	15 - 25	22.8	1.75" OD Bottom-Inlet Pneumatic Pump (AP2B) - QED Environmental Systems	0.46	2.1	0.97
EW-11-43C	3/15/2011	585.07	586.80	45.0	43.3	-	4" Open Borehole	4"	0 - 14	0 - 13	13 -14	NA	NA	NA	42.3	1.75" OD Bottom-Inlet Pneumatic Pump (AP2B) - QED Environmental Systems	0.62	1.8	1.12
EW-12-45C (c)	8/16/2007 modified: 2015 (grouted up 45-80' interval)	586.47	587.07	45.0	44.4	-	4" Open Borehole	4"	0 - 25	0 - 25	NA	NA	NA	NA	43.4	1.75" OD Bottom-Inlet Pneumatic Pump (Short AP2B) - QED Environmental Systems	0.68	1.7	1.16
EW-13	12/2/2022	NS	NS	40.3	-	-	Type 304 Stainless Steel Well and Screen	4"	0 - 20.5	0 - 20.5	20 - 22.5	22.5 - 40.3	SS	-	36.3	1.75" OD Bottom-Inlet Pneumatic Pump (Short AP2B) - QED Environmental Systems	0.65	1.55	1.01
EW-14	12/2/2022	NS	NS	40.5	-	-	Type 304 Stainless Steel Well and Screen	4"	0 - 20	0 - 20	20.5 - 23	23 - 40.5	SS	-	36.5	1.75" OD Bottom-Inlet Pneumatic Pump (Short AP2B) - QED Environmental Systems	0.65	1.55	1.01
																Total (gpm & scfm) =		26.1	16.9
																Compressor Capacity at 175 psi (250 scfm) =		-	250

Allowable Compressed Air Piping Capacity (Without Significant Headloss)	
1-inch duratec compressed air pipe capacity at 100 psi (scfm) =	50.0
1/2-inch duratec compressed air pipe capacity at 100 psi (scfm) =	25
3/4-inch duratec compressed air pipe capacity at 100 psi (scfm) =	15

Groundwater force Main Anticipated headloss	
Anticipated headloss at startup - 1-1/4-inch nylon-12 and SDR 11 HDPE (ft per 100 ft) =	13.4
Existing system piping =	385
Expansion piping =	135
Anticipated head loss (feet) =	69.7

a/ ft = feet, " = inch, ~ = approximate, NA = data not available, bgs = below ground surface, amsl = above mean sea level, btoc = below top of casing, OD = outer diameter (total depth and all well interval measurements are approximate, no piezometers in well vaults) NS = not surveyed
scf = standard cubic feet; scfm = standard cubic feet per minute; gpm = gallons per minute, psi = pounds per square inch.
b/ Four corner evelations of the well vault averaged to represent the ground surface elevation.
c/ EW - 12 was drillled on 8/16/2007 but then converted into an extraction well on 6/3/15.

Appendix B
Table 2

Semi-Annual Site-Wide Groundwater Sampling Results (December 2022 Event)
Former Emerson Power Transmission
Ithaca, New York (a)

Well ID:	**Evaluation**	**MW-1B**	**MW-3B**		**MW-4B**	**MW-5B**	**MW-5-25**	**MW-5-40**	**MW-5-100**	**MW-7B**	**MW-8B**	**MW-12C**	**MW-15C**	**MW-32B**	**MW-36B**	**MW-46-43C**	**MW-46-72C**
Sample ID:	**Criteria**	MW-1B	MW-3B	MW-1222A	MW-4B	MW-5B	MW-5-25	MW-5-40	MW-5-100	MW-7B	MW-8B	MW-12C	MW-15C	MW-32B	MW-36B	MW-46-43C	MW-46-72C
Date:	**(b)**	12/14/22	12/14/22	12/14/22	12/14/22	12/14/22	12/14/22	12/14/22	12/14/22	12/13/22	12/13/22	12/14/22	12/14/22	12/14/22	12/13/22	12/13/22	12/13/22
VOCs (µg/l)																	
Acetone	50	10 U			10 U	10 U	6.9 J	100 U	10 U	10 U	10 U	10 U	6.4 J	10 U	10 U	1,000 U	200 U
Benzene	1	0.5 U			0.5 U	0.5 U	0.5 U	5 U	0.5 U	0.5 U	0.5 U	0.5 U	1 U		1 U	100 U	
Carbon disulfide	60	2 U			2 U	2 U	2 U	20 U	2 U	2 U	1 U	2 U		2 UJ	2 UJ	100 U	2 U
Chloroethane	5	1 U	5 U		1 U	1 U	1 U	10 U	**5.5**	1 U	1 U	1 U		1 U	1 U	**19,902**	1 U
Chloroform	7	1 U	5 U		1 U	1 U	1 U	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	100 U	25 U
1,1-Dichloroethene	5	1 U	**8.3**	**8.2**	1 U	1 U	1 U	**13.7**	1 U	1 U	1 U	1 U	1 U	1 U	1 U	100 U	25 U
cis-1,2-Dichloroethene	5	0.63 J	**4,990**	**4,990**	0.95 J	**198**	0.7 J	**7,780**	**20.1**	1.2	0.51 J	3.2	**347**	4.8	**7.5**	**12,300**	**13,500**
trans-1,2-Dichloroethene	5	1 U	**27.1**	**27.3**	1 U	2.3	1 U	**56.2**	1 U	1 U	1 U	1 U	0.91 J	1 U	1 U	**142**	**41.1**
Tetrachloroethene	5	1 U	5 U	5 U	1 U	1.1	1 U	10 U	1 U	1 U	1 U	1 U		1 U	1 U	1 U	1 U
1,1,1-Trichloroethane	5	1 U	5 U	5 U	1 U	1 U	1 U	10 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	100 U	25 U
Trichloroethene	5	1 U	**1,170**	**1,190**	1 U	**569**	1 U	**1,720**	1 U	1 U	1 U	1 U	**176**	**24.1**	1.8	100 U	**3,180**
Vinyl chloride	2	1 U	**133**	**140**	**10.5**		1 U	**1,060**	**21.6**	1 U	1 U	1 U	**35.1**	1 U	1 U	**7,460**	**2,360**
Total VOCs:	-	**1**	**6,328**	**6,371**	**11.5**	**770**	**8**	**10,630**	**47**	**1**	**1**	**3**	**565**	**29**	**9**	**79,608**	**19,081**
Total CVOCs:	-	**1**	**6,328**	**6,356**	**11.5**	**770**	**1**	**10,630**	**47**	**1**	**1**	**3**	**559**	**29**	**9**	**47,264**	**19,081**

Well ID:	**Evaluation**	**MW-50-160D**	**EXB-7**	**EXB-9**	**EXB-10**		**EW-13**	**EW-14**
Sample ID:	**Criteria**	MW-50-160D	EXB-7	EXB-9	EXB-10	MW-121522	EW-13	EW-14
Date:	**(b)**	12/14/22	12/15/22	12/15/22	12/15/22	12/15/22	12/14/22	12/15/22
VOCs (µg/l)								
Acetone	50	200 U		10 U	10 U	10 U	**11.6**	3.3 J
Benzene	1	10 U		1 U	0.91	0.93		
Chloroform	7	20 U		1 U	1 U	1 U	**21.6**	**12.5**
Cyclohexane	-	100 U		5 U	0.8 J	1.8 J		
Dibromochloromethane	50	20 U		1 U	1 U	1 U	0.91 J	0.68 J
1,1-Dichloroethane	5	20 U		1 U	1 U	1 U		
1,1-Dichloroethene	5	20 U	1.7	1 U	1 U	1 U		
cis-1,2-Dichloroethene	5	**2,910**	**1,550**	1 U	1.8	1 U	**23.3**	**25.6**
trans-1,2-Dichloroethene	5	20 U	**13.8**	1 U	1 U	1 U	1 U	
Methylcyclohexane	-	100 U		5 U	1.40 J	1.1 J		
Toluene	5	20 U		1 U	1 U	1 U	1.7	0.61 J
1,1,1-Trichloroethane	5	20 U		1 U	1 U	1 U		
Trichloroethene	5	20 U	**60.1**	1 U	1 U	1 U	4	**13.6**
Vinyl chloride	2	**1,040**	**13.4**	1 U	0.97 J	1.1	**3.6**	**29.8**
Total VOCs:	-	**3,950**	**1,639**	**ND**	**ND**	**ND**	**70**	**ND**
Total CVOCs:	-	**3,950**	**1,639**	**ND**	**2.8**	**ND**	**31**	**69**

a/ VOC = volatile organic compound; CVOC = chlorinated volatile organic compound; µg/l = micrograms per liter; U = analyte not detected above Reporting Limit; J = estimated concentration below the laboratory Reporting Limit or equal to or greater than the Method Detection Limit; ND = none detected.

b/ Concentrations highlighted and in bold text exceed evaluation criteria. Concentrations in bold text indicate the laboratory method detection limit exceeds evaluation criteria. Evaluation criteria are the New York State Ambient Water Quality Standards or Guidance Values for Class GA groundwater provided in the New York State Department of Environmental Conservation Division of Water Technical and Operational Guidance Series (1.1.1), dated June 1998, and the April 2000 Addendum.

c/ The blind duplicates MW-1222A and MW-121522 are for MW-3B and EXB-10, respectively.

Appendix B
Table 3

Extraction Well Aqueous Phase Sampling Results (2020-2022)
Former Emerson Power Transmission
Ithaca, New York (a)

Sample ID:	**EW-1-62C**			**EW-2-62C**			**EW-3-60C**			**EW-4-25B**		
Sample Date:	7/24/2020	10/7/2021	9/22/2022	7/24/2020	10/7/2021	9/22/2022	7/24/2020	10/7/2021	9/22/2022	7/24/2020	10/7/2021	9/22/2022
VOCs (µg/L)												
Acetone	60 U	10 U	10 U	60 U	12.1 J	10 U	60 U	500 U	20 U	30 U	200 U	40 U
Benzene	4.3 U	0.5 U	0.05 U	4.3 U	2 U	0.5 U	4.3 U	25 U	1 U	2.1 U	10 U	2 U
Bromodichloromethane	5.8 U	1 U	1 U	5.8 U	4 U	1 U	5.8 U	50 U	2 U	2.9 U	20 U	4 U
Bromoform	6.3 U	1 U	1 U	6.3 U	4 U	1 U	6.3 U	50 U	2 U	3.2 U	20 U	4 U
Bromomethane	16 U	2 U	2 U	16 U	8 U	2 U	16 U	100 U	4 U	8.2 U	40 U	8 U
2-Butanone (MEK)	69 U	10 U	10 U	69 U	40 U	10 U	69 U	500 U	20 U	34 U	200 U	40 U
Carbon disulfide	9.5 U	2 U	2 U	9.5 U	8 U	2 U	9.5 U	100 U	4 U	4.8 U	40 U	8 U
Carbon tetrachloride	5.5 U	1 U	1 U	5.5 U	4 U	1 U	5.5 U	50 U	2 U	2.8 U	20 U	4 U
Chlorobenzene	5.6 U	1 U	1 U	5.6 U	4 U	1 U	5.6 U	50 U	2 U	2.8 U	20 U	4 U
Chloroethane	7.3 U	1 U	1 U	7.3 U	4 U	1 U	7.3 U	50 U	2 U	3.6 U	20 U	4 U
Chloroform	5 U	1 U	1 U	5 U	4 U	1 U	5 U	50 U	2 U	2.5 U	20 U	4 U
Chloromethane	7.6 U	1 U	1 U	7.6 U	4 U	1 U	7.6 U	50 U	2 U	3.8 U	20 U	4 U
Cyclohexane	7.8 U	5 U	5 U	7.8 U	20 U	5 U	7.8 U	250 U	10 U	3.9 U	100 U	20 U
1,2-Dibromo-3-chloropropane	12 U	2 U	2 U	12 U	8 U	2 U	12 U	100 U	4 U	6 U	40 U	8 U
Dibromochloromethane	5.6 U	1 U	1 U	5.6 U	4 U	1 U	5.6 U	50 U	2 U	2.8 U	20 U	4 U
1,2-Dibromoethane	4.8 U	1 U	1 U	4.8 U	4 U	1 U	4.8 U	50 U	2 U	2.4 U	20 U	4 U
1,2-Dichlorobenzene	5.3 U	1 U	1 U	5.3 U	4 U	1 U	5.3 U	50 U	2 U	2.7 U	20 U	4 U
1,3-Dichlorobenzene	5.4 U	1 U	1 U	5.4 U	4 U	1 U	5.4 U	50 U	2 U	2.7 U	20 U	4 U
1,4-Dichlorobenzene	5.1 U	1 U	1 U	5.1 U	4 U	1 U	5.1 U	50 U	2 U	2.5 U	20 U	4 U
Dichlorodifluoromethane	14 U	2 U	2 U	14 U	8 U	2 U	14 U	100 U	4 U	6.8 U	40 U	8 U
1,1-Dichloroethane	5.7 U	1 U	1 U	5.7 U	4 U	1 U	5.7 U	50 U	2 U	2.8 U	20 U	4 U
1,2-Dichloroethane	6 U	1 U	1 U	6 U	4 U	1 U	6 U	50 U	2 U	3 U	20 U	4 U
1,1-Dichloroethene	5.9 U	1 U	1 U	5.9 U	4 U	1 U	5.9 U	50 U	1.6 J	3 U	20 U	4 U
cis-1,2-Dichloroethene	1,550	379	321	2,020	2,000	403	4,020	7,480	1,100	521	2,970	772
trans-1,2-Dichloroethene	17.8	8.6	3.2	35	301	3.5	135	42.2 J	15.1	7.9	488	8.4
1,2-Dichloropropane	5.1 U	1 U	1 U	5.1 U	4 U	1 U	5.1 U	50 U	2 U	2.5 U	20 U	4 U
cis-1,3-Dichloropropene	4.7 U	1 U	1 U	4.7 U	4 U	1 U	4.7 U	50 U	2 U	2.4 U	20 U	4 U
trans-1,3-Dichloropropene	4.3 U	1 U	1 U	4.3 U	4 U	1 U	4.3 U	50 U	2 U	2.2 U	20 U	4 U
Ethylbenzene	6 U	1 U	1 U	6 U	4 U	1 U	6 U	50 U	2 U	3 U	20 U	4 U
Freon 113	19 U	5 U	5 U	19 U	20 U	5 U	19 U	250 U	10 U	9.7 U	100 U	20 U
2-Hexanone	20 U	5 U	5 U	20 U	20 U	5 U	20 U	250 U	10 U	10 U	100 U	20 U
Isopropylbenzene	6.5 U	1 U	1 U	6.5 U	4 U	1 U	6.5 U	50 U	2 U	3.2 U	20 U	4 U
Methyl Acetate	8 U	5 U	5 U	8 U	20 U	5 U	8 U	250 U	10 U	4 U	100 U	20 U
Methylcyclohexane	6 U	5 U	5 U	6 U	20 U	5 U	6 U	250 U	10 U	3 U	100 U	20 U
Methyl Tert Butyl Ether	5.1 U	1 U	1 U	5.1 U	4 U	1 U	5.1 U	50 U	2 U	2.5 U	20 U	4 U
4-Methyl-2-pentanone (MIBK)	19 U	5 U	5 U	19 U	20 U	5 U	19 U	250 U	10 U	9.3 U	100 U	20 U
Methylene chloride	10 U	2 U	2 U	10 U	8 U	2 U	10 U	100 U	4 U	5 U	40 U	8 U
Styrene	7 U	1 U	1 U	7 U	4 U	1 U	7 U	50 U	2 U	3.5 U	20 U	4 U
1,1,2,2-Tetrachloroethane	6.5 U	1 U	1 U	6.5 U	4 U	1 U	6.5 U	50 U	2 U	3.3 U	20 U	4 U
Tetrachloroethene	9 U	1 U	1 U	9 U	4 U	1 U	9 U	50 U	2 U	4.5 U	20 U	4 U
Toluene	5.3 U	1 U	1 U	5.3 U	4 U	1 U	5.3 U	50 U	2 U	2.7 U	20 U	4 U
1,2,4-Trichlorobenzene	5 U	1 U	1 U	5 U	4 U	1 U	5 U	50 U	2 U	2.5 U	20 U	4 U
1,1,1-Trichloroethane	5.4 U	1 U	1 U	5.4 U	4 U	1 U	5.4 U	50 U	2 U	2.7 U	20 U	4 U
1,1,2-Trichloroethane	5.3 U	1 U	1 U	5.3 U	4 U	1 U	5.3 U	50 U	2 U	2.7 U	20 U	4 U
Trichloroethene	556	49.9	33.6	2,350	589	70.8	3,380	1,300	960	761	3,570	867
Trichlorofluoromethane	8.4 U	2 U	2 U	8.4 U	8 U	2 U	8.4 U	100 U	4 U	4.2 U	40 U	8 U
Vinyl chloride	55.2	15.5	31.1	7.9 U	25	24.4	14.2	50 U	36.2	3.9 U	20 U	4 U
Xylene (total)	5.9 U	1 U	1 U	5.9 U	4 U	1	5.9 U	50 U	2 U	3 U	20 U	4 U
Total VOCs (µg/L)	**2,179**	**453**	**389**	**4,405**	**2,927**	**503**	**7,549**	**8,822**	**2,113**	**1,290**	**7,028**	**1,647**

a/ Abbreviations: VOC = volatile organic compound; µg/l = micrograms per liter; NS = not sampled;
U = compound not detected, J = Indicates an estimated value

Appendix B
Table 3

Extraction Well Aqueous Phase Sampling Results (2020-2022)
Former Emerson Power Transmission
Ithaca, New York (a)

Sample ID:	**EW-5-25B**			**EW-6-60C**			**EW-7-25B**			**EW-8-62C**			
Sample Date:	7/24/2020	10/7/2021	9/22/2022	7/24/2020	10/7/2021	9/22/2022	7/24/2020	10/7/2021	9/22/2022	7/24/2020	10/7/2021	9/22/2022	7/24/2020
VOCs (µg/L)													
Acetone	30 U	40 U	20 U	60 U	33.3 J	20 U	120 U	100 U	50 U	30 U	100 U	100 U	120 U
Benzene	2.1 U	2 U	1 U	4.3 U	2.5 U	1 U	8.5 U	5 U	2.5 U	2.1 U	5 U	5 U	8.5 U
Bromodichloromethane	2.9 U	4 U	2 U	5.8 U	5 U	2 U	12 U	10 U	5 U	2.9 U	10 U	10 U	12 U
Bromoform	3.2 U	4 U	2 U	6.3 U	5 U	2 U	13 U	10 U	5 U	3.2 U	10 U	10 U	13 U
Bromomethane	8.2 U	8 U	4 U	16 U	10 U	4 U	33 U	20 U	10 U	10	20 U	20 U	33 U
2-Butanone (MEK)	34 U	40 U	20 U	69 U	50 U	20 U	140 U	100 U	50 U	34 U	100 U	100 U	140 U
Carbon disulfide	4.8 U	8 U	4 U	9.5 U	10 U	4 U	19 U	20 U	10 U	4.8 U	20 U	20 U	19 U
Carbon tetrachloride	2.8 U	4 U	2 U	5.5 U	5 U	2 U	11 U	10 U	5 U	2.8 U	10 U	10 U	11 U
Chlorobenzene	2.8 U	4 U	2 U	5.6 U	5 U	2 U	11 U	10 U	5 U	2.8 U	10 U	10 U	11 U
Chloroethane	3.6 U	4 U	2 U	7.3 U	5 U	2 U	15 U	10 U	5 U	3.6 U	10 U	10 U	15 U
Chloroform	2.5 U	4 U	2 U	5 U	5 U	2 U	10 U	10 U	5 U	2.5 U	10 U	10 U	10 U
Chloromethane	3.8 U	4 U	2 U	7.6 U	5 U	2 U	15 U	10 U	5 U	3.8 U	10 U	10 U	15 U
Cyclohexane	3.9 U	20 U	10 U	7.8 U	25 U	10 U	16 U	50 U	25 U	3.9 U	50 U	50 U	16 U
1,2-Dibromo-3-chloropropane	6 U	8 U	4 U	12 U	10 U	4 U	24 U	20 U	10 U	6 U	20 U	20 U	24 U
Dibromochloromethane	2.8 U	4 U	2 U	5.6 U	5 U	2 U	11 U	10 U	5 U	2.8 U	10 U	10 U	11 U
1,2-Dibromoethane	2.4 U	4 U	2 U	4.8 U	5 U	2 U	9.5 U	10 U	5 U	2.4 U	10 U	10 U	9.5 U
1,2-Dichlorobenzene	2.7 U	4 U	2 U	5.3 U	5 U	2 U	11 U	10 U	5 U	2.7 U	10 U	10 U	11 U
1,3-Dichlorobenzene	2.7 U	4 U	2 U	5.4 U	5 U	2 U	11 U	10 U	5 U	2.7 U	10 U	10 U	11 U
1,4-Dichlorobenzene	2.5 U	4 U	2 U	5.1 U	5 U	2 U	10 U	10 U	5 U	2.5 U	10 U	10 U	10 U
Dichlorodifluoromethane	6.8 U	8 U	4 U	14 U	10 U	4 U	27 U	20 U	10 U	6.8 U	20 U	20 U	27 U
1,1-Dichloroethane	2.8 U	4 U	2 U	5.7 U	5 U	2 U	11 U	10 U	5 U	2.8 U	10 U	10 U	11 U
1,2-Dichloroethane	3 U	4 U	2 U	6 U	5 U	2 U	12 U	10 U	5 U	3 U	10 U	10 U	12 U
1,1-Dichloroethene	3 U	4 U	2 U	5.9 U	5 U	2 U	12 U	10 U	3.6 J	3 U	10 U	10 U	12 U
cis-1,2-Dichloroethene	1,040	740	673	1,190	1,200	880	3,920	2,400	2,230	1,270	3,820	3,080	3,080
trans-1,2-Dichloroethene	33.3	25.9	5.5	10	7.5	3.7	33.8	89.4	24.4	6.3	30.5	15.8	48.6
1,2-Dichloropropane	2.5 U	4 U	2 U	5.1 U	5 U	2 U	10 U	10 U	5 U	2.5 U	10 U	10 U	10 U
cis-1,3-Dichloropropene	2.4 U	4 U	2 U	4.7 U	5 U	2 U	9.4 U	10 U	5 U	2.4 U	10 U	10 U	9.4 U
trans-1,3-Dichloropropene	2.2 U	4 U	2 U	4.3 U	5 U	2 U	8.6 U	10 U	5 U	2.2 U	10 U	10 U	8.6 U
Ethylbenzene	3 U	4 U	2 U	6 U	5 U	2 U	12 U	10 U	5 U	3 U	10 U	10 U	12 U
Freon 113	9.7 U	20 U	10 U	19 U	25 U	10 U	39 U	50 U	25 U	9.7 U	50 U	50 U	39 U
2-Hexanone	10 U	20 U	10 U	20 U	25 U	10 U	41 U	50 U	25 U	10 U	50 U	50 U	41 U
Isopropylbenzene	3.2 U	4 U	2 U	6.5 U	5 U	2 U	13 U	10 U	5 U	3.2 U	10 U	10 U	13 U
Methyl Acetate	4 U	20 U	10 U	8 U	25 U	10 U	16 U	50 U	25 U	4 U	50 U	50 U	16 U
Methylcyclohexane	3 U	20 U	10 U	6 U	25 U	10 U	12 U	50 U	25 U	3 U	50 U	50 U	12 U
Methyl Tert Butyl Ether	2.5 U	4 U	2 U	5.1 U	5 U	2 U	10 U	10 U	5 U	2.5 U	10 U	10 U	10 U
4-Methyl-2-pentanone (MIBK)	9.3 U	20 U	10 U	19 U	25 U	10 U	37 U	50 U	25 U	9.3 U	50 U	50 U	37 U
Methylene chloride	5 U	8 U	4 U	10 U	10 U	4 U	20 U	20 U	10 U	5 U	20 U	20 U	20 U
Styrene	3.5 U	4 U	2 U	7 U	5 U	2 U	14 U	10 U	5 U	3.5 U	10 U	10 U	14 U
1,1,2,2-Tetrachloroethane	3.3 U	4 U	2 U	6.5 U	5 U	2 U	13 U	10 U	5 U	3.3 U	10 U	10 U	13 U
Tetrachloroethene	4.5 U	4 U	2 U	9 U	5 U	2 U	18 U	10 U	5 U	4.5 U	10 U	10 U	18 U
Toluene	2.7 U	4 U	2 U	5.3 U	5 U	2 U	11 U	10 U	5 U	2.7 U	10 U	10 U	11 U
1,2,4-Trichlorobenzene	2.5 U	4 U	2 U	5 U	5 U	2 U	10 U	10 U	5 U	2.5 U	10 U	10 U	10 U
1,1,1-Trichloroethane	2.7 U	4 U	2 U	5.4 U	5 U	2 U	11 U	10 U	5 U	2.7 U	10 U	10 U	11 U
1,1,2-Trichloroethane	2.7 U	4 U	2 U	5.3 U	5 U	2 U	11 U	10 U	5 U	2.7 U	10 U	10 U	11 U
Trichloroethene	962	225	386	1,820	101	142	3,500	15.3	92.3	857	67	296	2,070
Trichlorofluoromethane	4.2 U	8 U	4 U	8.4 U	10 U	4 U	17 U	20 U	10 U	4.2 U	20 U	20 U	17 U
Vinyl chloride	8.2	4 U	8.4	7.9 U	26.2	4	25.4	10 U	97.4	3.9 U	13.8	48.5	16 U
Xylene (total)	3 U	4 U	2 U	5.9 U	5 U	2 U	12 U	10 U	5 U	3 U	10 U	10 U	12 U
Total VOCs (µg/L)	**2,044**	**991**	**1,073**	**3,020**	**1,368**	**1,030**	**7,479**	**2,505**	**2,448**	**2,143**	**3,931**	**3,440**	**5,199**

a/ Abbreviations: VOC = volatile org
U = compound not detected, J = In

Appendix B
Table 3

Extraction Well Aqueous Phase Sampling Results (2020-2022)
Former Emerson Power Transmission
Ithaca, New York (a)

Sample ID:	**EW-9R-72C**			**EW-10-25B**			**EW-11-45C**			**EW-12-45C**		**EW-13**	**EW-14**
Sample Date:	10/7/2021	9/22/2022	7/24/2020	10/7/2021	9/22/2022	7/24/2020	10/7/2021	9/22/2022	7/24/2020	10/7/2021	9/22/2022	12/14/2022	12/15/2022
VOCs (µg/L)													
Acetone	100 U	50 U	15.5	8.2 J	10 U	120 U	1,000 U	500 U	30 U	100	50 U	11.6	3.3 J
Benzene	5 U	2.5 U	0.43 U	0.5 U	0.5 U	8.5 U	50 U	25 U	2.1 U	2.5 U	2.5 U	0.5 U	0.5 U
Bromodichloromethane	10 U	5 U	0.58 U	1 U	1 U	12 U	100 U	50 U	2.9 U	5 U	5 U	3.4	2.1
Bromoform	10 U	5 U	0.63 U	1 U	1 U	13 U	100 U	50 U	3.2 U	5 U	5 U	1 U	1 U
Bromomethane	20 U	10 U	1.6 U	2 U	2 U	33 U	200 U	100 U	8.2 U	10 U	10 U	1 U	2 U
2-Butanone (MEK)	100 U	50 U	6.9 U	10 U	10 U	140 U	1,000 U	500 U	34 U	50 U	50 U	2 U	10 U
Carbon disulfide	20 U	10 U	0.95 U	2 U	2 U	19 U	200 U	100 U	4.8 U	2.6 J	10 U	10 U	2 U
Carbon tetrachloride	10 U	5 U	0.55 U	1 U	1 U	11 U	100 U	50 U	2.8 U	5 U	5 U	1 U	1 U
Chlorobenzene	10 U	5 U	0.56 U	1 U	1 U	11 U	100 U	50 U	2.8 U	5 U	5 U	1 U	1 U
Chloroethane	10 U	5 U	0.73 U	1 U	1 U	15 U	100 U	50 U	3.6 U	5 U	5 U	1 U	1 U
Chloroform	10 U	5 U	0.5 U	1 U	1 U	10 U	100 U	50 U	2.5 U	5.8	3.7 J	21.6	12.5
Chloromethane	10 U	5 U	0.76 U	1 U	1 U	15 U	100 U	50 U	3.8 U	5 U	5 U	1 U	1 U
Cyclohexane	50 U	25 U	0.78 U	5 U	5 U	16 U	500 U	250 U	3.9 U	25 U	25 U	5 U	5 UJ
1,2-Dibromo-3-chloropropane	20 U	10 U	1.2 U	2 U	2 U	24 U	200 U	100 U	6 U	10 U	10 U	2 U	2 U
Dibromochloromethane	10 U	5 U	0.56 U	1 U	1 U	11 U	100 U	50 U	2.8 U	5 U	5 U	0.91 J	0.68 J
1,2-Dibromoethane	10 U	5 U	0.48 U	1 U	1 U	9.5 U	100 U	50 U	2.4 U	5 U	5 U	1 U	1 U
1,2-Dichlorobenzene	10 U	5 U	0.53 U	1 U	1 U	11 U	100 U	50 U	2.7 U	5 U	5 U	1 U	1 U
1,3-Dichlorobenzene	10 U	5 U	0.54 U	1 U	1 U	11 U	100 U	50 U	2.7 U	5 U	5 U	1 U	1 U
1,4-Dichlorobenzene	10 U	5 U	0.51 U	1 U	1 U	10 U	100 U	50 U	2.5 U	5 U	5 U	1 U	1 U
Dichlorodifluoromethane	20 U	10 U	1.4 U	2 U	2 U	27 U	200 U	100 U	6.8 U	10 U	10 U	2 U	2 U
1,1-Dichloroethane	10 U	5 U	0.57 U	1 U	1 U	11 U	100 U	50 U	2.8 U	5 U	5 U	1 U	1 U
1,2-Dichloroethane	10 U	5 U	0.6 U	1 U	1 U	12 U	100 U	50 U	3 U	5 U	5 U	1 U	1 U
1,1-Dichloroethene	10 U	5 U	0.59 U	1 U	1 U	12 U	100 U	49.9 J	3 U	3.2 J	5 U	1 U	1 U
cis-1,2-Dichloroethene	2,610	1,730	236	166	343	3,620	8,430	21,900	841	2,100	2,030	23.3	25.6
trans-1,2-Dichloroethene	25.1	5	6.3	4.3	3.6	59.3	100 U	124	2.7 U	6.4	4.7 J	1 U	1 U
1,2-Dichloropropane	10 U	5 U	0.51 U	1 U	1 U	10 U	100 U	50 U	2.5 U	5 U	5 U	1 U	1 U
cis-1,3-Dichloropropene	10 U	5 U	0.47 U	1 U	1 U	9.4 U	100 U	50 U	2.4 U	5 U	5 U	1 U	1 U
trans-1,3-Dichloropropene	10 U	5 U	0.43 U	1 U	1 U	8.6 U	100 U	50 U	2.2 U	5 U	5 U	1 U	1 U
Ethylbenzene	10 U	5 U	0.6 U	1 U	1 U	12 U	100 U	50 U	3 U	5 U	5 U	1 U	1 U
Freon 113	50 U	25 U	1.9 U	5 U	5 U	39 U	500 U	250 U	9.7 U	25 U	25 U	5 U	5 U
2-Hexanone	50 U	25 U	2 U	5 U	5 U	41 U	500 U	250 U	10 U	25 U	25 U	5 U	5 U
Isopropylbenzene	10 U	5 U	0.65 U	1 U	1 U	13 U	100 U	50 U	3.2 U	5 U	5 U	1 U	1 U
Methyl Acetate	50 U	25 U	0.8 U	5 U	5 U	16 U	500 U	250 U	4 U	25 U	25 U	5 U	5 U
Methylcyclohexane	50 U	25 U	0.6 U	5 U	5 U	12 U	500 U	250 U	3 U	25 U	25 U	5 U	5 U
Methyl Tert Butyl Ether	10 U	5 U	0.51 U	1 U	1 U	10 U	100 U	50 U	2.5 U	5 U	5 U	1 U	1 U
4-Methyl-2-pentanone (MIBK)	50 U	25 U	1.9 U	5 U	5 U	37 U	500 U	250 U	9.3 U	25 U	25 U	5 U	5 U
Methylene chloride	20 U	10 U	1 U	2 U	2 U	20 U	200 U	100 U	5 U	10 U	10 U	2 U	2 U
Styrene	10 U	5 U	0.7 U	1 U	1 U	14 U	100 U	50 U	3.5 U	5 U	5 U	1 U	1 U
1,1,2,2-Tetrachloroethane	10 U	5 U	0.65 U	1 U	1 U	13 U	100 U	50 U	3.3 U	5 U	5 U	1 U	1 U
Tetrachloroethene	10 U	5 U	0.9 U	1 U	1 U	18 U	100 U	50 U	4.5 U	5 U	5 U	1 U	1 U
Toluene	10 U	5 U	0.53 U	1 U	1 U	11 U	100 U	50 U	2.7 U	5 U	5 U	1.7	0.61 J
1,2,4-Trichlorobenzene	10 U	5 U	0.5 U	1 U	1 U	10 U	100 U	50 U	2.5 U	5 U	5 U	1 U	1 U
1,1,1-Trichloroethane	10 U	5 U	0.54 U	1 U	1 U	11 U	100 U	50 U	2.7 U	5 U	5 U	1 U	1 U
1,1,2-Trichloroethane	10 U	5 U	0.53 U	1 U	1 U	11 U	100 U	50 U	2.7 U	5 U	5 U	1 U	1 U
Trichloroethene	10 U	28.2	98.2	63.2	124	6,420	13,600	26,600	220	5 U	68.6	4	13.6
Trichlorofluoromethane	20 U	10 U	0.84 U	2 U	2 U	17 U	200 U	100 U	4.2 U	10 U	10 U	2 U	2 U
Vinyl chloride	1,140	85.2	2.4	1 U	4	16 U	100 U	587	3.9 U	150	44.5	3.6	29.8
Xylene (total)	10 U	5 U	0.59 U	1 U	1 U	12 U	100 U	50 U	3 U	5 U	5 U	1 U	1 U
Total VOCs (µg/L)	**3,775**	**1,848**	**358**	**242**	**475**	**10,099**	**22,030**	**49,261**	**1,061**	**2,368**	**2,152**	**70**	**88**

a/ Abbreviations: VOC = volatile org
U = compound not detected, J = In

Appendix B
Table 4

Extraction Well Vapor Phase Sampling Results (2020-2022)
Former Emerson Power Transmission
Ithaca, New York (a)

Sample ID:	**EW-1-62C**						**EW-2-62C**					
Sample Date:	7/24/2020		10/8/2021		9/22/2022		7/24/2020		10/8/2021		9/22/2022	
	(ppbv)	(µg/m3)	(ppbv)	(µg/m^3)	(ppbv)	(µg/m3)	(ppbv)	(µg/m3)	(ppbv)	(µg/m^3)	(ppbv)	(µg/m3)
VOCs												
1,1,1-Trichloroethane	5 U	27 U	0.4 U	2.2 U	0.4 U	2.2 U	5 U	27 U	0.4 U	2.2 U	0.4 U	2.2 U
1,1,2,2-Tetrachloroethane	5 U	34 U	0.4 U	2.7 U	0.4 U	2.7 U	5 U	34 U	0.4 U	2.7 U	0.4 U	2.7 U
1,1,2-Trichloroethane	5 U	27 U	0.4 U	2.2 U	0.4 U	2.2 U	5 U	27 U	0.4 U	2.2 U	0.4 U	2.2 U
1,1-Dichloroethane	5 U	20 U	0.8 U	3.2 U	0.8 U	3.2 U	5 U	20 U	0.8 U	3.2 U	0.8 U	3.2 U
1,1-Dichloroethene	16	62	0.16 U	0.63 U	0.2 U	0.6 U	5 U	20 U	1.3	5.2	0.16 U	0.63 U
1,2,4-Trichlorobenzene	5 U	37 U	0.4 U	3 U	0.4 U	3 U	5 U	37 U	0.4 U	2.6 U	0.4 U	3 U
1,2,4-Trimethylbenzene	5 U	25 U	0.38 J	1.9 J	0.8 U	3.9 U	5 U	25 U	0.8 U	3.9 U	0.8 U	3.9 U
1,2-Dibromoethane	5 U	38 U	0.4 U	3.1 U	0.4 U	3.1 U	5 U	38 U	0.4 U	3.1 U	0.4 U	3.1 U
1,2-Dichlorobenzene	5 U	30 U	0.16 U	0.96 U	0.2 U	1 U	5 U	30 U	0.16 U	0.96 U	0.16 U	9.6 U
1,2-Dichloroethane	5 U	20 U	0.8 U	3.2 U	0.8 U	3.2 U	5 U	20 U	0.8 U	3.2 U	0.8 U	3.2 U
1,2-Dichloropropane	5 U	23 U	0.8 U	3.7 U	0.8 U	3.7 U	5 U	23 U	0.8 U	3.7 U	0.8 U	3.7 U
1,3,5-Trimethylbenzene	5 U	25 U	0.8 U	3.9 U	0.8 U	3.9 U	5 U	25 U	0.8 U	3.9 U	0.8 U	3.9 U
1,3-butadiene	5 U	11 U	0.8 U	1.8 U	0.8 U	1.8 U	5 U	11 U	0.8 U	1.8 U	0.8 U	1.8 U
1,3-Dichlorobenzene	5 U	30 U	0.4 U	2.4 U	0.4 U	2.4 U	5 U	30 U	0.4 U	2.4 U	0.4 U	2.4 U
1,4-Dichlorobenzene	5 U	30 U	0.4 U	2.4 U	0.4 U	2.4 U	5 U	30 U	0.4 U	2.4 U	0.4 U	2.4 U
1,4-Dioxane	10 U	36 U	0.8 U	2.9 U	0.8 U	2.9 U	10 U	36 U	0.8 U	2.9 U	0.8 U	2.9 U
2,2,4-trimethylpentane	5 U	23 U	0.8 U	3.7 U	0.8 U	3.7 U	5 U	23 U	0.8 U	3.7 U	0.8 U	3.7 U
2-chlorotoluene	-	-	0.8 U	4.1 U	0.8 U	4.1 U	-	-	0.8 U	4.1 U	0.8 U	4.1 U
4-ethyltoluene	5 U	25 U	0.8 U	3.9 U	0.8 U	3.9 U	5 U	25 U	0.8 U	3.9 U	0.8 U	3.9 U
Acetone	10 U	24 U	40.4	96	3.2	7.6	10 U	24 U	8.2	19	2.6	6.2
Allyl chloride	5 U	16 U	0.8 U	2.5 U	0.8 U	2.5 U	5 U	16 U	0.8 U	2.5 U	0.8 U	2.5 U
Benzene	5 U	16 U	1.7	5.4	0.8 U	2.6 U	5 U	16 U	0.97	3.1	0.8 U	2.6 U
Benzyl chloride	5 U	29 U	0.8 U	4.1 U	0.8 U	4.1 U	5 U	29 U	0.8 U	4.1 U	0.8 U	4.1 U
Bromodichloromethane	5 U	33 U	0.4 U	2.7 U	0.4 U	2.7 U	5 U	33 U	0.4 U	2.7 U	0.4 U	2.7 U
Bromoform	5 U	52 U	0.16 U	1.7 U	0.2 U	1.7 U	5 U	52 U	0.16 U	1.7 U	0.16 U	1.7 U
Bromomethane	5 U	19 U	0.56 J	2.2 J	0.8 U	3.1 U	5 U	19 U	0.8 U	3.1 U	0.8 U	3.1 U
Carbon disulfide	5 U	16 U	0.41 J	1.3 J	0.8 U	2.5 U	5 U	16 U	0.8 U	2.5 U	0.8 U	2.5 U
Carbon tetrachloride	5 U	31 U	0.16 U	1 U	0.2 U	1 U	5 U	31 U	0.16 U	1 U	0.16 U	1 U
Chlorobenzene	5 U	23 U	0.8 U	3.7 U	0.8 U	3.7 U	5 U	23 U	0.8 U	3.7 U	0.8 U	3.7 U
Chloroethane	5 U	13 U	0.8 U	2.1 U	0.8 U	2.1 U	5 U	13 U	0.8 U	2.1 U	0.8 U	2.1 U
Chloroform	5 U	24 U	0.8 U	3.9 U	0.8 U	3.9 U	5 U	24 U	0.8 U	3.9 U	0.8 U	3.9 U
Chloromethane	5 U	10 U	1.3	2.7	0.8 U	1.7 U	5 U	10 U	0.54 J	1.1 J	0.8 U	1.7 U
cis-1,2-Dichloroethene	1	3,900	18.6	73.7	1.6	6.3	290	1,100	118	468	29.6	117
cis-1,3-Dichloropropene	5 U	23 U	0.8 U	3.6 U	0.8 U	3.6 U	5 U	23 U	0.8 U	3.6 U	0.8 U	3.6 U
Cyclohexane	5 U	17 U	0.8 U	2.8 U	0.8 U	2.8 U	5 U	17 U	0.8 U	2.8 U	0.8 U	2.8 U
Dibromochloromethane	5 U	43 U	0.4 U	3.4 U	0.4 U	3.1 U	5 U	43 U	0.4 U	3.4 U	0.4 U	3.4 U
Ethanol	-	-	23.2	43.7	2 U	3.8 U	-	-	5.1	9.6	3.4	6.4
Ethyl acetate	10 U	36 U	45.4	163	0.8 U	2.9 U	10 U	36 U	22	79.2	90.3	325
Ethylbenzene	5 U	22 U	0.64 J	2.8 J	0.8 U	3.5 U	5 U	22 U	0.8 U	3.5 U	0.8 U	3.5 U
Freon 11	5 U	28 U	0.53	3	0.5	2.9	5 U	28 U	0.4 U	2.2 U	0.4 U	2.2 U
Freon 113	5 U	38 U	0.4 U	3.1 U	0.4 U	3.1 U	5 U	38 U	0.4 U	3.1 U	0.4 U	3.1 U
Freon 114	5 U	35 U	0.4 U	2.8 U	0.4 U	2.8 U	5 U	35 U	0.4 U	2.8 U	0.4 U	2.8 U
Freon 12	5 U	25 U	0.88	4.4	0.4 J	2 J	5 U	25 U	0.41 J	2 J	0.43 J	2.1 J
Heptane	5 U	20 U	0.97	4	0.8 U	3.3 U	5 U	20 U	0.8 U	0.29 U	0.8 U	3.3 U
Hexachloro-1,3-butadiene	5 U	53 U	0.36 U	3.8 U	0.4 U	3.8 U	5 U	53 U	0.36 U	3.8 U	3.6 U	3.8 U
Hexane	5 U	18 U	0.81	2.9	0.8 U	2.8 U	5 U	18 U	0.8 U	2.8 U	0.8 U	2.8 U
Isopropyl alcohol	5 U	12 U	3.6	8.8	0.8 U	2 U	5 U	12 U	0.8 U	2 U	1.1	2.7
m&p-Xylene	10 U	43 U	2.2	9.6	0.8 U	3.5 U	10 U	43 U	0.51 J	2.2 J	0.8 U	3.5 U
Methyl Butyl Ketone	10 U	41 U	0.8 U	3.3 U	0.8 U	3.3 U	10 U	41 U	0.8 U	3.3 U	0.8 U	3.3 U
Methyl Ethyl Ketone	10 U	29 U	45.3	134	0.8 U	2.4 U	10 U	29 U	7.5	22	0.88	2.6
Methyl Isobutyl Ketone	10 U	41 U	0.69 J	2.8 J	0.8 U	3.3 U	10 U	41 U	0.8 U	3.3 U	0.8 U	3.3 U
Methyl tert-butyl ether	5 U	18 U	0.8 U	2.9 U	0.8 U	2.9 U	5 U	18 U	0.8 U	2.9 U	0.8 U	2.9 U
Methylene chloride	5 U	17 U	0.8 U	2.8 U	1.5	5.2	5 U	17 U	0.8 U	2.8 U	0.79 J	2.7 J
Methylmethacrylate	-	-	0.8 U	3.3 U	0.8 U	3.3 U	-	-	0.8 U	3.3 U	0.8 U	3.3 U
o-Xylene	5 U	22 U	0.83	3.6	0.8 U	3.5 U	5 U	22 U	0.8 U	3.5 U	0.8 U	3.5 U
Propylene	5 U	8.6 U	2 U	3.4 U	2 U	3.4 U	5 U	8.6 U	2 U	3.4 U	2 U	3.4 U
Styrene	5 U	21 U	0.8 U	3.4 U	0.8 U	3.4 U	5 U	21 U	0.8 U	3.4 U	0.8 U	3.4 U
Tertiary Butyl Alcohol	-	-	9.9	30	0.8 U	2.4 U	-	-	1.4	4.2	0.8 U	2.4 U
Tetrachloroethene	5 U	34 U	0.57	3.9	0.2 U	1.1 U	5 U	34 U	0.16 U	1.1 U	0.16 U	1.1 U
Tetrahydrofuran	13	39	0.8 U	2.4 U	0.8 U	2.4 U	5 U	15 U	0.8 U	2.4 U	0.8 U	2.4 U
Toluene	5 U	19 U	10.1	38.1	0.8 U	3 U	5 U	19 U	1.3	4.9	1.8	6.8
trans-1,2-Dichloroethene	27	110	0.8 U	3.2 U	0.8 U	3.2 U	7.1	28	2.8	11	0.8 U	3.2 U
trans-1,3-Dichloropropene	5 U	23 U	0.8 U	3.6 U	0.8 U	3.6 U	5 U	23 U	0.8 U	3.6 U	0.8 U	3.6
Trichloroethene	710	3,800	4.1	22	0.2 U	0.9 U	0.56	3,000	93.7	504	35.3	190
Vinyl acetate	5 U	18 U	0.8 U	2.8 U	0.8 U	2.8 U	5 U	18 U	0.8 U	2.8 U	0.98	3.4
Vinyl Bromide	5 U	22 U	0.8 U	3.5 U	0.8 U	3.5 U	5 U	22 U	0.8 U	3.5 U	0.8 U	3.5 U
Vinyl chloride	600	1,500	6.8	17	1.3	3.3	9.3	24	12.8	32.7	1.3	3.3
Total VOCs	**1,367**	**9,411**	**220**	**677**	**9**	**202**	**307**	**4,152**	**277**	**1,168**	**168**	**672**

a/ Abbreviations: VOC = volatile organic compound; ppbv = parts per billion by volume;
mg/m^3 = milligrams per cubic meter; U = compound not detected.
- = Not sampled

Appendix B
Table 4

Extraction Well Vapor Phase Sampling Results (2020-2022)
Former Emerson Power Transmission
Ithaca, New York (a)

Sample ID:	**EW-3-60C**						**EW-4-25B**					
Sample Date:	7/24/2020		10/8/2021		9/22/2022		7/24/2020		10/8/2021		9/22/2022	
	(ppbv)	(µg/m3)	(ppbv)	(µg/m^3)	(ppbv)	(µg/m3)	(ppbv)	(µg/m3)	(ppbv)	(µg/m^3)	(ppbv)	(µg/m3)
VOCs												
1,1,1-Trichloroethane	5 U	27 U	0.4 U	2.2 U	2 U	11 U	5 U	27 U	0.4 U	2.2 U	8 U	44 U
1,1,2,2-Tetrachloroethane	5 U	34 U	0.4 U	2.7 U	2 U	14 U	5 U	34 U	0.4 U	2.7 U	8 U	55 U
1,1,2-Trichloroethane	5 U	27 U	0.4 U	2.2 U	2 U	11 U	5 U	27 U	0.4 U	2.2 U	8 U	44 U
1,1-Dichloroethane	5 U	20 U	0.8 U	3.2 U	4 U	16 U	5 U	20 U	0.8 U	3.2 U	16 U	65 U
1,1-Dichloroethene	5 U	20 U	0.8 U	3.2 U	7.1	28 U	5 U	20 U	3.2	13	3.2 U	13 U
1,2,4-Trichlorobenzene	5 U	37 U	0.4 U	2.6 U	2 U	15 U	5 U	37 U	0.4 U	2.6 U	8 U	59 U
1,2,4-Trimethylbenzene	5 U	25 U	0.8 U	3.9 U	4 U	20 U	5 U	25 U	0.8 U	3.9 U	16 U	79 U
1,2-Dibromoethane	5 U	38 U	0.4 U	3.1 U	2 U	15 U	5 U	38 U	0.4 U	3.1 U	8 U	61 U
1,2-Dichlorobenzene	5 U	30 U	0.16 U	0.96 U	0.8 U	4.8 U	5 U	30 U	0.16 U	0.96 U	3.2 U	19 U
1,2-Dichloroethane	5 U	20 U	0.8 U	3.2 U	4 U	16 U	5 U	20 U	0.8 U	3.2 U	16 U	65 U
1,2-Dichloropropane	5 U	23 U	0.8 U	3.7 U	4 U	18 U	5 U	23 U	0.8 U	3.7 U	16 U	74 U
1,3,5-Trimethylbenzene	5 U	25 U	0.8 U	3.9 U	4 U	20 U	5 U	25 U	0.8 U	3.9 U	16 U	79 U
1,3-butadiene	5 U	11 U	0.8 U	1.8 U	4 U	8.8 U	5 U	11 U	0.8 U	1.8 U	16 U	35 U
1,3-Dichlorobenzene	5 U	30 U	0.4 U	2.4 U	2 U	12 U	5 U	30 U	0.4 U	2.4 U	8 U	48 U
1,4-Dichlorobenzene	5 U	30 U	0.4 U	2.4 U	2 U	12 U	5 U	30 U	0.4 U	2.4 U	8 U	48 U
1,4-Dioxane	10 U	36 U	0.8 U	2.9 U	4 U	14 U	10 U	36 U	0.8 U	2.9 U	16 U	58 U
2,2,4-trimethylpentane	5 U	23 U	0.8 U	3.7 U	4 U	19 U	5 U	23 U	0.8 U	3.7 U	16 U	75 U
2-chlorotoluene	-	-	0.8 U	4.1 U	4 U	21 U	-	-	0.8 U	4.1 U	16 U	83 U
4-ethyltoluene	5 U	25 U	0.8 U	3.9 U	4 U	20 U	5 U	25 U	0.8 U	3.9 U	16 U	79 U
Acetone	10 U	24 U	8.2	19	4	9.5	10 U	24 U	17.6	41.8	16 U	38 U
Allyl chloride	5 U	16 U	0.8 U	2.5 U	4 U	13 U	5 U	16 U	0.8 U	2.5 U	16 U	50 U
Benzene	5 U	16 U	0.8 U	2.6 U	4 U	13 U	5 U	16 U	0.86	2.7	16 U	51 U
Benzyl chloride	5 U	29 U	0.8 U	4.1 U	4 U	21 U	5 U	29 U	0.8 U	4.1 U	16 U	82 U
Bromodichloromethane	5 U	33 U	0.4 U	2.7 U	2 U	13 U	5 U	33 U	0.4 U	2.7 U	8 U	54 U
Bromoform	5 U	52 U	0.47	4.9	0.8 U	8.3 U	5 U	52 U	0.16 U	1.7 U	3.2 U	33 U
Bromomethane	5 U	19 U	0.54 J	2.1 J	4 U	16 U	5 U	19 U	0.8 U	3.1 U	16 U	62 U
Carbon disulfide	5 U	16 U	0.8 U	2.5 U	4 U	12 U	5 U	16 U	0.8 U	2.5 U	16 U	50 U
Carbon tetrachloride	5 U	31 U	0.16 U	1 U	0.8 U	5 U	5 U	31 U	0.16 U	1 U	3.2 U	20 U
Chlorobenzene	5 U	23 U	0.8 U	3.7 U	4 U	18 U	5 U	23 U	0.8 U	3.7 U	16 U	74 U
Chloroethane	5 U	13 U	0.8 U	2.1 U	4 U	11 U	5 U	13 U	0.8 U	2.1 U	16 U	42 U
Chloroform	5 U	24 U	0.8 U	3.9 U	4 U	20 U	5 U	24 U	0.8 U	3.9 U	16 U	78 U
Chloromethane	5 U	10 U	0.57 J	1.2 J	4 U	8.3 U	5 U	10 U	0.61 J	1.3 J	16 U	33 U
cis-1,2-Dichloroethene	120	480	0.16 U	0.63 U	1,310	5,190	280	1,100	560	2,220	1,330	5,270
cis-1,3-Dichloropropene	5 U	23 U	0.8 U	3.6 U	4 U	18 U	5 U	23 U	0.8 U	3.6 U	16 U	73 U
Cyclohexane	5 U	17 U	0.8 U	2.8 U	4 U	14 U	5 U	17 U	0.8 U	2.8 U	16 U	55 U
Dibromochloromethane	5 U	43 U	0.4 U	3.4 U	2 U	17 U	5 U	43 U	0.4 U	3.4 U	8 U	68 U
Ethanol	-	-	8	15	10 U	19 U	-	-	8.8	17	40 U	75 U
Ethyl acetate	10 U	36 U	9.7	35	17.1	61.5	10 U	36 U	14.3	51.5	21.6	77.7
Ethylbenzene	5 U	22 U	0.8 U	3.5 U	4 U	17 U	5 U	22 U	0.8 U	3.5 U	16 U	69 U
Freon 11	5 U	28 U	0.4 U	2.2 U	2 U	11 U	5 U	28 U	0.4 U	2.2 U	8 U	45 U
Freon 113	5 U	38 U	0.4 U	3.1 U	2 U	15 U	5 U	38 U	0.4 U	3.1 U	8 U	61 U
Freon 114	5 U	35 U	0.4 U	2.8 U	2 U	14 U	5 U	35 U	0.4 U	2.8 U	8 U	56 U
Freon 12	5 U	25 U	0.41 J	2 J	4 U	20 U	5 U	25 U	0.44 J	2.2 J	16 U	79 U
Heptane	5 U	20 U	0.8 U	0.29 U	4 U	16 U	5 U	20 U	0.6 J	2.5 J	16 U	66 U
Hexachloro-1,3-butadiene	5 U	53 U	0.36 U	3.8 U	1.8 U	19 U	5 U	53 U	0.36 U	3.8 U	7.2 U	77 U
Hexane	5 U	18 U	0.8 U	2.8 U	4 U	14 U	5 U	18 U	0.8 U	2.8 U	16 U	56 U
Isopropyl alcohol	5 U	12 U	0.8 U	2 U	4 U	9.8 U	5 U	12 U	1.6	3.9	16 U	39 U
m&p-Xylene	10 U	43 U	0.8 U	3.5 U	4 U	17 U	10 U	43 U	0.81	3.5	16 U	69 U
Methyl Butyl Ketone	10 U	41 U	0.8 U	3.3 U	4 U	16 U	10 U	41 U	0.8 U	3.3 U	16 U	65 U
Methyl Ethyl Ketone	10 U	29 U	5.5	16	4 U	12 U	10 U	29 U	22.4	66.1	16 U	47 U
Methyl Isobutyl Ketone	10 U	41 U	0.8 U	3.3 U	4 U	16 U	10 U	41 U	0.8 U	3.3 U	16 U	66 U
Methyl tert-butyl ether	5 U	18 U	0.8 U	2.9 U	4 U	14 U	5 U	18 U	0.8 U	2.9 U	16 U	58 U
Methylene chloride	5 U	17 U	0.8 U	2.8 U	4 U	14 U	5 U	17 U	0.8 U	2.8 U	16 U	56 U
Methylmethacrylate	-	-	0.8 U	3.3 U	4 U	16 U	-	-	0.8 U	3.3 U	16 U	66 U
o-Xylene	5 U	22 U	0.8 U	3.5 U	4 U	17 U	5 U	22 U	0.8 U	3.5 U	16 U	69 U
Propylene	5 U	8.6 U	2 U	3.4 U	10 U	17 U	5 U	8.6 U	2 U	3.4 U	40 U	69 U
Styrene	5 U	21 U	0.8 U	3.4 U	4 U	17 U	5 U	21 U	0.8 U	3.4 U	16 U	68 U
Tertiary Butyl Alcohol	-	-	1.2	3.6	4 U	12 U	-	-	5.1	15	16 U	49 U
Tetrachloroethene	5 U	34 U	0.16 U	1.1 U	0.73 J	5 J	5 U	34 U	0.29	2	3.2 U	22 U
Tetrahydrofuran	5 U	15 U	0.8 U	2.4 U	4 U	12 U	5 U	15 U	0.8 U	2.4 U	16 U	47 U
Toluene	5 U	19 U	0.77 J	2.9 J	4 U	15 U	5 U	19 U	4.2	16	16 U	60 U
trans-1,2-Dichloroethene	5 U	20 U	0.8 U	3.2 U	18	71.4	5 U	20 U	7.8	31	12.2 J	48.4 J
trans-1,3-Dichloropropene	5 U	23 U	0.8 U	3.6 U	4 U	18 U	5 U	23 U	0.8 U	3.6 U	16 U	73 U
Trichloroethene	360	2,000	0.27	1.5	992	5,330	750	4,000	680	3,650	3,370	18,100
Vinyl acetate	5 U	18 U	0.8 U	2.8 U	4 U	14 U	5 U	18 U	0.8 U	2.8 U	16 U	56 U
Vinyl Bromide	5 U	22 U	0.8 U	3.5 U	4 U	17 U	5 U	22 U	0.8 U	3.5 U	16 U	70 U
Vinyl chloride	9.5	24	0.16 U	0.41 U	279	713	5 U	13 U	4.6	12	10.5	26.8
Total VOCs	**490**	**2,504**	**36**	**103**	**2,628**	**11,380**	**1,030**	**5,100**	**1,333**	**6,152**	**4,744**	**23,523**

Appendix B
Table 4

Extraction Well Vapor Phase Sampling Results (2020-2022)
Former Emerson Power Transmission
Ithaca, New York (a)

Sample ID:	**EW-5-25B**							
Sample Date:	7/24/2020		10/8/2021		9/22/2022		7/24/2020	
	(ppbv)	(µg/m3)	(ppbv)	(µg/m^3)	(ppbv)	(µg/m3)	(ppbv)	(µg/m3)
VOCs								
1,1,1-Trichloroethane	5 U	27 U	0.4 U	2.2 U	4 U	22 U	5 U	27 U
1,1,2,2-Tetrachloroethane	5 U	34 U	0.4 U	2.7 U	4 U	27 U	5 U	34 U
1,1,2-Trichloroethane	5 U	27 U	0.4 U	2.2 U	4 U	22 U	5 U	27 U
1,1-Dichloroethane	5 U	20 U	0.8 U	3.2 U	8 U	32 U	5 U	20 U
1,1-Dichloroethene	5 U	20 U	2.1	8.3	10.2	40.4	11	43
1,2,4-Trichlorobenzene	5 U	37 U	0.4 U	2.6 U	4 U	30 U	5 U	37 U
1,2,4-Trimethylbenzene	5 U	25 U	0.8 U	3.9 U	8 U	39 U	5 U	25 U
1,2-Dibromoethane	5 U	38 U	0.4 U	3.1 U	4 U	31 U	5 U	38 U
1,2-Dichlorobenzene	5 U	30 U	0.16 U	0.96 U	1.6 U	9.6 U	5 U	30 U
1,2-Dichloroethane	5 U	20 U	0.8 U	3.2 U	8 U	32 U	5 U	20 U
1,2-Dichloropropane	5 U	23 U	0.8 U	3.7 U	8 U	37 U	5 U	23 U
1,3,5-Trimethylbenzene	5 U	25 U	0.8 U	3.9 U	8 U	39 U	5 U	25 U
1,3-butadiene	5 U	11 U	0.8 U	1.8 U	8 U	18 U	5 U	11 U
1,3-Dichlorobenzene	5 U	30 U	0.4 U	2.4 U	4 U	24 U	5 U	30 U
1,4-Dichlorobenzene	5 U	30 U	0.4 U	2.4 U	4 U	24 U	5 U	30 U
1,4-Dioxane	10 U	36 U	0.8 U	2.9 U	8 U	29 U	10 U	36 U
2,2,4-trimethylpentane	5 U	23 U	0.8 U	3.7 U	8 U	37 U	5 U	23 U
2-chlorotoluene	-	-	0.8 U	4.1 U	8 U	41 U	-	-
4-ethyltoluene	5 U	25 U	0.8 U	3.9 U	8 U	39 U	5 U	25 U
Acetone	10 U	24 U	21.6	51.3	8 U	19 U	10 U	24 U
Allyl chloride	5 U	16 U	0.8 U	2.5 U	8 U	25 U	5 U	16 U
Benzene	5 U	16 U	0.8	2.6	8 U	26 U	5 U	16 U
Benzyl chloride	5 U	29 U	0.8 U	4.1 U	8 U	41 U	5 U	29 U
Bromodichloromethane	5 U	33 U	0.4 U	2.7 U	4 U	27 U	5 U	33 U
Bromoform	5 U	52 U	0.16 U	1.7 U	1.6 U	17 U	5 U	52 U
Bromomethane	5 U	19 U	0.8 U	3.1 U	8 U	31 U	5 U	19 U
Carbon disulfide	5 U	16 U	2.2	6.9	8 U	25 U	5 U	16 U
Carbon tetrachloride	5 U	31 U	0.16 U	1 U	1.6 U	10 U	5 U	31 U
Chlorobenzene	5 U	23 U	0.8 U	3.7 U	8 U	37 U	5 U	23 U
Chloroethane	5 U	13 U	0.8 U	2.1 U	8 U	21 U	5 U	13 U
Chloroform	5 U	24 U	0.8 U	3.9 U	8 U	39 U	5 U	24 U
Chloromethane	5 U	10 U	0.71 J	1.5 J	8 U	17 U	5 U	10 U
cis-1,2-Dichloroethene	60	240	350	1,390	1,490	5,910	5,100	20,000
cis-1,3-Dichloropropene	5 U	23 U	0.8 U	3.6 U	8 U	36 U	5 U	23 U
Cyclohexane	5 U	17 U	0.8 U	2.8 U	8 U	28 U	5 U	17 U
Dibromochloromethane	5 U	43 U	0.4 U	3.4 U	4 U	34 U	5 U	43 U
Ethanol	-	-	7.8	15	20 U	38 U	-	-
Ethyl acetate	10 U	36 U	11.7	42.1	8 U	29 U	10 U	36 U
Ethylbenzene	5 U	22 U	0.8 U	3.5 U	8 U	35 U	5 U	22 U
Freon 11	5 U	28 U	0.4 U	2.2 U	4 U	22 U	5 U	28 U
Freon 113	5 U	38 U	0.4 U	3.1 U	4 U	31 U	5 U	38 U
Freon 114	5 U	35 U	0.4 U	2.8 U	4 U	28 U	5 U	35 U
Freon 12	5 U	25 U	0.44 J	2.2 J	8 U	40 U	5 U	25 U
Heptane	5 U	20 U	0.54 J	2.2 J	8 U	33 U	5 U	20 U
Hexachloro-1,3-butadiene	5 U	53 U	0.36 U	3.8 U	3.6 U	38 U	5 U	53 U
Hexane	5 U	18 U	0.8 U	2.8 U	8 U	28 U	5 U	18 U
Isopropyl alcohol	5 U	12 U	1.3	3.2	8 U	20 U	5 U	12 U
m&p-Xylene	10 U	43 U	1	4.3	8 U	35 U	10 U	43 U
Methyl Butyl Ketone	10 U	41 U	6	25	8 U	33 U	10 U	41 U
Methyl Ethyl Ketone	10 U	29 U	17.4	51.3	8 U	24 U	10 U	29 U
Methyl Isobutyl Ketone	10 U	41 U	0.8 U	3.3 U	8 U	33 U	10 U	41 U
Methyl tert-butyl ether	5 U	18 U	0.8 U	2.9 U	8 U	29 U	5 U	18 U
Methylene chloride	5 U	17 U	0.83	2.9	8 U	28 U	5 U	17 U
Methylmethacrylate	-	-	0.8 U	3.3 U	8 U	33 U	-	-
o-Xylene	5 U	22 U	0.41 J	1.8 J	8 U	35 U	5 U	22 U
Propylene	5 U	8.6 U	2 U	3.4 U	20 U	34 U	5 U	8.6 U
Styrene	5 U	21 U	0.8 U	3.4 U	8 U	34 U	5 U	21 U
Tertiary Butyl Alcohol	-	-	3.5	11	8 U	24 U	-	-
Tetrachloroethene	5 U	34 U	0.51	3.5	1.6 U	11 U	5.8	39
Tetrahydrofuran	5 U	15 U	0.8 U	2.4 U	8 U	24 U	5 U	15 U
Toluene	5 U	19 U	2	7.5	8 U	30 U	5 U	19 U
trans-1,2-Dichloroethene	5 U	20 U	7.2	29	21.7	86	35	140
trans-1,3-Dichloropropene	5 U	23 U	0.8 U	3.6 U	8 U	36 U	5 U	23 U
Trichloroethene	86	460	144	774	1390	7,470	11,000	58,000
Vinyl acetate	5 U	18 U	0.8 U	2.8 U	8 U	28 U	5 U	18 U
Vinyl Bromide	5 U	22 U	0.8 U	3.5 U	8 U	35 U	5 U	22 U
Vinyl chloride	5 U	13 U	102	261	264	675	29	75
Total VOCs	**146**	**700**	**684**	**2,697**	**3,176**	**14,181**	**16,181**	**78,297**

Appendix B
Table 4

Extraction Well Vapor Phase Sampling Results (2020-2022)
Former Emerson Power Transmission
Ithaca, New York (a)

Sample ID:	**EW-6-60C**				**EW-7-25B**					
Sample Date:	10/8/2021		9/22/2022		7/24/2020		10/8/2021		9/22/2022	
	(ppbv)	($\mu g/m^3$)	(ppbv)	(µg/m3)	(ppbv)	(µg/m3)	(ppbv)	($\mu g/m^3$)	(ppbv)	(µg/m3)
VOCs										
1,1,1-Trichloroethane	1 U	5.5 U	2 U	11 U	5 U	27 U	24 U	130 U	0.4 U	2.2 U
1,1,2,2-Tetrachloroethane	1 U	6.9 U	2 U	14 U	5 U	34 U	24 U	160 U	0.4 U	2.7 U
1,1,2-Trichloroethane	1 U	5.5 U	2 U	11 U	5 U	27 U	24 U	130 U	0.4 U	2.2 U
1,1-Dichloroethane	2 U	8.1 U	4 U	16 U	5 U	20 U	47 U	190 U	0.8 U	3.2 U
1,1-Dichloroethene	1	4	6.4	25	10	41	67.1	266	1	4
1,2,4-Trichlorobenzene	1 U	6.6 U	2 U	15 U	5 U	37 U	24 U	180 U	0.4 U	3 U
1,2,4-Trimethylbenzene	2 U	7.4 U	4 U	20 U	5 U	25 U	47 U	230 U	0.8 U	3.9 U
1,2-Dibromoethane	1 U	7.7 U	2 U	15 U	5 U	38 U	24 U	180 U	0.4 U	3.1 U
1,2-Dichlorobenzene	0.4 U	2.4 U	0.8 U	4.8 U	5 U	30 U	9.4 U	57 U	0.16 U	0.96 U
1,2-Dichloroethane	2 U	8.1 U	4 U	16 U	5 U	20 U	47 U	190 U	0.8 U	3.2 U
1,2-Dichloropropane	2 U	9.2 U	4 U	18 U	5 U	23 U	47 U	220 U	0.8 U	3.7 U
1,3,5-Trimethylbenzene	2 U	9.8 U	4 U	20 U	5 U	25 U	47 U	230 U	0.8 U	3.9 U
1,3-butadiene	2 U	4.4 U	4 U	8.8 U	5 U	11 U	47 U	100 U	0.8 U	1.8 U
1,3-Dichlorobenzene	1 U	6 U	2 U	12 U	5 U	30 U	24 U	140 U	0.4 U	2.4 U
1,4-Dichlorobenzene	1 U	6 U	2 U	12 U	5 U	30 U	24 U	140 U	0.4 U	2.4 U
1,4-Dioxane	2 U	7.2 U	4 U	14 U	10 U	36 U	47 U	170 U	0.8 U	2.9 U
2,2,4-trimethylpentane	2 U	9.3 U	4 U	19 U	5 U	23 U	47 U	220 U	0.8 U	3.7 U
2-chlorotoluene	2 U	10 U	4 U	21 U	-	-	47 U	240 U	0.8 U	4.1 U
4-ethyltoluene	2 U	9.8 U	4 U	20 U	5 U	25 U	47 U	230 U	0.8 U	3.9 U
Acetone	14.1	33.5	4 U	9.5 U	10 U	24 U	58.9	140	2.8	6.7
Allyl chloride	2 U	6.3 U	4 U	13 U	5 U	16 U	47 U	150 U	0.8 U	2.5 U
Benzene	1 J	3.2 J	4 U	13 U	5 U	16 U	2.8 J	1.5 J	0.8 U	2.6 U
Benzyl chloride	2 U	10 U	4 U	21 U	5 U	29 U	47 U	240 U	0.8 U	4.1 U
Bromodichloromethane	1 U	6.7 U	2 U	13 U	5 U	33 U	24 U	160 U	0.4 U	2.7 U
Bromoform	0.4 U	4.1 U	0.8 U	8.3 U	5 U	52 U	9.4 U	97 U	0.16 U	1.7 U
Bromomethane	2 U	7.8 U	4 U	16 U	5 U	19 U	47 U	180 U	0.8 U	3.1 U
Carbon disulfide	2 U	6.2 U	4 U	12 U	5 U	16 U	47 U	150 U	0.8 U	2.5 U
Carbon tetrachloride	0.4 U	2.5 U	0.8 U	5 U	5 U	31 U	9.4 U	59 U	0.16 U	1 U
Chlorobenzene	2 U	9.2 U	4 U	18 U	5 U	23 U	47 U	220 U	0.8 U	3.7 U
Chloroethane	2 U	5.3 U	4 U	11 U	5 U	13 U	47 U	120 U	0.8 U	2.1 U
Chloroform	2 U	9.8 U	4 U	20 U	5 U	24 U	47 U	230 U	0.8 U	3.9 U
Chloromethane	2 U	4.1 U	4 U	8.3 U	5 U	10 U	47 U	97 U	0.8 U	1.7 U
cis-1,2-Dichloroethene	564	2,240	2,310	9,160	1,900	7,700	9,400	37,300	227	900
cis-1,3-Dichloropropene	2 U	9.1 U	4 U	18 U	5 U	23 U	47 U	210 U	0.8 U	3.6 U
Cyclohexane	2 U	6.9 U	4 U	14 U	5 U	17 U	47 U	160 U	0.8 U	2.8 U
Dibromochloromethane	1 U	8.5 U	2 U	17 U	5 U	43 U	24 U	200 U	0.4 U	3.4 U
Ethanol	7.6	14	10 U	19 U	-	-	120 U	230 U	3.1	5.8
Ethyl acetate	13.1	47.1	24.1	86.7	10 U	36 U	47 U	170 U	45.8	165
Ethylbenzene	2 U	8.7 U	4 U	17 U	5 U	22 U	47 U	200 U	0.8 U	3.5 U
Freon 11	1 U	5.6 U	2 U	11 U	5 U	28 U	24 U	130 U	0.39 J	2.2 J
Freon 113	1 U	7.7 U	2 U	15 U	5 U	38 U	24 U	180 U	0.4 U	3.1 U
Freon 114	1 U	7 U	2 U	14 U	5 U	35 U	24 U	170 U	0.4 U	2.8 U
Freon 12	2 U	9.9 U	4 U	20 U	5 U	25 U	47 U	230 U	0.42 J	2.1 J
Heptane	2 U	8.2 U	4 U	16 U	5 U	20 U	47 U	190 U	0.8 U	3.3 U
Hexachloro-1,3-butadiene	0.9 U	9.6 U	1.8 U	19 U	5 U	53 U	21 U	220 U	0.36 U	3.8 U
Hexane	2 U	7 U	4 U	14 U	5 U	18 U	47 U	170 U	0.8 U	2.8 U
Isopropyl alcohol	2 U	4.9 U	4 U	9.8 U	5 U	12 U	47 U	120 U	0.87	2.1
m&p-Xylene	2 U	8.7 U	4 U	17 U	10 U	43 U	47 U	200 U	0.8 U	3.5 U
Methyl Butyl Ketone	2 U	8.2 U	4 U	16 U	10 U	41 U	47 U	190 U	0.8 U	3.3 U
Methyl Ethyl Ketone	17.8	52.5	4 U	12 U	10 U	29 U	47 U	140 U	0.8 U	2.4 U
Methyl Isobutyl Ketone	2 U	8.2 U	4 U	16 U	10 U	41 U	47 U	190 U	0.8 U	3.3 U
Methyl tert-butyl ether	2 U	7.2 U	4 U	14 U	5 U	18 U	47 U	170 U	0.8 U	2.9 U
Methylene chloride	2 U	6.9 U	4 U	14 U	5 U	17 U	47 U	160 U	0.82	2.8
Methylmethacrylate	2 U	8.2 U	4 U	16 U	-	-	47 U	190 U	0.8 U	3.3 U
o-Xylene	2 U	87 U	4 U	17 U	5 U	22 U	47 U	200 U	0.8 U	3.5 U
Propylene	5 U	8.6 U	10 U	17 U	5 U	8.6 U	120 U	210 U	2 U	3.4 U
Styrene	2 U	8.5 U	4 U	17 U	5 U	21 U	47 U	200 U	0.8 U	3.4 U
Tertiary Butyl Alcohol	2.8	8.5	4 U	12 U	-	-	47 U	140 U	0.8 U	2.4 U
Tetrachloroethene	0.59	4	0.8 U	5.4 U	5 U	34 U	9.4 U	64 U	0.15 J	1 J
Tetrahydrofuran	6.5	19	4 U	12 U	5 U	15 U	47 U	140 U	0.8 U	2.4 U
Toluene	1.1 J	4.1 J	4 U	15 U	5 U	19 U	47 U	180 U	1.1	4.1
trans-1,2-Dichloroethene	4	16	17.8	70.6	37	150	210	833	3.6	14
trans-1,3-Dichloropropene	2 U	9.1 U	4 U	18 U	5 U	23 U	47 U	210 U	0.8 U	3.6 U
Trichloroethene	131	704	817	4,390	190	1,000	104	559	14.4	77.4
Vinyl acetate	2 U	7 U	4 U	14 U	5 U	18 U	47 U	170 U	0.8 U	2.8 U
Vinyl Bromide	2 U	8.7 U	4 U	17 U	5 U	22 U	47 U	210 U	0.8 U	3.5 U
Vinyl chloride	80.3	205	183	468	1,300	3,200	1,380	3,530	89.4	229
Total VOCs	**845**	**3,355**	**3,358**	**14,200**	**3,437**	**12,091**	**11,223**	**42,630**	**391**	**1,416**

Appendix B
Table 4

Extraction Well Vapor Phase Sampling Results (2020-2022)
Former Emerson Power Transmission
Ithaca, New York (a)

Sample ID:	**EW-8-62C**						**EW-9R-72C**					
Sample Date:	7/24/2020		10/8/2021		9/22/2022		7/24/2020		10/8/2021		9/22/2022	
	(ppbv)	(µg/m3)	(ppbv)	(µg/m^3)	(ppbv)	(µg/m3)	(ppbv)	(µg/m3)	(ppbv)	(µg/m^3)	(ppbv)	(µg/m3)
VOCs												
1,1,1-Trichloroethane	5 U	27 U	0.4 U	2.2 U	0.4 U	2.2 U	5 U	27 U	0.4 U	2.2 U	1 U	5.5 U
1,1,2,2-Tetrachloroethane	5 U	34 U	0.4 U	2.7 U	0.4 U	2.7 U	5 U	34 U	0.4 U	2.7 U	1 U	6.9 U
1,1,2-Trichloroethane	5 U	27 U	0.4 U	2.2 U	0.4 U	2.2 U	5 U	27 U	0.4 U	2.2 U	1 U	5.5 U
1,1-Dichloroethane	5 U	20 U	0.8 U	3.2 U	0.8 U	3.2 U	5 U	20 U	0.8 U	3.2 U	2 U	8.1 U
1,1-Dichloroethene	5 U	20 U	0.57	2.3	0.66	2.6	120	490	0.16 U	0.63 U	5.6	22
1,2,4-Trichlorobenzene	5 U	37 U	0.4 U	2.6 U	0.4 U	3 U	5 U	37 U	0.4 U	2.6 U	1 U	7.4 U
1,2,4-Trimethylbenzene	5 U	25 U	0.8 U	3.9 U	0.8 U	3.9 U	5 U	25 U	0.8 U	3.9 U	2 U	9.8 U
1,2-Dibromoethane	5 U	38 U	0.4 U	3.1 U	0.4 U	3.1 U	5 U	38 U	0.4 U	3.1 U	1 U	7.7 U
1,2-Dichlorobenzene	5 U	30 U	0.16 U	0.96 U	0.16 U	0.96 U	5 U	30 U	0.16 U	0.96 U	0.4 U	2.4 U
1,2-Dichloroethane	5 U	20 U	0.8 U	3.2 U	0.8 U	3.2 U	5 U	20 U	0.8 U	3.2 U	2 U	8.1 U
1,2-Dichloropropane	5 U	23 U	0.8 U	3.7 U	0.8 U	3.7 U	5 U	23 U	0.8 U	3.7 U	2 U	9.2 U
1,3,5-Trimethylbenzene	5 U	25 U	0.8 U	3.9 U	0.8 U	3.9 U	5 U	25 U	0.8 U	3.9 U	2 U	9.8 U
1,3-butadiene	5 U	11 U	0.8 U	1.8 U	0.8 U	1.8 U	5 U	11 U	0.8 U	1.8 U	2 U	4.4 U
1,3-Dichlorobenzene	5 U	30 U	0.4 U	2.4 U	0.4 U	2.4 U	5 U	30 U	0.4 U	2.4 U	1 U	6 U
1,4-Dichlorobenzene	5 U	30 U	0.4 U	2.4 U	0.4 U	2.4 U	5 U	30 U	0.4 U	2.4 U	1 U	6 U
1,4-Dioxane	10 U	36 U	0.8 U	2.9 U	0.8 U	2.9 U	10 U	36 U	0.8 U	2.9 U	2 U	7.2 U
2,2,4-trimethylpentane	5 U	23 U	0.8 U	3.7 U	0.8 U	3.7 U	5 U	23 U	0.8 U	3.7 U	2 U	9.3 U
2-chlorotoluene	-	-	0.8 U	4.1 U	0.8 U	4.1 U	-	-	0.8 U	4.1 U	2 U	1 U
4-ethyltoluene	5 U	25 U	0.8 U	3.9 U	0.8 U	3.9 U	5 U	25 U	0.8 U	3.9 U	2 U	9.8 U
Acetone	10 U	24 U	11.8	28	4.3	1	10 U	24 U	5.5	13	7	17
Allyl chloride	5 U	16 U	0.8 U	2.5 U	0.8 U	2.5 U	5 U	16 U	0.8 U	2.5 U	2 U	6.3 U
Benzene	5 U	16 U	0.47 J	1.5 J	0.8 U	2.6 U	5 U	16 U	0.8 U	2.6 U	2 U	6.4 U
Benzyl chloride	5 U	29 U	0.8 U	4.1 U	0.8 U	4.1 U	5 U	29 U	0.8 U	4.1 U	2 U	10 U
Bromodichloromethane	5 U	33 U	0.4 U	2.7 U	0.4 U	2.7 U	5 U	33 U	0.4 U	2.7 U	1 U	6.7 U
Bromoform	5 U	52 U	0.16 U	1.7 U	0.16 U	1.7 U	5 U	52 U	0.16 U	1.7 U	0.4 U	4.1 U
Bromomethane	5 U	19 U	0.8 U	3.1 U	0.8 U	3.1 U	5 U	19 U	0.8 U	3.1 U	2 U	7.8 U
Carbon disulfide	5 U	16 U	0.8 U	2.5 U	0.8 U	2.5 U	5 U	16 U	0.8 U	2.5 U	2 U	6.2 U
Carbon tetrachloride	5 U	31 U	0.16 U	1 U	0.16 U	1 U	5 U	31 U	0.16 U	1 U	0.4 U	2.5 U
Chlorobenzene	5 U	23 U	0.8 U	3.7 U	0.8 U	3.7 U	5 U	23 U	0.8 U	3.7 U	2 U	9.2 U
Chloroethane	5 U	13 U	0.8 U	2.1 U	0.8 U	2.1 U	5 U	13 U	0.8 U	2.1 U	2 U	5.3 U
Chloroform	5 U	24 U	0.8 U	3.9 U	0.8 U	3.9 U	5 U	24 U	0.8 U	3.9 U	2 U	9.8 U
Chloromethane	5 U	10 U	0.6 J	1.2 J	0.8 U	1.7 U	5 U	10 U	0.54 J	1.1 J	2 U	4.1 U
cis-1,2-Dichloroethene	210	820	210	833	339	1,340	30,000	120,000	9.4	37	1,520	6,030
cis-1,3-Dichloropropene	5 U	23 U	0.8 U	3.6 U	0.8 U	3.6 U	5 U	23 U	0.8 U	3.6 U	2 U	9.1 U
Cyclohexane	5 U	17 U	0.8 U	2.8 U	0.8 U	2.8 U	6.5	22	0.8 U	2.8 U	2 U	6.9 U
Dibromochloromethane	5 U	43 U	0.4 U	3.4 U	0.4 U	3.4 U	5 U	43 U	0.4 U	3.4 U	1 U	8.5 U
Ethanol	-	-	5.8	11	3.1	5.8	-	-	2.6	4.9	5 U	9.4 U
Ethyl acetate	10 U	36 U	12.7	45.7	67.4	243	10 U	36 U	1.5	5.4	6.9	25
Ethylbenzene	5 U	22 U	0.8 U	3.5 U	0.8 U	3.5 U	5 U	22 U	0.8 U	3.5 U	2 U	8.7 U
Freon 11	5 U	28 U	0.4 U	2.2 U	0.4 U	2.2 U	5 U	28 U	0.4 U	2.2 U	1 U	5.6 U
Freon 113	5 U	38 U	0.4 U	3.1 U	0.4 U	3.1 U	5 U	38 U	0.4 U	3.1 U	1 U	7.7 U
Freon 114	5 U	35 U	0.4 U	2.8 U	0.4 U	2.8 U	5 U	35 U	0.4 U	2.8 U	1 U	7 U
Freon 12	5 U	25 U	0.42 J	2.1 J	0.39 J	1.9 J	5 U	25 U	0.43 J	2.1 J	2 U	9.9 U
Heptane	5 U	20 U	0.8 U	0.29 U	0.8 U	3.3 U	5 U	20 U	0.8 U	0.29 U	2 U	8.2 U
Hexachloro-1,3-butadiene	5 U	53 U	0.36 U	3.8 U	0.36 U	3.8 U	5 U	53 U	0.36 U	3.8 U	0.9 U	9.6 U
Hexane	5 U	18 U	0.8 U	2.8 U	0.8 U	2.8 U	8.1	29	0.8 U	2.8 U	2 U	7 U
Isopropyl alcohol	5 U	12 U	0.99	2.4	0.86	2.1	5 U	12 U	0.8 U	2 U	2 U	4.9 U
m&p-Xylene	10 U	43 U	0.73 J	3.2 J	0.8 U	3.5 U	10 U	43 U	0.8 U	3.5 U	2 U	8.7 U
Methyl Butyl Ketone	10 U	41 U	0.8 U	3.3 U	0.8 U	3.3 U	10 U	41 U	0.8 U	3.3 U	2 U	8.2 U
Methyl Ethyl Ketone	10 U	29 U	12.1	35.7	0.57 J	1.7 J	10 U	29 U	0.42 J	1.2 J	2.1	6.2
Methyl Isobutyl Ketone	10 U	41 U	0.8 U	3.3 U	0.8 U	3.3 U	10 U	41 U	0.8 U	3.3 U	2 U	8.2 U
Methyl tert-butyl ether	5 U	18 U	0.8 U	2.9 U	0.8 U	2.9 U	5 U	18 U	0.8 U	2.9 U	2 U	7.2 U
Methylene chloride	5 U	17 U	0.8 U	2.8 U	0.8 U	2.8 U	5 U	17 U	0.8 U	2.8 U	2 U	6.9 U
Methylmethacrylate	-	-	0.8 U	3.3 U	0.8 U	3.3 U	-	-	0.8 U	3.3 U	2	8.2
o-Xylene	5 U	22 U	0.8 U	3.5 U	0.8 U	3.5 U	5 U	22 U	0.8 U	3.5 U	2 U	8.7 U
Propylene	5 U	8.6 U	2 U	3.4 U	2 U	3.4 U	5 U	8.6 U	2 U	3.4 U	5 U	8.6 U
Styrene	5 U	21 U	0.8 U	3.4 U	0.8 U	3.4 U	5 U	21 U	0.8 U	3.4 U	2 U	8.5 U
Tertiary Butyl Alcohol	-	-	2.9	8.8	0.8 U	2.4 U	-	-	0.8 U	2.4 U	2 U	6.1 U
Tetrachloroethene	5 U	34 U	0.16 U	1.1 U	0.16 U	1.1 U	8.7	59	0.16 U	1.1 U	0.4 U	2.7 U
Tetrahydrofuran	5 U	15 U	0.8 U	2.4 U	0.8 U	2.4 U	5 U	15 U	0.8 U	2.4 U	3.1	9.1
Toluene	5 U	19 U	1.8	6.8	1.7	6.4	5 U	19 U	2.8	11	2 U	7.5 U
trans-1,2-Dichloroethene	5 U	20 U	2	7.9	2.3	9.1	270	1,100	0.8 U	3.2 U	15	59.5
trans-1,3-Dichloropropene	5 U	23 U	0.8 U	3.6 U	0.8 U	3.6 U	5 U	23 U	0.8 U	3.6 U	2 U	9.1 U
Trichloroethene	930	5,000	11.7	62.9	85.7	461	34,000	180,000	12.4	66.6	477	2,560
Vinyl acetate	5 U	18 U	0.8 U	2.8 U	0.83	2.9	5 U	18 U	0.8 U	2.8 U	2 U	7 U
Vinyl Bromide	5 U	22 U	0.8 U	3.5 U	0.8 U	3.5 U	5 U	22 U	0.8 U	3.5 U	2 U	8.7 U
Vinyl chloride	5 U	13 U	16.9	43.2	22.1	56.5	1,100	2,800	2	5.1	483	1,230
Total VOCs	**1,140**	**5,820**	**291**	**1,096**	**529**	**2,134**	**65,513**	**304,500**	**38**	**147**	**2,522**	**9,967**

Appendix B
Table 4

Extraction Well Vapor Phase Sampling Results (2020-2022)
Former Emerson Power Transmission
Ithaca, New York (a)

Sample ID:	**EW-10-25B**							
Sample Date:	7/24/2020		10/8/2021		9/22/2022		7/24/2020	
	(ppbv)	(µg/m3)	(ppbv)	(µg/m^3)	(ppbv)	(µg/m3)	(ppbv)	(µg/m3)
VOCs								
1,1,1-Trichloroethane	5 U	27 U	2 U	11 U	2 U	11 U	5 U	27 U
1,1,2,2-Tetrachloroethane	5 U	34 U	2 U	14 U	2 U	14 U	5 U	34 U
1,1,2-Trichloroethane	5 U	27 U	2 U	11 U	2 U	11 U	5 U	27 U
1,1-Dichloroethane	5 U	20 U	4 U	16 U	4 U	16 U	5 U	20 U
1,1-Dichloroethene	5 U	20 U	3.4	13	2.9	11	5 U	20 U
1,2,4-Trichlorobenzene	5 U	37 U	2 U	15 U	2 U	15 U	5 U	37 U
1,2,4-Trimethylbenzene	5 U	25 U	4 U	20 U	4 U	20 U	5 U	25 U
1,2-Dibromoethane	5 U	38 U	2 U	15 U	2 U	15 U	5 U	38 U
1,2-Dichlorobenzene	5 U	30 U	0.8 U	4.8 U	0.8 U	4.8 U	5 U	30 U
1,2-Dichloroethane	5 U	20 U	4 U	18 U	2 U	16 U	5 U	20 U
1,2-Dichloropropane	5 U	23 U	4 U	1.8 U	4 U	18 U	5 U	23 U
1,3,5-Trimethylbenzene	5 U	25 U	4 U	20 U	4 U	20 U	5 U	25 U
1,3-butadiene	5 U	11 U	4 U	8.8 U	4 U	8.8 U	5 U	11 U
1,3-Dichlorobenzene	5 U	30 U	2 U	12 U	2 U	12 U	5 U	30 U
1,4-Dichlorobenzene	5 U	30 U	2 U	12 U	2 U	12 U	5 U	30 U
1,4-Dioxane	10 U	36 U	4 U	14 U	4 U	14 U	10 U	36 U
2,2,4-trimethylpentane	5 U	23 U	4 U	19 U	4 U	19 U	5 U	23 U
2-chlorotoluene	-	-	4 U	21 U	4 U	21 U	-	-
4-ethyltoluene	5 U	25 U	4 U	20 U	4 U	20 U	5 U	25 U
Acetone	10 U	24 U	12.7	30.2	5.7	14	10 U	24 U
Allyl chloride	5 U	16 U	4 U	13 U	4 U	13 U	5 U	16 U
Benzene	5 U	16 U	4 U	13 U	4 U	13 U	5 U	16 U
Benzyl chloride	5 U	29 U	4 U	21 U	4 U	21 U	5 U	29 U
Bromodichloromethane	5 U	33 U	2 U	13 U	2 U	13 U	5 U	33 U
Bromoform	5 U	52 U	0.8 U	8.3 U	0.8 U	8.3 U	5 U	52 U
Bromomethane	5 U	19 U	4 U	16 U	4 U	16 U	5 U	19 U
Carbon disulfide	5 U	16 U	4 U	12 U	4 U	12 U	5 U	16 U
Carbon tetrachloride	5 U	31 U	0.8 U	5 U	0.8 U	5 U	5 U	31 U
Chlorobenzene	5 U	23 U	4 U	18 U	4 U	18 U	5 U	23 U
Chloroethane	5 U	13 U	4 U	11 U	4 U	11 U	5 U	13 U
Chloroform	5 U	24 U	4 U	20 U	4 U	20 U	5 U	24 U
Chloromethane	5 U	10 U	4 U	8.3 U	4 U	8.3 U	5 U	10 U
cis-1,2-Dichloroethene	46	180	1,100	4,360	349	1,380	5 U	20 U
cis-1,3-Dichloropropene	5 U	23 U	4 U	18 U	4 U	18 U	5 U	23 U
Cyclohexane	5 U	17 U	4 U	14 U	4 U	14 U	5 U	17 U
Dibromochloromethane	5 U	43 U	2 U	17 U	2 U	17 U	5 U	43 U
Ethanol	-	-	10 U	19 U	10 U	19 U	-	-
Ethyl acetate	10 U	36 U	11.2	40.3	13.3	47.9	10 U	36 U
Ethylbenzene	5 U	22 U	4 U	17 U	4 U	17 U	5 U	22 U
Freon 11	5 U	28 U	2 U	11 U	2 U	11 U	5 U	28 U
Freon 113	5 U	38 U	2 U	15 U	2 U	15 U	5 U	38 U
Freon 114	5 U	35 U	2 U	14 U	2 U	14 U	5 U	35 U
Freon 12	5 U	25 U	4 U	20 U	4 U	20 U	5 U	25 U
Heptane	5 U	20 U	4 U	16 U	4 U	16 U	5 U	20 U
Hexachloro-1,3-butadiene	5 U	53 U	1.8 U	19 U	1.8 U	19 U	5 U	53 U
Hexane	5 U	18 U	4 U	14 U	4 U	14 U	5 U	18 U
Isopropyl alcohol	5 U	12 U	4 U	9.8 U	4 U	9.8 U	5 U	12 U
m&p-Xylene	10 U	43 U	4 U	17 U	4 U	17 U	10 U	43 U
Methyl Butyl Ketone	10 U	41 U	4 U	16 U	4 U	16 U	10 U	41 U
Methyl Ethyl Ketone	10 U	29 U	6.4	19	4 U	12 U	10 U	29 U
Methyl Isobutyl Ketone	10 U	41 U	4 U	16 U	4 U	16 U	10 U	41 U
Methyl tert-butyl ether	5 U	18 U	4 U	14 U	4 U	14 U	5 U	18 U
Methylene chloride	5 U	17 U	4 U	14 U	4 U	14 U	5 U	17 U
Methylmethacrylate	-	-	4 U	16 U	4 U	16 U	-	-
o-Xylene	5 U	22 U	4 U	17 U	4 U	17 U	5 U	22 U
Propylene	5 U	8.6 U	10 U	17 U	10 U	17 U	5 U	8.6 U
Styrene	5 U	21 U	4 U	17 U	4 U	17 U	5 U	21 U
Tertiary Butyl Alcohol	-	-	4 U	12 U	4 U	12 U	-	-
Tetrachloroethene	5 U	34 U	0.8 U	5.4 U	0.8 U	5.4 U	5 U	34 U
Tetrahydrofuran	5 U	15 U	4 U	12 U	4 U	12 U	5 U	15 U
Toluene	5 U	19 U	4 U	15 U	4 U	15 U	5 U	19 U
trans-1,2-Dichloroethene	5 U	20 U	21.8	86.4	5.3	21	5 U	20 U
trans-1,3-Dichloropropene	5 U	23 U	4 U	18 U	4 U	18 U	5 U	23 U
Trichloroethene	30	160	409	2,200	604	3,250	9.8	53
Vinyl acetate	5 U	18 U	4 U	14 U	4 U	14 U	5 U	18 U
Vinyl Bromide	5 U	22 U	4 U	17 U	4 U	17 U	5 U	22 U
Vinyl chloride	5 U	13 U	157	401	112	286	5 U	13 U
Total VOCs	**76**	**340**	**38**	**7,150**	**1,092**	**5,010**	**9.80**	**53**

Appendix B
Table 4

Extraction Well Vapor Phase Sampling Results (2020-2022)
Former Emerson Power Transmission
Ithaca, New York (a)

Sample ID:	**EW-11-45C**						**EW-12-45C**				**EW-13**		**EW-14**	
Sample Date:	10/8/2021		9/22/2022		7/24/2020		10/8/2021		9/22/2022		NS		NS	
	(ppbv)	(µg/m^3)	(ppbv)	(µg/m3)	(ppbv)	(µg/m3)	(ppbv)	(µg/m^3)	(ppbv)	(µg/m3)	(ppbv)	(µg/m3)	(ppbv)	(µg/m3)
VOCs														
1,1,1-Trichloroethane	200 U	1,100 U	110 U	600 U	5 U	27 U	0.4 U	2.2 U	0.4 U	2.2 U	-	-	-	-
1,1,2,2-Tetrachloroethane	200 U	1,400 U	110 U	760 U	5 U	34 U	0.4 U	2.7 U	0.4 U	2.7 U	-	-	-	-
1,1,2-Trichloroethane	200 U	1,100 U	110 U	600 U	5 U	27 U	0.4 U	2.2 U	0.4 U	2.2 U	-	-	-	-
1,1-Dichloroethane	400 U	1,600 U	220 U	890 U	5 U	20 U	0.8 U	3.2 U	0.8 U	3.2 U	-	-	-	-
1,1-Dichloroethene	312	1,240	201	797	5 U	20 U	1	4	0.71	2.8	-	-	-	-
1,2,4-Trichlorobenzene	200 U	1,500 U	110 U	820 U	5 U	37 U	0.4 U	2.6 U	0.4 U	3 U	-	-	-	-
1,2,4-Trimethylbenzene	400 U	2,000 U	220 U	1,100 U	5 U	25 U	0.8 U	3.9 U	0.8 U	3.9 U	-	-	-	-
1,2-Dibromoethane	200 U	1,500 U	110 U	850 U	5 U	38 U	0.4 U	3.1 U	0.4 U	3.1 U	-	-	-	-
1,2-Dichlorobenzene	79 U	470 U	45 U	270 U	5 U	30 U	0.16 U	0.96 U	0.16 U	0.96 U	-	-	-	-
1,2-Dichloroethane	400 U	1,800 U	220 U	890 U	5 U	20 U	0.8 U	3.2 U	0.8 U	3.2 U	-	-	-	-
1,2-Dichloropropane	400 U	1,800 U	220 U	1,000 U	5 U	23 U	0.8 U	3.7 U	0.8 U	3.7 U	-	-	-	-
1,3,5-Trimethylbenzene	400 U	2,000 U	220 U	1,100 U	5 U	25 U	0.8 U	3.9 U	0.8 U	3.9 U	-	-	-	-
1,3-butadiene	400 U	880 U	220 U	490 U	5 U	11 U	0.8 U	1.8 U	0.8 U	1.8 U	-	-	-	-
1,3-Dichlorobenzene	200 U	1,200 U	110 U	660 U	5 U	30 U	0.4 U	2.4 U	0.4 U	2.4 U	-	-	-	-
1,4-Dichlorobenzene	200 U	1,200 U	110 U	660 U	5 U	30 U	0.4 U	2.4 U	0.4 U	2.4 U	-	-	-	-
1,4-Dioxane	400 U	1,400 U	220 U	790 U	10 U	36 U	0.8 U	2.9 U	0.8 U	2.9 U	-	-	-	-
2,2,4-trimethylpentane	400 U	1,900 U	220 U	1,000 U	5 U	23 U	0.8 U	3.7 U	0.8 U	3.7 U	-	-	-	-
2-chlorotoluene	400 U	2,100 U	220 U	1,100 U	-	-	0.8 U	4.1 U	0.8 U	4.1 U	-	-	-	-
4-ethyltoluene	400 U	2,000 U	220 U	1,100 U	5 U	25 U	0.8 U	3.9 U	0.8 U	3.9 U	-	-	-	-
Acetone	400 U	950 U	220 U	520 U	11	24	20.9	49.6	5.5	13	-	-	-	-
Allyl chloride	400 U	1,300 U	220 U	690 U	5 U	16 U	0.8 U	2.5 U	0.8 U	2.5 U	-	-	-	-
Benzene	400 U	1,300 U	220 U	700 U	5 U	16 U	0.58 J	1.9 J	1	3.2	-	-	-	-
Benzyl chloride	400 U	2,100 U	220 U	1,100 U	5 U	29 U	0.8 U	4.1 U	0.8 U	4.1 U	-	-	-	-
Bromodichloromethane	200 U	1,300 U	110 U	740 U	5 U	33 U	0.4 U	2.7 U	0.4 U	2.7 U	-	-	-	-
Bromoform	79 U	820 U	45 U	470 U	5 U	52 U	0.16 U	1.7 U	0.16 U	1.7 U	-	-	-	-
Bromomethane	400 U	1,600 U	220 U	850 U	5 U	19 U	0.8 U	3.1 U	0.8 U	3.1 U	-	-	-	-
Carbon disulfide	400 U	1,200 U	220 U	690 U	5 U	16 U	0.87	2.7	0.79 J	2.5 J	-	-	-	-
Carbon tetrachloride	79 U	500 U	45 U	280 U	5 U	31 U	0.16 U	1 U	0.16 U	1 U	-	-	-	-
Chlorobenzene	400 U	1,800 U	220 U	1,000 U	5 U	23 U	0.8 U	3.7 U	0.8 U	3.7 U	-	-	-	-
Chloroethane	400 U	1,100 U	220 U	580 U	5 U	13 U	0.8 U	2.1 U	0.8 U	2.1 U	-	-	-	-
Chloroform	400 U	2,000 U	220 U	1,100 U	5 U	24 U	0.8 U	3.9 U	0.8 U	3.9 U	-	-	-	-
Chloromethane	400 U	830 U	220 U	450 U	5 U	10 U	0.86	1.8	2.1	4.3	-	-	-	-
cis-1,2-Dichloroethene	35,300	140,000	13,700	54,300	30	120	187	741	84.8	336	-	-	-	-
cis-1,3-Dichloropropene	400 U	1,800 U	220 U	1,000 U	5 U	23 U	0.8 U	3.6 U	0.8 U	3.6 U	-	-	-	-
Cyclohexane	400 U	1,400 U	220 U	760 U	5 U	17 U	0.8 U	2.8 U	0.8 U	2.8 U	-	-	-	-
Dibromochloromethane	200 U	1,700 U	110 U	940 U	5 U	43 U	0.4 U	3.4 U	0.4 U	3.4 U	-	-	-	-
Ethanol	990 U	1,900 U	560 U	1,100 U	-	-	3.2	6	2 U	3.8 U	-	-	-	-
Ethyl acetate	400 U	1,400 U	220 U	790 U	10 U	36 U	3.2	12	5.3	19	-	-	-	-
Ethylbenzene	400 U	1,700 U	220 U	960 U	5 U	22 U	0.8 U	3.5 U	0.8 U	3.5 U	-	-	-	-
Freon 11	200 U	1,100 U	110 U	620 U	5 U	28 U	0.4 U	2.2 U	0.4 U	2.2 U	-	-	-	-
Freon 113	200 U	1,500 U	110 U	840 U	5 U	38 U	0.4 U	3.1 U	0.4 U	3.1 U	-	-	-	-
Freon 114	200 U	1,400 U	110 U	770 U	5 U	35 U	0.4 U	2.8 U	0.4 U	2.8 U	-	-	-	-
Freon 12	400 U	2,000 U	220 U	1,100 U	5 U	25 U	0.43 J	2.1 J	0.4 J	2 J	-	-	-	-
Heptane	400 U	1,600 U	220 U	900 U	5 U	20 U	0.8 U	0.29 U	0.8 U	3.3 U	-	-	-	-
Hexachloro-1,3-butadiene	180 U	1,900 U	100 U	1,100 U	5 U	53 U	0.36 U	3.8 U	0.36 U	3.8 U	-	-	-	-
Hexane	400 U	1,400 U	220 U	780 U	5 U	18 U	0.8 U	2.8 U	0.8 U	2.8 U	-	-	-	-
Isopropyl alcohol	400 U	980 U	220 U	540 U	5 U	12 U	0.8 U	2 U	0.8 U	2 U	-	-	-	-
m&p-Xylene	400 U	1,700 U	220 U	960 U	10 U	43 U	1.1	4.8	0.8 U	3.5 U	-	-	-	-
Methyl Butyl Ketone	400 U	1,600 U	220 U	900 U	10 U	41 U	0.8 U	3.3 U	0.8 U	3.3 U	-	-	-	-
Methyl Ethyl Ketone	400 U	1,200 U	220 U	650 U	10 U	29 U	7.4	22	0.83	2.4	-	-	-	-
Methyl Isobutyl Ketone	400 U	1,600 U	220 U	900 U	10 U	41 U	0.8 U	3.3 U	0.8 U	3.3 U	-	-	-	-
Methyl tert-butyl ether	400 U	1,400 U	220 U	790 U	5 U	18 U	0.8 U	2.9 U	0.8 U	2.9 U	-	-	-	-
Methylene chloride	400 U	1,400 U	220 U	760 U	5 U	17 U	0.8 U	2.8 U	0.8 U	2.8 U	-	-	-	-
Methylmethacrylate	400 U	1,600 U	220 U	900 U	-	-	0.8 U	3.3 U	0.8 U	3.3 U	-	-	-	-
o-Xylene	400 U	1,700 U	220 U	960 U	5 U	22 U	0.52 J	2.3 J	0.8 U	3.5 U	-	-	-	-
Propylene	990 U	1,700 U	560 U	960 U	5 U	8.6 U	3.8	6.5	2.5	4.3	-	-	-	-
Styrene	400 U	1,700 U	220 U	940 U	5 U	21 U	0.8 U	3.4 U	0.8 U	3.4 U	-	-	-	-
Tertiary Butyl Alcohol	400 U	1,200 U	220 U	670 U	-	-	1.3	3.9	0.8 U	2.4 U	-	-	-	-
Tetrachloroethene	79 U	540 U	45 U	310 U	5 U	34 U	0.56	3.8	0.16 U	1.1 U	-	-	-	-
Tetrahydrofuran	400 U	1,200 U	220 U	650 U	5 U	15 U	2.3	6.8	0.8 U	2.4 U	-	-	-	-
Toluene	400 U	1,500 U	220 U	830 U	5 U	19 U	1.9	7.2	0.8 U	3 U	-	-	-	-
trans-1,2-Dichloroethene	380 J	1,510 J	174 J	690 J	5 U	20 U	1.4	5.6	0.64 J	2.5 J	-	-	-	-
trans-1,3-Dichloropropene	400 U	1,800 U	220 U	1,000 U	5 U	23 U	0.8 U	3.6 U	0.8 U	3.6 U	-	-	-	-
Trichloroethene	94,900	510,000	42,000	227,000	120	640	450	2,420	141	758	-	-	-	-
Vinyl acetate	400 U	1,400 U	220 U	770 U	5 U	18 U	0.8 U	2.8 U	0.8 U	2.8 U	-	-	-	-
Vinyl Bromide	400 U	1,700 U	220 U	960 U	5 U	22 U	0.8 U	3.5 U	0.8 U	3.5 U	-	-	-	-
Vinyl chloride	1,230	3,140	4250	10,900	5 U	13 U	3.7	9.5	38.1	97.4	-	-	-	-
Total VOCs	**132,122**	**655,890**	**60,325**	**293,687**	**161**	**784**	**692**	**3,314**	**284**	**1,247**	NS	NS	NS	NS

Appendix B
Table 5

DPE System Aqueous Phase Sampling Results (2020-2023)
Former Emerson Power Transmission
Ithaca, New York (a, b)

Sample ID:						**WINF**					
Location:						**System Influent**					
Sample Date:	03/25/20	06/04/20	09/30/20	03/16/21	04/08/21	08/25/21	12/10/21	01/19/22	04/14/22	07/27/22	10/24/22
VOCs (µg/l)											
Acetone	50 U	10 U	50 U	100 U	100 U	100 U	100 U	50 U	100 U	10 U	10 U
Benzene	2.5 U	0.50 U	2.50 U	5.0 U	5.0 U	5 U	5 U	2.5 U	5.0 U	0.50 U	0.50 U
Bromodichloromethane	5 U	1.0 U	5.0 U	10.0 U	10 U	10 U	10 U	5.0 U	10 U	1.0 U	1.0 U
Bromoform	5 U	1.0 U	5.0 U	10.0 U	10 U	10 U	10 U	5.0 U	10 U	1.0 U	1.0 U
Bromomethane	10 U	2.0 U	10.0 U	20 U	20 U	20 U	20 U	10 U	20 U	2.0 U	2.0 U
2-Butanone (MEK)	50 U	10 U	50 U	100 U	100 U	100 U	100 U	50 U	100 U	10 U	10 U
Carbon disulfide	10 U	2.0 U	10.0 U	20 U	20 U	20 U	20 U	10 U	20 U	2.0 U	2.0 U
Carbon tetrachloride	5 U	1.0 U	5.0 U	10.0 U	10 U	10 U	10 U	5.0 U	10 U	1.0 U	1.0 U
Chlorobenzene	5 U	1.0 U	5.0 U	10.0 U	10 U	10 U	10 U	5.0 U	10 U	1.0 U	1.0 U
Chloroethane	5 U	1.0 U	5.0 U	10.0 U	10 U	10 U	10 U	5.0 U	10 U	1.0 U	1.0 U
Chloroform	5 U	1.0 U	5.0 U	10.0 U	10 U	10 U	10 U	6.2	8.1 J	1.0 U	1.0 U
Chloromethane	5 U	1.0 U	5.0 U	10.0 U	10 U	10 U	10 U	5.0 U	10 U	1.0 U	1.0 U
Cyclohexane	25 U	5.0 U	25.0 U	50 U	50 U	50 U	50 U	25 U	50 U	5.0 U	5.0 U
1,2-Dibromo-3-chloropropane	10 U	2.0 U	10.0 U	20 U	20 U	20 U	20 U	10 U	20 U	2.0 U	2.0 U
Dibromochloromethane	5 U	1.0 U	5.0 U	10.0 U	10 U	10 U	10 U	5.0 U	10 U	1.0 U	1.0 U
1,2-Dibromoethane	5 U	1.0 U	5.0 U	10.0 U	10 U	10 U	10 U	5.0 U	10 U	1.0 U	1.0 U
1,2-Dichlorobenzene	5 U	1.0 U	5.0 U	10.0 U	10 U	10 U	10 U	5.0 U	10 U	1.0 U	1.0 U
1,3-Dichlorobenzene	5 U	1.0 U	5.0 U	10.0 U	10 U	10 U	10 U	5.0 U	10 U	1.0 U	1.0 U
1,4-Dichlorobenzene	5 U	1.0 U	5.0 U	10.0 U	10 U	10 U	10 U	5.0 U	10 U	1.0 U	1.0 U
Dichlorodifluoromethane	10 U	2.0 U	10.0 U	20 U	20 U	20 U	20 U	10 U	20 U	2.0 U	2.0 U
1,1-Dichloroethane	5 U	1.0 U	5.0 U	10.0 U	10 U	10 U	10 U	5.0 U	10 U	1.0 U	1.0 U
1,2-Dichloroethane	5 U	1.0 U	5.0 U	10.0 U	10 U	10 U	10 U	5.0 U	10 U	1.0 U	1.0 U
1,1-Dichloroethene	3.4 J	2.5	3.4 J	10.0 U	10 U	19	10 U	3.2 J	10 U	1.0 U	1.0 U
cis-1,2-Dichloroethene	1,830	1,640	1,660	3,020	3,040	8,720	2,900	2,060	1,420	425	735
trans-1,2-Dichloroethene	11.6	13.7	10.2	22.3	21.8	53.1	18.1	11.3	6.8 J	2.7	4.4
1,2-Dichloropropane	5 U	1.0 U	5.0 U	10.0 U	10 U	10 U	10 U	5.0 U	10 U	1.0 U	1.0 U
cis-1,3-Dichloropropene	5 U	1.0 U	5.0 U	10.0 U	10 U	10 U	10 U	5.0 U	10 U	1.0 U	1.0 U
trans-1,3-Dichloropropene	5 U	1.0 U	5.0 U	10.0 U	10 U	10 U	10 U	5.0 U	10 U	1.0 U	1.0 U
Ethylbenzene	5 U	1.0 U	5.0 U	10.0 U	10 U	10 U	10 U	5.0 U	10 U	1.0 U	1.0 U
Freon 113	25 U	5.0 U	25.0 U	50 U	50 U	50 U	50 U	25 U	50 U	5.0 U	5.0 U
2-Hexanone	25 U	5.0 U	25.0 U	50 U	50 U	50 U	50 U	25 U	50 U	5.0 U	5.0 U
Isopropylbenzene	5 U	1.0 U	5.0 U	10.0 U	10 U	10 U	10 U	5.0 U	10 U	1.0 U	1.0 U
Methyl Acetate	25 U	5.0 U	25.0 U	50 U	50 U	50 U	50 U	25 U	50 U	5.0 U	5.0 U
Methylcyclohexane	25 U	5.0 U	25.0 U	50 U	50 U	50 U	50 U	25 U	50 U	5.0 U	5.0 U
Methyl Tert Butyl Ether	5 U	1.0 U	5.0 U	10.0 U	10 U	10 U	10 U	5.0 U	10 U	1.0 U	1.0 U
4-Methyl-2-pentanone(MIBK)	25 U	5.0 U	25.0 U	50 U	50 U	50 U	50 U	25 U	50 U	5.0 U	5.0 U
Methylene chloride	10 U	2.0 U	10.0 U	20 U	20 U	20 U	20 U	10 U	20 U	2.0 U	2.0 U
Styrene	5 U	1.0 U	5.0 U	10.0 U	10 U	10 U	10 U	5.0 U	10 U	1.0 U	1.0 U
1,1,2,2-Tetrachloroethane	5 U	1.0 U	5.0 U	10.0 U	10 U	10 U	10 U	5.0 U	10 U	1.0 U	1.0 U
Tetrachloroethene	5 U	1.0 U	5.0 U	10.0 U	10 U	10 U	10 U	5.0 U	10 U	1.0 U	1.0 U
Toluene	5 U	1.0 U	5.0 U	10.0 U	10 U	10 U	10 U	5.0 U	10 U	1.0 U	1.0 U
1,2,4-Trichlorobenzene	5 U	1.0 U	5.0 U	10.0 U	10 U	10 U	10 U	5.0 U	10 U	1.0 U	1.0 U
1,1,1-Trichloroethane	5 U	1.0 U	5.0 U	10.0 U	10 U	10 U	10 U	5.0 U	10 U	1.0 U	1.0 U
1,1,2-Trichloroethane	5 U	1.0 U	5.0 U	10.0 U	10 U	10 U	10 U	5.0 U	10 U	1.0 U	1.0 U
Trichloroethene	2,000	1,800	1,400	2,830	3,790	5,140	243	465	268	124	421
Trichlorofluoromethane	10 U	2.0 U	10.0 U	20 U	20 U	20 U	20 U	10 U	20 U	2.0 U	2.0 U
Vinyl chloride	5 U	4.8	5.0 U	11.0	11	741	259	95.1	10 U	11.8	5.7
Xylene (total)	5 U	1.0 U	5.0 U	10.0 U	10 U	10 U	10 U	5.0 U	10 U	1.0 U	1.0 U
Total VOCs (µg/l)	**3,847**	**3,455**	**3,075**	**5,882**	**6,863**	**13,923**	**3,420**	**2,543**	**1,705**	**553**	**1,166**

Appendix B
Table 5

DPE System Aqueous Phase Sampling Results (2020-2023)
Former Emerson Power Transmission
Ithaca, New York (a, b)

Sample ID:	**WAS**										
Location:	**Post Air-Stripper/Pre-Carbon**										
Sample Date:	03/25/20	06/04/20	09/30/20	03/16/21	04/08/21	08/25/21	12/10/21	01/19/22	04/14/22	07/27/22	10/24/22
VOCs (µg/l)											
Acetone	10 U	10 U	10 U	10 U	10 U	10.0 U	10.0 U	10 U	10 U	10 U	10 U
Benzene	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.5 U	0.5 U	0.50 U	0.50 U	0.50 U	0.50 U
Bromodichloromethane	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromoform	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromomethane	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
2-Butanone (MEK)	10 U	10 U	10 U	10 U	10 U	10.0 U	10.0 U	10 U	10 U	10 U	10 U
Carbon disulfide	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Carbon tetrachloride	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chlorobenzene	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chloroethane	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chloroform	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chloromethane	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Cyclohexane	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
1,2-Dibromo-3-chloropropane	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Dibromochloromethane	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dibromoethane	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichlorobenzene	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,3-Dichlorobenzene	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,4-Dichlorobenzene	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Dichlorodifluoromethane	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
1,1-Dichloroethane	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichloroethane	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1-Dichloroethene	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
cis-1,2-Dichloroethene	2.1	1.0 U	1.0 U	2.9	200	3.7	0.89 J	3.6	1.0 U	1.0 U	2.4
trans-1,2-Dichloroethene	1.0 U	1.0 U	1.0 U	1.0 U	1.0 J	1.0 U	1 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichloropropane	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
cis-1,3-Dichloropropene	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
trans-1,3-Dichloropropene	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Ethylbenzene	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Freon 113	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
2-Hexanone	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Isopropylbenzene	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Methyl Acetate	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Methylcyclohexane	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Methyl Tert Butyl Ether	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
4-Methyl-2-pentanone(MIBK)	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Methylene chloride	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Styrene	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1,2,2-Tetrachloroethane	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Tetrachloroethene	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Toluene	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2,4-Trichlorobenzene	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1,1-Trichloroethane	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1,2-Trichloroethane	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Trichloroethene	1.2	1.0 U	1.00 U	1.5	140	1.0 U	1 U	1.0 U	1.0 U	1.0 U	0.68 J
Trichlorofluoromethane	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Vinyl chloride	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Xylene (total)	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Total VOCs (µg/l)	3.3	ND	ND	4.4	341.0	3.7	0.9	3.6	ND	ND	3.1

Appendix B
Table 5

DPE System Aqueous Phase Sampling Results (2020-2023)
Former Emerson Power Transmission
Ithaca, New York (a, b)

Sample ID:	**WMID GAC**										
Location:	**Between Aqueous Carbon Vessels**										
Sample Date:	03/25/20	06/04/20	09/30/20	03/16/21	04/08/21	08/25/21	12/10/21	01/19/22	04/14/22	07/27/22	10/24/22
VOCs (µg/l)											
Acetone	10 U	10 U	10 U	10 U	10 U	10.0 U	10.0 U	10 U	10 U	10 U	10 U
Benzene	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.5 U	0.5 U	0.50 U	0.50 U	0.50 U	0.50 U
Bromodichloromethane	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromoform	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromomethane	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
2-Butanone (MEK)	10 U	10 U	10 U	10 U	10 U	10.0 U	10.0 U	10 U	10 U	10 U	10 U
Carbon disulfide	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Carbon tetrachloride	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chlorobenzene	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chloroethane	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chloroform	1.0 U	1.00 U	1.00 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	0.64 J	0.56 J
Chloromethane	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Cyclohexane	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
1,2-Dibromo-3-chloropropane	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Dibromochloromethane	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dibromoethane	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichlorobenzene	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,3-Dichlorobenzene	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,4-Dichlorobenzene	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Dichlorodifluoromethane	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
1,1-Dichloroethane	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichloroethane	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1-Dichloroethene	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
cis-1,2-Dichloroethene	1 U	1 U	1 U	1.0 U	2.1	3.0	3.5	3.6	4.4	6.9	8.1
trans-1,2-Dichloroethene	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichloropropane	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
cis-1,3-Dichloropropene	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
trans-1,3-Dichloropropene	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Ethylbenzene	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Freon 113	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
2-Hexanone	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Isopropylbenzene	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Methyl Acetate	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Methylcyclohexane	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Methyl Tert Butyl Ether	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
4-Methyl-2-pentanone(MIBK)	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Methylene chloride	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Styrene	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1,2,2-Tetrachloroethane	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Tetrachloroethene	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Toluene	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2,4-Trichlorobenzene	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1,1-Trichloroethane	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1,2-Trichloroethane	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Trichloroethene	1.0 U	1.0 U	1.0 U	1.0 U	0.8	1.0 U	1 U	1.0 U	1.0 U	1.0 U	1.0 U
Trichlorofluoromethane	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Vinyl chloride	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Xylene (total)	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Total VOCs (µg/l)	**ND**	**ND**	**ND**	**ND**	**2.9**	**3.0**	**3.5**	**3.6**	**4.4**	**7.5**	**8.7**

Appendix B
Table 5

DPE System Aqueous Phase Sampling Results (2020-2023)
Former Emerson Power Transmission
Ithaca, New York (a, b)

Sample ID:	**WPOST GAC**										
Location:	**Post-Carbon (System Discharge)**										
Sample Date:	03/25/20	06/04/20	09/30/20	03/16/21	04/08/21	08/25/21	12/10/21	01/19/22	04/14/22	07/27/22	10/24/22
VOCs (µg/l)											
Acetone	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Benzene	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U	0.50 U
Bromodichloromethane	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromoform	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Bromomethane	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
2-Butanone (MEK)	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U
Carbon disulfide	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Carbon tetrachloride	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chlorobenzene	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chloroethane	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chloroform	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Chloromethane	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Cyclohexane	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
1,2-Dibromo-3-chloropropane	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Dibromochloromethane	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dibromoethane	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichlorobenzene	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,3-Dichlorobenzene	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,4-Dichlorobenzene	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Dichlorodifluoromethane	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
1,1-Dichloroethane	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichloroethane	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1-Dichloroethene	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
cis-1,2-Dichloroethene	1.6	1.6	2.2	1.6	2.1	1.1	1.1	1.1	2.3	2.4	3.0
trans-1,2-Dichloroethene	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2-Dichloropropane	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
cis-1,3-Dichloropropene	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
trans-1,3-Dichloropropene	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Ethylbenzene	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Freon 113	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
2-Hexanone	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Isopropylbenzene	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Methyl Acetate	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Methylcyclohexane	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Methyl Tert Butyl Ether	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
4-Methyl-2-pentanone(MIBK)	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U
Methylene chloride	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Styrene	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1,2,2-Tetrachloroethane	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Tetrachloroethene	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Toluene	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,2,4-Trichlorobenzene	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1,1-Trichloroethane	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
1,1,2-Trichloroethane	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Trichloroethene	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Trichlorofluoromethane	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U
Vinyl chloride	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Xylene (total)	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U
Total VOCs (µg/l)	**1.6**	**1.6**	**2.2**	**1.6**	**2.1**	**1.1**	**1.1**	**1.1**	**2.3**	**2.4**	**3.0**

a/ Abbreviations: VOC = volatile organic compound; µg/l = micrograms per liter; J = estimated concentration below reporting limit; U = compound not detected; ND = no compounds detected.

b/ System samples were not collected during the fourth quarter 2020.

Appendix B
Table 6

DPE System Vapor Phase Sampling Results (2020-2022)
Former Emerson Power Transmission
Ithaca, New York (a)

Sample ID:		**VINF**																					
Sample Location:		**System Influent**																					
Sample Date:	**Molecular Weight**	03/25/20		06/04/20		12/30/20		01/20/21		04/08/21		08/25/21		12/10/21		01/19/22		04/14/22		07/27/22		10/24/22	
Units:	**(g/mol)**	(ppmv)	(mg/m^3)	(ppmv)	(mg/m^3)	(ppmv)	(mg/m^3)	(ppmv)	(mg/m^3)	(ppmv)	(mg/m^3)	(ppmv)	(mg/m^3)	(ppmv)	(mg/m^3)	(ppmv)	(mg/m^3)	(ppmv)	(mg/m^3)	(ppmv)	(mg/m^3)	(ppmv)	(mg/m^3)
VOCs																							
1,1-Dichloroethene	96.9	0.035	0.14	0.02 U	ND	0.02 U	ND	0.02 U	ND	0.02 U	ND	0.14	0.56	0.0111	0.04	0.0092	0.036	0.0049	0.019	0.00056	0.0022	0.00016 U	0.00063 U
cis-1,2-Dichloroethene	96.9	6.5	25.77	2.5	9.91	3.9	15.46	4.2	16.65	2.8	11.10	35	138.77	2.77	10.98	6.87	27.2	0.737	2.92	0.236	0.936	0.0073	0.029
trans-1,2-Dichloroethene	96.9	0.06	0.24	0.05 U	ND	0.05 U	ND	0.05 U	ND	0.05 U	ND	0.32	1.27	0.0322	0.13	0.0242	0.0959	0.0074	0.029	0.0016	0.0063	0.0008 U	0.0032 U
Tetrachloroethene	165.8	0.01 U	ND	0.01 U	ND	0.01 U	ND	0.01 U	ND	0.01 U	ND	0.01 U	ND	0.0016	0.01	0.0016 U	0.011 U	0.0014 U	0.010 U	0.00018	0.0012	0.00016 U	0.0011 U
Trichloroethene	131.4	9.8	52.7	3.6	19.35	6.9	37.1	7.2	38.7	6.2	33.3	2.3	12.4	0.905	4.9	0.84	4.53	0.551	2.96	0.0634	0.341	0.0031	0.017
Vinyl Chloride	62.5	1.0 U	ND	1.0 U	ND	5.6	14.31	37.0	94.58	1.0 U	ND	6.7	17.13	0.4	1.05	0.9	2.24	0.0491	0.126	0.0295	0.0754	0.00016 U	0.00041 U
	Total VOCs:	**16.40**	**78.81**	**6.10**	**29.26**	**16.40**	**66.86**	**48.40**	**149.92**	**9.00**	**44.42**	**44.46**	**170.08**	**4.13**	**17.08**	**8.62**	**34.10**	**1.35**	**6.05**	**0.33**	**1.36**	**0.01**	**0.05**

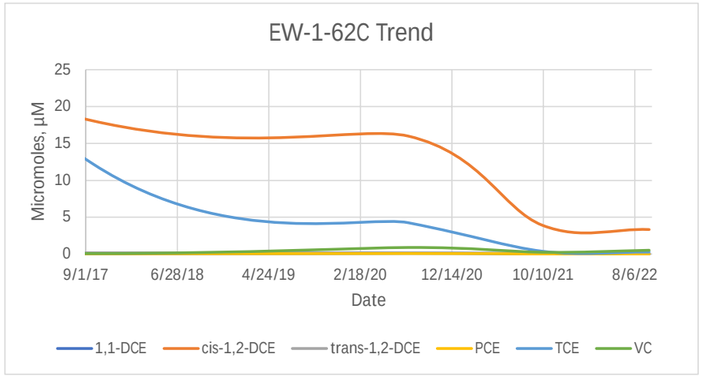
Sample ID:		**VPOST GAC**																					
Sample Location:		**System Effluent (Post-GAC Treatment)**																					
Sample Date:	**Molecular Weight**	03/25/20		06/04/20		12/30/20		01/20/21		04/08/21		08/25/21		12/10/21		01/19/22		04/14/22		07/27/22		10/24/22	
Units:	**(g/mol)**	(ppmv)	(mg/m^3)	(ppmv)	(mg/m^3)	(ppmv)	(mg/m^3)	(ppmv)	(mg/m^3)	(ppmv)	(mg/m^3)	(ppmv)	(mg/m^3)	(ppmv)	(mg/m^3)	(ppmv)	(mg/m^3)	(ppmv)	(mg/m^3)	(ppmv)	(mg/m^3)	(ppmv)	(mg/m^3)
VOCs																							
1,1-Dichloroethene	96.9	0.02 U	ND	0.02 U	ND	0.02 U	ND	0.02 U	ND	0.02 U	ND	0.02 U	ND	0.00 U	ND	0.00016 U	0.00063 U	0.0008 U	0.0032 U	0.00016 U	0.00063 U	0.00016 U	0.00063 U
cis-1,2-Dichloroethene	96.9	0.23	0.91	0.05 U	ND	0.05 U	ND	0.11	0.44	0.4	1.59	0.14	0.56	0.11	0.44	0.187	0.741	0.571	2.26	0.18	0.714	0.0064	0.025
trans-1,2-Dichloroethene	96.9	0.05 U	ND	0.05 U	ND	0.05 U	ND	0.05 U	ND	0.05 U	ND	0.05 U	ND	0.00	0.00	0.0011	0.0044	0.003 J	0.012 J	0.00092	0.0036	0.0008 U	0.0032 U
Tetrachloroethene	165.8	0.01 U	ND	0.01 U	ND	0.01 U	ND	0.01 U	ND	0.01 U	ND	0.01 U	ND	0.00 U	ND	0.0027	0.02	0.0008 U	0.0054 U	0.00058	0.0039	0.00016 U	0.0011 U
Trichloroethene	131.4	0.13	0.70	0.098	0.53	0.028	0.15	0.11	0.59	0.32	1.72	0.04	0.22	0.15	0.83	0.178	0.957	0.545	2.93	0.159	0.855	0.0095	0.051
Vinyl Chloride	62.5	1.0 U	ND	1.0 U	ND	1.0 U	ND	2.0	5.11	2.3	5.88	1.0 U	ND	0.02	0.05	0.0287	0.0734	0.0008 U	0.002 U	0.0121	0.0309	0.0015	0.0038
	Total VOCs:	**0.36**	**1.61**	**0.10**	**0.53**	**0.03**	**0.15**	**2.22**	**6.14**	**3.07**	**9.18**	**0.23**	**0.78**	**0.27**	**1.32**	**0.40**	**1.79**	**1.12**	**5.20**	**0.35**	**1.61**	**0.02**	**0.08**

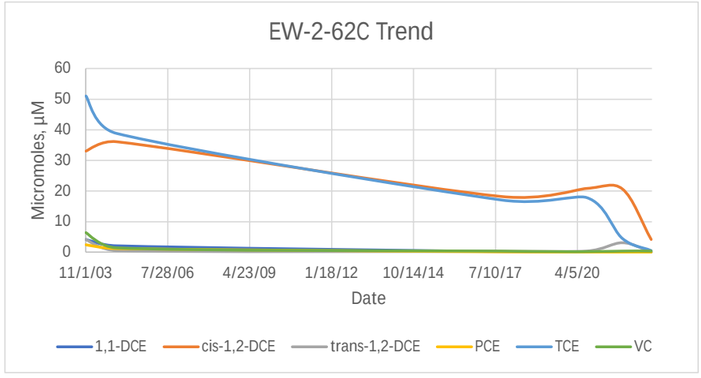
a/ Abbreviations: VOC = volatile organic compound; g/mol = grams per mole; ppmv = parts per million by volume; mg/m^3 = milligrams per cubic meter; U = compound not detected; ND = compound not detected.

Appendix B
Table 7

Historical Groundwater Sampling Results and Trends - CVOCs (DPE System)
Former Emerson Power Transmission
Ithaca, New York (a)

Well ID	Date	1,1-DCE		cis-1,2-DCE		trans-1,2-DCE		PCE		TCE		VC	
Evaluation Criteria		5		5		5		5		5		2	
Molecular Weight		96.94	µM	96.95	µM	96.95	µM	165.82	µM	131.38	µM	62.50	µM
EW-1-62C	9/11/07	**14**	0.14	**5,800 D**	60	**63**	0.6	**5.7**	0	**17,000 D**	129	**52**	0.8
	9/26/17	3.2 J	0.03	**1,750**	18	**16.8**	0.2	5 U	0	**1,600**	12	5 U	0.1
	7/24/20	10 U	0.1	**1,550**	16	**17.8**	0.2	10 U	0.1	**556**	4.2	**55.2**	0.9
	10/7/21	1 U	0.01	**379**	3.9	**8.6**	0.1	1 U	0	**49.9**	0.4	**15.5**	0.2
	9/22/22	1 U	0.01	**321**	3.3	3.2	0	1 U	0	**33.6**	0.3	**31.1**	0.5
EW-2-62C	11/5/03	400 U	4.13	**3,200**	33	400 U	4.1	400 U	2.4	**6,700**	51	400 U	6.4
	11/12/04	200 U	2.06	**3,500**	36	**54 J**	0.6	200 U	1.2	**5,100**	39	**88 J**	1.4
	9/26/17	20 U	0.21	**1,760**	18	**24.8**	0.3	20 U	0.1	**2,240**	17	20 U	0.3
	7/24/20	10 U	0.1	**2,020**	21	**35**	0.4	10 U	0.1	**2,350**	18	10 U	0.2
	10/7/21	4 U	0.04	**2,000**	21	**301**	3.1	4 U	0	**589**	4.5	**25**	0.4
	9/22/22	1 U	0.01	**403**	4.2	3.5	0	1 U	0	**70.8**	0.5	**24.4**	0.4

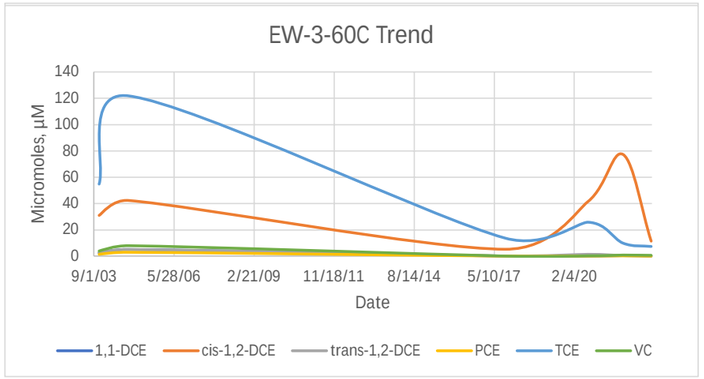


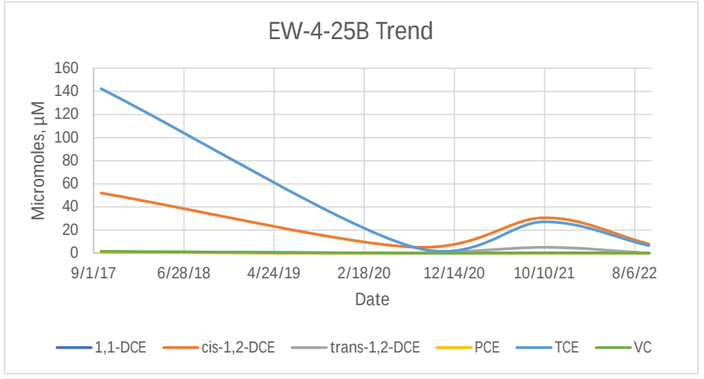


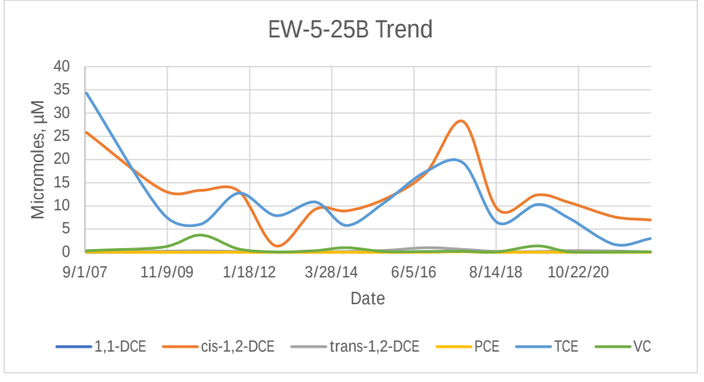
Appendix B
Table 7

Historical Groundwater Sampling Results and Trends - CVOCs (DPE System)
Former Emerson Power Transmission
Ithaca, New York (a)

Well ID	Date	1,1-DCE		cis-1,2-DCE		trans-1,2-DCE		PCE		TCE		VC	
	Evaluation Criteria	5		5		5		5		5		2	
	Molecular Weight	96.94	µM	96.95	µM	96.95	µM	165.82	µM	131.38	µM	62.50	µM
EW-3-60C	11/5/03	250 U	2.58	**3,000**	31	250 U	2.6	250 U	1.5	**7,200**	55	250 U	4
	11/12/04	500 U	5.16	**4,100**	42	500 U	5.2	500 U	3	**16,000**	122	500 U	8
	9/26/17	5 U	0.05	**503**	5.2	**14.5**	0.1	5 U	0	**1,800**	14	3.3 J	0.1
	7/24/20	10 U	0.1	**4,020**	41	**135**	1.4	10 U	0.1	**3,380**	26	**14.2**	0.2
	10/7/21	50 U	0.52	**7,480**	77	**42.2 J**	0.4	50 U	0.3	**1,300**	9.9	50 U	0.8
	9/22/22	1.6 J	0.02	**1,100**	11	**15.1**	0.2	2 U	0	**960**	7.3	**36.2**	0.6
EW-4-25B	9/26/17	100 U	1.03	**5,050**	52	**106**	1.1	100 U	0.6	**18,700**	142	100 U	1.6
	7/24/20	5 U	0.05	**521**	5.4	**7.9**	0.1	5 U	0	**761**	5.8	5 U	0.1
	10/7/21	20 U	0.21	**2,970**	31	**488**	5	20 U	0.1	**3,570**	27	20 U	0.3
	9/22/22	4 U	0.04	**772**	8	**8.4**	0.1	4 U	0	**867**	6.6	4 U	0.1
EW-5-25B	9/14/07	3.1	0.03	**2,500 D**	26	**8.5**	0.1	**5.6**	0	**4,500 D**	34	**21**	0.3
	9/25/09	3.2	0.03	**1,300 DJ**	13	**24 J**	0.2	1.3	0	**1,100 DJ**	8.4	**70 J**	1.1
	9/29/10	3.9	0.04	**1,290**	13	**30.7**	0.3	1.2	0	**793**	6	**231**	3.7
	10/3/11	3.3	0.03	**1,280**	13	**16.4**	0.2	1.3	0	**1,670**	13	**45.1**	0.7
	10/1/12	1 U	0.01	**134**	1.4	1.94	0	2.03	0	**1,040**	7.9	**5.28**	0.1
	10/18/13	3.1	0.03	**897**	9.3	**8.8**	0.1	3.2	0	**1,420**	11	**21.7**	0.3
	8/21/14	2.8 J	0.03	**863**	8.9	**14.7**	0.2	1.6	0	**761**	5.8	**61.7**	1
	8/24/15	3	0.03	**1,110**	11	**36.1**	0.4	1	0	**1,410**	11	**10.2**	0.2
	9/28/16	3.3	0.03	**1,650 J**	17	**94.2**	1	4.8	0	**2,280**	17	**11.1**	0.2
	9/26/17	20 U	0.21	**2,730**	28	**60.1**	0.6	20 U	0.1	**2,530**	19	**12.7 J**	0.2
	8/28/18	1.6	0.02	**897**	9.3	**14.4**	0.1	1 U	0	**839**	6.4	**5.8**	0.1
	9/19/19	5 U	0.05	**1,200**	12	**14.3**	0.1	5 U	0	**1,350**	10	**86**	1.4
	7/24/20	5 U	0.05	**1,040**	11	**33.3**	0.3	5 U	0	**962**	7.3	**8.2**	0.1
	10/7/21	4 U	0.04	**740**	7.6	**25.9**	0.3	4 U	0	**225**	1.7	4 U	0.1
	9/22/22	2 U	0.02	**673**	6.9	**5.5**	0.1	2 U	0	**386**	2.9	**8.4**	0.1



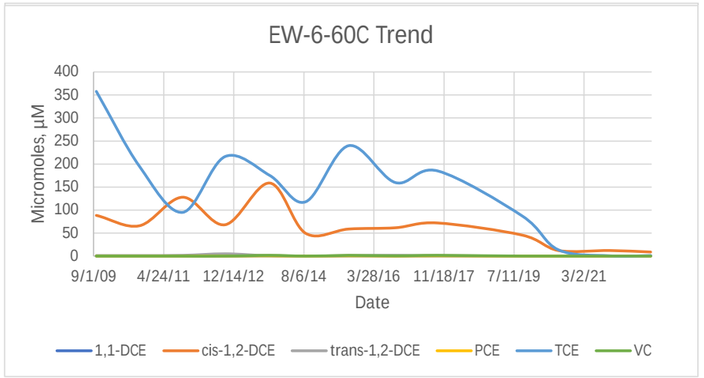


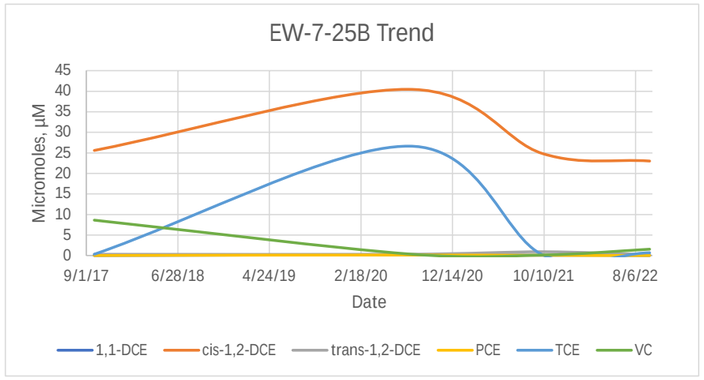


Appendix B
Table 7

Historical Groundwater Sampling Results and Trends - CVOCs (DPE System)
Former Emerson Power Transmission
Ithaca, New York (a)

Well ID	Date	1,1-DCE		cis-1,2-DCE		trans-1,2-DCE		PCE		TCE		VC	
	Evaluation Criteria	5		5		5		5		5		2	
	Molecular Weight	96.94	µM	96.95	µM	96.95	µM	165.82	µM	131.38	µM	62.50	µM
EW-6-60C	9/25/09	16 J	0.17	**8,600 DJ**	89	**150 J**	1.5	**41 J**	0.2	**47,000 DJ**	358	**4.8 J**	0.1
	9/29/10	**9.5**	0.1	**6,400**	66	**142**	1.5	**28.1**	0.2	**25,600**	195	**5.9**	0.1
	10/3/11	12 J	0.12	**12,400 J**	128	**180 J**	1.9	**13.7 J**	0.1	**12,500 J**	95	**3.9 J**	0.1
	10/1/12	**10**	0.1	**6,590**	68	500 U	5.2	**33.6**	0.2	**28,400**	216	**2.42**	0
	10/18/13	100 U	1.03	**15,400**	159	**55.9 J**	0.6	100 U	0.6	**23,000**	175	100 U	1.6
	8/21/14	**14.4 J**	0.15	**4,810**	50	**33.3**	0.3	**32.4**	0.2	**15,500**	118	0.8 J	0
	8/24/15	100 U	1.03	**5,710**	59	100 U	1	100 U	0.6	**31,500**	240	100 U	1.6
	9/28/16	**14.6**	0.15	**5,950 J**	61	**168**	1.7	**27.4**	0.2	**21,000 J**	160	**45.1**	0.7
	9/26/17	100 U	1.03	**6,970**	72	**76.5 J**	0.8	100 U	0.6	**24,300**	185	100 U	1.6
	9/19/19	10 U	0.1	**4,430**	46	**24.1**	0.2	10 U	0.1	**11,500**	88	**16.5**	0.3
	7/24/20	10 U	0.1	**1,190**	12	**10**	0.1	10 U	0.1	**1,820**	14	10 U	0.2
	10/7/21	5 U	0.05	**1,200**	12	**7.5**	0.1	5 U	0	**101**	0.8	**26.2**	0.4
	9/22/22	2 U	0.02	**880**	9.1	3.7	0	2 U	0	**142**	1.1	**4**	0.1
EW-7-25B	9/27/17	4.3 J	0.04	**2,480**	26	**29.1**	0.3	5 U	0	**44.1**	0.3	**539**	8.6
	7/24/20	20 U	0.21	**3,920**	40	**33.8**	0.3	20 U	0.1	**3,500**	27	**25.4**	0.4
	10/7/21	10 U	0.1	**2,400**	25	**89.4**	0.9	10 U	0.1	**15.3**	0.1	10 U	0.2
	9/22/22	3.6 J	0.04	**2,230**	23	**24.4**	0.3	5 U	0	**92.3**	0.7	**97.4**	1.6

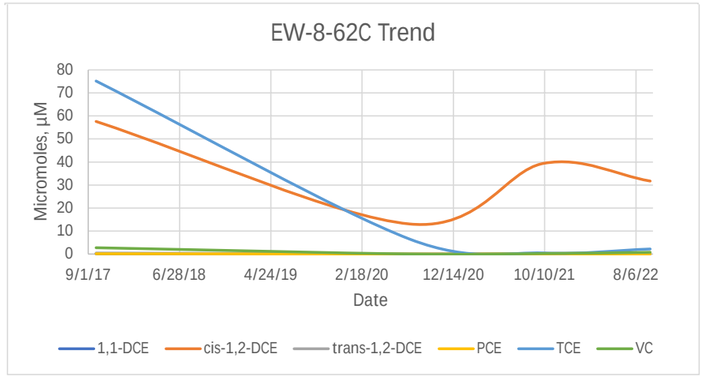


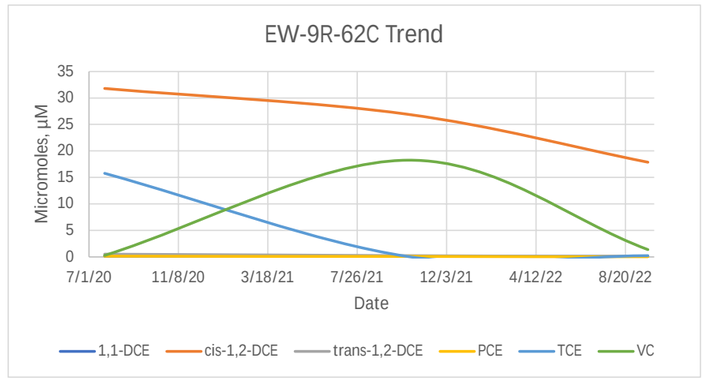


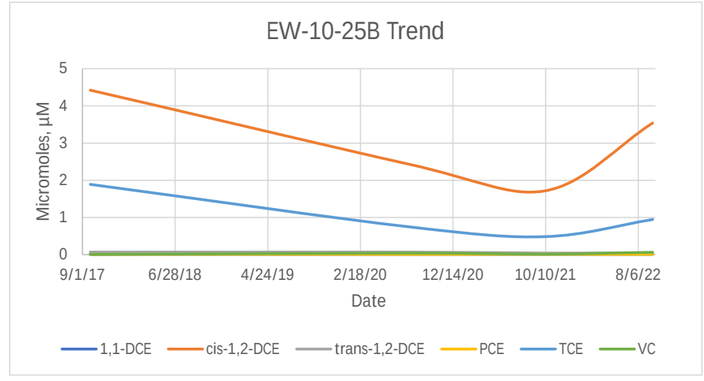
Appendix B
Table 7

Historical Groundwater Sampling Results and Trends - CVOCs (DPE System)
Former Emerson Power Transmission
Ithaca, New York (a)

Well ID	Date	1,1-DCE		cis-1,2-DCE		trans-1,2-DCE		PCE		TCE		VC	
Evaluation Criteria		5		5		5		5		5		2	
Molecular Weight		96.94	µM	96.95	µM	96.95	µM	165.82	µM	131.38	µM	62.50	µM
EW-8-62C	9/27/17	**12.5 J**	0.13	**5,580**	58	**48.9**	0.5	25 U	0.2	**9,870**	75	**174**	2.8
	7/24/20	5 U	0.05	**1,270**	13	**6.3**	0.1	5 U	0	**857**	6.5	5 U	0.1
	10/7/21	10 U	0.1	**3,820**	39	**30.5**	0.3	10 U	0.1	**67**	0.5	**13.8**	0.2
	9/22/22	10 U	0.1	**3,080**	32	**15.8**	0.2	10 U	0.1	**296**	2.3	**48.5**	0.8
EW-9R-72C	7/24/20	12 U	0.12	**3,080**	32	**48.6**	0.5	18 U	0.1	**2,070**	16	16 U	0.3
	10/7/21	10 U	0.1	**2,610**	27	**21.1**	0.2	10 U	0.1	10 U	0.1	**1,140**	18
	9/22/22	5 U	0.05	**1,730**	18	**5**	0.1	5 U	0	**28.2**	0.2	**85.2**	1.4
EW-10-25B	9/27/17	1 U	0.01	**429**	4.4	**6.3**	0.1	1 U	0	**248**	1.9	0.64 J	0
	7/24/20	1 U	0.01	**236**	2.4	**6.3**	0.1	1 U	0	**98.2**	0.7	**2.4**	0
	10/7/21	1 U	0.01	**166**	1.7	4.3	0	1 U	0	**63.2**	0.5	1 U	0
	9/22/22	1 U	0.01	**343**	3.5	3.6	0	1 U	0	**124**	0.9	**4**	0.1



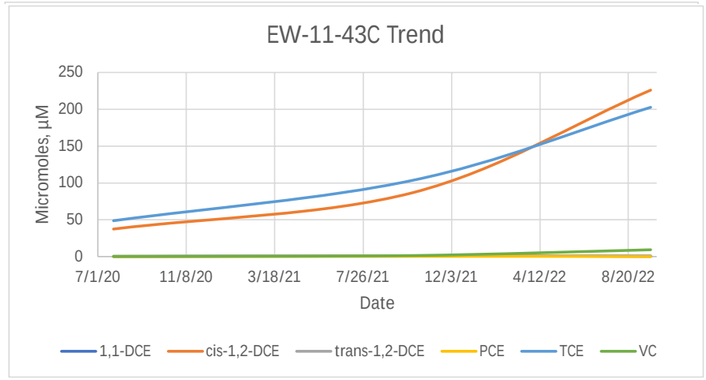


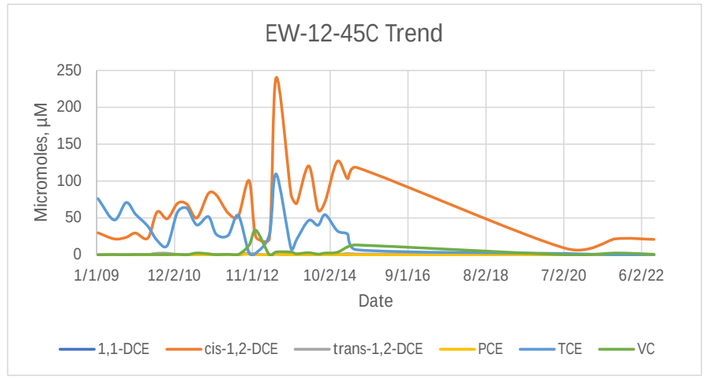


Appendix B
Table 7

Historical Groundwater Sampling Results and Trends - CVOCs (DPE System)
Former Emerson Power Transmission
Ithaca, New York (a)

Well ID	Date	1,1-DCE		cis-1,2-DCE		trans-1,2-DCE		PCE		TCE		VC	
	Evaluation Criteria	5		5		5		5		5		2	
	Molecular Weight	96.94	µM	96.95	µM	96.95	µM	165.82	µM	131.38	µM	62.50	µM
EW-11-43C	7/24/20	20 U	0.21	**3,620**	37	**59.3**	0.6	20 U	0.1	**6,420**	49	20 U	0.3
	10/7/21	100 U	1.03	**8,430**	87	100 U	1	100 U	0.6	**13,600**	104	100 U	1.6
	9/22/22	**49.9 J**	0.51	**21,900**	226	**124**	1.3	50 U	0.3	**26,600**	202	**587**	9.4
EW-12-45C	1/14/09	2	0.02	**2,900 D**	30	**11**	0.1	**6.1**	0	**10,000 D**	76	**10**	0.2
	6/9/09	2	0.02	**2,100 D**	22	**7.3**	0.1	2.4	0	**6,200 D**	47	**13**	0.2
	9/23/09	2	0.02	**2,300 D**	24	**20**	0.2	**7.2**	0	**9,300 J**	71	**7.6**	0.1
	12/17/09	3	0.03	**2,870 D**	30	**11.7**	0.1	**6.1**	0	**7,270 D**	55	**16.8 J**	0.3
	4/6/10	1 U	0.01	**2,210 D**	23	**21.8**	0.2	4.3	0	**5,110 D**	39	**14.5**	0.2
	6/29/10	**12.5**	0.13	**5,650**	58	**212 J**	2.2	2.2	0	**2,560**	19	**21**	0.3
	9/29/10	**8.3**	0.09	**4,750**	49	**189**	1.9	1 U	0	**1,680**	13	**30**	0.5
	12/28/10	**6**	0.06	**6,740**	70	**32.7**	0.3	4.1	0	**7,550**	57	**44.7**	0.7
	3/22/11	3.4	0.04	**6,680**	69	**22.4**	0.2	3.8	0	**8,310**	63	**9.2**	0.1
	6/22/11	4.6	0.05	**4,850**	50	**39.2**	0.4	3.8	0	**5,320**	40	**157**	2.5
	10/3/11	2.6 J	0.03	**8,080 J**	83	**20.1 J**	0.2	1.9 J	0	**6,810 J**	52	**81.1 J**	1.3
	12/13/11	1.3	0.01	**7,880**	81	**59.6**	0.6	1 U	0	**3,670**	28	**7.4**	0.1
	3/28/12	4.7	0.05	**5,500**	57	**55.2**	0.6	1 U	0	**3,470**	26	**44.4**	0.7
	6/27/12	4.7 J	0.05	**5,040**	52	**45.6 J**	0.5	2.3 J	0	**7,020**	53	**33.1 J**	0.5
	10/3/12	200 U	2.06	**9,760**	101	200 U	2.1	200 U	1.2	**308**	2.3	**807**	13
	12/4/12	3	0.03	**2,330**	24	**71.6**	0.7	1 U	0	**327**	2.5	**2070**	33
	4/4/13	1 U	0.01	**2,140**	22	**16.7**	0.2	1.3	0	**3,550**	27	**9.2**	0.1
	6/3/13	100 U	1.03	**23,300**	240	**214**	2.2	100 U	0.6	**14,400**	110	**235**	3.8
	10/16/13	**21.6**	0.22	**7,930**	82	**188**	1.9	1 U	0	**1,130**	8.6	**230**	3.7
	12/4/13	3.3	0.03	**6,730**	69	**68.6**	0.7	1 U	0	**2,720**	21	**90.4**	1.4
	3/24/14	40 U	0.41	**11,700**	121	**59**	0.6	40 U	0.2	**6,130**	47	**184**	2.9
	6/16/14	20 U	0.21	**5,890**	61	**37.5**	0.4	20 U	0.1	**5,270**	40	**60.5**	1
	8/19/14	20 U	0.21	**7,010**	72	**48.8**	0.5	20 U	0.1	**7,150**	54	**146**	2.3
	12/4/14	**15.5**	0.16	**12,300**	127	**54**	0.6	1 U	0	**4,260**	32	**209 J**	3.3
	3/11/15	50 U	0.52	**10,000**	103	**155**	1.6	50 U	0.3	**3,640**	28	**686 J**	11
	5/27/15	**18.6 J**	0.19	**11,500**	119	**94.1**	1	25 U	0.2	**890**	6.8	**844**	14
	7/24/20	5 U	0.05	**841**	8.7	5 U	0.1	5 U	0	**220**	1.7	5 U	0.1
	10/7/21	3.2 J	0.03	**2,100**	22	**6.4**	0.1	5 U	0	5 U	0	**150**	2.4
	9/22/22	5 U	0.05	**2,030**	21	4.7 J	0	5 U	0	**68.8**	0.5	**44.5**	0.7

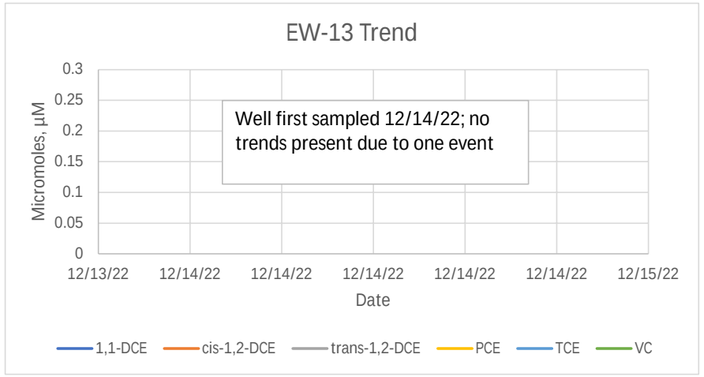


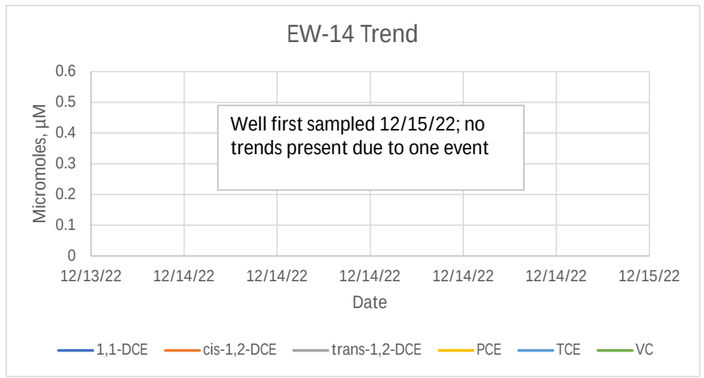


Appendix B
Table 7

Historical Groundwater Sampling Results and Trends - CVOCs (DPE System)
Former Emerson Power Transmission
Ithaca, New York (a)

Well ID	Date	1,1-DCE		cis-1,2-DCE		trans-1,2-DCE		PCE		TCE		VC	
Evaluation Criteria		5		5		5		5		5		2	
Molecular Weight		96.94	µM	96.95	µM	96.95	µM	165.82	µM	131.38	µM	62.50	µM
EW-13	12/14/22	1 U	0.01	**23.3**	0.2	1 U	0	1 U	0	4	0	3.6	0.1
EW-14	12/15/22	1 U	0.01	**25.6**	0.3	1 U	0	1 U	0	**13.6**	0.1	**29.8**	0.5





1,1-Dichloroethene = 1,1-DCE; cis-1,2-Dichloroethene = cis-1,2-DCE; trans-1,2-Dichloroethene = trans-1,2-DCE; Tetrachloroethene = PCE; Trichloroethene = TCE; Vinyl Chloride = VC

Appendix B
Table 8

DPE System VOC Mass Loading
Former Emerson Power Transmission
Ithaca, New York (a)

Aqueous Mass Loading (2020-2022)								
Year	**Sampling Period**	**Date**	**Total VOC Influent (µg/l)**	**Total VOC Effluent (µg/l)**	**Effluent Water Meter Reading (gallons)**	**Volume of Water Extracted (gallons)**	**VOC Mass Removed (lbs)**	**Average Mass Loading**
2020	Quarter 1	3/24/2020	3,845	1.6	2,795,809	64,747	2.1	
	Quarter 2	6/19/2020	3,461	1.6	2,841,835	46,025	1.3	
	Quarter 3	9/22/2020	3,074	2.2	2,873,605	31,771	0.8	
	Quarter 4	12/23/2020	3,074	2.2	2,912,750	39,145	1.0	
							lbs/day =	0.0144
2021	Quarter 1	3/10/2021	5,883	1.6	2,958,712	45,962	2.3	
	Quarter 2	6/9/2021	6,863	2.1	3,008,400	49,688	2.8	
	Quarter 3	9/8/2021	14,673	1.1	3,060,787	52,387	6.4	
	Quarter 4	12/6/2021	3,420	1.1	3,107,270	46,483	1.3	
							lbs/day =	0.0369
2022	Quarter 1	3/14/2022	2,641	1.1	3,155,646	48,376	1.1	
	Quarter 2	6/8/2022	1,703	2.3	3,211,425	55,779	0.8	
	Quarter 3	9/2/2022	564	2.4	3,246,633	35,208	0.2	
	Quarter 4	12/7/2022	1,166	3	3,295,865	49,232	0.5	
							lbs/day =	0.0068

Projected Aqueous Mass Loading	
Additional Mass Loading from EW-13 and EW-14 (lbs/day) (b)	**Total Mass Loading Anticipated (lbs/day) (c)**
0.0019	0.0213

a/ VOC = volatile organic compound; µg/l = micrograms per liter; lbs = pounds.
b/ Assumes groundwater flow of 0.5 gpm per new well and concentrations of VOC based on December 2022 sample results.
c/ Assumes mass loading rate based on average rate over three year period (2020-2022).

Vapor Mass Loading (2020-2022)								
Year	**Sampling Period**	**Date**	**Total VOC Influent (mg/m^3) (b)**	**Cumulative Vacuum Blower Run Time (hrs)**	**Sampling Period Vacuum Blower Run Time (hrs)**	**Flow of Vacuum Blower (m^3/hr)**	**VOC Mass Removed (lbs)**	**Average Mass Loading**
2020	Quarter 1	3/31/2020	78.81	21,036.5	2,175	685.63	258.98	
	Quarter 2	6/30/2020	29.26	22,992.8	1,956	570.29	71.94	
	Quarter 3	9/30/2020	66.86	24,708.6	1,716	471.99	119.33	
	Quarter 4	12/31/2020	66.86	26,620.0	1,911	458.73	129.20	
							lbs/day =	1.58
2021	Quarter 1	3/31/2021	149.92	28,727.7	2,108	441.74	307.65	
	Quarter 2	6/30/2021	44.42	30,113.8	1,386	464.40	63.02	
	Quarter 3	9/30/2021	170.08	31,903.6	1,790	441.74	296.37	
	Quarter 4	12/31/2021	17.08	34,128.2	2,225	441.74	36.99	
							lbs/day =	1.93
2022	Quarter 1	3/31/2022	34.10	35,889.7	1,762	441.74	58.48	
	Quarter 2	6/30/2022	6.05	37,617.5	1,728	441.74	10.18	
	Quarter 3	9/30/2022	1.36	39,390.6	1,773	441.74	2.35	
	Quarter 4	12/31/2022	0.05	41,601.1	2,211	441.74	0.10	
							lbs/day =	0.19

a/ VOC = volatile organic compound; mg/m3 = milligrams per cubic meter; hrs = hours; lbs = pounds.
b/ Quarter 3 2020 VOCs are based on the Quarter 4 2020 data.

APPENDIX

C AOC 1 EXTRACTION WELL BORING LOGS AND CONSTRUCTION DETAILS

Project Name: Former EPT	Client: Emerson	Location: Ithaca, NY	Boring Log: EW-13
Drilled By: Parratt Wolff, Inc.	Drill Start Date: 11/29/2022	Drill End Date: 12/2/2022	Drill Method: Core Barrel
Logged By: Nathaniel Winston	Total Depth (ft): 40.3	Bore Diameter (in): 8.25/4	Ground Surface (ft-msl):

Depth (ft)	Elevation (ft-msl)	Sample Type	Lab Sample Interval	Recovery (%)	RQD	Graphic Log	Physical Description
							Ground Surface
							OVERBURDEN
20				Total: 100%; Solid: 90%	0		***SILTSTONE*** Siltstone; strong; strong to light gray; aphanitic; massive; fresh; competent.
				Total: 100%; Solid: 92%	20		20.60' trace brachiopod fossils 20.40-20.50' bedding plane fracture; trace brachiopod fossils; narrow; partially healed; trace cohesive sediment; smooth; wet 21.00-26.0' bedding plane fractures every 1.0-1.5"; trace brachiopod fossils; narrow; not healed; clean; smooth; damp to wet 26.00-27.60' fracture zone, bedding plane fractures every 1.0-1.5"; trace brachiopod fossils; narrow; not healed; clean; smooth; damp to wet 29.90-30.00' bedding plane fracture; moderately narrow; partially healed; cohesive sediment; rough; wet 31.00-36.00' bedding plane fractures every 3.5-5.0"; trace brachiopod fossils; narrow; trace healing; trace cohesive sediment; smooth; damp to wet 31.25' joint; 70 degrees; very narrow; not healed; clean; smooth; wet 33.90-34.80' fracture zone; bedding plane fractures; moderate vertical to 70-80 degree fractures; narrow to tight; partially healed; trace oxidation; some cohesive sediment; rough; wet 36.30' bedding plane fracture; narrow; partially healed; trace cohesive sediment; smooth; wet 37.60' bedding plane fracture; narrow; partially healed; trace cohesive sediment; stepped; wet 39.60' bedding plane fracture; narrow; partially healed; trace cohesive sediment; stepped; wet
30				Total: 100%; Solid: 100%	58		
				Total: 100%; Solid: 93%	40		
				Total: 100%; Solid: 100%	51		
40							*Bottom of boring at 40.3 feet. End of boring at 40.3 ft. bgs.*

Notes:

Well

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Project Name: Former EPT	**Client:** Emerson	**Location:** Ithaca, NY	**Boring Log:** EW-14
Drilled By: Parratt Wolff, Inc.	**Drill Start Date:** 11/30/2022	**Drill End Date:** 12/2/2022	**Drill Method:** Core Barrel
Logged By: Nathaniel Winston	**Total Depth (ft):** 40.5	**Bore Diameter (in):** 8.25/4	**Ground Surface (ft-msl):**

Depth (ft)	Elevation (ft-msl)	Sample Type	Lab Sample Interval	Recovery (%)	RQD	Graphic Log	Physical Description
							Ground Surface
							OVERBURDEN
				Total: 100%; Solid: 94%	10		***SILTSTONE*** Siltstone; strong; strong to light gray; aphanitic; massive; fresh; competent. 20.50-22.50' broken due to material grinding by bit 22.50-25.50' bedding plane fractures every 1.0-2.0"; trace brachiopod fossils; tight to narrow; trace healing; trace cohesive sediment; smooth to rough; damp to wet 27.00-28.50' fracture zone, bedding plane fractures every 1.0-1.5"; narrow to moderaterly narrow; trace healing; trace cohesive sediment; smooth; damp to wet 30.50-35.90' fracture zone; bedding plane fractures; moderate vertical to 70-80 degree fractures; narrow to tight; partially healed, trace calcite mineralization; some cohesive sediment; smooth to rough; wet
				Total: 100%; Solid: 94%	40		
				Total: 100%; Solid: 90%	33		
				Total: 100%; Solid: 96%	62		
							Bottom of boring at 40.5 feet. End of boring at 40.5 ft. bgs.

Notes:

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APPENDIX

D EXCAVATION WORK PLAN

APPENDIX D

EXCAVATION WORK PLAN (EWP)

This Excavation Work Plan (EWP) applies to ground intrusive activities conducted at the Site that will penetrate a cap or cover system (hereinafter referred to collectively as "cover system") or otherwise encounter areas of remaining contamination including non-soil areas of remaining contamination such as the barium-impacted building materials (concrete walls) in Building 15. The Excavation Contingency Plan (Section F-12 of the EWP) will apply for previously undetected, unknown, or uncharacterized areas of contamination found as a result of demolition or Site redevelopment activities.

F-1 NOTIFICATION

At least 15 days prior to the start of any activity that is anticipated to encounter remaining contamination or breach or alter the Site's cover system, the Site owner or their representative will notify the NYSDEC contacts listed in the table below. Table F-1 includes contact information for the above notification. The information on this table will be updated as necessary to provide accurate contact information. A full listing of site-related contact information is provided in Appendix B.

Table F-1: Notifications*

Karen A. Cahill	315-426-7432 karen.cahill@dec.ny.gov
Gary Priscott	315-426-7551 gary.priscott@dec.ny.gov
Margaret Sheen	315-426-7405 margaret.sheen@dec.ny.gov
Kelly Lewandowski (NYSDEC Site Control):	518-402-9569 kelly.lewandowski@dec.ny.gov
Anthony Perretta	518-402-7860 anthony.perretta@health.ny.gov

* Note: Notifications are subject to change and will be updated as necessary.

This notification will include:

- A detailed description of the work to be performed, including the location and areal extent of excavation, plans/drawings for site re-grading, intrusive elements or utilities to be installed below the soil cover, estimated volumes of contaminated soil to be excavated, any modifications of truck routes, and any work that may impact an engineering control;
- A summary of environmental conditions anticipated to be encountered in the work areas, including the nature and concentration levels of contaminants of concern, potential presence of grossly contaminated media, and plans for any pre-construction sampling;
- A schedule for the work, detailing the start and completion of all intrusive work;
- A summary of the applicable components of this EWP;
- A statement that the work will be performed in compliance with this EWP and 29 CFR 1910.120 and 29 CFR 1926 Subpart P;
- A copy of the contractor's health and safety plan (HASP), in electronic format, if it differs from the HASP provided in Appendix G of this Interim SMP;
- Identification of disposal facilities for potential waste streams; and
- Identification of sources of any anticipated backfill, along with the required request to import form and all supporting documentation including, but not limited to, chemical testing results.

APPENDIX D

F-2 SOIL SCREENING METHODS

Visual, olfactory and instrument-based (e.g. photoionization detector) soil screening will be performed during all excavations into known or potentially contaminated material (remaining contamination) or a breach of a cover system. A qualified environmental professional as defined in 6 NYCRR Part 375, a PE who is licensed and registered in New York State, or a qualified person who directly reports to a PE who is licensed and registered in New York State will perform the screening. Soil screening will be performed when invasive work is done and will include all excavation and invasive work performed during development, such as excavations for foundations and utility work, after issuance of the Certificate of Completion.

Soils will be segregated based on previous environmental data and screening results into material that requires off-site disposal and material that requires testing to determine if the material can be reused on-site as soil beneath a cover or if the material can be used as cover soil. Further discussion of off-site disposal of materials and on-site reuse is provided in Sections F-6 and F-7 of this Appendix.

F-3 SOIL STAGING METHODS

Soil stockpiles will be continuously encircled with a berm, filter sock, and/or silt fence. Hay bales will be used as needed near catch basins, surface waters and other discharge points.

Stockpiles will be kept covered at all times with appropriately anchored tarps. Stockpiles will be routinely inspected and damaged tarp covers will be promptly replaced.

Stockpiles will be inspected at a minimum once each week and after every storm event. Results of inspections will be recorded in a logbook and maintained at the site and available for inspection by the NYSDEC.

F-4 MATERIALS EXCAVATION AND LOAD-OUT

A qualified environmental professional as defined in 6 NYCRR Part 375, a PE who is licensed and registered in New York State, or a qualified person who directly reports to a PE who is licensed and registered in New York State will oversee all invasive work and the excavation and load-out of all excavated material.

The owner of the property and remedial party (as appropriate) and its contractors are responsible for safe execution of all invasive and other work performed under this Plan. See Appendix C for additional responsibilities of each party under this Interim SMP.

The presence of utilities and easements on the site will be investigated by the qualified environmental professional. It will be determined whether a risk or impediment to the planned work under this SMP is posed by utilities or easements on the site. A site utility stakeout will be completed for all utilities prior to any ground intrusive activities at the site.

Loaded vehicles leaving the site will be appropriately lined, tarped, securely covered, manifested, and placarded in accordance with appropriate Federal, State, local, and NYSDOT requirements (and all other applicable transportation requirements).

A truck wash will be operated on-site, as appropriate. The qualified environmental professional will be responsible for ensuring that all outbound trucks will be washed at the truck wash before leaving the site until the activities performed under this section are complete. Truck wash waters will be collected and disposed of off-site in an appropriate manner.

Locations where vehicles enter or exit the site shall be inspected daily for evidence of off-site soil tracking.

The qualified environmental professional will be responsible for ensuring that all egress points for truck and equipment transport from the site are clean of dirt and other materials derived from the site during intrusive excavation activities. Cleaning of the adjacent streets will be performed as needed to maintain a clean condition with respect to site-derived materials. Material accumulated from the street cleaning and egress cleaning activities will be disposed off-site at a permitted landfill facility in accordance with all applicable local, State, and Federal regulations.

APPENDIX D

F-5 MATERIALS TRANSPORT OFF-SITE

All transport of materials will be performed by licensed haulers in accordance with appropriate local, State, and Federal regulations, including 6 NYCRR Part 364. Haulers will be appropriately licensed and trucks properly placarded.

Material transported by trucks exiting the site will be secured with tight-fitting covers. Loose-fitting canvas-type truck covers will be prohibited. If loads contain wet material capable of producing free liquid, truck liners will be used.

All trucks loaded with site materials will exit the vicinity of the site using approved truck routes to be coordinated with the City and Town of Ithaca at the time when work is performed. The most appropriate route and takes into account: (a) limiting transport through residential areas and past sensitive sites; (b) use of city mapped truck routes; (c) prohibiting off-site queuing of trucks entering the facility; (d) limiting total distance to major highways; (e) promoting safety in access to highways; and (f) overall safety in transport.

Trucks will be prohibited from stopping and idling in the neighborhood outside the project site.

Egress points for truck and equipment transport from the site will be kept clean of dirt and other materials during site remediation and development.

Queuing of trucks will be performed on-site in order to minimize off-site disturbance. Off-site queuing will be prohibited.

F-6 MATERIALS DISPOSAL OFF-SITE

All material excavated and removed from the site will be treated as contaminated and regulated material and will be transported and disposed off-site in a permitted facility in accordance with all local, State and Federal regulations. If disposal of material from this site is proposed for unregulated off-site disposal (i.e. clean soil removed for development purposes), a formal request with an associated plan will be made to the NYSDEC project manager. Unregulated off-site management of materials from this site will not occur without formal NYSDEC project manager approval.

Off-site disposal locations for excavated soils will be identified in the pre-excavation notification. This will include estimated quantities and a breakdown by class of disposal facility if appropriate, (e.g. hazardous waste disposal facility, solid waste landfill, petroleum treatment facility, C&D debris recovery facility). Actual disposal quantities and associated documentation will be reported to the NYSDEC in the Periodic Review Report. This documentation will include, but will not be limited to: waste profiles, test results, facility acceptance letters, manifests, bills of lading and facility receipts.

Non-hazardous historic fill and contaminated soils taken off-site will be handled consistent with 6 NYCRR Parts 360, 361, 362, 363, 364 and 365. Material that does not meet Unrestricted SCOs is prohibited from being taken to a New York State C&D debris recovery facility (6 NYCRR Subpart 360-15 registered or permitted facility).

F-7 MATERIALS REUSE ON-SITE

The qualified environmental professional as defined in 6 NYCRR part 375 will ensure that procedures defined for materials reuse in this SMP are followed and that unacceptable material (i.e. contaminated) does not remain on-site. Contaminated on-site material, including historic fill and contaminated soil, that is acceptable for reuse on-site will be placed below the demarcation layer or impervious surface, and will not be reused within a cover soil layer, within landscaping berms, or as backfill for subsurface utility lines.

Proposed materials for reuse on-site must be sampled for full suite analytical parameters including per- and polyfluoroalkyl substances (PFAS) and 1,4-dioxane. The sampling frequency will be in accordance with DER-10 Table 5.4(e)10 unless prior approval is obtained from the NYSDEC project manager for modification of the sampling frequency. The analytical results of soil/fill material testing must meet the site use criteria presented in NYSDEC DER-10 Appendix 5 – Allowable Constituent Levels for Imported Fill or Soil for all constituents listed, and the NYSDEC Sampling, Analysis, and Assessment of Per- and Polyfluoroalkyl Substances (latest version) guidance values. Approvals for modifications to the analytical parameters must be obtained from the NYSDEC project manager prior to the sampling event.

Soil/fill material for reuse on-site will be segregated and staged as described in Sections F-2 and F-3 of this EWP. The anticipated size and location of stockpiles will be provided in the 15-day notification to the NYSDEC project manager. Stockpile locations will be based on the location of site excavation activities and proximity to nearby site features. Material reuse on-site will comply with requirements of NYSDEC DER-10 Section 5.4(e)4. Any modifications to the requirements of DER-10 Section 5.4(e)4 must be approved by the NYSDEC project manager.

Any demolition material proposed for reuse on-site will be sampled for asbestos and the results will be reported to the NYSDEC for acceptance. Concrete crushing or processing on-site will not be performed without prior NYSDEC approval. Organic matter (wood, roots, stumps, etc.) or other solid waste derived from clearing and grubbing of the site will not be reused on-site.

F-8 FLUIDS MANAGEMENT

All liquids to be removed from the site, including but not limited to, excavation dewatering, decontamination waters and groundwater monitoring well purge and development waters, will be handled, transported and disposed off-site at a permitted facility in accordance with applicable local, State, and Federal regulations, except as otherwise approved in the O&M Plan (Appendix I of the Interim SMP). Dewatering, purge and development fluids will not be recharged back to the land surface or subsurface of the site, and will be managed off-site, unless prior approval is obtained from NYSDEC.

Discharge of water generated during large-scale construction activities to surface waters (i.e. a local pond, stream or river) will be performed under a SPDES permit.

F-9 COVER SYSTEM RESTORATION

After the completion of soil removal and any other invasive activities the cover system will be restored in a manner that complies with the AROD. The existing cover system is comprised of a demarcation layer and clean fill (minimum 24 inches in restricted residential and 12 inches in commercial and industrial land use areas), asphalt or concrete pavements, or buildings. The demarcation layer consisting of orange snow fencing material, white geotextile, or equivalent material, etc. will be replaced to provide a visual reference to the top of the remaining contamination zone, the zone that requires adherence to special conditions for disturbance of remaining contaminated soils defined in this SMP. If the type of cover system changes from that which exists prior to the excavation (i.e., a soil cover is replaced by asphalt), this will constitute a modification of the cover element of the remedy and the upper surface of the remaining contamination. A figure showing the modified surface will be included in the subsequent Periodic Review Report and in an updated SMP.

F-10 BACKFILL FROM OFF-SITE SOURCES

All materials proposed for import onto the site will be approved by the qualified environmental professional, as defined in 6 NYCRR Part 375, and will be in compliance with provisions in this SMP prior to receipt at the site. A Request to Import/Reuse Fill or Soil form, which can be found at http://www.dec.ny.gov/regulations/67386.html, will be prepared and submitted to the NYSDEC project manager allowing a minimum of 5 business days for review.

Material from industrial sites, spill sites, other environmental remediation sites, or potentially contaminated sites will not be imported to the site.

All imported soils will meet the backfill and cover soil quality standards established in 6 NYCRR 375-6.7(d) and DER-10 Appendix 5 for restricted residential, commercial, or industrial use as appropriate based on the location on the Site. Based on an evaluation of the land use, protection of groundwater and protection of ecological resources criteria, the resulting soil quality standards are listed in DER-10 Appendix 5. Soils that meet ‘general’ fill requirements under 6 NYCRR Part 360.13, but do not meet backfill or cover soil objectives for this site, will not be imported onto the site without prior approval by NYSDEC project manager. Soil material will be sampled for the full suite of analytical parameters, including PFAS and 1, 4-dioxane. Solid waste will not be imported onto the site. Backfill will conform to DOT specifications and haulers’ permits.

Trucks entering the site with imported soils will be securely covered with tight fitting covers. Imported soils will be stockpiled separately from excavated materials and covered to prevent dust releases.

F-11 STORMWATER POLLUTION PREVENTION

For any excavation or land disturbance activity exceeding 1 acre, coverage under the General Permit for Stormwater Discharges from Construction Activities will be obtained and a Stormwater Pollution Prevention Plan (SWPPP) developed to conform to the requirements of the NYSDEC Division of Water guidelines and NYS regulations. The SWPPP will describe the erosion and sediment controls, installation procedures, and inspection and maintenance requirement for the type of work expected to be performed. At a minimum (e.g., for excavation or land disturbance activities less than 1 acre), the following control measures will be implemented.

Barriers and hay bale checks will be installed and inspected once a week and after every storm event. Results of inspections will be recorded in a logbook and maintained at the site and available for inspection by the NYSDEC. All necessary repairs shall be made immediately.

Accumulated sediments will be removed as required to keep the barrier and hay bale check functional.

All undercutting or erosion of the silt fence toe anchor shall be repaired immediately with appropriate backfill materials.

Manufacturer's recommendations will be followed for replacing silt fencing or filter socks damaged due to weathering.

Erosion and sediment control measures identified in the SMP shall be observed to ensure that they are operating correctly. Where discharge locations or points are accessible, they shall be inspected to ascertain whether erosion control measures are effective in preventing significant impacts to receiving waters.

Silt fencing or hay bales will be installed around the entire perimeter of the construction area.

F-12 EXCAVATION CONTINGENCY PLAN

If grossly contaminated media, underground tanks or structures containing free product, or other previously unidentified contaminant sources are found during post-remedial subsurface excavations or development related construction, excavation activities will be suspended until sufficient equipment is mobilized to address the condition. The NYSDEC project manager and others listed in Table F-1 will be promptly notified of the discovery.

Sampling will be performed on product, sediment and surrounding soils, etc. as necessary to determine the nature of the material and proper disposal method. Chemical analysis will be performed for a full list of analytes [TAL metals, TCL volatiles and semi-volatiles (including 1,4-dioxane), TCL pesticides and PCBs, and PFAS], unless the site history and previous sampling results provide sufficient justification to limit the list of analytes. In this case, a reduced list of analytes will be proposed to the NYSDEC project manager for approval prior to sampling. Any tanks will be closed as per NYSDEC regulations and guidance.

Identification of unknown or unexpected contaminated media identified by screening during invasive site work will be promptly communicated by phone within two hours to NYSDEC's Project Manager. Reportable quantities of petroleum product will also be reported to the NYSDEC spills hotline. These findings will be also included in the Periodic Review Report.

After sampling and notifications are completed, a work plan will be prepared and submitted to the NYSDEC's project manager to remediate the grossly contaminated media, underground tanks or structures containing free product, or other previously unidentified contaminant sources. The content of the remediation work plan will be based on the specific environmental conditions encountered, but will generally include the following information: removal of free product, temporary staging of contaminated materials, compound-specific procedures for community air monitoring, and other items listed below:

- A detailed description of the work to be performed, including the location and areal extent of excavation, estimated volumes of contaminated materials, plans/drawings for removal of free product, excavation and temporary staging of contaminated materials, post-remediation sampling, backfilling and restoration, and installation of additional institutional or engineering controls;
- A schedule for the work, detailing the start and completion of all intrusive work;

- A summary of the applicable components of this EWP;
- A statement that the work will be performed in compliance with this EWP and 29 CFR 1910.120 and 29 CFR 1926 Subpart P;
- An updated HASP and CAMP based on the types and contaminant concentrations present;
- Identification of disposal facilities for potential waste streams;
- Identification of sources of any anticipated backfill, along with the required request to import fill and all supporting documentation including, but not limited to, chemical testing results.
- Any other measures required by the NYSDEC.

F-13 COMMUNITY AIR MONITORING PLAN

A Community Air Monitoring Plan (CAMP) will be prepared before beginning any intrusive soil management work at the site and will be implemented during active excavation, staging, loading, backfilling, grading and other ground-intrusive activities. A generic CAMP can be obtained in Appendix 1A of the DER-10. The CAMP will include details of the perimeter air monitoring program (VOCs and particulates), methods of monitoring (continuous and periodic), instrumentation (e.g., photoionization detector or dust meter), and action levels to be used.

The CAMP will include a figure showing the location of air sampling stations based on generally prevailing wind conditions. The locations will be adjusted on a daily or more frequent basis based on actual wind directions to provide an upwind and at least two downwind monitoring stations.

Exceedances of action levels listed in the CAMP will be reported to NYSDEC and NYSDOH Project Managers.

F-13A SPECIAL REQUIREMENTS FOR WORK WITHIN 20 FEET OF POTENTIALLY EXPOSED INDIVIDUALS OR STRUCTURES

When work areas are within 20 feet of potentially exposed populations or occupied structures, the continuous monitoring locations for VOCs and particulates must reflect the nearest potentially exposed individuals and the location of ventilation system intakes for nearby structures. The use of engineering controls such as vapor/dust barriers, temporary negative-pressure enclosures, or special ventilation devices should be considered to prevent exposures related to the work activities and to control dust and odors. Consideration should be given to implementing the planned activities when potentially exposed populations are at a minimum, such as during weekends or evening hours in non-residential settings.

- If total VOC concentrations opposite the walls of occupied structures or next to intake vents exceed 1 part-per-million, monitoring should occur within the occupied structure(s). Depending upon the nature of contamination, chemical-specific colorimetric tubes of sufficient sensitivity may be necessary for comparing the exposure point concentrations with appropriate pre-determined response levels (response actions should also be pre-determined). Background readings in the occupied spaces must be taken prior to commencement of the planned work. Any unusual background readings should be discussed with NYSDOH prior to commencement of the work.
- If total particulate concentrations opposite the walls of occupied structures or next to intake vents exceed 150 micrograms per cubic meter, work activities should be suspended until controls are implemented and are successful in reducing the total particulate concentration to 150 micrograms per cubic meter or less at the monitoring point.
- Depending upon the nature of contamination and remedial activities, other parameters (e.g., explosivity, oxygen, hydrogen sulfide, carbon monoxide) may also need to be monitored. Response levels and actions should be pre-determined, as necessary, for each site.

F-13B SPECIAL REQUIREMENTS FOR INDOOR WORK WITH CO-LOCATED RESIDENCES OR FACILITIES

Unless a self-contained, negative-pressure enclosure with proper emission controls will encompass the work area, all individuals not directly involved with the planned work must be absent from the room in which the work will occur. Monitoring requirements shall be as stated above under “Special Requirements for Work Within 20 Feet of Potentially Exposed Individuals or Structures” except that in this instance “nearby/occupied structures” would be adjacent occupied rooms. Additionally, the location of all exhaust vents in the room and their discharge points, as well as potential vapor pathways (openings, conduits, etc.) relative to adjoining rooms, should be

understood and the monitoring locations established accordingly. In these situations, it is strongly recommended that exhaust fans or other engineering controls be used to create negative air pressure within the work area during remedial activities. Additionally, it is strongly recommended that the planned work be implemented during hours (e.g. weekends or evenings) when building occupancy is at a minimum.

F-14 ODOR CONTROL PLAN

An odor control plan capable of controlling emissions of nuisance odors off-site will be developed, if necessary, at the time the EWP is implemented. Specific odor control methods to be used on a routine basis are described in the following paragraph.

If nuisance odors are identified at the site boundary or an area of the Site where residents or tenants exist, or if odor complaints are received, work will be halted and the source of odors will be identified and corrected. Work will not resume until all nuisance odors have been abated. NYSDEC and NYSDOH will be notified of all odor events and of any other complaints about the project. Implementation of all odor controls, including the halt of work, is the responsibility of the owner's or remedial party's Remediation Engineer, and any measures that are implemented will be discussed in the Periodic Review Report.

All necessary means will be employed to prevent on- and off-site nuisances. At a minimum, these measures will include: (a) limiting the area of open excavations and size of soil stockpiles; (b) shrouding open excavations with tarps and other covers; and (c) using foams to cover exposed odorous soils. If odors develop and cannot be otherwise controlled, additional means to eliminate odor nuisances will include: (d) direct load-out of soils to trucks for off-site disposal; (e) use of chemical odorants in spray or misting systems; and, (f) use of staff to monitor odors in surrounding neighborhoods.

If nuisance odors develop during intrusive work that cannot be corrected, or where the control of nuisance odors cannot otherwise be achieved due to on-site conditions or close proximity to sensitive receptors, odor control will be achieved by sheltering the excavation and handling areas in a temporary containment structure equipped with appropriate air venting/filtering systems.

F-15 DUST CONTROL PLAN

Particulate monitoring must be conducted according to the Community Air Monitoring Plan (CAMP) provided in Section F-13. If particulate levels at the site exceed the thresholds listed in the CAMP or if airborne dust is observed on the site or leaving the site, the dust suppression techniques listed below will be employed. The owner or remedial party will also take measures listed below to prevent dust production on the site.

- A dust suppression plan that addresses dust management during invasive on-site work will include, at a minimum, the items listed below:
- Dust suppression will be achieved using a dedicated on-site water truck for road wetting. The truck will be equipped with a water cannon capable of spraying water directly onto off-road areas including excavations and stockpiles.
- Clearing and grubbing of larger sites will be done in stages to limit the area of exposed, unvegetated soils vulnerable to dust production.
- Gravel will be used on roadways to provide a clean and dust-free road surface.
- On-site roads will be limited in total area to minimize the area required for water truck sprinkling.
- Excavations and stockpiles will be covered as soon as possible after intrusive activities, especially during dry conditions.
- Vegetation or pavement will be installed as soon as possible after backfilling.

F-16 OTHER NUISANCES

If necessary, based on conditions at the Site, a plan for rodent control will be developed and utilized by the contractor prior to and during site clearing and site grubbing, and during all remedial work.

A plan will be developed and utilized by the contractor for all remedial work to ensure compliance with local noise control ordinances.

APPENDIX D

F-17 BARIUM-IMPACTED BUILDING MATERIALS

Any remediation or removal of barium-impacted building materials (concrete walls) in Building 15 shall be performed in accordance with all applicable laws and regulations, as well as with the relevant provisions of DER-10 and this EWP. The latter includes Subsections F-1, F-4 (but only with respect to excavation load-out), F-5, F-6, F-13, F-15, and F-16. If previously unidentified areas of impacted building materials are found, the requirements in the Excavation Contingency Plan (Section F-12) will apply.

APPENDIX

E HEALTH AND SAFETY PLAN

HEALTH AND SAFETY PLAN

FORMER EMERSON POWER TRANSMISSION FACILITY
ITHACA, TOMPKINS COUNTY, NEW YORK
NYSDEC SITE NO. 755010

EMERSON

PROJECT NO.:31401545.001
DATE: AUGUST 2022

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SIGNATURES

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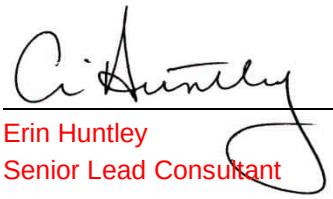

Erin Huntley
Senior Lead Consultant

REVIEWED BY

David Rykaczewski
Senior Lead Consultant

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1 INTRODUCTION

This Health and Safety Plan (HASP) was prepared by WSP USA Inc. (WSP) for the field activities (see Section 4) associated with the EMERSUB 15, LLC (formerly Emerson Power Transmission, or "EPT") facility property located at 620 South Aurora Street, Tompkins County, Ithaca, New York (Site; Figure 1).

This HASP provides an overview of conditions at the site and describes the safety procedures to be employed during implementation of the activities listed in Section 1.1. The HASP presents the minimum requirements applicable to all WSP employees and WSP's subcontractors; all subcontractors and other environmental consultants are also required to prepare and follow their own HASP and may use more stringent requirements as necessary to fulfill their own corporate requirements.

During the development of this HASP, consideration was given to current safety standards as defined by the United States Environmental Protection Agency (EPA), the Occupational Safety and Health Administration (OSHA), the American Conference of Governmental Industrial Hygienists (ACGIH), and the National Institute for Occupational Safety and Health (NIOSH). In addition, the HASP includes information on health effects and standards for known contaminants and the procedures designed to account for the potential for exposure to unknown substances. Specifically, the following references have been consulted:

- 29 Code of Federal Regulations (CFR) 1910.120 and 40 CFR 311
- OSHA/NIOSH/EPA Occupational Health and Safety Guidelines for Activities at Hazardous Waste Sites
- NIOSH Pocket Guide to Chemical Hazards
- ACGIH Threshold Limit Values

All onsite personnel will be informed of the site emergency response procedures and any potential fire, explosion, health, or safety hazards associated with field activities. These potential hazards and the planned protective measures are discussed in detail in this HASP.

All WSP personnel conducting work onsite will review and become familiar with all aspects of this HASP. Each employee assigned a responsibility for site work will sign an agreement to comply with the HASP requirements before conducting any activities at the site. A copy of WSP's HASP Certification is provided in Section 16.

In addition to their own HASP, all WSP contractors working at the site will be briefed by WSP's site health and safety coordinator (SHSC) and will be required to become familiar with the following sections of this plan:

- Training Program – Section 11
- Medical Monitoring Program – Section 12
- Emergency Response Plan – Section 13
- Safety Rules and Personal Hygiene – Appendix A
- NIOSH Pocket Guide to Chemical Hazards – Appendix B
- Personal Sampling Pump Procedures – Appendix C
- Heat and Cold Stress Monitoring and Prevention – Appendix D
- Procedures for Putting on and Decontaminating Personal Protective Equipment (PPE) – Appendix E

This HASP may be modified if it becomes evident that the provisions specified are not feasible or adequate to protect the health and safety of personnel, or if supplemental activities are implemented that are not addressed herein. All changes to this HASP shall be documented by completing a HASP modification form (Form 2), and changes should be reviewed by the SHSCs, and Field Team Leaders before implementation onsite. As changes are made to the HASP, WSP must relate all changes and explain how they may change potential exposure hazards to all subcontractor supervisors. A copy of completed HASP modification forms will be included in each copy of the HASP and will be maintained with the project records. The SHSC or their designee will be responsible for informing field personnel of all HASP changes during the daily briefing meetings.

2 SITE BACKGROUND

2.1 SITE LOCATION

The Site consists of three main buildings located on a terraced section of a steep hillside ("South Hill") (Figures 1 and 2). The buildings are located at an elevation of approximately 600 feet above mean sea level. The main buildings are flanked by several smaller buildings to the southwest and a series of access roads and parking lots to the east. South Aurora Street borders the Site to the east followed by the campus of Ithaca College.

Undeveloped woodland borders the Site to the west-southwest along a steep embankment followed by West Spencer Street, which marks the base of South Hill. Residential areas are located west of West Spencer Street and north of the Site. Six Mile Creek, located further to the west, flows north along the base of South Hill and eventually empties into Cayuga Lake approximately 2 miles northwest of the Site (Figure 1).

One of the Site's many parking lots may provide access by air (Figure 2). The Site can be accessed by road from South Aurora Street (i.e., the North or Main Entrance) through a secure and guarded entrance gate. A second entrance (i.e., the South Entrance), is located approximately 1,600 feet to the south of the Main Entrance along South Aurora street, and can be accessed using a site key that must be obtained at the guard shack. A third entrance (i.e., the West Entrance) is located at the eastern end of South Turner Place, adjacent to the Guard Shack, and is accessed using the site key. Parking Lot 3 provides access to the treatment building and is located at the eastern end of Turner Place outside of the perimeter fencing of the site (i.e., unguarded and unlocked).

2.2 SITE HISTORY AND DESCRIPTION

The facility was founded in 1906 by Morse Industrial Corporation, manufacturer of steel roller chain for the automobile industry. Morse operated the facility until approximately 1928 when it was bought by Borg-Warner Corporation, manufacturer of automotive components and power transmission equipment. In 1983, Emerson acquired Morse from Borg-Warner. As a result, the Ithaca facility eventually became part of the former EPT business, a wholly owned subsidiary of Emerson and part of Emerson's Power Transmission Solutions business. EPT continued to manufacture industrial roller chain, bearings, and clutching for the power transmission industry until operations ceased in 2009. The facility was subsequently decommissioned and has been vacant since 2011. In December 2014, Emerson transferred the property to EMERSUB 15, LLC, a wholly owned subsidiary of Emerson, in anticipation of the sale of Emerson Power Transmission Solutions business.

Up until the late 1970s, Borg-Warner used trichloroethene (TCE), a common solvent at the time, for cleaning and degreasing metal parts. An estimated sixty metal piercing and clanking machines were in operation from the early 1950s to 1977. Additional operations included metal finishing, plating, pickling, and salt bath quenching utilizing barium chloride and cyanide salts.

In 1987, groundwater containing elevated concentrations of volatile organic compounds (VOCs), specifically chlorinated VOCs (CVOCs), was discovered, originating from the fire water reservoir (FWR) in the western portion of the property. Subsequent to reporting these findings to NYSDEC, Emerson and EPT entered into a Consent Order on July 12, 1987 with the NYSDEC (Index # A7-0125-87-09; NYSDEC 1988) requiring Emerson to develop and implement a Remedial Investigation and Feasibility Study (RI/FS) followed by a remedial program to address the release of hazardous substances to the environment. An RI Report was completed by Radian Corporation (later Radian International LLC) in 1990 (Radian 1990). A groundwater pump and treat system was installed as an IRM to address VOC-affected groundwater near the FWR; operation began in late 1991. In 1994, the FS completed by Radian proposed a dual-phase groundwater extraction and treatment system as the remedial alternative based on testing that indicated such a system would outperform the existing IRM (Radian 1994). The alternative was approved by NYSDEC and detailed in the 1994 ROD (NYSDEC 1994). The dual-phase extraction (DPE) and treatment system began operating in 1996.

Based on the results of a supplemental remedial investigation (SRI) and Alternatives Analysis performed between 2004 and 2008, NYSDEC issued a ROD Amendment in 2009. In December 2014, EPT transferred the property to EMERSUB 15, LLC, a wholly owned subsidiary of Emerson, in anticipation of the sale of its Power Transmissions Solutions business, of which EPT was a part. In addition, in October 2018 the NYSDEC approved a boundary modification for the Site decreasing the Site size to approximately 61.5 acres. The Site then included two operable units, OU-1 (the former manufacturing plant complex) and OU-2 (the former FWR).

In 2018, in preparation for the conveyance of the property to L Enterprises, LLC, Emerson commenced Interim Remedial Measures (IRMs) to address sixteen (16) areas of concern (AOCs) with soil contamination. This work was completed in 2019. In 2020, Emerson concluded an FS to address other contamination and potential exposure pathways at the Site, including, but not limited to, site-wide chlorinated VOCs, barium, and cyanide in groundwater, isolated areas of site-wide non-aqueous phase liquid (NAPL), seeps containing various chemicals of concerns, a historical underground well, and soil vapor intrusion into Site buildings. Together with the IRM work, the FS laid the foundation for the remedial actions selected in the 2021 ROD Amendment (AROD) which has preceded EMERSUB 15 LLC's transfer of OU-2 (and the Boundary Modification Area) to L Enterprises, LLC.

2.2.1 OU-1

Subsequent to the 2009 ROD Amendment, a variety of activities have occurred in OU-1 including decommissioning the FWR; evaluating the potential presence of NAPL below the FWR; removal of NAPL since 2010; and upgrading the DPE and treatment system. EMERSUB 15, LLC, will retain ownership of that portion of the property coterminous with OU-1.

The pre-existing IRM DPE system (as upgraded in 2009) consisted of 10 wells, 9 were aligned in a north-south direction downgradient of and below the FWR to the west, and 1 well was immediately south of the FWR (EW-9-86C). Of the 10 DPE wells, four wells (EW-4-25B, EW-5-25B, EW-7-25B, and EW-10-25B) were installed in the highly fractured B-zone and the upper C-zone. The remaining six DPE wells (EW-1-62C, EW-2-62C, EW-3-60C, EW-6-60C, EW-8-62C, and EW-9-86C) were installed in the C-zone primarily to intercept and contain impacted groundwater in the lower portion of the C-zone. The OU-1 Groundwater IRM will be a component of the final remedy for the Site.

Following the 2009 ROD Amendment (NYSDEC 2009), several additional investigations were completed in OU-1. The findings indicated that the highest concentrations of CVOCs in groundwater occurred within two bedding plane fractures underlying the reservoir at 550 and 544 feet above mean sea level (amsl). These bedding plane fractures, as well as a deeper bedding plane fracture at 515 feet amsl, were identified as the primary migration pathways for affected groundwater. The pre-2009 system largely addressed these same intervals. In June 2015, the DPE and treatment system was modified and enhanced to include 12 extraction points (abandoning EW-9-86C, and installing EW-9R-72C, EW-11-43C, and EW-12-45C targeting the bedding plane fractures).

2.2.2 OU-2

OU-2 includes several AOCs, including AOC 1 (the Former Department 507 Degreaser in Building 4) where soil and groundwater affected by CVOCs were identified and delineated over the course of several investigations. At the request of NYSDEC, WSP's Phase II SRI Report, dated August 5, 2016, included summary information on this area. Much of the remainder of OU-2 was subject to soil, soil vapor, and groundwater investigations as part of the Phase II SRI. WSP's IRM Work Plan, dated August 8, 2018, was developed to address the excavation of shallow soil in the former degreaser area as well as other areas of OU-2 to reduce potential migration of constituents of concern to groundwater.

A sanitary sewer line was initially constructed across a portion of the Site to serve the former NCR facility to the south. The line extends approximately 2,700 feet from the southern property boundary to the north-northeast across OU-2 and connects to the main city sewer line on South Aurora Street (Figure 2). The line lies within two easements previously granted to NCR by Morse Chain Company. Another easement for a lateral to the NCR sewer line benefits Ithaca College. The original easements extended 10 feet from the center line, for a total width of 20 feet.

In October 2018, the NYSDEC approved a proposal by Emerson to remove 34.34 acres of undeveloped land in the southern portion of the property (Figure 2) from the area subject to the Order on Consent, the Administrative ROD, and the Registry of Inactive Hazardous Waste Sites (NYSDEC 2018d). A condition to the boundary modification was the filing of a deed

restriction requiring soil vapor assessments prior to any habitable structures being connected to or being constructed within 40 feet from the centerline on either side of the sewer running from the former NCR property and the Ithaca College lateral. The New York State Department of Health (NYSDOH) requested the restriction to account for potential vapor intrusion. The deed restriction was filed and recorded on September 6, 2018. As shown in Figure 2, the southern portion of the sewer and the lateral are no longer within the limits of Site No. 755010.

Residual source materials were removed from several manholes and two trench systems within the buildings in 2017 (WSP 2018a). The cleanout was accomplished by physical means (shovel, breaker bars, scrapers, etc.) followed by final removal by high vacuum. The use of water to remove solid residuals from manholes was minimized by temporary plugging to prevent solid residuals and wash water from being discharged to the sanitary sewer system.

The final IRM Work Plan for soils was submitted to and approved by the NYSDEC in August 2018 (WSP 2018b). The primary objectives of the work plan were to remediate soil in OU-2 to meet applicable soil cleanup objectives (SCOs) and to facilitate future use of the property consistent with L Enterprises, LLC redevelopment plans. The IRM activities were completed in August 2019; the Soil IRM Construction Completion Report was submitted to NYSDEC in October 2020. The OU-2 Soil IRM will be a component of the final remedy for the Site while providing for the removal of sources to groundwater contamination. Approximately 4,550 cubic yards of soil were excavated during the IRM. At the request of NYSDEC, the IRM work incorporated actions to further address portions of the sanitary sewer network inside the facility.

Ownership of OU-2 will be conveyed to L ENTERPRISES, LLC.

2.2.3 OU-3

OU-3 consists of the neighborhoods, sewer lines, and residential structures offsite to the north and west of the Site. To evaluate the potential for vapor intrusion, sub-slab and indoor air testing was conducted in homes within OU-3 between 2004 and 2005. Based on the results of the testing, Emerson voluntarily constructed vapor mitigation systems in 59 homes with approval of NYSDEC and New York State Department of Health (NYSDOH). These systems are inspected annually and maintenance is performed as necessary. In October 2010, NYSDEC issued a ROD for OU-3 which incorporated the mitigation of homes previously conducted by Emerson and the removal and replacement of approximately 300 feet of sanitary sewer line (and removal of associated overburden and bedding material) along East Spencer Street. The remedial work plan for the sewer replacement was approved by NYSDEC in July 2011; however, the City of Ithaca has not approved the easement to allow for its implementation. WSP submitted a letter to the NYSDEC in June 2021 requesting, on behalf of Emerson, requesting that the OU-3 ROD be amended to eliminate the requirement for partial sewer line replacement and vent stack installation. As of April 2022, the NYSDEC was in the process of finalizing the Explanation of Significant Differences to complete this request.

2.3 CLIMATE

Ithaca experiences a moderate continental climate characterized by warm, humid summers and long, cold, and snowy winters. Average high temperatures of the warmest months (July and August) are above 79 degrees Fahrenheit (°F), and during at least 6 months the average high temperature is above 59°F. The average high temperature in January, the coldest month is 31°F. Annual precipitation is approximately 37 inches, and summer is typically the wettest season.

Appendix D provides information regarding safety procedures during summer and winter months (extreme heat and extreme cold). These procedures must be followed to prevent adverse health effects due to climate while implementing the Site scope of work.

2.4 CONTAMINANTS OF CONCERN

The following contaminants of concern (COCs) have been identified at the Site:

— 1,2-dichloroethane (1,2-DCA)

- cis-1,2-dichloroethene (cis-DCE)
- trans-1,2-dichlorothene (trans-DCE)
- vinyl chloride
- 1,1,1-trichloroethane (1,1,1-TCA)
- tetrachloroethene (PCE)
- trichloroethene (TCE)

- benzo(a)anthracene (B(a)A)
- benzo(a)pyrene (B(a)P)
- benzo(b)fluoranthene (B(a)F)
- benzo(k)fluoranthene (B(a)K)
- chrysene
- dibenzo(a,h)anthracene (D(a,h)A)
- fluoranthene
- indeno(1,2,3-cd) pyrene (I(123cd)P)

- arsenic
- barium
- cadmium
- chromium
- copper
- nickel
- cyanide

- polychlorinated biphenyls

The maximum concentrations of each COC by media are presented in Table 1.

3 PROJECT ORGANIZATION

A number of roles are required for the safe and efficient operation of a field team. These roles include Client Manager, Site Coordinator, SHSC, Field Team Leader, and Field Personnel, and are described below. A team member may take on more than one role, but the roles must be clearly assigned and must cover all those required. The responsibilities of key technical personnel are described below.

3.1 CLIENT MANAGER – SCOTT HAITZ

The Client Manager has primary responsibility for the completion of project activities. He will be responsible for overall planning, scheduling, and cost control. The Client Manager is responsible for assigning resources to the project, maintaining communication with the client; ensuring compliance with all project programs and protocols; providing oversight; managing the document control process; and maintaining consistency in and reviewing all work products. Mr. Haitz will be directly responsible for the preparation of technical reports and other project documents and for ensuring adherence to the HASP. Mr. Haitz will assist the Site Coordinator in planning, coordinating, and controlling technical aspects of the project. He will be responsible for monitoring the quality of the technical and management aspects of the project, implementing quality assurance procedures, implementing tasks, and maintaining communication with the NYSDEC to ensure that the objectives of the project are met.

Additionally, Mr. Haitz will provide strategic direction during the project regarding client and contract requirements, work quality, and compliance with budget and schedule requirements, as well as review project deliverables.

3.2 SITE COORDINATOR – LISA KELLY

The Site Coordinator is responsible for the day-to-day progress of the project, overall supervision of field personnel, and that this HASP complies with all local, state, and federal regulations, as well as any WSP and Emerson policies and procedures that may be applicable to the proposed work. These responsibilities include organizing field activities, complying with the provisions of the work plan, field documentation and record keeping, and ensuring quality control of field activities. The Site Coordinator will ensure that all necessary equipment and supplies are available to complete the proposed tasks and any necessary accident, incident, and near hit investigations are completed in a safe, thorough, and effective manner. The Site Coordinator must ensure that all field team leaders have the necessary training and equipment to implement their assigned tasks as well as the skills necessary to lead a field crew and manage WSP contractors. Additionally, the Site Coordinator will ensure that all subcontractors have the necessary health, safety, and potential exposure information to safely and effectively complete their onsite tasks. They will ensure that investigations are performed in a safe manner to eliminate hazards and coordinate with personnel and contractors regarding all procedures related to health and safety.

The Site Coordinator will conduct periodic site inspections to ensure that WSP personnel and WSP contractors are complying with all requirements of this HASP and all Site safety policies.

3.3 SITE HEALTH AND SAFETY COORDINATOR - NATHANIEL WINSTON

The SHSC is responsible for observing field activities for compliance with this HASP; ensuring that decontamination procedures are followed and are effective; and maintaining the onsite documentation of WSP employees' medical clearances and emergency medical treatment programs. Additionally, the SHSC will assist in onsite emergencies, if any, and modify the health and safety protocols or terminate field work when unsafe work conditions exist. The SHSC will familiarize personnel with health and safety protocols and observe that field personnel wear appropriate PPE. Data from direct reading instruments, hazards evaluation, and any occurrence of site injury or illness will be recorded by the SHSC. Decontamination procedures will also be monitored by the SHSC.

The SHSC are responsible for monitoring Field Team Leaders and Field Personnel to determine if employees should be removed from the work site. Behaviors such as, but not limited to:

- horse play
- fatigue
- evidence of lack of fitness for duty
- heat or cold stress
- irresponsible behavior
- harassment (physical or verbal threats/abuse) of WSP or other site workers

If unsafe conditions are encountered, if illness or injury occurs, or if the level of protection needs to be changed, the SHSC will consult in a timely manner with the Site Coordinator.

In the event that unsafe acts conducted by WSP's subcontractors are observed, the SHSC will inform the subcontractor and ensure that the subcontractor comply with this HASP. If the subcontractor continues with unsafe practices, the SHSC shall have the authority to stop work until corrective measures are implemented. Subcontractors are responsible for correcting any unsafe conditions created by their activities or acts by their employees in compliance with their HASP and any applicable regulations.

The SHSC will determine if work practices or site conditions require changes in this HASP including, but not limited to, upgrades or downgrades in personal protection; changes in equipment or methodology to more safely accomplish work tasks or monitoring; and implementation of engineering or administrative controls. The SHSC shall notify the Site Coordinator of these changes.

3.4 FIELD TEAM LEADER

The Field Team Leader is assigned by the Site Coordinator and is responsible for the safe implementation of the work plan by the field team. Responsibilities include organization of field activities, compliance with the provisions of site work and sampling plans, field documentation and recordkeeping, quality control of field activities, and communication with the Site Coordinator. In the absence of the SHSC, the Site Coordinator will assign a Field Team leader to assume the responsibilities of the SHSC.

3.5 WSP FIELD PERSONNEL

WSP Field Personnel are responsible for safely implementing the tasks described herein, which includes donning appropriate PPE, conducting assigned site monitoring, performing assigned tasks, and decontamination of field equipment and PPE, all under direction from their respective Field Team Leader. All activities conducted onsite will conform to this HASP. Field personnel will report all safety concerns, task-related problems and successes, and equipment deficiencies/malfunctions directly to their Field Team Leader.

3.6 CONTACT INFORMATION

The responsibilities of key technical personnel are described below; contact information for project personnel is provided in Table 3.1.

Table 3.1 Project Personnel Contact Information

Name	Role	Phone	E-mail
Scott Haitz	Client Manager	Office: +1 703.318.3951 Mobile: +1 571.217.3612	Scott.Haitz@wsp.com

Lisa Kelly	Site Coordinator	Office: +1 212.465.5334 Mobile: +1 703.626.0543	Lisa.Kelly@wsp.com
Nathaniel Winston	SHSC	Mobile: +1 315.420.9973	Nathaniel.Winston@wsp.com
Dave Rykaczewski	Project Professional Engineer	Office: +1 412.375.0282 Mobile: +1 412.418.0140	Dave.Rykaczewski@wsp.com
Jeffrey Baker	Project Engineer (DPE Treatment System)	Mobile: +1 724.882.9723	Jeffrey.Baker@wsp.com

4 PLANNED ACTIVITIES

The following subsections describe the planned activities that may be conducted as part of the field activities for the Site during various investigation or remediation projects. All procedures will be completed in accordance (or noted otherwise) with WSP's standard operating procedures (SOPs), the appropriate NYSDEC guidance, the OU-1 DPE System Operation and Maintenance (O&M) Plan (Appendix I of the Interim Site Management Plan [SMP]), the Monitoring and Sampling Plan OU-1 and OU-2 (Appendix J of the Interim SMP), and any future site-specific work plans. All non-disposable equipment will be decontaminated between locations.

4.1 CONCRETE CORING AND CUTTING OVERSIGHT

To access sub-slab soils and bedrock, concrete floors will need to be cored or cut. Concrete coring or cutting equipment (e.g., concrete saw, diamond core bit, star bit) will be provided and operated by a subcontractor, and WSP field personnel will oversee the activities. Contractor shall collect and contain any contact water, dust or concrete generated and decontaminate all equipment before use and between locations. WSP employees must survey the work area thoroughly and select an observation point that provides adequate clearance from potential hazards.

4.2 VIDEO SURVEY OVERSIGHT

Video surveys may be conducted in subsurface structures, such as sewer lines, manholes and manways. Video surveys entail inserting video equipment to conduct visual inspections of subsurface structures. The video surveys will be conducted by a subcontractor, and a WSP field team member will oversee the activities. Contractor shall decontaminate all equipment before use and between locations. WSP employees must survey the work area thoroughly and select an observation point that provides adequate clearance from potential hazards.

4.3 TRENCHING AND EXCAVATION OVERSIGHT

WSP personnel may periodically be involved in the oversight of intrusive work, including trenching for system modifications or expansions and excavations, to assure compliance with applicable project plans. Trenching and excavations will be conducted by a subcontractor, and a WSP field team member will oversee the activities. The subcontractor will provide the competent person.

Before any intrusive work is initiated, underground utilities will be located by notifying Dig Safely New York and by subcontracting a private utility locator. Utility lines within the work areas may be temporarily de-energized, drained, or removed during excavation work, then restored in kind following completion of the work. Identified utilities that are outside the proposed remediation areas and all overhead utilities will be protected throughout the work. Process lines and equipment found within excavation areas that are confirmed to be inactive and not required for future use of the Site may be removed and not replaced.

Trenching and excavation work may include the use of heavy construction equipment (e.g., excavators, bobcats, etc.) or hand tools (e.g., shovels, breaker bars). Erosion and sediment controls (e.g., silt fence, filter socks, hay bales, erosion mat, earthen berms, diversions, stockpile covers, stabilized construction entrances, inlet and outlet protection, and temporary and permanent seeding) may be installed and maintained. Small trees and brush will be cleared and mulched or disposed of with the excavated soil. Excavated soil will direct-loaded, transferred to roll-off boxes, or stockpiled. The excavated soil will be characterized and disposed of off-site, as necessary. Any water that has the potential of contacting affected materials shall be collected and transferred to holding tanks (e.g., polyethylene tanks or fractionation tanks) equipped with secondary containment. The excavation will be backfilled with clean fill and compacted. A low permeability cap (e.g., bentonite, geomembrane, polyethylene) may be installed in some areas. Surfaces of backfilled areas will be restored with native grasses, gravel or pavement (asphalt or concrete).

Fugitive dust migration will be visually assessed during all work activities. The excavation surfaces will be maintained damp and additional dust suppressant will be applied, as needed, to prevent or reduce dust emissions resulting from construction activities. Dust suppressant will be applied when exposed ground surfaces are dry and wind or vehicular traffic result in visible dust generation. Dust suppressant applications will consist of applying potable water via a mobile broadcast applicator in a controlled manner.

Soil samples may be collected for field screening from roll-offs/stockpiles for characterization purposes, from the base and sidewalls of the excavation to verify that remedial objectives are met, and from backfill material to determine if clean fill requirements are met by WSP oversight personnel. Soil samples may be analyzed in the field for metals using a portable X-ray fluorescence (XRF) analyzer by WSP personnel who have undergone XRF radiation safety training. In addition, water samples may be collected from water that has accumulated in the excavation, roll-off boxes, or stockpiles for disposal characterization purposes.

WSP oversight must inspect the work area thoroughly and select an observation point that provides adequate clearance from potential hazards.

4.4 DPE TREATMENT SYSTEM O&M

The DPE Treatment System consists of DPE wells containing pneumatic pumps to recover groundwater, underground piping (including compressed air delivery lines, soil vapor extraction (SVE) lines, and groundwater conveyance), an air compressor, tankage, filtration units, air stripper, SVE blower, liquid- and vapor-phase carbon units, and a PLC. All piping/ conduit is routed underground to the treatment building where the treatment equipment is housed.

Groundwater is pumped from the extraction wells into a 1,000-gallon aluminum equalization tank, which is intended to equalize the influent flows and minimize downstream cycling of system components. The bag filter feed pump, controlled by the equalization tank level, discharges water from the equalization tank through the bag filter system, and into the air stripper. Under the current operations, the bag filter feed pump processes water in approximately 600 gallon batches, at a flow rate of approximately 10 to 12 gallons per minute. A low-profile, shallow-tray air stripper unit, is used to remove liquid-phase VOCs from the groundwater stream as it passes through the trays to the sump below (integral to the unit). The air stripper is equipped with a sump pump, which discharges water from the air stripper sump, through the liquid-phase granular activated carbon (GAC) units and to the State Pollution Discharge Elimination System Outfall 001 in a single step. Soil vapor is drawn from the DPE wells through a 120-gallon air/water separator, using a positive displacement rotary lobe blower. The blower is equipped with a discharge silencer which reduces the noise coming from the discharge stack. Separated liquids that accumulate in the air/water separator are batch-pumped back to the equalization tank for aqueous treatment. The combined vapor stream (from the vacuum blower and the air stripper) is treated by two 1,000-pound vapor-phase GAC vessels in series before discharge to the atmosphere through the discharge stack.

4.4.1 OPERATION AND MAINTENANCE ACTIVITIES

In order to verify that the system is operating satisfactorily, an O&M contractor conducts periodic site visits, typically on a monthly basis. The following activities are conducted as part of the system monitoring. Some of these activities are performed during each site visit while others are performed on an as- needed basis. WSP personnel may also conduct some of these activities.

DPE WELL VAULTS

- Open each well vault and visually observe the vault interior.
- Check all instrumentation and exercise valves by opening and closing them.
- Check that adequate pressure is being provided to the pneumatic pumps by recording the air pressure gauge reading.
- Record the vacuum reading from the vacuum line header.
- Record the water pressure reading from the water pipe lateral to ensure there is no blockage in the water pipe.
- Adjust the air relief valve, if necessary, to maintain the design vacuum at the wellhead.

- Record the pump stroke displacement data and airline cycle flow counter associated with the pneumatic pump. Verify the heat tape is functioning and pipe insulation is intact.
- Remove any accumulated water from the vault and clear the weep drain if obstructed.

TREATMENT BUILDING

- Inspect each equipment skid and associated piping for leaks and disconnections.
- Manually turn the system on to observe the transfer pumps and listen for unusual sounds.
- Observe the flow meters for proper operation by checking the instantaneous flow measurement. If the flow meters appear to be inoperable, clean the flow meter in accordance with the manufacturer's recommendations.
- Check the stainless steel mounted 4-position float switch assembly in the equalization tank to observe it is hanging properly and free from obstruction. Also, observe the groundwater contained in the equalization tank. Make notes of any unusual odors, floating debris, water clarity, the amount of solids on the bottom of the tank, etc.
- Visually observe and clean, as necessary, the inlet wye strainer to the transfer pump for the equalization tank and air stripper sump.
- Record the pressure readings associated with the bag filter units. Clean and/or replace bag filters as necessary.
- Observe the operation of the air stripper including the blower, transfer pump, and associated appurtenances. Inspect the trays of the air stripper for accumulated sludge. Clean trays as necessary to maintain design performance of the air stripper.
- Record the pressure readings before and after each liquid and vapor phase activated carbon unit. Visually inspect the PLC to ensure it is functioning properly; check for any alarm conditions and address as necessary. Inspect sump in treatment building to ensure it is free of liquid and debris; clean, if necessary. If liquid is present, determine source.
- Ensure exhaust fan, heaters, or louvers are operational, depending on season.
- Check piping entrance into building for damage or leaks.
- Inspect outside of treatment building for damage to vapor exhaust stack, gutters, doors, infrastructure, fencing, and electric panel.
- Check the satellite drum (personal protection equipment and bag filters) for leaks and fastened the drum lid tightly.

GENERAL SYSTEM MAINTENANCE

- Check air compressor oil level in the sight glass.
- Inspect compressor inlet filter.
- Inspect compressor moisture separator.
- Inspect flow sensors.
- Inspect magnahelic differential pressure gauges; disconnect the magnahelic pressure gauge to atmosphere and re-zero, if necessary.
- Remove dirt and grease from air compressor exterior.
- Remove dirt and grease from vacuum blower exterior.
- Inspect and clean compressor motor air ventilation slots to prevent clogging and starving the motor of cooling air.
- Inspect the vacuum blower and clean the compartment vent guards, dampers, motors, and propellers as necessary to prevent decreased airflow and overheating motor.
- Inspect fan blades and bolts for tightness (including exhaust silencer).

AQUEOUS CARBON VESSELS

- Monitor backpressure to determine if blockage is occurring in each vessel.

AIR STRIPPER

- Check operating amps of blower motor.

- Inspect air inlet screen and clean if required.
- Record magnahelic gauge reading for reference.
- As necessary, disassemble and clean trays; also check mist eliminator for fouling.

PUMPS

- Check effluent from pump for excessive air discharge.
- Inspect tubing. Check particulate filter.
- Check membrane dryer for debris.
- Check motor coupling; tighten if necessary.
- Check operating amps of transfer pump motor.
- Inspect shaft seal for leakage.

VACUUM BLOWER

- Inspect and clean the vacuum blower inline particle filter; replace when necessary.
- Inspect and clean the vacuum blower dilution air filter; replace when necessary.
- Determine if the vacuum blower needs an oil change or lubrication based on the run time of the motor.

PERIODIC CARBON MAINTENANCE

Aqueous carbon vessels are monitored for breakthrough by a combination of water samples collected before, between, and after the vessels, and by monitoring water pressure on the vessels. When carbon change-out is necessary, the spent GAC in the vessels will be removed by a vacuum truck or similar means and containerized in 55-gallon United States Department of Transportation (DOT)-compliant drums for proper disposal. WSP may oversee the replacement and containerization activities.

4.4.2 SYSTEM MONITORING

Aqueous phase samples are collected from sample taps located before (influent) the air stripper, and before, between, and after (effluent) the GAC vessels. Approximately, 1 gallon of water will be purged from the tap before grab sample collection for pH, temperature, and VOCs; purged groundwater will be discharged to the equalization tank. pH and temperature will be measured in the field with a calibrated, hand-held water quality meter. VOCs will be collected in a laboratory-provided container and shipped to an off-site laboratory for analysis.

Vapor phase samples are collected from sample ports located before (influent), between, and after (effluent) the GAC vessels with a syringe and injected into an evacuated vial and shipped to an off-site laboratory for VOC analysis.

4.5 VAPOR MITIGATION SYSTEM O&M

Multiple single family residential properties have been equipped with vapor mitigation systems. Sub-slab vapor and crawl space vapor is pumped to the exterior of the residential properties and discharged directly to the atmosphere using radon-style fans and polyvinyl chloride (PVC) piping.

At each residence, a minimum of one vacuum point was installed through the floor slab into the soil underneath or into the crawl space. In some cases, more than one vacuum point was installed to achieve a pressure differential over the entire footprint of the concrete slab. Each vacuum point was sealed to the surrounding concrete slab using an elastomeric joint sealant. Liquid filled manometers were installed on the vertical riser of each vacuum point to measure the vacuum. In addition, shutoff valves were installed to control the flow from each vacuum location. An appropriately-sized fan and exhaust piping were installed on the outside of each home, extending above the roofline in accordance with applicable standards.

On an annual basis, each vapor mitigation system is inspected and maintenance will be performed, as appropriate, to ensure the system is operating satisfactorily. The building's owners or occupants also may report that the warning device (liquid filled manometer) indicates the mitigation system is not operating properly. The following maintenance and monitoring activities may be conducted:

- A visual inspection of the complete system will be conducted including the vent fan, piping, warning device (liquid filled manometers), labeling on the system, and any membranes installed as a soil vapor retarder. The fan will be inspected to ensure proper operation and continued effectiveness at proving the appropriate vacuum. Manufacturer's specifications will be referenced to determine if and when replacement parts and/or system adjustments are required.
- Any leaks identified will be repaired. This will include, at a minimum, inspecting all sealed joints, cracks, etc. on the concrete floor, foundation walls, vacuum points, and soil vapor retarder membrane (where it is attached to the walls and around foundation piers). Smoke tests will be performed as necessary to verify there are no leaks.
- Damage to the mitigation system (e.g., piping, valves, soil retarder membrane, and fan) may require replacement parts and/or system adjustments.
- Exhaust or discharge point from the mitigation system will be inspected to verify no air intakes have been located nearby.

4.6 LNAPL RECOVERY

Before initiating LNAPL recovery polyethylene sheeting will be placed around the wellhead.

4.6.1 ACTIVE RECOVERY

If sufficient LNAPL thickness (i.e., greater than 1-inch) is measured in the monitoring well, a top fill bailer, AMS Product No. 2100.39 (or similar), will be used to skim product at the water table surface. The bailer will be tethered with rope or a stainless steel cabled and lowered below the water table. The product will be skimmed with until the product thickness is less than 1-inch thick or 5-gallons has been removed. Recovered product will be drummed and handled as hazardous waste.

4.6.2 PASSIVE RECOVERY

Rigid oil-only absorbent socks will be placed in select monitoring wells with measurable products. Before placing the sock in the monitoring well, the sock will be weighed with a digital scale (or similar) and the weight recorded in the field book. The sock will be tethered in the well with a dedicated vinyl coated wire rope and attached with a carabineer, and an 8-ounce weight will be secured to the bottom of the sock with a weight clip. The sock and weight will be lowered into the well until approximately 3-inch of the sock extends above the water table. The sock will be secured to the well cap.

The socks will be removed from the well, and disconnected from the tether Holding the sock over a bucket, as much water as possible will be removed from the sock by squeezing. The sock will then be placed in a pre-weighed bucket and weighed with a digital scale (or similar) and the weights recorded in the field book.

4.7 WELL INSTALLATION AND DEVELOPMENT OVERSIGHT

Groundwater monitoring and extraction wells may be installed both indoors and outdoors by a drilling subcontractor. WSP field personnel will oversee monitoring well and extraction well installation and development. Drilling equipment will include direct-push, sonic, hollow stem auger, and air rotary and mud rotary technologies. For some drilling locations, temporary or permanent conductor casing will be installed into competent bedrock to isolate specific water-bearing zones. Soil and rock cores and cuttings returned during drilling may be visually screened for evidence of contamination, described, and screened for organic vapors in the field with a PID. This information will be recorded in a field book. Select samples may be collected for laboratory analyses.

WSP employees must survey the work area thoroughly and select an observation point that provides adequate clearance from potential hazards.

4.7.1 WELL INSTALLATION

Groundwater monitoring wells and extraction wells may be constructed of PVC or stainless steel riser with machine slotted screen. For each monitoring well or extraction well, a clean sand filter pack will be placed from the bottom of the borehole to approximately 2 feet above the top of the screen. An approximate 3-foot-thick bentonite seal (hydrated pellets) will be placed on top of the sand filter pack. The remaining annular space will be backfilled with a cement-bentonite grout mixture (tremie piped from the bottom to the top). The wells will be completed with either flush-mount or stickup assemblies, and secured in a concrete pad. The wells will be equipped with a lockable watertight cap.

4.7.2 WELL DEVELOPMENT

Well development involves removing groundwater from a monitoring well using submersible pumps, bailers, or inertial pumps in conjunction with surging of the well screen with a surge block assembly to remove sediments and ensure effective communication between the well screens and surrounding saturated zones. Well development may be conducted by a subcontractor with WSP oversight or by WSP personnel. WSP field personnel may monitor groundwater level with an electronic water level indicator during development and measure field parameters (e.g., pH, temperature, specific conductance, and turbidity) using a multi-parameter water quality meter.

4.8 WELL ABANDONMENT OVERSIGHT

Before well abandonment, WSP or their subcontractor will remove any downhole equipment (e.g., pumps) and the surface protection materials (e.g., surface casing protection) from each location. The wells will be abandoned in accordance with NYSDEC requirements. Following grout placement, the well casings will be cut at 5 feet below ground surface (bgs) and removed. Following abandonment, the surface around the well will be restored to match the surrounding surface and grade.

A small amount of groundwater may be forced out of the wells as grout is added to the bottom of these structures. Where possible, the groundwater will be collected and will be transported to either the treatment building for processing through the DPE Treatment System. Well construction materials (well casing, steel well protective casings, and concrete pads) will be disposed of offsite as general construction debris, as appropriate.

4.9 DOWNHOLE GEOPHYSICAL SURVEYING OVERSIGHT

Downhole geophysical logging may be conducted in new boreholes following drilling or at existing wells. Geophysical logging entails lowering field (testing) instruments into the existing borehole to measure properties of the formation or borehole fluid. Downhole geophysical logging equipment will be provided and operated by a subcontractor, and WSP field personnel will oversee the activities. Contractor shall decontaminate all downhole equipment before use and between borehole locations. WSP employees must survey the work area thoroughly and select an observation point that provides adequate clearance from potential hazards.

4.10 SURFACE GEOPHYSICAL SURVEYING OVERSIGHT

Surface geophysical surveying may be conducted along the ground surface. Surface geophysical surveying entails setting up survey probes at varying distances from a central location to map the subsurface. Surface geophysical surveying equipment will be provided and operated by a subcontractor, and WSP field personnel will oversee the activities. WSP employees must survey the work area thoroughly and select an observation point that provides adequate clearance from potential hazards.

4.11 SOIL SAMPLING

Soil borings may be installed using direct-push technology (e.g., Geoprobe®, or equivalent), sonic drilling equipment, and hollow-stem auger drilling equipment. Direct-push soil samples will be collected in dedicated acetate liners and the hollow stem auger drilling soil samples will be collected using split-barrel samplers. At locations installed using a sonic drill rig, continuous core samples will be collected with a core barrel advanced ahead of an override casing. The core barrel will be removed from the borehole and the soils will be extruded into low-density polyethylene bags for logging, screening, and sample collection. In addition, hand augers, shovels, and trowels may be used for collection of shallow soil samples by WSP personnel.

Upon recovery, the soils will be visually screened for evidence of contamination, described, and screened for organic vapors in the field with a PID. This information will be recorded in a field book. Select soil samples will be collected for laboratory analyses.

4.12 GROUNDWATER SAMPLING

WSP employees will conduct groundwater sampling at site-wide monitoring wells, and extraction wells. Groundwater purging and sampling may be conducted using peristaltic or submersible pumps connected to in-line water quality meters or bailers. Submersible pumps will be powered by a mobile gasoline-powered generator, compressed gas, or direct-current batteries. Dedicated pumps and tubing installed at select wells may be used for sampling. Groundwater samples collected from extraction wells will be collected via the existing electrical supply and piping. Before sampling, the extraction wells are shut down for approximately 24 hours. The groundwater samples are then collected using either standard or low-flow sampling procedures (see above). Once the samples are collected, they will be prepared for shipment to the offsite laboratory analysis.

Purge water will be transported to either the treatment building for processing through the DPE Treatment System, using an electric sump pump routed to system's equilibration tank via a garden hose or to the 90-day hazardous waste storage area located in Building 33 for characterization and eventual offsite disposal (Figure 2). Access to the 90-day storage area is located on the east side of Building 33 via several loading docks and entryways. Purge water will only be stored in containers larger than a 5-gallon bucket, such as a drum or tote, if the water has been approved for processing through the DPE Treatment System.

4.12.1 WATER LEVEL GAUGING

The water level in each monitoring well or extraction well will be gauged with an electronic water level meter and the measurement recorded in the field book. Select wells will be checked for the presence of LNAPL using an interface probe or bailer.

Gauging of DPE treatment system wells is conducted by opening each steel flush-mount well vault, closing off the vacuum extraction line from each well head with a ball valve on the pope assembly, and removing the 1-inch diameter steel threaded access port on each well cap to provide access for the electronic water level meter.

4.12.2 STANDARD PURGE SAMPLING

Standard well purging will be conducted through the removal of a minimum of 3 well volumes from a monitoring well using one or more of the following equipment:

- Disposable polyethylene or Teflon®-lined bailer connected to a nylon chord
- 12-volt battery-powered electronic submersible pump
- Electronic submersible pump with power supplied using a 120-volt electrical outlet or gasoline-powered portable electric generator

- Bladder pump or air-displacement pump powered by a 12-volt battery-powered gas compressor, a gasoline powered gas compressor, a pressurized carbon dioxide tank, or a pressurized nitrogen tank.
- 12-volt battery-powered or 120-volt electrical peristaltic pump.

Purge water will be contained in 5-gallon buckets, 55-gallon DOT-compliant steel drums, or 250-gallon polyethylene totes. Drums or totes will be loaded into the bed of a pickup truck or the back of a cargo van while empty and transported to each well site to contain purge water. Groundwater quality will be monitored during the purge using a multi-parameter water quality meter (e.g., Horiba U-52 or similar device) in a field measuring cup or inside a flow-through cell. The purge will be complete when field parameters are stable in accordance with WSP's SOPs or a site-specific work plan.

4.12.3 LOW-FLOW PURGE SAMPLING

Low-flow well purging will be conducted using one or more of the following equipment:

- 12-volt battery-powered electronic submersible pump
- Electronic submersible pump with power supplied using a 120-volt electrical outlet or gasoline-powered portable electric generator.
- Bladder pump powered by a 12-volt battery-powered gas compressor, a gasoline powered gas compressor, a pressurized carbon dioxide tank, or a pressurized nitrogen tank.
- 12-Volt battery-powered or 120-volt electrical peristaltic pump.

Purge water will be contained in 5-gallon buckets. Groundwater quality will be monitored during the purge using a multi-parameter water quality meter (i.e. Horiba U-52 or similar device) in a field measuring cup or inside a flow- through cell. The purge will be complete when field parameters are stable in accordance with WSP's SOPs or a site-specific work plan.

4.13 SURFACE WATER SAMPLING

Surface water samples may be collected from ditches (intermittent water flow, less than 6-inches deep) or seeps. The samples will be collected from stable non-erosive areas. The samples will be collected using transfer bottles, dippers, peristaltic pumps, or composite samplers; the method will be selected based on the location, depth of surface water, and intended use of the data.

Unless a peristaltic pump or composite sampler is used to sample surface water, the method-specific sampling vessel will be slowly lowered into the surface water to the desired sampling depth. Surface water will be allowed to slowly enter the sampling vessel until the necessary sample volume has been collected. Once filled, the sampling vessel will be slowly retrieved and transferred directly to the sample containers. When using a peristaltic pump or composite sampler, the tubing will be slowly lowered in to the surface water and pumped directly into the sample containers or transfer container; a particulate filter or check valve may be placed on the sample intake.

Groundwater seeps will be sampled by filling sample containers directly from the seep or transfer bottles.

4.14 WASTEWATER SAMPLING

Samples of wastewater within the sanitary and storm sewers and from the DPE treatment system may be collected. The samples will be collected from stable non-erosive areas; confined space entries are not permitted. The samples will be collected using transfer bottles, bailers, peristaltic pumps, composite samplers, or dedicated sample ports; the method will be selected based on the location, depth of water, and intended use of the data.

If the wastewater sample is collected from a sample port, approximately 1 gallon will be purged to flush settled solids from the pipe, and samples will be collected directly into the sample containers.

For locations without permanent samplers or ports, the sampling vessel (e.g., plastic container, bailer, peristaltic pump) will be slowly lowered into the wastewater body to the desired sampling depth. The wastewater will be allowed to slowly enter

the sampling vessel until the necessary sample volume has been collected. Once filled, the sampling vessel will be slowly retrieved and transferred directly to the sample containers.

4.15 SEDIMENT SAMPLING

Sediment samples may be collected from manholes, ditches, or surface water bodies. The samples will be collected from stable non-erosive areas; confined space entries are not permitted. Samples will be collected using a shovel, hand auger (or similar), grab sampler, or dredge; the method will be selected based on the location, depth of surface water, and intended use of the data.

The sampling equipment will be pushed or driven into the sediment to the desired sampling depth using cleaned equipment. Once filled, the sampling vessel will be slowly retrieved and the sample will be transferred to the sample containers.

4.16 SOIL VAPOR SAMPLING

Soil vapor samples will be collected from soil vapor probes installed using a direct-push drill rig or manual methods (e.g., hand auger). Once the terminal depth is achieved, a stainless-steel screen will be attached to tubing and lowered to the bottom of the open borehole. Approximately 1 foot of quartz sand will be placed in the bottom of the borehole around the screen and tubing. The remainder of the borehole will be sealed with pre- hydrated bentonite chips that will be compacted in the borehole to form a seal. Appropriate fittings (e.g., a 3-way valve) and additional tubing will be placed, as appropriate. Following installation, the tubing will be clamped off to avoid discharging vapor to the air. Steps will be taken to minimize infiltration of surface water and outdoor air and to prevent accidental damage. Sampling will not be attempted until the subsurface equilibrium had been re- established. Soil vapor probes will be tested for leaks using helium, a tracer gas, and a shroud.

The sample probe will be purged of stagnant/ambient air with a personal air sampling pump (or similar). Air purged from the port will be screening with a PID. After all stagnant/ambient air has been removed, the pump will be removed and an evacuated canister fitted with a pneumatic flow controller provided by the analytical laboratory, will be attached using a suitable secure connection. The canister valve will then be opened initiating sample collection. Field personnel will monitor the vacuum of the canister during sample collection; the sample will be collected once the required pressure (as specific by the analytical laboratory) is reached by closing the canister valve.

Physical and visual barriers will be placed around the canisters, as necessary, so that they will not be disturbed during sample collection; these barriers will be placed in a manner so as to not compromise air flow around the canisters.

After the specified amount of time has elapsed from the start of the air sampling, the sampling valve will be closed and the canister set up disassembled and prepared for shipment to the offsite laboratory. The flow regulator will be removed from the canister to complete the sample collection and the canister will be labeled with the sample name. The sample name, location, time and date of sample collection, pre- and post-pressure readings, canister and regulator number, and analytical method were recorded on the chain-of-custody form and in the field log book.

The soil vapor sample probes will be removed after sample collection and the borehole filled with hydrated bentonite. The boring will be repaired to match surrounding conditions.

4.17 SUB-SLAB VAPOR SAMPLING

Sub-slab vapor samples may be collected at the site or at offsite residential locations. The installation of sub-slab vapor probes consists of drilling through the floor with a hand-held hammer-drill, installing a stainless-steel (or similar) sampling port, and once in place, grouted into the hole using a mixture of quick-drying Portland cement and distilled or potable water. Vapor Pin® sampling ports may be hammered in place in lieu of grouting ports in place. Before sampling, the sub-slab probes will be allowed to equilibrate and the cement grout to cure. The sub- slab probes will then be tested for leaks using helium, a tracer gas, and a shroud.

The sample probe will be purged of stagnant/ambient air with a personal air sampling pump (or similar). Air purged from the port will be screening with a PID. After all stagnant/ambient air has been removed, the pump will be removed and an evacuated canister fitted with a pneumatic flow controller provided by the analytical laboratory, will be attached using a suitable secure connection. The canister valve will then be opened initiating sample collection. Field personnel will monitor the vacuum of the canister during sample collection; the sample will be collected once the required pressure (as specific by the analytical laboratory) is reached by closing the canister valve.

Physical and visual barriers will be placed around the canisters, as necessary, so that they will not be disturbed during sample collection; these barriers will be placed in a manner so as to not compromise air flow around the canisters.

After the specified amount of time has elapsed from the start of the air sampling, the sampling valve will be closed and the canister set up disassembled and prepared for shipment to the offsite laboratory. The flow regulator will be removed from the canister to complete the sample collection and the canister will be labeled with the sample name. The sample name, location, time and date of sample collection, pre- and post-pressure readings, canister and regulator number, and analytical method were recorded on the chain-of-custody form and in the field log book.

The sub-slab sample probes will be removed after sample collection and the borehole be repaired to match the surrounding surface conditions.

4.18 INDOOR AIR SAMPLING

Indoor air samples may occasionally be collected inside residential or site buildings. The air samples will be collected inside pre-evacuated canisters over specified periods of time. Each of the indoor air sample canisters will be set to collect the air samples from an appropriate height above the floor of the building to be representative of the breathing zone. Physical and visual barriers will be placed around the canisters, as necessary, so that they will not be disturbed during sample collection; these barriers will be placed in a manner so as to not compromise air flow around the canisters.

After the specified amount of time has elapsed from the start of the air sampling, the sampling valve will be closed and the canister set up disassembled and prepared for shipment to the offsite laboratory. The flow regulator will be removed from the canister to complete the sample collection and the canister will be labeled with the sample name. The sample name, location, time and date of sample collection, pre- and post-pressure readings, canister and regulator number, and analytical method were recorded on the chain-of-custody form and in the field log book.

4.19 INVESTIGATION-DERIVED WASTE HANDLING AND DISPOSAL OVERSIGHT

Four types of investigation-derived waste (IDW) will be generated during the project:

- drill and excavation cuttings
- rinsate from decontamination of equipment
- purge water
- LNAPL
- disposable PPE, sampling, and decontamination equipment

Non-LNAPL liquid waste (i.e., rinsate, purge water) will be contained and may be transferred to the IRM DPE Treatment System for onsite treatment and disposal.

LNAPL waste and solid waste (drill and excavation cuttings, disposable equipment) will be containerized, characterized, and transferred offsite for disposal by licensed non-hazardous and hazardous waste haulers to approved permitted waste treatment, storage, and disposal facilities. All trucks will be lined, covered, and placarded in accordance with DOT regulations. WSP personnel with current DOT training may be present onsite during waste management activities to label waste containers and during truck loading activities to sign shipping documents.

4.20 DECONTAMINATION

Decontamination of equipment will prevent the removal of hazardous chemicals from the site to offsite areas and prevent cross-contamination from dirty to clean areas of the site. Equipment to be decontaminated includes all excavation equipment and tools which may come into contact with the potentially contaminated media and reusable sampling equipment. The decontamination process typically uses a non-phosphate soap and a distilled water rinse to clean equipment.

As necessary, a bermed decontamination pad will be installed at the site. The pad will consist of polyethylene sheeting, or equivalent impermeable material, and a collection sump. Large equipment and vehicles, which require decontamination, will be cleaned inside the decontamination area. Rinsate water derived from decontamination of sampling, excavation, and construction equipment will be contained, transferred, and processed through the DPE Treatment System for treatment and disposal.

5 HAZARD ASSESSMENT

The following subsections describe the potential hazards to which employees may be exposed while performing required tasks onsite (Section 4). Activities will be conducted in areas containing potentially affected environmental media. Some of the protective measures to be implemented during completion of those operations are also identified.

Based on current Site conditions, all tasks may be initiated in personal protection Level D PPE, as defined in Section 6. However, should Site conditions change or monitoring data show evidence of potentially hazardous exposures work, the initiation level of PPE may need to be changed.

For tasks that WSP personnel will perform that have established SOPs referenced in the work plans, all personnel should review the appropriate SOP prior to initiating the task. Some tasks may not have established SOPs, in such cases the tasks will be discussed and hazards will be identified by the field personnel before starting the task.

A job hazard analysis (JHA) was performed for each task described herein (Appendix F). Hazards associated with Site investigation may include, but are not limited to, chemical exposure, physical hazards, and environmental hazards. Hazards will be controlled using the following hierarchy:

- Elimination: physically remove the hazard
- Substitution: replace the hazard
- Engineering controls: isolate people from the hazard
- Administrative controls: change the way people work
- PPE: protect the worker with PPE

5.1 DETAILED DESCRIPTION OF HAZARDS AND HAZARD CONTROLS

Site conditions such as normal operating conditions (e.g., truck and other motorized vehicle traffic), inclement weather, and third party subcontractors working onsite pose a variety of hazards. The only means to prevent injury from these hazards is to maintain control of WSP's work zones and to carefully traverse other areas of the Site. When traversing the site, WSP and its subcontractors will control and secure all equipment and supplies to prevent accidental release, slips, or driver distraction while traversing the Site. Additionally, all mobilization pathways will be visually cleared before equipment or vehicles are moved.

Many of the tasks WSP and their subcontractors will conduct present unique physical hazards that may not be apparent to Site employees, visitors, or other Site subcontractors. Field personnel must be aware of the inherent risk of working near or in the vicinity of heavy equipment (e.g., drill rigs, forklifts), using energized field equipment (e.g., pumps, generators), and using other hand tools (e.g., hand augers, knives). WSP work zones will be continuously monitored to prevent unauthorized entry and to control potential physical hazards within the work zones. For example, WSP subcontractors are expected to use and store their equipment in a manner that prevents accidental movement or falling.

5.1.1 SLIPPING, TRIPPING, AND FALLING HAZARDS

Uneven, wet, or slick surfaces present an increased risk of injury. The key to preventing injuries due to these hazards is to recognize and correct situations where unsecure footing or trip hazards exist.

5.1.2 HEAVY LIFTING

Lifting and carrying equipment and samples incorrectly may result in injury. WSP personnel should be familiar with correct lifting techniques, including:

- Maintain a neutral and straight spine alignment (bend at knees, not the waist)
- Place materials to be manually lifted about mid-thigh to mid-chest (power zone)
- Keep materials close to your body
- Avoid twisting
- Use proper handholds
- Use hand trucks or pallet jacks for heavy loads

5.1.3 HEAVY EQUIPMENT AND TRUCK TRAFFIC

Field personnel should be cognizant of potential physical hazards associated with use of heavy equipment and truck traffic during field operations. Working with, or being near, heavy equipment and large vehicles (e.g., drill rigs, excavators, trucks, backhoes) present a risk of injury due to being struck or crushed by moving machine parts and being present in blind spots as well as excessive noise making it difficult to get the attention of the equipment operators. Heavy equipment shall contain the original manufacturer's machine guarding and safety apparatus such as shrouds, guards, backup warnings, emergency kill switches, mufflers, and spark arresters. Site workers must be aware of the location of working heavy equipment and traffic patterns at the site in relation to WSPs work zone. Machine operators must be made aware of the work plan to raise attention to the location of workers nearby before beginning operation. Other appropriate precautions include the following:

- Use of American National Standards Institute (ANSI)-approved hardhats, safety glasses or goggles, and steel-toe boots will be required at all times onsite.
- Loose clothing that may catch in moving parts will not be worn.
- Hearing protection will be worn if a preliminary noise survey or past experience indicates that maximum noise levels will exceed 85 decibels at any time during site operations.
- Use of DOT-compliant high visibility reflective clothing, such as bright vests with applied reflective tape.

5.1.4 OVERHEAD HAZARDS

Overhead hazards will be generated during the use of heavy equipment onsite. As an example, when drill rig masts are extended equipment such as drilling rods are raised to heights that pose overhead hazards in the work zone.

Therefore, a risk of injury due to being struck by falling objects or moving pieces of machinery may be present in the work zone. Additionally, this equipment can contact overhead utilities and cause unsafe conditions. Site workers must be aware at all times of the location of working heavy equipment. Machine operators will be made aware of the presence of all workers nearby before beginning operation.

5.1.5 UNDERGROUND HAZARDS

Underground utilities are present at the Site. Contact with underground utilities during intrusive activities (e.g. drilling, digging) can cause unsafe conditions. WSP's Utility Locating Procedure will be followed prior to commencement of any intrusive activities.

5.1.6 POWERED TOOLS AND EQUIPMENT

Steam-cleaning spray wands or other high-pressure washers may be employed for purposes of decontamination of equipment and vehicles. These present hazards of laceration, burns, noise, and eye injury. Steam-cleaning spray wands discharge hot water and steam at pressures exceeding 1,000 pounds per square inch. The steam can severely lacerate and burn exposed skin, and hurl soil and rocks at high velocity.

All powered tools must be operated and maintained according to the manufacturer's instructions. All protective shrouds, guards, and emergency kill switches must be present and in working order. All powered tools and equipment should be kept dry. Ground fault protectors will be included with connections to portable electrical generators. Before refueling, equipment

should be shut down; fuel must be stored outdoors in a labeled, approved container. Site workers using these tools must wear the PPE specified in 29 CFR, Part 1910, Subpart I.

5.1.7 CONFINED SPACE ENTRY

Confined spaces and confined space entry are not anticipated as part of this project. However, if confined space conditions are identified, a Permit-Required Confined Space Entry Program will be followed and a confined space entry permit will be completed in accordance with applicable regulations. No WSP employee may conduct permit-required confined space entries as assessed by the Director of Environment. No attempt will be made by WSP personnel to enter any type of confined space without prior review and approval of the Director of Environment.

5.1.8 NOISE

Regulations require that hearing protection be used when noise levels exceed 90 dBA averaged over an 8-hour work day. All WSP employees are entered in a Hearing Conservation Program and will don hearing protection when noise is expected above the OSHA action level of 85 dBA. Sources of noise that may exceed 85 dBA during the work at the Site include the following:

- Hydraulic hammer drilling (i.e., Geoprobe®)
- Working around internal combustion engines (e.g., steam wand)
- Working near heavy equipment and hand tools

Hearing protection will be worn when any activities are performed that produce noise loud enough to make conversation difficult without raising the voice at a distance of 3 feet. Foam insert ear plugs or protective ear muffs capable of providing a 33 dBA noise reduction rating are considered minimum protection.

5.1.9 OPERATIONS, MAINTENANCE, AND MONITORING OF THE SYSTEM

Proper installation, operation, and maintenance of the treatment System will help prevent explosion, electrical, ergonomic, and mechanical hazards associated with System operation. System maintenance will be conducted by properly trained personnel in accordance with an O&M plan. Hazardous energies will be controlled (as necessary) by implementing the OSHA lockout/tag out standard (259 CFR 1910.147) during system maintenance. In addition, a fire extinguisher is maintained in the System enclosure in case of fire.

5.1.10 TEMPERATURE

Environmental hazards include temperature extremes (heat or cold) that result in heat stress or exhaustion or cold stress. Heat stress and cold stress preventative measures will be implemented (Appendix D).

5.1.11 ULTRAVIOLET RADIATION

Ultraviolet (UV) rays are a part of sunlight that is an invisible form of radiation. UV rays can penetrate and change the structure of skin cells. There are three types of UV rays: UVA, UVB, and UVC. UVA is the most abundant source of solar radiation at the earth's surface and penetrates beyond the top layer of human skin. Scientists believe that UVA radiation can cause damage to connective tissue and increase a person's risk for developing skin cancer. UVB rays penetrate less deeply into skin, but can still cause some forms of skin cancer. Natural UVC rays do not pose a risk to workers because they are absorbed by the Earth's atmosphere.

Sunlight exposure is highest during the summer and between 10:00 a.m. and 4:00 p.m. Working outdoors during these times increases the chances of getting sunburned. Snow and light-colored sand reflect UV light and increase the risk of sunburn. At work sites with these conditions, UV rays may reach workers' exposed skin from both above and below. Workers are at risk of UV radiation even on cloudy days. Many drugs increase sensitivity to sunlight and the risk of getting sunburn. Some

common ones include thiazides, diuretics, tetracycline, doxycycline, sulfa antibiotics, and nonsteroidal anti-inflammatory drugs, such as ibuprofen.

Workers should follow these recommendations to protect themselves from UV damage:

- Wear sunscreen with a minimum Sun Protection Factor (SPF) of 15.
  - SPF refers to the amount of time that persons will be protected from a burn. An SPF of 15 will allow a person to stay out in the sun 15 times longer than they normally would be able to stay without burning. The SPF rating applies to skin reddening and protection against UVB exposure.
  - SPF does not refer to protection against UVA. Products containing Mexoryl, Parsol 1789, titanium dioxide, zinc oxide, or avobenzone block UVA rays.
  - Sunscreen performance is affected by wind, humidity, perspiration, and proper application.
  - Old sunscreens should be thrown away because they lose their potency after 1-2 years.
- Sunscreens should be liberally applied (a minimum of 1 ounce) at least 20 minutes before sun exposure.
  - Special attention should be given to covering the ears, scalp, lips, neck, tops of feet, and backs of hands.
- Sunscreens should be reapplied at least every 2 hours and each time a person gets out of the water or perspires heavily.
  - Some sunscreens may also lose efficacy when applied with insect repellents, necessitating more frequent application when the two products are used together.
- Follow the application directions on the sunscreen bottle.
- Another effective way to prevent sunburn is by wearing appropriate clothing.
  - Dark clothing with a tight weave is more protective than light-colored, loosely woven clothing.
  - High-SPF clothing has been developed to provide more protection for those with photosensitive skin or a history of skin cancer.
  - Wear wide-brimmed hats and sunglasses with almost 100% UV protection and with side panels to prevent excessive sun exposure to the eyes.

5.1.12 WEATHER

During the health and safety briefing the weather will be discussed if it poses any potential hazard (including heat and cold stress). Work activities must cease during thunderstorms. If thunder is heard after work has already commenced, all field personnel will stop what they are doing and move indoors when it is safe to do so. Field personnel will shelter indoors or in field vehicles for at least 30 minutes after hearing the last sound of thunder.

5.1.13 BIOLOGICAL HAZARDS

Direct contact with poisonous plants (poison ivy) or insect bites can cause skin irritation. Insect or animal bites can transmit disease or inject venom. Field personnel will be mindful of the potential presence of arachnids and insects, particularly when working outside and when opening well vaults. The work area will be inspected for biological hazards and limbs will not be placed into concealed area. Insect repellent containing DEET should be used to prevent tick and mosquito bites. Medical information (i.e. allergies and current medications of field personnel) will be requested before site activities are initiated.

5.1.14 CHEMICAL HAZARDS

Table 1 lists the COCs detected in environmental media from previous investigations. Information available for many of these constituents from the NIOSH Pocket Guide to Chemical Hazards is presented in Appendix B.

COCs of interest identified include VOCs, PAHs, metals, and polychlorinated biphenyls (PCBs; Section 2.4). Depending on concentrations, these substances may be toxic, ignitable, corrosive, and may pose risks to skin, tissues, eyes, and other body parts. Additionally, these constituents, depending on concentrations, may cause chronic illnesses if impacted dust is inhaled over time.

Soils, sediment, surface water, wastewater, groundwater, and bedrock cores generated during drilling or sampling activities may pose absorption, inhalation, or ingestion hazards to these chemicals for field personnel. Handling of equipment that has been exposed to contaminated media, as well as decontamination fluid generated from the cleaning of equipment, may pose an absorption, inhalation, and/or ingestion risk. In addition, sample preservatives (e.g., hydrochloric and nitric acids) may pose absorption, inhalation, or ingestion hazards for field personnel handling preserved sample containers, and coolers/boxes holding sample containers.

WSP will minimize the exposure to toxic substances by properly utilizing PPE, implementing engineering or institutional site controls, adhering to WSP's training requirements and SOPs, following all equipment manufacturer specifications, and modifying the work practices, as necessary, based on the hazard monitoring results.

Field personnel will minimize potential chemical hazards by (1) avoiding direct contact with potentially contaminated media (2) performing air monitoring to determine the necessary level of personal protective equipment to avoid inhalation exposures, and (3) avoiding generation of and ingestion or inhalation of dust and/or aerosolized water.

6 PERSONAL PROTECTIVE EQUIPMENT

WSP contractors will be required to understand the hazards detailed in this HASP and maintain a site-specific HASP that their employer has prepared. Additionally, WSP contractors will be responsible and provide appropriate PPE for their employees. All WSP personnel and WSP contractors will have received training for all assigned PPE before any work task begins.

Most activities are expected to be performed in what WSP considers modified Level D PPE. Modifications to this level of PPE are permitted with review and permission by the Site Coordinator and the SHSC. These changes will be communicated to the Site Coordinator who will then inform other members of the project team. Levels of protection should be selected based on the following:

- type and concentration of the chemical substance in the ambient atmosphere and its toxicity
- potential for exposure to substances in air, liquids, solids, or other materials personnel may come into contact with during the work
- knowledge of chemicals present along with their properties such as toxicity, route of exposure, and contaminant matrix

The current PPE assessment was based on the anticipated hazards of work activities using existing Site characterization data as shown in Table 1. Proper modifications to the level of PPE to be used will be made as necessary. Types of sampling that may be performed include instantaneous and continuous organic vapor monitoring, instantaneous and continuous particulate matter monitoring, and OSHA and NIOSH reference method sampling. This monitoring would be performed at a frequency and duration adequate to assess potential hazards.

6.1 PERSONAL PROTECTION EQUIPMENT

Most activities are expected to be performed in what WSP considers modified Level D PPE. Modifications to this level of PPE are permitted with review and permission by the project manager and the SHSC. These changes will be communicated to the Site Coordinator who will then inform other members of the project team. Levels of protection should be selected based on the following:

- type and concentration of the chemical substance in the ambient atmosphere and its toxicity
- potential for exposure to substances in air, liquids, solids, or other materials personnel may come into contact with during the work
- knowledge of chemicals present along with their properties such as toxicity, route of exposure, and contaminant matrix

The current PPE assessment was based on the anticipated hazards of work activities using existing Site characterization data as shown in Table 1. Proper modifications to the level of PPE to be used will be made as necessary.

Personal protective equipment will be used to reduce employee exposure to chemical, physical, and environmental hazards that cannot be abated through engineering and/or administrative controls.

WSP's Modified Level D PPE will consist of the following equipment:

- ANSI-approved hard hat (when heavy equipment is being used)
- chemical resistant nitrile gloves (when handling contaminated media)
- work (i.e., leather palm) gloves (for handling materials or equipment around the site)
- ANSI-approved safety toed boots
- reflective safety vest (for high traffic areas)
- ANSI-approved safety glasses (when heavy equipment, hand tools, or pressurized equipment are being used)
- safety goggles or a face shield should be used when a foreseeable splash hazard exists (e.g., steam cleaning)
- disposable hearing protection (for high-noise activities)

- Tyvek® or Saranek®-coated Tyvek® coveralls when working in dusty or dirty environments (e.g., excavations within the building)
-

Additional equipment will be readily available to upgrade on-site workers to modified Level C PPE, if necessary. This equipment includes:

- dual-canister full-face air-purifying respirator (NIOSH approved)
  - organics, HEPA, acid gas respirator cartridges (MSA cartridges GMA-H, GMC-H, GMC-S)
- Tyvek® or Saranek®-coated Tyvek® coveralls
- outer latex booties

The fit of the facepiece-to-face seal of the respirator affects its performance. The SHSC will be responsible for ensuring that a good seal is maintained. After each day's use, the respirator will be inspected, cleaned, and stored.

Damaged PPE will be replaced immediately. Backup equipment will be kept onsite for replacement as necessary. Subcontractors will provide their own PPE.

The following protective equipment will be discarded and replaced daily:

- respirator cartridges
- Tyvek® coveralls
- outer booties
- inner surgical gloves
- outer gloves
- safety glasses or equivalent PPE, when working near liquids

Procedures for putting on PPE are given in Appendix E. Item 15 in Appendix E outlines procedures for containerizing PPE and personal decontamination wastes.

6.1.1 INSPECTION

Proper PPE inspection features several sequences of inspection depending on specific PPE articles and its frequency of use. The different levels of inspection are as follows:

- inspection and operational testing of equipment received from the factory or distributor
- inspection of equipment as it is issued to workers
- inspection after use or training
- periodic inspection of stored equipment
- periodic inspection when a question arises concerning the appropriateness of the selected equipment or when problems with similar equipment arise

The primary PPE inspection in use for activities at the site will occur before use and will be conducted by the user. This ensures that the device or article has been checked out by the user and the user is familiar with its use.

6.1.2 MAINTENANCE

Damaged PPE will be replaced immediately. Backup equipment will be kept onsite for replacement as necessary. Subcontractors will provide their own PPE.

The following protective equipment will be discarded and replaced daily:

- respirator cartridges
- Tyvek® coveralls
- outer booties

- inner surgical gloves
- outer gloves
- safety glasses or equivalent PPE, when working near liquids

Procedures for putting on PPE are given in Appendix E. Item 15 in Appendix E outlines procedures for containerizing PPE and personal decontamination wastes.

6.1.3 UPGRADING/DOWNGRADING

The level of protection provided by PPE selection may be upgraded or downgraded by the SHSC based on changes in site conditions or findings of investigations. When a significant change occurs, the hazards will be reassessed. Some indicators of the need for reassessment are as follows:

- the start of a new work phase, such as the start of work on a different portion of the site
- a change in job tasks during a work phase
- a change in work method (e.g., changing equipment being used)
- a change of weather
- encountering contaminants at higher concentrations than expected
- encountering contaminants other than those previously identified
- a change in ambient levels of contaminants
- a change in work scope that affects the degree of contact with contaminants
- inspection

6.2 ONSITE SAFETY EQUIPMENT

Several pieces of safety equipment will be provided near the work area. A PID will be used to detect organic vapors and an aerosol particulate monitor will be used to detect respirable particulates in the breathing zone of the workers upwind and downwind of each sampling location. It will also be used to measure background air concentrations before the start of work. Depending on the site activities, colorimetric tubes for compound-specific air screening may be available for select onsite contaminants. An oxygen monitor and a carbon monoxide detector will be used for indoor work to monitor oxygen and carbon monoxide concentrations in the breathing zone. A first aid kit, eye wash, and fire extinguishers are kept in the onsite treatment building.

A standard first aid kit will be made available at the site for use in the event of an emergency. Such kits will be contained in weatherproof containers with individual sealed packages for each type of item. The kits will contain, as a minimum, the items specified in Appendix A of 29 CFR 1910.151, which are as follows:

- gauze roller bandages, 1 inch and 2 inch
- gauze compress bandages, 4 inch
- adhesive bandages, 1 inch
- triangular bandages, 40 inch
- ammonia inhalants and ampoules
- antiseptic applicators or swabs
- burn dressing
- eye dressing
- wire or thin board splints
- forceps and tourniquet

The designated first aid provider is responsible for checking the kits prior to bringing them to the Site to ensure they are fully stocked. On sites where there is a potential for the eyes or body to be exposed to injurious corrosive materials, a means to

flush the eyes and/or body will be provided. If a plumbed-in-place eye wash fountain/shower is not available, the designated first aid provider will ensure that a portable, gravity feed eye wash fountain is brought to the site along with the standard first aid kit.

Awareness of the location of the nearest telephone, potable water supply, and sanitary facility during each field activity will be acknowledged by all appropriate personnel.

7 MONITORING PROCEDURES

7.1 MONITORING PROCEDURES FOR SITE WORKERS

A literature review was conducted to find ionization potentials (IPs), exposure limits, and concentrations that are immediately dangerous to life and health (IDLH) for contaminants potentially occurring in environmental media at the site. Exposure limit data are expressed as time weighted averages (TWAs) or ceiling limits. TWAs promulgated in the OSHA regulations are referred to as permissible exposure limits (PELs). TWAs found in the NIOSH publications are recommended exposure limits. The ACGIH adopts values for exposure limits referred to as threshold limit values (TLVs). ACGIH further divides some TLVs into TWAs, ceiling limits, and short-term exposure limits.

The COCs detected in environmental media during past investigations at the site are listed in Section 2.4. The exposure limits and concentrations that are IDLH for these COCs are presented in Table 1. This does not preclude the chance of encountering other chemicals while onsite. All activities and associated levels of protection described herein are subject to actual field conditions and thus may change during the field activities.

Many of the COCs listed in Table 1 can enter the body by inhalation, ingestion, eye and skin contact, and absorption through the skin. Table 1 also indicates exposure pathways and short-term effects such as dizziness or eye and skin irritations, which can be identified rather promptly. However, long-term health effects such as kidney and liver damage may not easily be detected until chronic damage has occurred. It is important that all personnel involved in field activities adhere to the recommended personal protective procedures advised by the SHSC to reduce the potential for exposure.

Exposure limits, IPs, and IDLH values are used to establish which monitoring instruments will be needed. For example, collection methods and laboratory analysis methods vary according to the COCs. Based on the data collected to date at the Site, ongoing monitoring with a 10.6 eV PID and an 11.7 eV PID, colorimetric tubes, aerosol particulate monitor (e.g., Personal dataRAM), and a carbon monoxide detector (indoor work, as necessary) will be required. The air monitoring equipment will be calibrated as per manufacturer's specifications. In addition, the other safety equipment will be inspected daily and batteries will be re-charged, as required.

Based on a review of the planned activities, compounds listed in Section 2.4, physical hazards, the hazards for each activity are anticipated to be easily controlled and, generally, potential exposure is expected to be low to moderate; therefore, all site work will be initiated in modified Level D protection (see Section 7.2). This level of protection will be modified, as necessary. The IPs, exposure limits, and concentration data are used to establish action levels when upgrading from modified Level D PPE (i.e., no respiratory protection) to Level C PPE (i.e., dual-cartridge, full-face, tight-sealing, APR) or Level B (i.e., atmosphere supplied respiratory protection) and select the appropriate types of outer garments, gloves, and respirator cartridges. Action levels triggering an upgrade in respiratory protection from Level D to Level C or Level B are established by examining exposure limit data. The action levels and monitoring requirements by volatile and non-volatile compounds are discussed below.

7.1.1 VOLATILE CONTAMINANTS

Employees will determine potential exposures to VOCs during work activities using real-time air monitoring for organic vapors. Action levels for the known and suspected onsite VOCs have been calculated to determine the appropriate level of PPE for site activities. An action level for an upgrade in levels of respiratory protection is determined using the PEL or TLV, whichever is lower. The appropriate action levels and upgrade triggers are described below.

In addition to breathing zone monitoring, personal air samples (i.e., industrial hygiene samples) may also be used to measure the actual concentration of vinyl chloride to which a site worker is being exposed. This data will be used to better predict site exposure scenarios, monitoring procedures, and PPE requirements. Industrial hygiene samples will be collected using properly calibrated personal air sampling pumps. Calibration of the pumps will be conducted according to NIOSH sampling method 1007 and/or OSHA method 75. The procedures for personal sampling pumps calibration and sample collection are provided in Appendix C. Results of personal air sampling will be reviewed by the Site Coordinator and SHSC, and site monitoring and PPE upgrades may be updated based on these data.

Both chlorinated ethenes and ethanes are COCs for the Site. Therefore, the breathing zone will be monitored with both a 10.6 eV PID, for COCs with an IP less than 10.6 eV (i.e., chlorinated ethenes), and an 11.7 eV PID, for COCs with an IP greater than 10.6 eV, but less than 11.7 eV (i.e., chlorinated ethanes).

CHLORINATED ETHENES

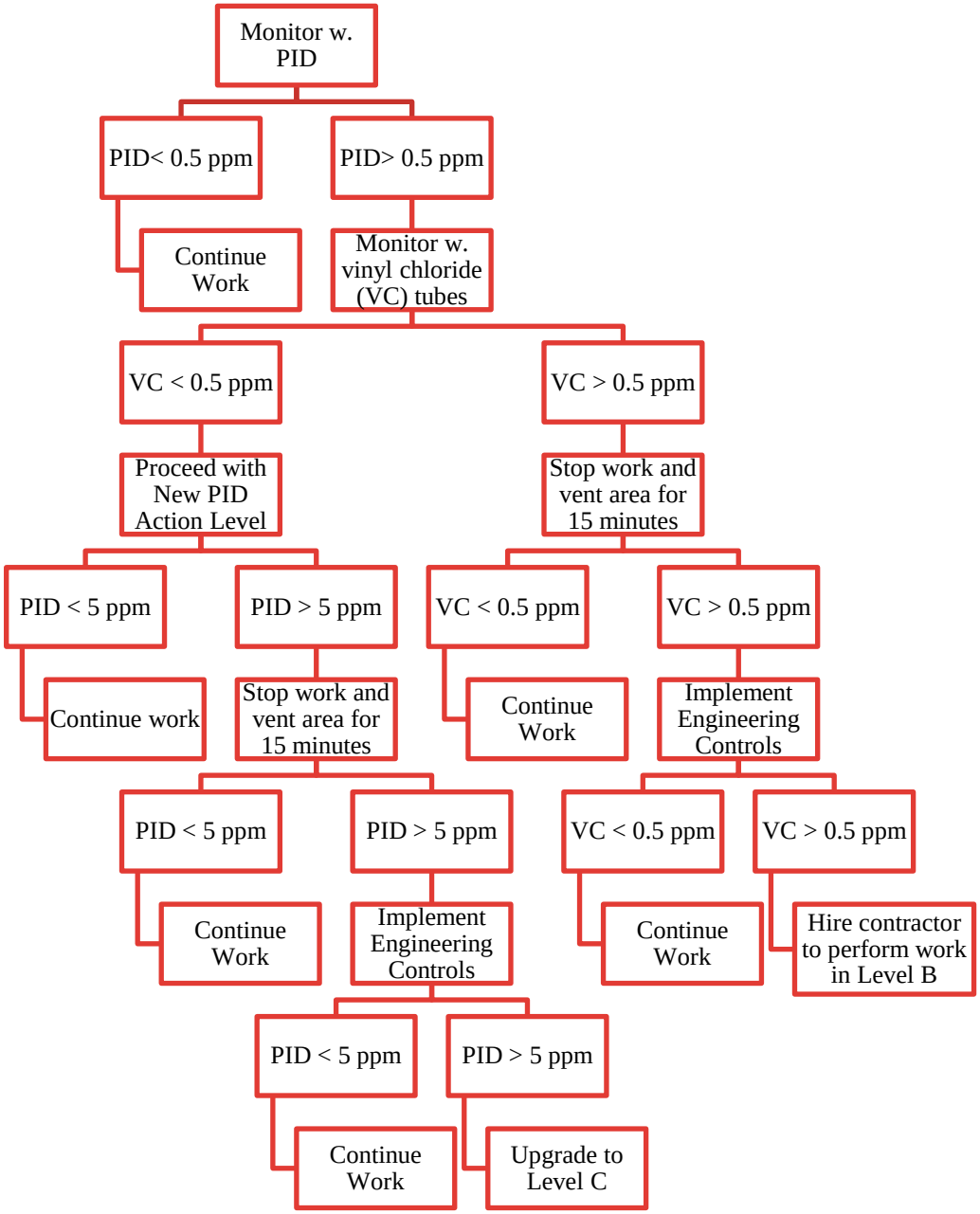
For organic vapors with an IP less than 10.6 eV, the action level will be based on vinyl chloride, which has both a TLV and PEL of 1 part per million (ppm). Site work will be initiated in modified Level D protection. A PID with a 10.6 eV lamp will be used to monitor total VOC concentrations in the breathing zone. VOC measurements in the breathing zone are not expected to exceed background levels; however, if PID readings of 0.5 ppm (1/2 the TLV for vinyl chloride) are sustained for a period of 5 minutes or greater, the breathing zone will be sampled using colorimetric or length of stain indicator tubes for the identification and quantification of vinyl chloride. If vinyl chloride is detected at any concentration greater than or equal to 0.5 ppm, Site activities will cease until constituent-specific personal monitoring (i.e., an ORM or NIOSH reference method) is conducted to determine if an upgrade to Level B PPE is necessary. If constituent-specific monitoring indicates that Level B PPE is required, Site activities will cease and a qualified contractor is retained to perform any Level B work. WSP will continue to monitor activities from outside the exclusion zone during Level B work. If vinyl chloride is not detected above 0.5 ppm, work will proceed with a new respirator protection action level of 5 ppm (based on 1/2 the TLV for TCE, the chlorinated ethene with the next most stringent TLV). If PID readings are sustained at or above 5 ppm for 5 minutes, work must cease until engineering controls can be implemented to abate the build-up of organic vapors. If airborne organic vapor concentrations cannot be controlled, respiratory protection will be upgraded to Level C. Level C respiratory protection includes the donning of a full-face, tight-fitting APR equipped with the appropriate organic vapor cartridge. Respiratory protection may only be downgraded once consistent PID measurements indicate that vapors have decreased below the action level. The SHSC and Site Coordinator will determine when a PPE downgrade may occur.

CHLORINATED ETHANES

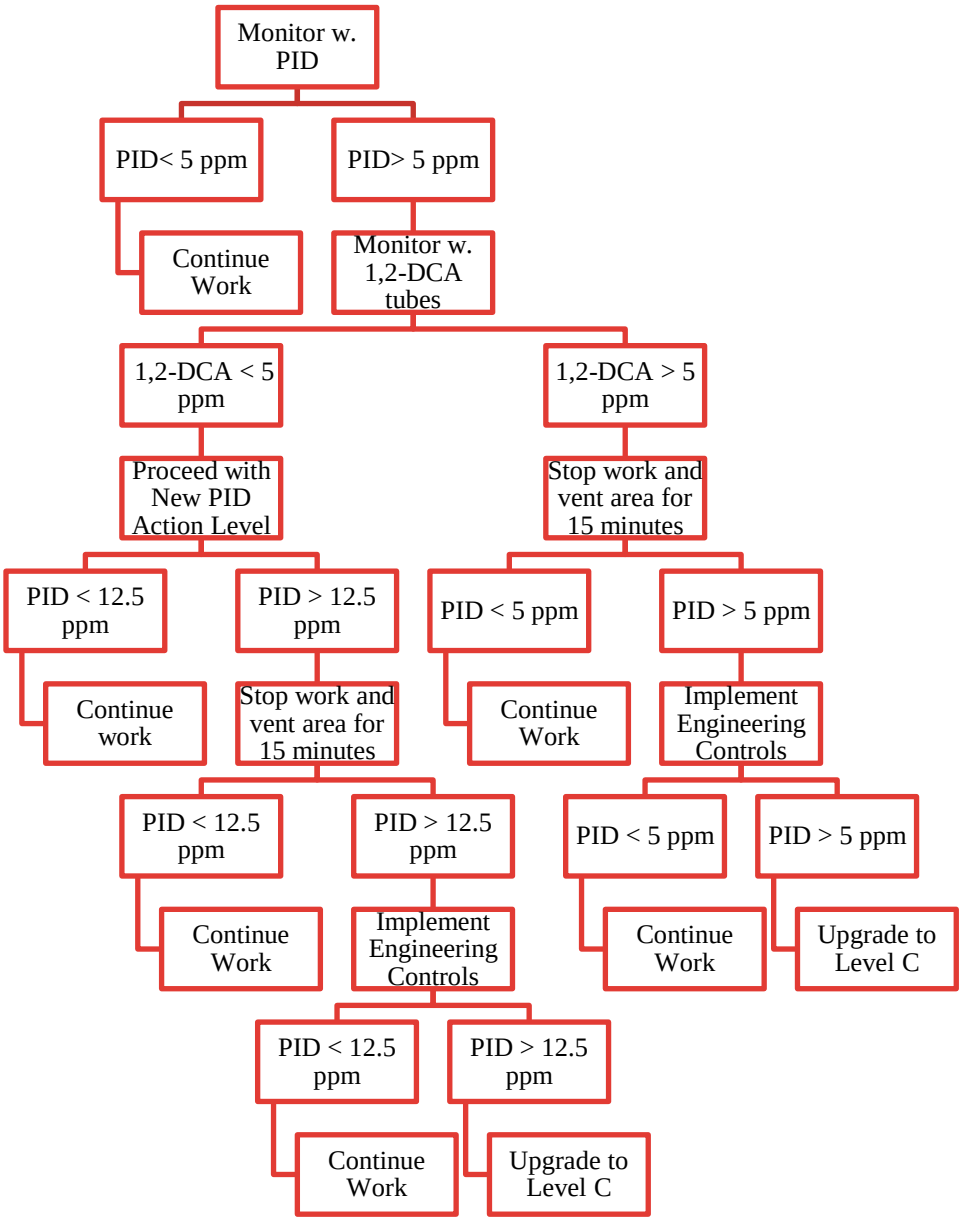
For organic vapors with an IP greater than 10.6 eV, the action level will be based on 1,2-DCA, which has a TLV of 10 ppm. Site work will be initiated in modified Level D protection. A PID with an 11.7 eV lamp will be used to monitor total VOC concentrations in the breathing zone. VOC measurements in the breathing zone are not expected to exceed background levels; however; if PID readings of 5 ppm (1/2 the TLV for 1,2-DCA) are sustained for a period of 5 minutes or greater, the breathing zone will be sampled using colorimetric or length of stain indicator tubes for the identification and quantification of 1,2-DCA. If 1,2-DCA is detected at any concentration greater than or equal to 5 ppm, work must cease until engineering controls can be implemented to abate the build-up of organic vapors. If airborne organic vapor concentrations cannot be controlled, respiratory protection will be upgraded to Level C. Level C respiratory protection includes the donning of a full-face, tight-fitting APR equipped with the appropriate organic vapor cartridge. If 1,2-DCA is not detected above 5 ppm, work will proceed with a new respirator protection action level of 12.5 ppm (based on 1/2 the PEL for methylene chloride). If PID readings are sustained at or above 12.5 ppm for 5 minutes, work must cease until engineering controls can be implemented to abate the build-up of organic vapors. If airborne organic vapor concentrations cannot be controlled, respiratory protection will be upgraded to Level C. Level C respiratory protection includes the donning of a full-face, tight-fitting APR equipped with the appropriate organic vapor cartridge.

Respiratory protection may only be downgraded once consistent PID measurements indicate that vapors have decreased below the action level. The SHSC and project manager will determine when a PPE downgrade may occur.

Tiered Air Monitoring for Ionization Potential Less than 10.6 eV (Chlorinated Ethenes)



Tiered Air Monitoring for Ionization Potential Greater than 10.6 eV (Chlorinated Ethanes)



7.1.2 AIRBORNE PARTICULATES

During activities where the ground surface is disturbed (e.g., drilling, trenching) the breathing zone in the work area will be constantly monitored with a handheld personal dataRAM particulate monitor (PM). Several metals and PCBs have been detected in soil, sediment, and groundwater at the Site. The airborne concentration of dust that would result in an airborne concentration equal to the PEL for a given chemical can be calculated using the following equation:

$$C_{dust} = \frac{PEL_{air}}{C_{soil}} \times 10^6 \frac{mg}{kg}$$

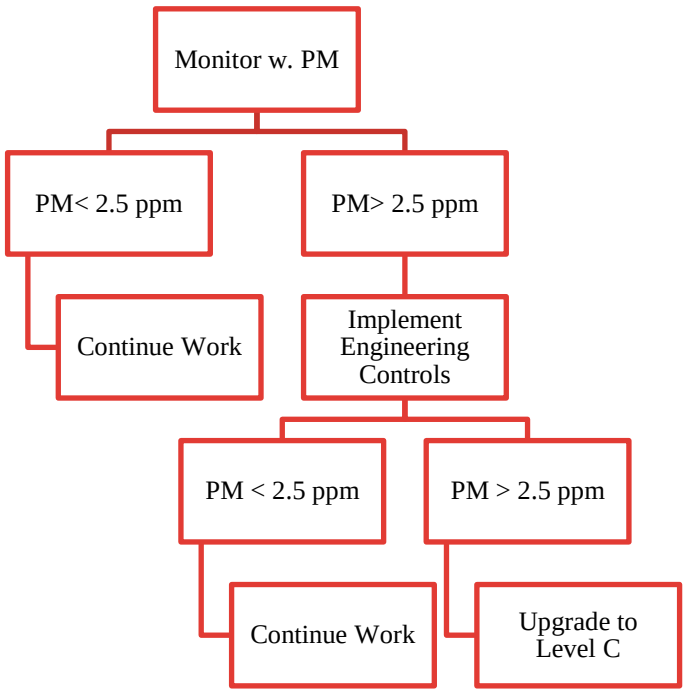
Where:

- C_{dust} = Airborne concentration of dust, expressed in milligrams per cubic meter (mg/m^3), at which the chemical of interest would be at its PEL.
- PEL_{air} = PEL for the chemical of interest expressed in mg/m^3.
- C_{soil} = Estimated soil concentration of the chemical of interest expressed in milligrams per kilogram (mg/kg).

Surrogate action levels are listed in Table 1.

All surrogate action levels exceed the PEL for nuisance dust, therefore the action level will be 2.5 milligrams per cubic meter (mg/m^3) based on the half the PEL for nuisance dust of 5 mg/m^3. If aerosol particulate measurements are sustained at or above 2 mg/m^3, work will cease and engineering controls (e.g., aqueous dust suppression) will be implemented to reduce the amount of airborne dust in the worker's breathing zone. If engineering controls cannot reduce the concentration of airborne particulate, respiratory protection will be upgraded to Level C PPE, which consists of the donning of a tight-fitting full-face piece APR equipped with a HEPA cartridge.

Tiered Air Monitoring for Airborne Particulates



7.1.3 OXYGEN DEFICIENCY AND CARBON MONOXIDE

During indoor activities that require the use of gasoline-driven equipment (e.g., drill rig), oxygen and carbon monoxide levels will be monitored and ventilation will be required. If the oxygen concentration drops to or below 19.5 percent, work will be stopped until the area has been ventilated and the oxygen concentration returns to 20 percent or above. If the carbon monoxide concentration is sustained at 12.5 ppm, half of the TLV for carbon monoxide (25 ppm) for 5 minutes, work will be stopped until the area has been ventilated and the carbon monoxide concentration returns to below 12.5 ppm.

If engineering controls cannot mitigate the hazards, field personnel will contact the Site Coordinator to discuss alternative sampling locations/engineering controls.

7.2 COMMUNITY AIR MONITORING PLAN

A Community Air Monitoring Plan (CAMP) requires real-time monitoring for volatile organic compounds (VOCs) and particulates (i.e., dust) at the downwind perimeter of each designated work area when certain activities are in progress at contaminated sites. The CAMP is not intended for use in establishing action levels for worker respiratory protection. Rather, its intent is to provide a measure of protection for the downwind community (i.e., off-site receptors including residences and businesses and on-site workers not directly involved with the subject work activities) from potential airborne contaminant releases as a direct result of investigative and remedial work activities. The New York State Department of Health generic CAMP, provided in Appendix G, will be implemented for the site.

8 SITE CONTROLS AND DECONTAMINATION

The following section defines the measures and procedures for maintaining Site control (i.e., work zone access) and decontamination. Site control is an essential component in the implementation of the health and safety program; decontamination procedures will ensure that hazardous materials are not removed from the work zones and that offsite exposure risks are minimized.

8.1 LONE WORKING

Employees should not be sent out to work alone in the field whenever possible. Should lone working be required, the following must be adhered to:

- Lone work may only be conducted during weekly O&M visits to collect gauge and flow totalizer readings. Any additional maintenance work may require the support of additional personnel should the task not be deemed acceptable as a risk for lone working.
- Communication between field personnel and their home office should be made prior to departure, during the work (for tasks lasting longer than half a day), and upon completion of the task whether returning to the office or going to another location.
- Consideration will be made for the level of competence of the individual being sent to perform the work. Under no circumstances shall interns be sent out to work alone.

8.2 PRE-ENTRY HEALTH AND SAFETY BRIEFING

At the beginning of each work day and before any work starts, the SHSC or their designee will review activities scheduled for the day and the hazards associated with those tasks with all WSP employees, WSP contractors, as well as other Site workers that will be engaged in the implementation of the work plan prior to start of work. The SHSC or their designee will document the pre-entry health and safety briefing in the field log books.

8.3 SITE SECURITY

The site is located at 620 South Aurora Street in Tompkins County in Ithaca, New York (Figure 1). The Site is located in a mixed industrial and residential area of Ithaca. Access to the main plant is restricted by a chain-link fence that surrounds the entire property, gates, including a guard station which is manned 24 hours a day, 7 days a week.

To maintain a safe working environment, all visitors who enter the site shall be informed of the following:

- the presence of potentially hazardous materials and any potential fire, explosion, health, or safety hazards (Section 6)
- the site emergency response procedures (Section 13)
- standard safety rules and personal hygiene procedures (Appendix A)

Access to the site shall be provided at reasonable times to government employees, subcontractors, agents, and consultants for the purposes of inspections and work monitoring. Visitors to the on-property work areas may be permitted, but access to work zones (e.g., drilling locations) will be restricted without evidence of applicable training, medical surveillance, donning of required PPE, and review and certification of this HASP. WSP contractors shall establish a safe perimeter of a minimum of 20 feet around all operating equipment when conducting drilling, soil, surface water, and groundwater sampling.

When working on private property, the Site Coordinator shall work to communicate with property owners, homeowners, residents, or tenants regarding safety procedures during activities performed on or in the vicinity of their property. Visitors to

the offsite work areas may be permitted, but access to work zones (e.g., drilling locations) will be restricted, including private property owners, without evidence of applicable training, medical surveillance, donning of required PPE, and review and certification of this HASP. WSP contractors shall establish a safe perimeter of a minimum of 20 feet around all operating equipment when conducting drilling, soil, surface water, and groundwater sampling. No equipment shall be stored on private property for overnight storage without consent of the private property owner. All IDW generated on private property shall be containerized for disposal in accordance with Section 4.19.

8.4 SITE CONTROL

Site entry will be controlled to reduce the possibility of (1) unauthorized entry and unintended contact with contaminants and (2) removal of contaminants by personnel or equipment leaving the Site. The possibility of exposure to or offsite transportation of COCs will be reduced by:

- excluding unauthorized personnel by establishing site security procedures
- establishing work zones within the Site
- establishing access control points to regulate access to work zones
- minimizing the number of personnel and equipment onsite, consistent with effective and efficient operations
- sampling in a manner to reduce the exposure of personnel, contamination of equipment, and to reduce the potential for airborne and surface water runoff dispersion
- implementing decontamination procedures

Work zones will be established as follows:

Exclusion/Work Zone: All excavation areas and a buffer area of at least 50 feet surrounding the excavation will be considered an exclusion/work zone where all employees will don appropriate PPE and atmospheric monitoring will be conducted to determine worker exposure. This area will be reduced to 20 feet for all other proposed onsite activities. The area will be separated from the rest of the site by caution tape, temporary fencing, or other demarcations to ensure that all site personnel are aware of areas requiring safety training and PPE. As the work progresses, the exclusion/work zone will be moved and marked as appropriate.

Contamination Reduction Zone (CRZ): All decontamination procedures will be conducted within the CRZ, which will be a designated area attached to the exclusion/work zone that leads to a support zone. As with the exclusion/work zone, the CRZ will be moved to ensure that the movement of drums, containers, and contaminated equipment is minimized and that no contamination enters the support zone.

Support Zone: All areas of the site not demarcated as an exclusion/work zone or a CRZ will be considered a support zone. The support zones change as work progresses. Barriers and/or signs will demarcate the edges of the exclusion/work zones will be clearly marked.

8.5 DECONTAMINATION

Decontamination is the process of removing or neutralizing contaminants that accumulated on personnel and equipment during site activities. It is critical to health and safety at sites where the potential for exposure to hazardous chemicals is present. Decontamination protects workers from hazardous substances that may contaminate and eventually permeate the protective clothing, respiratory equipment, sampling equipment, vehicles, and other equipment used onsite. Proper decontamination protects all site personnel by preventing the transfer of harmful materials into clean areas, the mixing of incompatible materials, and the uncontrolled transportation of contaminants from the site.

At the completion of the work task, all personnel will enter the decontamination area through the contaminant reduction zone for general (Level D Modified) decontamination. At the conclusion of each day or work shift, disposable gloves and Tyvek® coveralls will be removed and disposed of in onsite containers. Decontamination at the site will take two forms: equipment and personnel.

This HASP specifies the correct level of PPE to be worn based on the conditions and potential for exposure. Personnel decontamination procedures are provided in Appendix E. These procedures need only be followed if the work performed is

located within the areas of contaminants. Work performed in areas outside the contaminated areas will not require that workers decontaminate their PPE. Determinations of contaminated areas will be made by the project manager and approved by the Site Coordinator or designated person. Training Program

Several levels of health and safety training are required for personnel participating in the implementation of field activities. Documentation of this training will be maintained in the WSP project files and at the site for all personnel who have access to or work at the site. All WSP employees and WSP contractors, with the exception of those contractors who do not have the potential to be exposed to hazardous materials, must have current documentation for the following before field activities commence:

- initial 40-hour Hazardous Waste Operations and Emergency Response (HAZWOPER) training
- current 8-hour HAZWOPER refresher training
- first-aid, cardiopulmonary resuscitation (CPR) and automated external defibrillator (AED) training
- participation in a medical monitoring program
- annual qualitative fit-test results for the use of tight-fitting respirators

Documentation of this training will be maintained by WSP for all personnel who have access to or work at the site and is provided in Appendix H.

8.6 HAZARDOUS WASTE OPERATIONS AND EMERGENCY RESPONSE TRAINING

Personnel participating in field activities at the site who may be exposed to hazardous materials will receive 40 hours of initial HAZWOPER training and 8 hours of refresher training annually. The training program must comply with the requirements of 29 CFR 1910.120. At a minimum, the training program includes:

- Names of personnel and alternates responsible for site safety and health;
- Safety, health and other hazards present on the site;
- Use of personal protective equipment;
- Work practices by which the employee can minimize risks from hazards;
- Safe use of engineering controls and equipment on the site;
- Medical surveillance requirements including recognition of symptoms and signs which might indicate over exposure to hazards; and
- Elements of a HASP.

8.7 FIRST AID

All WSP personnel who perform fieldwork are required to have current American Red Cross and/or American Heart Association Heartsaver® certifications in first aid, CPR, and use of an AED. Training and certification are provided by WSP at no charge to the employees. WSP's Area Managers are responsible for ensuring that initial and required refresher training is provided to staff as necessary and for maintaining documentation of the training provided.

At all field sites where the response time from the local fire and rescue squad may exceed 4 minutes, the Project Manager must designate an individual to render first aid in the event of an emergency. The location of the nearest medical facility, the directions from the site to the facility, and the telephone number of the facility and the local rescue squad is provided in Section 13.

8.8 SITE SPECIFIC TRAINING

Daily pre-entry briefings will be held prior to initiating any site activity, and at such other times as necessary to ensure that employees are apprised of the HASP and that it is being followed. The meeting will provide site-specific exposure hazards expected, and will familiarize personnel with health and safety issues, protective equipment, emergency information and supplies, and to discuss special topics.

8.9 VISITOR TRAINING

All visitors to the active work areas will be briefed by the SHSC/FSSC or their designee on health and safety procedures to be followed. The visitors will be provided the HASP to review and, depending on the locations to be visited, will sign a certification that the plan has been provided, reviewed, and understood before visitors enter an active work area.

The Task Leader or his designee will control visitor entry to the active work areas. No visitor will enter these areas without previously notifying the Task Leader or their designee of the visit and providing documentation of training outlined in Section 11.1. The SHSC/FSSC or their designee will ensure that all visitors have the proper level of PPE for downrange activities and training in the use of the equipment; visitors who do not have the appropriate training will not be permitted in areas where the use of PPE is required.

9 MEDICAL MONITORING PROGRAM

All employees that may be exposed to potentially hazardous chemicals, regardless of the level of exposure predicted, are required to participate in the medical monitoring program established by WSP. OSHA regulations state that employees involved in certain activities that may expose them to hazardous materials at or above PELs or above the published exposure limit for greater than 30 days per year, or all employees who wear a respirator are required to participate in the monitoring program.

The purposes of the medical monitoring program are to ensure employees' fitness for duty (i.e., physically able to perform assigned tasks); to identify any illness or condition that might be aggravated by exposure to hazardous materials or work conditions; to determine if site work has had an adverse effect to employees' health; to certify that each employee can use negative pressure respirators as required by OSHA; to ensure that employees withstand heat or cold stress; and to establish and maintain a medical record to monitor for abnormalities that may be related to work exposure that could increase injury risk for the employee. WSP's medical monitoring program includes the following:

- a baseline physical examination
- a medical determination of fitness for duty by a licensed physician, including work restrictions after any injury or illness that may affect employee safety
- a review of potential project-specific exposures to determine the need for specific biological and medical monitoring
- annual and exit physical examinations with attention given to specific exposures or symptoms

9.1 BASELINE PHYSICAL EXAMINATION

A baseline physical examination will be performed on each employee engaged in hazardous site activities as outlined above before any assignment with the potential for exposure to hazardous chemicals. The purposes of this examination are to identify any illness or condition that might be aggravated by exposure to hazardous materials or work conditions; to certify the safe use of negative-pressure respirators (29 CFR 1910.134); and to develop a medical record for the assessment of exposure-related risk. Variable data, such as age, sex, race, smoking, previous employment, and exposure history, that may have a bearing on future examinations after employment begins will be gathered.

The baseline physical examination will include the following:

- medical and occupational histories including completion of a written questionnaire
- a complete physical examination, stressing the central and peripheral nervous system; cardiopulmonary system, spine and other musculoskeletal system, abdomen, rectum, and genitourinary system; and skin, including but not limited to an examination of:
  - height, weight, temperature, pulse, respiration rate, and blood pressure
  - head, nose, neck, and throat
  - chest (heart and lungs)
  - resting 12-lead electrocardiogram
  - chest X-ray (posterior-anterior view)
  - a pulmonary function test (FEV1, FVC, and FEV1/FEV ration)
  - an otoscopic examination and an audiogram at 500, 1,000, 2,000, 3,000, 4,000, and 6,000 hertz pure tone in an approved booth, administered by a qualified technician, and the results read by a qualified physician
  - a multichemistry blood panel (e.g., Chem 24), including kidney and liver function tests, complete blood count (CBC) with differential, and urinalysis with microscopic examination of centrifuged sediment
  - a red blood cell cholinesterase
  - visual acuity testing
- any other tests deemed necessary by the physician due to symptoms, or exposure, or medical history (e.g., blood lead level; urine screen for arsenic, mercury, chromium, and cadmium)

The following information will also be obtained from the employee by the physician to assist in the examination:

- history of respiratory disease
- work history
  - previous occupations
  - problems associated with breathing during normal work activities
  - past problems with respirator use
- any other medical information, such as:
  - psychological problems or symptoms including claustrophobia
  - any known physical deformities or abnormalities including those that may interfere with respirator use
  - past and current use of medication
  - tolerance to increased heart rate, which can be produced by extra weight, increased workload, and heat stress associated with wearing respirators and protective clothing

For all employees who are or will be exposed to airborne concentrations of asbestos fibers, the physical examination will also include completion of a respiratory disease standardized questionnaire per 29 CFR 1910.1001 Appendix D.

9.2 ANNUAL PHYSICAL EXAMINATION

An examination and updated occupational history will be performed annually during the anniversary month of the baseline physical examination. This annual examination serves to recertify that the employee is able to conduct work activities at hazardous waste and similar sites. The content of the examination may vary based on the nature of the work and potential exposure since the previous exam.

The annual physical examination will include the following:

- medical and occupational histories including completion of a written questionnaire
- a complete physical examination, stressing the central and peripheral nervous system; cardiopulmonary system, spine and other musculoskeletal system, abdomen, rectum, and genitourinary system; and skin, including but not limited to an examination of:
  - height, weight, temperature, pulse, respiration rate, and blood pressure
  - head, nose, neck, and throat
  - chest (heart and lungs)
  - resting 12-lead electrocardiogram for employees over 40 years of age at the time of the annual physical
  - chest X-ray (posterior-anterior view) every 5 years or as deemed necessary by a qualified physician. The employee may decline the X-ray unless it is deemed medically necessary by a qualified physician.
  - a pulmonary function test (FEV1, FVC, and FEV1/FEV ration)
  - an annual audiogram is required only for employees subject to high noise exposures (an 8-hour, time-weighted average of 85 dBA or more) or those required to wear hearing protection for extended periods
  - a multichemistry blood panel (e.g., Chem 24), including kidney and liver function tests, CBC with differential, and urinalysis with microscopic examination of centrifuged sediment
  - a red blood cell cholinesterase
- any other tests deemed necessary by the physician due to symptoms, or exposure, or medical history (e.g., blood lead level; urine screen for arsenic, mercury, chromium, and cadmium)

For all employees who are or may be exposed to airborne concentrations of asbestos fibers, the physical examination will also include completion of a respiratory disease standardized questionnaire per 29 CFR 1910.1001 Appendix D.

9.3 RETURN TO WORK EXAMINATION

Any job-related illness or injury will be followed by a medical examination to determine fitness for duty or possible job restrictions based on the physical findings of the medical examiner.

9.4 EXIT PHYSICAL EXAMINATION

When an employee terminates employment with WSP, that employee is required to have an exit physical examination. The content of the exit physical examination will include the following:

- a personal work history (based on specific project histories)
- medical, exposure, and fertility histories
- a complete physical examination, stressing the central and peripheral nervous systems; cardiopulmonary system; spine and other musculoskeletal system; abdomen, rectum, and genitourinary system; and skin, including but not limited to an examination of:
  - height, weight, temperature, pulse, respiration rate, and blood pressure
  - head, nose, neck, and throat
  - chest (heart and lungs)
  - resting 12-lead electrocardiogram
  - chest X-ray (posterior-anterior view)
  - a pulmonary function test (FEV1, FVC, and FEV1/FVC ratio)
  - an otoscopic examination and an audiogram at 500, 1,000, 2,000, 3,000, 4,000, and 6,000 hertz pure tone in an approved booth, administered by a qualified technician, and the results read by a qualified physician
  - a multichemistry blood panel (e.g., Chem 24), including kidney and liver function tests, CBC with differential, and urinalysis with microscopic examination of centrifuged sediment
  - a red blood cell cholinesterase
  - visual acuity testing
- any other tests deemed necessary by the physician due to symptoms, or exposure, or medical history (e.g., blood lead level, urine screen for arsenic, mercury, chromium, and cadmium)

For all employees who were potentially exposed to airborne concentrations of asbestos fibers, the physical examination will also include completion of a respiratory disease standardized questionnaire per 29 CFR 1910.1001 Appendix D.

9.5 OTHER EXAMINATIONS

Medical examinations in addition to those described above may be required by the WSP Health and Safety Leader. Additional examinations could be required before or after a project of long duration or after work at a site with particular exposure concerns. In addition, an employee may request a medical examination at their discretion based on potential exposure history, potential illness, or any condition which may produce a potential health hazard during work activities.

9.6 MEDICAL RECORDS

All medical records will be maintained by the examining physician, as well as the WSP medical monitoring provider. Copies of these records are typically transmitted directly to employees shortly after their annual physicals are completed. WSP's medical monitoring program administrator will maintain the certification of fitness provided by the physician, and the exposure records. Employee medical and exposure records will only be made available on written request by the employee or an authorized representative of the employee. OSHA compliance officers do not need to write a request for records that are

required for them to evaluate compliance. When records are requested, they will be furnished within 15 days of the request. If OSHA requests records in writing, the written request will be posted in a visible location for at least 15 days (29 CFR 1910.20). Medical records will be kept on file for at least 30 years. If WSP ceases to do business without a successor, then OSHA will be notified and may require transfer of the records.

10 EMERGENCY RESPONSE PLAN

Hazard recognition is an essential part of the Emergency Response Plan. The plan provides contingencies and evacuation procedures in case of an unexpected emergency. These procedures will be reviewed each day during the pre-entry briefing. Initiation of the contingency plan relies on the employee's ability to recognize an emergency or potential for an emergency. The following is a list of events that will immediately initiate emergency response procedures:

- Fire/Explosion
- Release of organic vapors or particulates above the action levels
- Personal injury
- Failure or expected failure of run-on/runoff control measures
- Failure or expected failure of groundwater control measures
- Natural occurrences (i.e., severe storms, lightning, tornado, high winds, etc.)
- Spills of hazardous materials

During daily Site briefings, personnel will be reminded of provisions outlined in the emergency response plan, communication systems, and evacuation routes. Additionally, emergency response procedures for WSP work zones and WSP contractors will be outlined daily by the SHSC and noted in the field log book. This will ensure that the WSP employees and WSP contractors know what to do in case of an emergency related to the implementation of the work plan or related to operations/activities on other private properties.

10.1 EMERGENCY COMMUNICATION

At least once per day, all WSP field personnel and WSP contractors shall contact their respective Field Team Leader to report on the day's activities. At this time, any identified health and safety concerns (e.g., accidents, incidents, or near hits) will be reported to the SHSC. Field Team Leaders shall report to the Site Coordinator such that health and safety concerns may be reported to other site personnel and contractors, as appropriate.

A series of three extended car horn blasts will be the emergency signal to indicate that all WSP personnel and WSP contractors must evacuate the WSP work zones. This alarm system may be initiated by any member of the WSP team. Field Team Leaders or SHSCs will use electronic communication (e.g., cell phones) to notify Site personnel, as required by the Site Emergency Evacuation Plan. WSP Field Team Leaders and/or SHSCs will then relate all instructions to WSP field personnel and contractors for the safe evacuation of the site.

Prior to WSP field personnel and/or WSP contractors beginning work on private property, the WSP Field Team Leader will establish communication procedures and evacuation routes with homeowners and/or residents. Local emergency authorities will be contacted as necessary as decided by the Field Team Leaders or SHSCs.

10.1.1 HAND SIGNALS

The following standard hand signals will be used in case injury or circumstance does not allow for verbal or other communication:

- Hand gripping throat = Out of air, can't breathe
- Grip partner's wrist or both hands around waist = Leave area immediately
- Hands on top of head = Need assistance
- Thumbs up = Ok, I'm all right, I understand
- Thumbs down = No, negative

10.1.2 TELEPHONES

Mobile telephones are used for routine communication and to notify offsite agencies of incidents and request assistance. Emergency telephone numbers are identified below in Section 13.4.

10.2 PERSONNEL ROLES AND LINES OF AUTHORITY

Field team leaders and WSP contractor supervisors have primary responsibility for responding to and correcting emergency situations affecting project personnel. Possible actions may involve evacuation of personnel from the work zones or from the entire Site. SHSC are responsible for the proper implementation of this HASP and all of its requirements. Both the field team leaders and the SHSC will work with the Site Coordinator to ensure the safe and effective implementation of the proposed work.

WSP contractors are responsible for addressing any emergencies resulting from their work, establishing the proper incident command structure, and implementing response actions, as necessary. This includes informing WSP employees of the potential hazards related to the operation of their equipment and plans for evacuation if there is an emergency related to the operation or storage of their equipment.

10.3 EVACUATION ROUTES AND PROCEDURES

WSP personnel and WSP contractors must sign-in with the site security each day before entering the site. The site uses these roles in case there in an emergency onsite to ensure that all people working on the property are accounted during an evacuation. The following describes the general emergency evacuation procedures that WSP personnel and WSP contractors will implement.

10.3.1 WSP WORK ZONE-RELATED EVACUATION

It is possible that an emergency could necessitate evacuation of all personnel. If such a situation should arise at a WSP work zone, the designated emergency signal of a series of three extended horn blasts shall be sounded and all personnel will move to the designated meeting location. Electronic communication (e.g., cell phone) will be used to alert workers beyond the range of the horns.

All available vehicles outside the work area would be used in the evacuation of a WSP work zone. All personnel would exit the area, making sure to be upwind of smoke, vapors, or spill location(s) and meet at the main guard house. A second rendezvous point will be selected by the SHSC in case the guard house would be inappropriate based on wind direction, severity, and type of incident. The Field Team Leader or his designee will conduct a head count to insure all personnel have been evacuated safely using the Site sign-in sheet. If someone is missing, the Task Leader or his designee will alert the appropriate personnel and local emergency response personnel.

10.3.2 WEATHER-RELATED EVACUATION

If a weather event occurs, an intermittent, high-pitched horn will sound indicating a required evacuation. WSP personnel and WSP contractors will immediately move to the assigned gathering location.

10.4 EMERGENCY INFORMATION AND TELEPHONE NUMBERS

To obtain medical assistance as soon as possible in case of an emergency, the following telephone numbers, addresses, and directions for the nearest medical treatment facilities will be posted in the temporary office:

Description	Contact	Phone
Ambulance	Bangs Ambulance	911
Fire Department	Ithaca Fire Department	911 or (607) 272-1234
Police	Ithaca Police Department	911 or (607) 272-3245
Hospital	Cayuga Medical Center	911 or (607) 274-4411
Poison Control	The Upstate New York Poison Control Center	1-800-222-1222
Disease Control	Centers for Disease Control 24-hour emergency line	(770) 488-7100

10.5 DIRECTIONS TO HOSPITAL

The nearest hospital with an emergency room is Cayuga Medical Center, 101 Dates Drive, Ithaca, New York. The directions are as follows:

1. Start at 620 S AURORA ST, ITHACA going north toward HILLVIEW PL - go 0.2-mile
2. Turn Left on Prospect St. - go 0.1-mile
3. Continue onto E. Clinton St. – go 0.6-mile
4. Turn right onto S. Meadow St. – go 0.3-mile
5. Turn left onto W. Buffalo St. – go 0.4-mile
6. Continue onto Cliff St. – go 1.0 mile
7. Continue onto Trumansburg Rd. – go 1.2 miles
8. Turn right onto Harris B Dates Dr. Extention – go 260 feet
9. Continue straight onto County Hospital Rd. – go 220 feet
10. Turn left to stay on County Hospital Rd. – go 400 feet
11. Arrive at 101 Dates Dr.

Total Estimated Time: 11 minutes Total Estimated Distance: 3.9 miles

A map showing the route to the hospital is shown in Figure 3.

10.6 EMERGENCY MEDICAL TREATMENT PROCEDURES

In an emergency, the primary concern is to prevent the loss of life or severe injury to site personnel. If immediate medical treatment is required, decontamination will be delayed until the condition of the victim has stabilized. If decontamination can be performed without interfering with first aid or if a worker has been contaminated with an extremely toxic or corrosive material that could cause severe injury, decontamination will be performed immediately. If an emergency caused by a heat-related illness develops, protective clothing will be removed from the victim as soon as possible to reduce heat stress.

The following standard emergency procedures will be used by onsite personnel. The SHSC shall be notified of any onsite emergencies and be responsible for ensuring that the appropriate procedures are followed. These procedures shall be rehearsed regularly as part of the overall program for the site.

Minor injuries: If the injury or illness is minor, full decontamination should be completed and first aid administered before the injured is transported to Cayuga Medical Center.

Major injuries: If the patient's condition is serious, call the Ithaca Fire Department for ambulance and paramedic support. At least partial decontamination should be completed. (i.e., complete disrobing of the victim and redressing

in clean coveralls or wrapping in a blanket). First aid should be administered while awaiting an ambulance or paramedics.

Any person being transported to a clinic or hospital for treatment should take with them information of the chemical or chemicals they have been exposed to at the site.

10.7 MEDICAL EMERGENCIES

Five medical emergencies have been identified as requiring implementation of emergency procedures. These emergencies are cardio-pulmonary emergencies, physical injuries, heat or cold-related injuries, chemical exposures, and snake or spider bites. Heat- and cold-related issues are discussed in Appendix D.

10.7.1 CARDIO-PULMONARY EMERGENCIES

Cardio-pulmonary emergencies are life-threatening situations requiring immediate response of trained individuals to prevent death. At no time will these emergencies be considered less than life-threatening. These emergencies include heart attack, cardiac arrest, or respiratory arrest. Response and emergency treatment will be rendered without regard to protective equipment or decontamination procedures. As a precaution, and if necessary, a representative from the Site will accompany the worker to the hospital to advise on matters of decontamination.

10.7.2 PHYSICAL INJURIES

Physical injuries can range from minor sprains, to internal injuries, to an open compound fracture. Depending on the severity of the injury, treatment may be delayed for decontamination procedures to be performed. If the physical injury is major, decontamination procedures should be supervised by a trained medical professional. The level of decontamination will be directly related to the seriousness of the injury and will be determined by the Task Leader or his designee.

Outside garments can be removed (depending on the weather) if they do not cause delays, interfere with treatment, or aggravate the injury. Respiratory masks and chemically resistant clothing should be removed from the injured person. If the outer contaminated garments cannot be safely removed, the individual should be wrapped in blankets to help prevent contaminating the inside of the ambulance or medical personnel. Outside garments are then removed at the medical facility. One exception would be if it is known that the individual has been contaminated with an extremely toxic or corrosive material which could cause severe injury or loss of life.

If an employee working in a contaminated area is physically injured, appropriate first aid procedures will be followed. Depending on the severity of the injury, emergency medical response may be sought. If the employee can be moved, he/she will be taken to the edge of the work area (on a stretcher, if needed) where contaminated clothing will be removed, additional emergency first aid will be administered, and transportation to a local emergency medical facility will be arranged.

10.7.3 CHEMICAL EXPOSURE

Exposure to chemicals can be divided into two categories:

- injuries from direct contact, such as acid burns or inhalation of toxic chemicals
- potential injury due to gross contamination on clothing or equipment

For inhaled contaminants, treatment can only be provided by qualified physicians. If the contaminant is on the skin or in the eyes, immediate measures must be taken to counteract the substance's effect. First aid treatment usually is flooding the affected area with clean water; however, for a select few chemicals, water may cause more severe problems.

When protective clothing is grossly contaminated, the constituents may be transferred to treatment personnel or the wearer and cause injuries. Unless severe medical problems have occurred simultaneously with splashes, the protective clothing should be washed off as rapidly as possible and carefully removed. Portable eye washes will be available to provide a means of flushing and washing such contamination.

If the injury to the worker results from a chemical splash or uncontrolled release, the following first aid procedures are to be instituted:

Eye Exposure: If contaminated solids or liquids get into the eyes, wash eyes immediately at the emergency eyewash station using large amounts of running or flowing water. Obtain medical attention immediately.

Skin Exposure: If contaminated solids or liquids get on the skin, promptly wash the contaminated skin using soap or mild detergent and water. Obtain medical attention immediately when exposed to concentrated solids or liquids.

Breathing: If a person breathes in large amounts of contaminants, move the exposed person to fresh air at once. If breathing has stopped, perform artificial respiration immediately. Keep the affected person warm and at rest. Obtain medical attention as soon as possible.

Swallowing: When contaminated solids or liquids have been swallowed and the person is conscious, attempt to obtain information from the person to aid in identifying the substance swallowed. Contact the poison control center immediately. Under their direction, one or two glasses of milk or water may be administered to dilute the swallowed material. The poison control center may direct a responder to induce vomiting. Do not induce vomiting if: the person is unconscious or semiconscious, or convulsing; if a strong corrosive has been swallowed or if a petroleum product has been swallowed. Vomiting is best induced by administering one tablespoon of Syrup of Ipecac. Transport the person to the hospital and monitor the airway constantly.

10.8 AIR RELEASE OR FIRE/EXPLOSION

On notification of an air release or a fire/explosion, the designated emergency signal of a series of three extended horn blasts shall be sounded and all personnel will travel at a right angle to the upwind direction. Electronic communication (e.g., cell phone) will be used to alert workers outside of the work area. The SHSC will then account for all personnel and notify the proper emergency agencies. The fire department shall be alerted and all personnel moved to a safe distance from the emergency area.

Fire extinguishers are present onsite. If a small, localized fire breaks out, chemical fire extinguishers may be used in an attempt to put out incipient-stage fires. However, WSP employees do not maintain current fire extinguisher training and are not expected to fight a fire in any stage. Local fire-fighting authorities will always be contacted before any attempt to extinguish a fire is made.

If an uncontrolled fire develops releasing potentially toxic gases, onsite personnel and the public in the immediate vicinity will be evacuated. Only personnel trained in fire-fighting and outfitted with proper protective equipment will be allowed in the immediate fire area. The field team leader or his/her designated assistant will alert local fire-fighting companies.

10.9 PERSONAL PROTECTIVE EQUIPMENT FAILURE

If any site worker experiences a failure or alteration of protective equipment that affects the protection factor that person and his/her buddy shall immediately leave the work area. Re-entry shall not be permitted until the equipment has been repaired or replaced.

10.10 OTHER EQUIPMENT FAILURE

If any other equipment onsite fails to operate properly, the field team leader or the SHSC shall be notified to determine the effect of this failure on continuing operations onsite. If the failure affects worker safety or prevents completion of the activity, all personnel shall evacuate the work area until the situation is evaluated and appropriate actions taken.

In all situations when an emergency results in the evacuation of a work area, personnel shall not re-enter the area until the following conditions have been met:

- the conditions resulting in the emergency have been corrected
- the hazards have been reassessed

- the HASP has been reviewed
- site personnel have been briefed on any changes in the HASP

11 SPILL CONTAINMENT PROGRAM

This chapter of the HASP describes the potential for hazardous substance spills at this site and procedures for controlling and containing such spills. The purpose of this chapter of the HASP is to ensure that spill containment planning is conducted and appropriate control measures are established.

The spill containment program is consistent with OSHA requirements in 29 CFR 1910.120(b)(4)(ii)(J) and (j)(1)(viii) and addresses the following site-specific information:

- potential hazardous substance spills and available controls
- initial notification and response
- spill evaluation and response
- post-spill evaluation

11.1 POTENTIAL SPILLS AND AVAILABLE CONTROLS

The following have been identified as potential spill sources. These include, but are not limited to:

Potential Spill Source	Preventative Measure
Re-fueling onsite equipment	No long-term storage of fuel will occur onsite. The amount of fuel kept onsite will be limited to the estimated weekly use.
General spill prevention requirements	Accessible spill response stations will be set up containing absorbent pillows, floor dry, shovels and brushes to be used in the event of a spill. Spill response equipment is located near Dock 8 of the main facility building. Additional task-specific locations will be discussed during daily briefings to inform all project personnel.

11.2 INITIAL SPILL NOTIFICATION AND RESPONSE

Any worker who discovers a hazardous substance spill will immediately notify the SHSC; the SHSC will relay the information to the Site Coordinator. The worker will, to his/her best ability, report the hazardous substance involved, the location of the spill, the estimated quantity of material spilled, the direction/flow of the spill material, related fire/explosion incidents, and any associated injuries. The site Emergency Response Plan (Section 10) will immediately be implemented if an emergency release has occurred.

11.3 SPILL EVALUATION AND RESPONSE

The Site Coordinator is responsible for evaluating spills and determining the appropriate response. When this evaluation is being made, the spill area will be isolated and demarcated to the extent possible. The procedures of the Emergency Response Plan (Section 10) are implemented when the spill is determined to require emergency precautions and action. If necessary to protect nearby community members, notification of the appropriate authorities is made.

When an incidental release occurs, cleanup personnel receive instructions in a pre-cleanup meeting as to spill conditions, PPE, response activities, decontamination, and waste handling. The following are general measures that response/cleanup personnel take when responding to a spill:

- To minimize the potential for a hazardous spill, hazardous substance and contaminated soils, control/absorbent media, drums and containers, and other contaminated materials are properly stored and labeled.
- When a spill occurs, only those persons involved in overseeing or performing spill containment operations will be allowed within the designated hazard areas. If necessary, the area will be roped, ribboned or otherwise blocked off. Unauthorized personnel are kept clear of the spill area.
- Appropriate PPE, as specified during the pre-cleanup meeting, is donned before entering the spill area.
- Appropriate spill control measures are specified in the pre-cleanup meeting and applied during spill response.
- Whenever possible without endangerment of personnel, the spill is stopped at the source or as close to the source as possible.
- Ignition points are removed if fire or explosion hazards exist.
- Surrounding reactive materials are removed.
- Drains or drainage in the spill area will be blocked or surrounded by berms to exclude the spilled waste and any materials applied to it.
- Provisions are made to contain and recover a neutralizing solution, if used.
- For small spills, sorbent materials such as sand, sawdust, or commercial sorbents are placed directly on the waste to prevent further spreading and aid in recovery.
- Large spills are diked at the leading edge of the spill. Berms of earthen or sorbent material are constructed downstream of the leading edge of the spill to contain it. Where feasible, pumps are utilized to transfer the liquid to appropriate containers.
- Spill area is sprayed with appropriate foam where the possibility of volatile emissions exists.
- If the spill results in the formation of a toxic vapor cloud, from vaporization, or reaction with surrounding materials or by the outbreak of fire, further evacuation may be required.
- To dispose of spill waste, all contaminated sorbents, liquid waste, or earthen material will be cleaned up and placed in DOT-compliant drums for proper storage or disposal as hazardous waste.

11.4 POST-SPILL EVALUATION

The spill area is inspected to ensure the area has been satisfactorily cleaned. The use of soil, water, and air sampling is utilized in this determination as necessary. The root cause of the spill is examined and corrective steps taken to ensure the engineering and control measures in place have performed as required. If alternative precautions or measures are needed, they are made available and implemented. All durable equipment placed into use during cleanup activities is decontaminated as specified in the Decontamination chapter of this HASP for future utilization. All spill response equipment and supplies are replenished as required.

12 ACCIDENT AND INCIDENT INVESTIGATION AND REPORTING

Accidents are defined by the National Safety Council as an undesired event that results in personal injury or property damage. Generally, incidents are defined as an unplanned, undesired event that adversely affects completion of a task. Lastly, near hits describe incidents where no property was damaged and no personal injury sustained, but where, given a slight shift in time or position, damage and/or injury easily could have occurred. WSP's health and safety programs and procedures are focused on preventing exposure to hazardous chemicals and potential accidents and incidents. One way of preventing future accidents and injuries is by investigating accidents and incidents as well as tracking near hits.

All accidents and incidents related to the work that WSP and WSP's subcontractors conduct on the Site will be investigated, the root cause determined, and corrective actions implemented. Field personnel will report accidents and incidents to their respective field team leader who will report to the SHSC and Site Coordinator. The Site Coordinator will report all incidents to the host facility and, subsequently, to applicable regulatory agencies within the necessary timeframe to meet regulatory requirements. However, all accidents/incidents will be reported within 24 hours to the WSP online Integrated Safety Management System (iSMS; https://zeroharm.onepb.net/fieldforms). An incident report should be filed using iSMS for the following:

- Occupational injury or illness
- Vehicular accidents
- Near hits/misses
- Environmental events (e.g., spill)
- Quality incidents
- Service or utility strikes
- Visits by regulatory authorities
- Notifications of legal action
- Complaints
- Security issues
- Loss, theft, or damage

Observation reports can be filed using iSMS for a potential safety hazard that has not created a near hit/miss or incident or a good safety practice that should be recognized.

In accordance with OSHA requirements (29 CFR 1904 and 29 CFR 1910.20), all reportable injuries or illnesses should be recorded on the OSHA Form 300 and either the OSHA 301 or equivalent state worker's compensation form within 6 days of the injury.

12.1 VEHICLE INCIDENTS

All vehicle incidents, no matter how minor, must be reported to the Site Coordinator and the WSP employee's Area Manager immediately. In addition to reporting the incident to iSMS, drivers must report incidents to Wheels, Inc. (1-800-477-2211) within 24 hours of the incident. If an employee was injured during the traffic accident, iSMS will be used to report the injury. The injury and the traffic incident can be reported on the same iSMS report.

13 AUTHORIZED CHANGES TO THE HEALTH AND SAFETY PLAN

All changes to the HASP are to be documented by completing a form for Modification of Site Health and Safety Plan (Appendix I). This completed form must be signed by the Project Manager. A copy of all completed forms will be included with each copy of the HASP and maintained with the project files.

14 CERTIFICATION

The HASP satisfies the requirements of OSHA 1910.120, WSP safety policies and procedures.

By their signature below, these and all Site personnel certify that they have read the HASP, and are familiar with, and will comply with, its provisions.

Name	Signature	Company	Phone No.

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ACRONYMS

1,1,1-TCA	1,1,1-trichloroethane
1,2-DCA	1,2-dichloroethane
ACGIH	American Conference of Government Industrial Hygienists
AED	automated external defibrillator
ANSI	American National Standards Institute
AOC	area of concern
APR	air-purifying respirator
bgs	below ground surface
CBC	complete blood count
CFR	Code of Federal Regulations
cis-DCE	cis-1,2-dichloroethene
COC	constituent of concern
CPR	cardiopulmonary resuscitation
CRZ	Contaminant Reduction Zone
CVOC	chlorinated volatile organic compound
dBA	decibel
DOT	United States Department of Transportation
DPE	dual phase extraction
EPA	United States Environmental Protection Agency
EPT	Emerson Power Transmission
eV	electron volt
°F	degree Fahrenheit
FSSC	field site safety coordinator
GAC	granular activated carbon
HASP	health and safety plan
HAZWOPER	Hazardous Waste Operations and Emergency Response
HEPA	high-efficiency particulate air
IDLH	immediately dangerous to life or health
IDW	investigation-derived waste
IP	ionization potential
IRM	Interim Remedial Measure
iSMS	Integrated Safety Management System
LNAPL	light non-aqueous phase liquid
mg/m^3	milligram per cubic meter
NIOSH	National Institute for Occupational Safety and Health
NYCRR	New York Codes, Rules and Regulations
NYSDEC	New York State Department of Environmental Conservation
O&M	operation and maintenance
OSHA	Occupational Safety and Health Administration
OU	Operable Unit

PCB	polychlorinated biphenyl
PCE	tetrachloroethene
PEL	permissible exposure limit
PID	photoionization detector
PLC	programmable logic controller
PPE	personal protective equipment
ppm	part per million
PVC	polyvinyl chloride
ROD	Record of Decision
SCO	Soil Cleanup Objective
SHSC	site health and safety coordinator
SOLAS	Safety of Life at Sea
SOP	standard operating procedure
SPF	sun protection factor
SRI	Supplemental Remedial Investigation
SVE	soil vapor extraction
TCE	trichloroethene
TLV	threshold limit value
trans-DCE	trans-1,2-dichloroethene
TWA	time weighted average
UV	ultraviolet
UVA	ultraviolet A
UVB	ultraviolet B
UVC	ultraviolet C
VOC	volatile organic compound
XRF	X-ray fluorescence

TABLES

Table 1

Chemical and Physical Characteristics of COCs
Former Emerson Power Transmission Facility
Ithaca, New York (a)

Parameters	Maximum Concentration (ppm)			IP (eV)	IDLH (ppm)	ACGIH 2018 TLV (ppm) (c)	PEL (ppm)	Surrogate Action Levels (mg/m^3)	Route of Exposure	Toxic Effects
	Soil	Groundwater	LNAPL							
Volatile Organic Compounds										
1,1,1-Trichloroethane	< SCO_{UU}	0.0068	-	11	700	350	350	-	INH, ING, CON	Eyes, skin, CNS, cardiovascular, liver
1,2-Dichloroethane	5.87	0.0014	-	11.05	50	10	50	-	INH, ING, CON, ABS	Eyes, skin, kidneys, liver, CNS, cardiovascular
cis-1,2-Dichloroethene	3.3	20.4	34	9.65	1,000	200 (d)	200	-	INH, ING, CON	Eyes, respiratory, CNS
Methylene chloride	0.63	-	-	11.32	2,300	50	25	-	INH, ING, CON, ABS	Eyes, skin, cardiovascular, CNS
Tetrachloroethene	1.36	0.0145	-	9.32	150	25	100	-	INH, ING, CON, ABS	Eyes, skin, respiratory, liver, kidneys, CNS
trans-1,2-Dichloroethene	0.63	0.241	-	9.65	1,000	200 (d)	200	-	INH, ING, CON	Eyes, respiratory, CNS
Trichloroethene	58.2	58.9	0.48	9.45	1,000	10	100	-	INH, ING, CON, ABS	Eyes, skin, respiratory, heart, liver, kidneys, CNS
Vinyl Chloride	9.4	2.04	0.9	9.99	Ca	1	1	-	INH, CON	Liver, CNS, blood, respiratory, lymphatic
Polycyclic Aromatic Hydrocarbons										
Benzo(a)anthracene	74	-	-	-	-	-	-	-	-	-
Benzo(a)pyrene	66	-	65	-	80	0.2	0.2	3,049	INH, CON	Respiratory system, skin, bladder, kidneys
Benzo(b)fluoranthene	57	-	81	-	-	-	-	-	-	-
Benzo(k)fluoranthene	57	-	41	-	-	-	-	-	-	-
Chyrsene	71	-	72	-	80	0.2	0.2	2,821	INH, CON	Respiratory system, skin, bladder, kidneys
Dibenz(a,h)anthracene	13	-	-	-	-	-	-	-	-	-
Fluoranthene	147	-	110	-	-	-	-	-	-	-
Indeno(1,2,3-cd)pyrene	32	-	23	-	-	-	-	-	-	-
Phenanthrene	115	-	-	-	80	0.2	0.2	1,739	INH, CON	Respiratory system, skin, bladder, kidneys
Pyrene	125	-	120	-	80	0.2	0.2	1,600	INH, CON	Respiratory system, skin, bladder, kidneys
Metals										
Arsenic	495	0.137	0.75	-	-	0.01 (b)	0.5 (b)	1,010	INH, ING, CON	Skin, respiratory, kidneys, CNS, liver, gatrointestinal tract, reproductive system
Barium	5,410	8.11	6.2	-	50 (b)	0.5 (b)	0.5 (b)	92	INH, ING, CON	Eyes, skin, respiratory, heart,CNS
Cadmium	6	0.006	-	-	9	0.002 (b)	0.005 (b)	806	INH, ING	Respiratory, kidneys, prostate, blood
Chromium	749	0.093	1.4	-	250	0.5 (b)	1 (b)	1,335	INH, ING, CON	Eyes, skin, respiratory
Copper	8,240	-	5.2	-	100	1 (b)	1 (b)	121	INH, ING, CON	Eyes, skin, respiratory, liver, kidneys
Nickel	567	-	0.67	-	10	0.2 (b)	1 (b)	1,764	INH, ING, CON	Nasal cavities, lungs, skin

Table 1

Chemical and Physical Characteristics of COCs
Former Emerson Power Transmission Facility
Ithaca, New York (a)

Cyanide										
Cyanide	34.9	1.6	-	-	25 (b)	5 (b)	5 (b)	-	INH, ING, CON, ABS	Eyes, skin, respiratory, cardiovascular, CNS, thyroid, blood
Polychlorinated Biphenyls										
Aroclor 1254	32.2	-	-	-	Ca	0.5 (b)	0.5 (b)	15,528	INH, ING, CON, ABS	Eyes, skin, liver, reproductive system

a/ ppm = parts per million; mg/m^3 = milligrams per cubic meter; < SCO_{UU} = less than unrestricted use soil cleanup objective; IDLH = immediately dangerous to life or health; ACGIH = American Conference of Governmental Industrial
TLV-TWA = Threshold limit value - time weighted average; PEL = Permissible exposure limit, 8-hr, time weighted average; CNS = Central Nervous System; Ca = Carcinogenic;
INH = Inhalation; ING = Ingestion; CON = Contact; ABS = Absorption; ND = not determined.

b/ value in mg/m^3.

c/ values from https://www.osha.gov/dsg/annotated-pels/tablez-1.html; accessed on 10/05/18.

FIGURES

REFERENCES:

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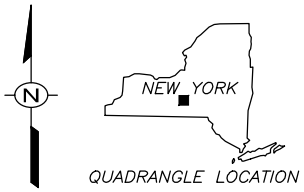

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SCALE, FEET

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FIGURE 1

SITE LOCATION

FORMER EMERSON POWER TRANSMISSION
ITHACA, NEW YORK

PREPARED FOR
EMERSON
ST. LOUIS, MISSOURI

DWG Name: 314P0551-A02
Checked: SLB 07/31/2018
Approved:
A
Drawn By: RLL 07/31/2018

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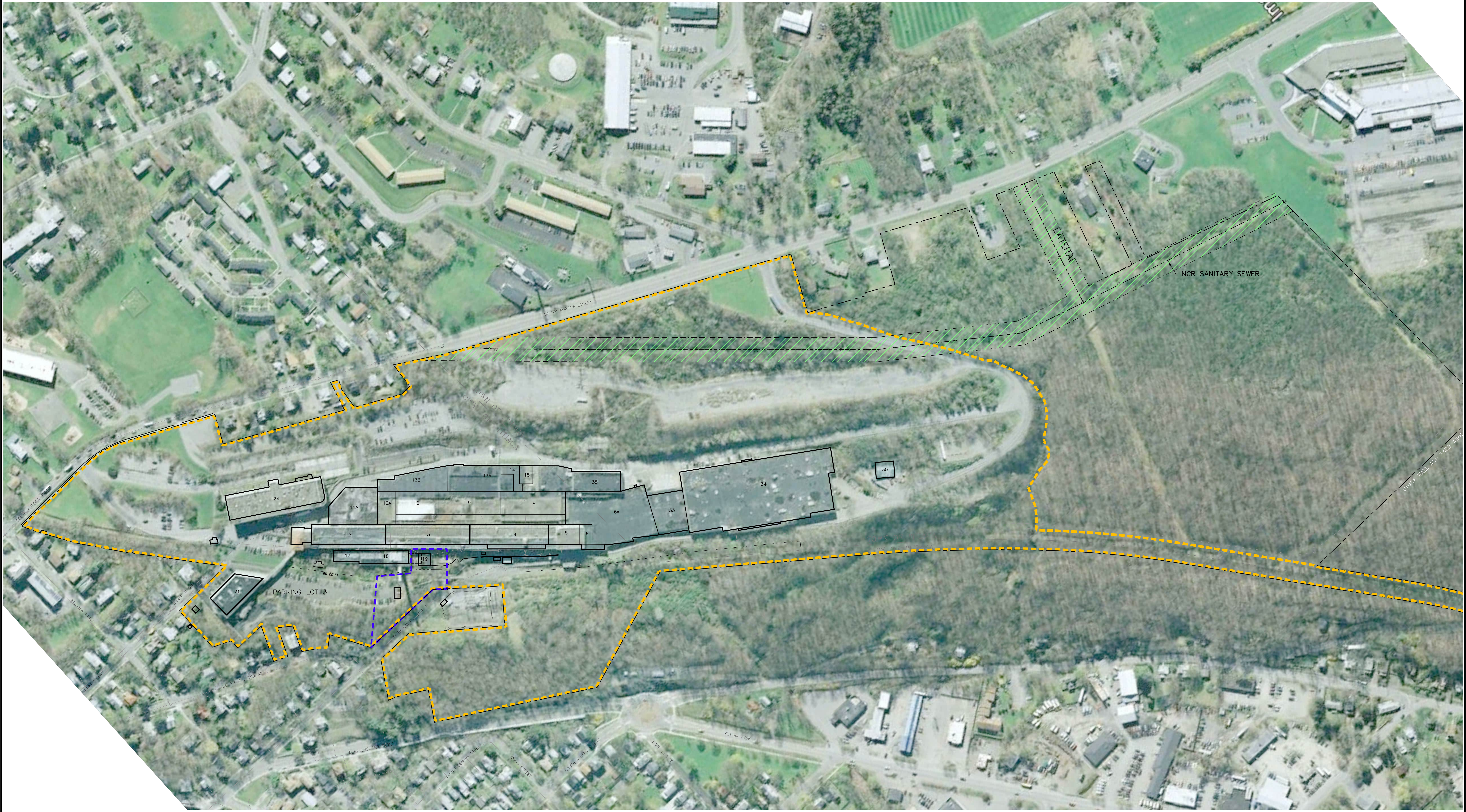

LEGEND

34 BUILDING NUMBER

SANITARY SEWER

PROPERTY LINE

DEED RESTRICTION PLACED BY EMERSON

BOUNDARY FOR OU-1 (RETAINED PROPERTY)

BOUNDARY FOR OU-2

150 0 150 300

SCALE, FEET

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D

REVISIONS

REV	DESCRIPTION
	Revised: Chkd: Appr.:
	Revised: Chkd: Appr.:
	Revised: Chkd: Appr.:

SEAL

DATE

DRAWN BY 03/12/2020

CHECKED 09/01/2021

APPROVED

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SITE LAYOUT

SITE MANAGEMENT PLAN
FORMER EMERSON POWER TRANSMISSION
ITHACA, NEW YORK

PREPARED FOR
EMERSON – ST. LOUIS, MISSOURI

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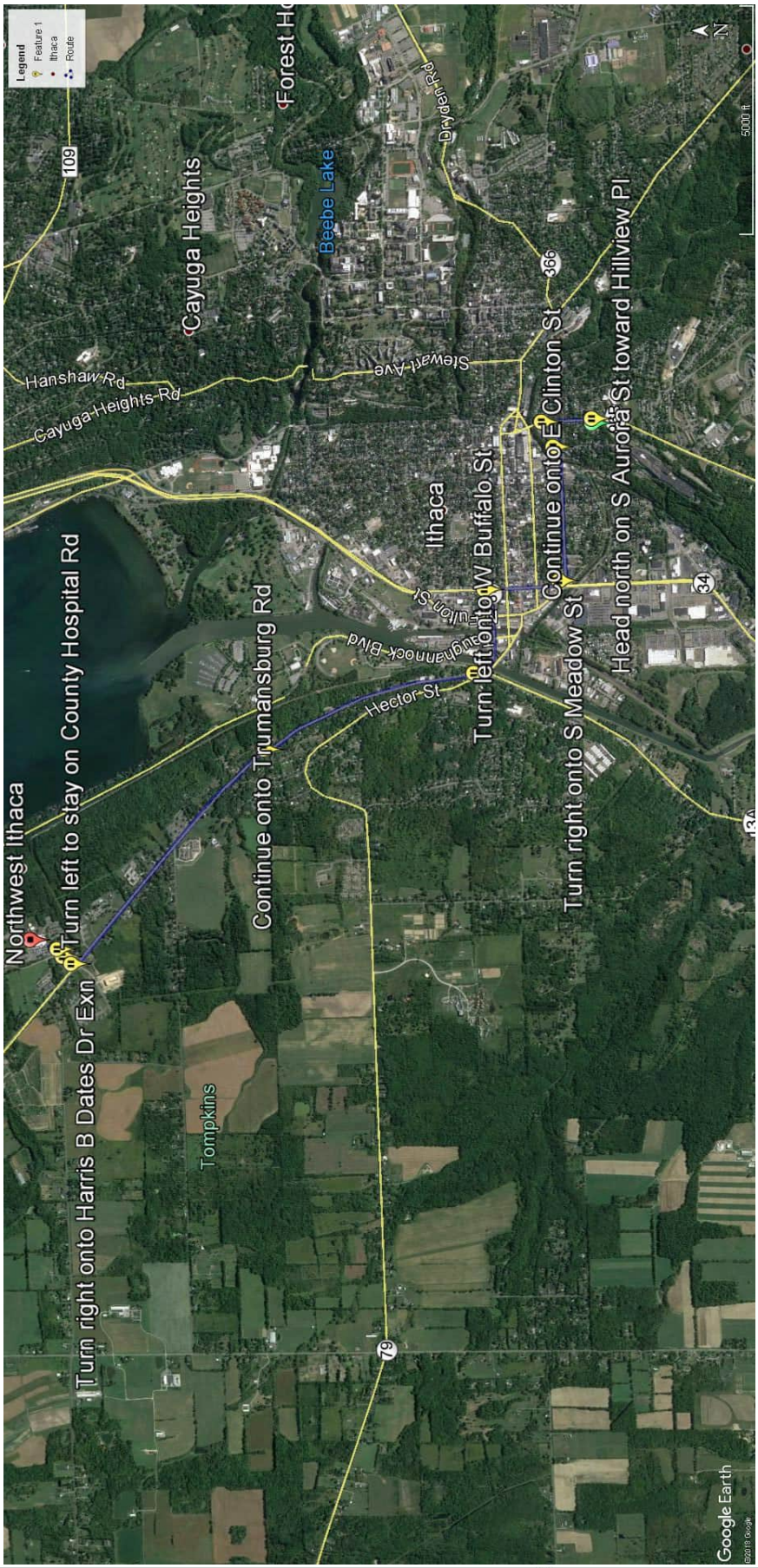
FIGURE 2

Drawing Number
314P1545.001–D132



A	Drawn By: emk 09/19/18	Checked:
		Approved:

DWG Name: 314000551_Figure 3_A03.pub

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FIGURE 3

HOSPITAL ROUTE

FORMER EMERSON POWER TRANSMISSION
ITHACA, NEW YORK
PREPARED FOR
EMERSON
ST. LOUIS, MISSOURI

APPENDIX

A SAFETY TIPS AND PERSONAL HYGIENE

SAFETY TIPS AND PERSONAL HYGIENE

1. During the pre-work safety meeting, the following information will be discussed:
   a. a description of the scheduled work and any known problem areas
   b. the level of protection required
   c. emergency medical information
   d. the locations of the first aid kit, telephones, nearest water supply, ice, and lavatory
2. Use the nearest lavatory.
3. Lay out and check safety gear.
4. Put on safety gear in the following order:
   a. Steel-toed work boots.
   b. Safety glasses
   c. Hearing protection (when applicable)
   d. Nitrile gloves (when applicable)
5. Select a buddy to act as a safety backup (where applicable).
6. Check your buddy's equipment and have your buddy check yours for rips, tears, or malfunctions.
7. If any equipment or gear gets damaged stop work and replace it immediately.
8. Remove nitrile gloves in the following manner:

Photo credit: https://www.yourglovesource.com

9. Dispose of PPE as prescribed by the HASP.
10. Whenever possible, avoid contact with contaminated or suspected contaminated surfaces.
11. When in the work zone, do not eat, drink, smoke, chew gum or tobacco, or engage in any other practice that increases the probability of hand-to-mouth transfer or ingestion of material.
12. Wash hands and face thoroughly after leaving the work area and before eating, drinking, or any other activities.

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APPENDIX

B NIOSH POCKET GUIDE TO CHEMICAL HAZARDS

Arsenic (organic compounds, as As)	Formula:	CAS#:	RTECS#:	IDLH: N.D.
Conversion:	**DOT:**			

Synonyms/Trade Names: Synonyms vary depending upon the specific organic arsenic compound.

Exposure Limits: **NIOSH REL:** none **OSHA PEL:** TWA 0.5 mg/m^3	**Measurement Methods (see Table 1):** **NIOSH** 5022
Physical Description: Appearance and odor vary depending upon the specific organic arsenic compound.	

Chemical & Physical Properties: Properties vary depending upon the specific organic arsenic compound.	**Personal Protection/Sanitation (see Table 2):** Recommendations regarding personal protective clothing vary depending upon the specific compound.	**Respirator Recommendations (see Tables 3 and 4):** Not available.

Incompatibilities and Reactivities: Varies

Exposure Routes, Symptoms, Target Organs (see Table 5): **ER:** Inh, Ing, Con **SY:** In animals: irrit skin, possible derm; resp distress; diarr; kidney damage; musc tremor, convuls; possible GI tract, repro effects; possible liver damage **TO:** Skin, resp sys, kidneys, CNS, liver, GI tract, repro sys	**First Aid (see Table 6):** **Eye:** Irr immed **Skin:** Soap wash immed **Breath:** Resp support **Swallow:** Medical attention immed

Barium nitrate (as Ba)	**Formula:** $Ba(NO_3)_2$	**CAS#:** 10022-31-8	**RTECS#:** CQ9625000	**IDLH:** 50 mg/m^3 (as Ba)
Conversion:	**DOT:** 1446 141			
Synonyms/Trade Names: Barium dinitrate, Barium(II) nitrate (1:2), Barium salt of nitric acid				
Exposure Limits: **NIOSH REL*:** TWA 0.5 mg/m^3 **OSHA PEL*:** TWA 0.5 mg/m^3 [***Note:** The REL and PEL also apply to other soluble barium compounds (as Ba) except Barium sulfate.]				**Measurement Methods (see Table 1):** **NIOSH** 7056 **OSHA** ID121
Physical Description: White, odorless solid.				

Chemical & Physical Properties:	**Personal Protection/Sanitation (see Table 2):**	**Respirator Recommendations (see Tables 3 and 4):**
MW: 261.4 **BP:** Decomposes **Sol:** 9% **FI.P:** NA **IP:** ? **Sp.Gr:** 3.24 **VP:** Low **MLT:** 1094°F **UEL:** NA **LEL:** NA Noncombustible Solid, but will accelerate the burning of combustible materials.	**Skin:** Prevent skin contact **Eyes:** Prevent eye contact **Wash skin:** When contam **Remove:** When wet or contam **Change:** Daily	**NIOSH/OSHA** **5 mg/m^3:** 95XQ/Sa **12.5 mg/m^3:** Sa:Cf/PaprHie **25 mg/m^3:** 100F/SaT:Cf/PaprTHie/ScbaF/SaF **50 mg/m^3:** SaF:Pd,Pp **§:** ScbaF:Pd,Pp/SaF:Pd,Pp:AScba **Escape:** 100F/ScbaE

Incompatibilities and Reactivities: Acids, oxidizers, aluminum-magnesium alloys, (barium dioxide + zinc) [**Note:** Contact with combustible material may cause fire.]	
Exposure Routes, Symptoms, Target Organs (see Table 5): **ER:** Inh, Ing, Con **SY:** Irrit eyes, skin, upper resp sys; skin burns; gastroenteritis; musc spasm; slow pulse, extrasystoles; hypokalemia **TO:** Eyes, skin, resp sys, heart, CNS	**First Aid (see Table 6):** **Eye:** Irr immed **Skin:** Water flush immed **Breath:** Resp support **Swallow:** Medical attention immed

Chlorodiphenyl (54% chlorine)	**Formula:** $C_6H_3Cl_2C_6H_2Cl_3$ (approx)	**CAS#:** 11097-69-1	**RTECS#:** TQ1360000	**IDLH:** Ca [5 mg/m^3]
Conversion:	**DOT:** 2315 171			
Synonyms/Trade Names: Aroclor® 1254, PCB, Polychlorinated biphenyl				
Exposure Limits: **NIOSH REL*:** Ca TWA 0.001 mg/m^3 See Appendix A [***Note:** The REL also applies to other PCBs.] **OSHA PEL:** TWA 0.5 mg/m^3 [skin]			**Measurement Methods (see Table 1):** **NIOSH** 5503 **OSHA** PV2088	
Physical Description: Colorless to pale-yellow, viscous liquid or solid (below 50°F) with a mild, hydrocarbon odor.				
Chemical & Physical Properties: **MW:** 326 (approx) **BP:** 689-734°F **Sol:** Insoluble **Fl.P:** NA **IP:** ? **Sp.Gr(77°F):** 1.38 **VP:** 0.00006 mmHg **FRZ:** 50°F **UEL:** NA **LEL:** NA	**Personal Protection/Sanitation (see Table 2):** **Skin:** Prevent skin contact **Eyes:** Prevent eye contact **Wash skin:** When contam **Remove:** When wet or contam **Change:** Daily **Provide:** Eyewash Quick drench		**Respirator Recommendations (see Tables 3 and 4):** **NIOSH** **¥:** ScbaF:Pd,Pp/SaF:Pd,Pp:AScba **Escape:** GmFOv100/ScbaE	
Nonflammable Liquid, but exposure in a fire results in the formation of a black soot containing PCBs, polychlorinated dibenzofurans, and chlorinated dibenzo-p-dioxins.				
Incompatibilities and Reactivities: Strong oxidizers				
Exposure Routes, Symptoms, Target Organs (see Table 5): **ER:** Inh, Abs, Ing, Con **SY:** Irrit eyes, chloracne; liver damage; repro effects; [carc] **TO:** Skin, eyes, liver, repro sys [in animals: tumors of the pituitary gland & liver, leukemia]			**First Aid (see Table 6):** **Eye:** Irr immed **Skin:** Soap wash immed **Breath:** Resp support **Swallow:** Medical attention immed	

C

Coal tar pitch volatiles	Formula:	CAS#: 65996-93-2	RTECS#: GF8655000	IDLH: Ca [80 mg/m^3]
Conversion:	**DOT:** 2713 153 (acridine)			

Synonyms/Trade Names: Synonyms vary depending upon the specific compound (e.g., pyrene, phenanthrene, acridine, chrysene, anthracene & benzo(a)pyrene).
[**Note:** NIOSH considers coal tar, coal tar pitch, and creosote to be coal tar products.]

Exposure Limits:
NIOSH REL: Ca
TWA 0.1 mg/m^3 (cyclohexane-extractable fraction)
See Appendix A
See Appendix C
OSHA PEL: TWA 0.2 mg/m^3 (benzene-soluble fraction) [1910.1002]
See Appendix C

Measurement Methods (see Table 1):
OSHA 58

Physical Description: Black or dark-brown amorphous residue.

Chemical & Physical Properties:
Properties vary depending upon the specific compound.
Combustible Solids

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: Daily
Remove: N.R.
Change: Daily

Respirator Recommendations (see Tables 3 and 4):
NIOSH
¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv100/ScbaE

Incompatibilities and Reactivities: Strong oxidizers

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Con
SY: Derm, bron, [carc]
TO: Resp sys, skin, bladder, kidneys [lung, kidney & skin cancer]

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash immed
Breath: Resp support
Swallow: Medical attention immed

1,2-Dichloroethylene	Formula: ClCH=CHCl	CAS#: 540-59-0	RTECS#: KV9360000	IDLH: 1000 ppm
Conversion: 1 ppm = 3.97 mg/m^3	**DOT:** 1150 130P			
Synonyms/Trade Names: Acetylene dichloride, cis-Acetylene dichloride, trans-Acetylene dichloride, sym-Dichloroethylene				
Exposure Limits: **NIOSH REL:** TWA 200 ppm (790 mg/m^3) **OSHA PEL:** TWA 200 ppm (790 mg/m^3)				**Measurement Methods (see Table 1):** **NIOSH** 1003 **OSHA** 7
Physical Description: Colorless liquid (usually a mixture of the cis & trans isomers) with a slightly acrid, chloroform-like odor.				
Chemical & Physical Properties: **MW:** 97.0 **BP:** 118-140°F **Sol:** 0.4% **Fl.P:** 36-39°F **IP:** 9.65 eV **Sp.Gr(77°F):** 1.27 **VP:** 180-265 mmHg **FRZ:** -57 to -115°F **UEL:** 12.8% **LEL:** 5.6% Class IB Flammable Liquid	**Personal Protection/Sanitation (see Table 2):** **Skin:** Prevent skin contact **Eyes:** Prevent eye contact **Wash skin:** When contam **Remove:** When wet (flamm) **Change:** N.R.		**Respirator Recommendations (see Tables 3 and 4):** **NIOSH/OSHA** **1000 ppm:** Sa:Cf£/PaprOv£/CcrFOv/ GmFOv/ScbaF/SaF **§:** ScbaF:Pd,Pp/SaF:Pd,Pp:AScba **Escape:** GmFOv/ScbaE	
	Incompatibilities and Reactivities: Strong oxidizers, strong alkalis, potassium hydroxide, copper [**Note:** Usually contains inhibitors to prevent polymerization.]			
Exposure Routes, Symptoms, Target Organs (see Table 5): **ER:** Inh, Ing, Con **SY:** Irrit eyes, resp sys; CNS depres **TO:** Eyes, resp sys, CNS			**First Aid (see Table 6):** **Eye:** Irr immed **Skin:** Soap wash prompt **Breath:** Resp support **Swallow:** Medical attention immed	

Ethylene dichloride	**Formula:** $ClCH_2CH_2Cl$	**CAS#:** 107-06-2	**RTECS#:** KI0525000	**IDLH:** Ca [50 ppm]
Conversion: 1 ppm = 4.05 mg/m^3	**DOT:** 1184 131			
Synonyms/Trade Names: 1,2-Dichloroethane; Ethylene chloride; Glycol dichloride				

Exposure Limits:
NIOSH REL: Ca
TWA 1 ppm (4 mg/m^3)
ST 2 ppm (8 mg/m^3)
See Appendix A,
See Appendix C (Chloroethanes)
OSHA PEL†: TWA 50 ppm
C 100 ppm
200 ppm [5-minute maximum peak in any 3 hours]

Measurement Methods (see Table 1):
NIOSH 1003
OSHA 3

Physical Description: Colorless liquid with a pleasant, chloroform-like odor. [**Note:** Decomposes slowly, becomes acidic & darkens in color.]

Chemical & Physical Properties:
MW: 99.0
BP: 182°F
Sol: 0.9%
FI.P: 56°F
IP: 11.05 eV
Sp.Gr: 1.24
VP: 64 mmHg
FRZ: -32°F
UEL: 16%
LEL: 6.2%
Class IB Flammable Liquid

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet (flamm)
Change: N.R.
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH
¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Strong oxidizers & caustics; chemically-active metals such as magnesium or aluminum powder, sodium & potassium; liquid ammonia [**Note:** Decomposes to vinyl chloride & HCl above 1112°F.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Ing, Abs, Con
SY: Irrit eyes, corn opac; CNS depres; nau, vomit; derm; liver, kidney, CVS damage; [carc]
TO: Eyes, skin, kidneys, liver, CNS, CVS [in animals: forestomach, mammary gland & circulatory sys cancer]

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash prompt
Breath: Resp support
Swallow: Medical attention immed

Methyl chloroform	Formula: CH_3CCl_3	CAS#: 71-55-6	RTECS#: KJ2975000	IDLH: 700 ppm
Conversion: 1 ppm = 5.46 mg/m^3	**DOT:** 2831 160			
Synonyms/Trade Names: Chlorothene; 1,1,1-Trichloroethane; 1,1,1-Trichloroethane (stabilized)				
Exposure Limits: **NIOSH REL:** C 350 ppm (1900 mg/m^3) [15-minute] See Appendix C (Chloroethanes) **OSHA PEL†:** TWA 350 ppm (1900 mg/m^3)				**Measurement Methods (see Table 1):** **NIOSH** 1003
Physical Description: Colorless liquid with a mild, chloroform-like odor.				
Chemical & Physical Properties: **MW:** 133.4 **BP:** 165°F **Sol:** 0.4% **FI.P:** ? **IP:** 11.00 eV **Sp.Gr:** 1.34 **VP:** 100 mmHg **FRZ:** -23°F **UEL:** 12.5% **LEL:** 7.5% Combustible Liquid, but burns with difficulty.	**Personal Protection/Sanitation (see Table 2):** **Skin:** Prevent skin contact **Eyes:** Prevent eye contact **Wash skin:** When contam **Remove:** When wet or contam **Change:** N.R.		**Respirator Recommendations (see Tables 3 and 4):** **NIOSH/OSHA** **700 ppm:** Sa*/ScbaF **§:** ScbaF:Pd,Pp/SaF:Pd,Pp:AScba **Escape:** GmFOv/ScbaE	
	Incompatibilities and Reactivities: Strong caustics; strong oxidizers; chemically-active metals such as zinc, aluminum, magnesium powders, sodium & potassium; water [**Note:** Reacts slowly with water to form hydrochloric acid.]			
Exposure Routes, Symptoms, Target Organs (see Table 5): **ER:** Inh, Ing, Con **SY:** Irrit eyes, skin; head, lass, CNS depres, poor equi; derm; card arrhy; liver damage **TO:** Eyes, skin, CNS, CVS, liver			**First Aid (see Table 6):** **Eye:** Irr immed **Skin:** Soap wash prompt **Breath:** Resp support **Swallow:** Medical attention immed	

Methylene chloride	Formula: CH_2Cl_2	CAS#: 75-09-2	RTECS#: PA8050000	IDLH: Ca [2300 ppm]
Conversion: 1 ppm = 3.47 mg/m^3	**DOT:** 1593 160			
Synonyms/Trade Names: Dichloromethane, Methylene dichloride				
Exposure Limits: **NIOSH REL:** Ca See Appendix A **OSHA PEL:** [1910.1052] TWA 25 ppm ST 125 ppm			**Measurement Methods (see Table 1):** **NIOSH** 1005, 3800 **OSHA** 59, 80	
Physical Description: Colorless liquid with a chloroform-like odor. [**Note:** A gas above 104°F.]				
Chemical & Physical Properties: **MW:** 84.9 **BP:** 104°F **Sol:** 2% **Fl.P:** ? **IP:** 11.32 eV **Sp.Gr:** 1.33 **VP:** 350 mmHg **FRZ:** -139°F **UEL:** 23% **LEL:** 13% Combustible Liquid	**Personal Protection/Sanitation (see Table 2):** **Skin:** Prevent skin contact **Eyes:** Prevent eye contact **Wash skin:** When contam **Remove:** When wet or contam **Change:** N.R. **Provide:** Eyewash Quick drench		**Respirator Recommendations (see Tables 3 and 4):** **NIOSH** **¥:** ScbaF:Pd,Pp/SaF:Pd,Pp:AScba **Escape:** GmFOv/ScbaE **See Appendix E** (page 351)	
Incompatibilities and Reactivities: Strong oxidizers; caustics; chemically-active metals such as aluminum, magnesium powders, potassium & sodium; concentrated nitric acid				
Exposure Routes, Symptoms, Target Organs (see Table 5): **ER:** Inh, Abs, Ing, Con **SY:** Irrit eyes, skin; lass, drow, dizz; numb, tingle limbs; nau; [carc] **TO:** Eyes, skin, CVS, CNS [in animals: lung, liver, salivary & mammary gland tumors]			**First Aid (see Table 6):** **Eye:** Irr immed **Skin:** Soap wash prompt **Breath:** Resp support **Swallow:** Medical attention immed	

P

Potassium cyanide (as CN)	Formula: KCN	CAS#: 151-50-8	RTECS#: TS8750000	IDLH: 25 mg/m^3 (as CN)
Conversion:	**DOT:** 1680 157 (solid); 3413 157 (solution)			
Synonyms/Trade Names: Potassium salt of hydrocyanic acid				
Exposure Limits: **NIOSH REL*:** C 5 mg/m^3 (4.7 ppm) [10-minute] **OSHA PEL*:** TWA 5 mg/m^3 [***Note:** The REL and PEL also apply to other cyanides (as CN) except Hydrogen cyanide.]				**Measurement Methods (see Table 1):** **NIOSH** 6010, 7904
Physical Description: White, granular or crystalline solid with a faint, almond-like odor.				
Chemical & Physical Properties: **MW:** 65.1 **BP:** 2957°F **Sol(77°F):** 72% **FI.P:** NA **IP:** NA **Sp.Gr:** 1.55 **VP:** 0 mmHg (approx) **MLT:** 1173°F **UEL:** NA **LEL:** NA Noncombustible Solid, but contact with acids releases highly flammable hydrogen cyanide.	**Personal Protection/Sanitation (see Table 2):** **Skin:** Prevent skin contact **Eyes:** Prevent eye contact **Wash skin:** When contam **Remove:** When wet or contam **Change:** Daily **Provide:** Eyewash Quick drench		**Respirator Recommendations (see Tables 3 and 4):** **NIOSH/OSHA** **25 mg/m^3:** Sa/ScbaF **§:** ScbaF:Pd,Pp/SaF:Pd,Pp:AScba **Escape:** GmFS100/ScbaE	
Incompatibilities and Reactivities: Strong oxidizers (such as acids, acid salts, chlorates & nitrates) [**Note:** Absorbs moisture from the air forming a syrup.]				
Exposure Routes, Symptoms, Target Organs (see Table 5): **ER:** Inh, Abs, Ing, Con **SY:** Irrit eyes, skin, upper resp sys; asphy; lass, head, conf; nau, vomit; incr resp rate, slow gasping respiration; thyroid, blood changes **TO:** Eyes, skin, resp sys, CVS, CNS, thyroid, blood			**First Aid (see Table 6):** **Eye:** Irr immed **Skin:** Soap wash immed **Breath:** Resp support **Swallow:** Medical attention immed	

S

Sodium cyanide (as CN)	Formula: NaCN	CAS#: 143-33-9	RTECS#: VZ7525000	IDLH: 25 mg/m^3 (as CN)
Conversion:	**DOT:** 1689 157 (solid); 3414 157 (solution)			

Synonyms/Trade Names: Sodium salt of hydrocyanic acid

Exposure Limits:
NIOSH REL*: C 5 mg/m^3 (4.7 ppm) [10-minute]
OSHA PEL*: TWA 5 mg/m^3
[***Note:** The REL and PEL also apply to other cyanides (as CN) except Hydrogen cyanide.]

Measurement Methods (see Table 1):
NIOSH 6010, 7904

Physical Description: White, granular or crystalline solid with a faint, almond-like odor.

Chemical & Physical Properties:
MW: 49.0
BP: 2725°F
Sol(77°F): 58%
Fl.P: NA
IP: NA
Sp.Gr: 1.60
VP: 0 mmHg (approx)
MLT: 1047°F
UEL: NA
LEL: NA
Noncombustible Solid, but contact with acids releases highly flammable hydrogen cyanide.

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: Daily
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH/OSHA
25 mg/m^3: Sa/ScbaF
§: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFS100/ScbaE

Incompatibilities and Reactivities: Strong oxidizers (such as acids, acid salts, chlorates & nitrates)
[**Note:** Absorbs moisture from the air forming a syrup.]

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit eyes, skin; asphy; lass, head, conf; nau, vomit; incr resp rate; slow gasping respiration; thyroid, blood changes
TO: Eyes, skin, CVS, CNS, thyroid, blood

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash immed
Breath: Resp support
Swallow: Medical attention immed

Tetrachloroethylene	Formula: $Cl_2C=CCl_2$	CAS#: 127-18-4	RTECS#: KX3850000	IDLH: Ca [150 ppm]
Conversion: 1 ppm = 6.78 mg/m^3	**DOT:** 1897 160			
Synonyms/Trade Names: Perchlorethylene, Perchloroethylene, Perk, Tetrachlorethylene				

Exposure Limits:
NIOSH REL: Ca
Minimize workplace exposure concentrations.
See Appendix A
OSHA PEL†: TWA 100 ppm
C 200 ppm (for 5 mins. in any 3-hr. period), with a maximum peak of 300 ppm

Measurement Methods (see Table 1):
NIOSH 1003
OSHA 1001

Physical Description: Colorless liquid with a mild, chloroform-like odor.

Chemical & Physical Properties:
MW: 165.8
BP: 250°F
Sol: 0.02%
FI.P: NA
IP: 9.32 eV
Sp.Gr: 1.62
VP: 14 mmHg
FRZ: -2°F
UEL: NA
LEL: NA
Noncombustible Liquid, but decomposes in a fire to hydrogen chloride and phosgene.

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: N.R.
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH
¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Strong oxidizers; chemically-active metals such as lithium, beryllium & barium; caustic soda; sodium hydroxide; potash

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit eyes, skin, nose, throat, resp sys; nau; flush face, neck; dizz, inco; head, drow; skin eryt; liver damage; [carc]
TO: Eyes, skin, resp sys, liver, kidneys, CNS [in animals: liver tumors]

First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash prompt
Breath: Resp support
Swallow: Medical attention immed

Trichloroethylene	Formula: $ClCH=CCl_2$	CAS#: 79-01-6	RTECS#: KX4550000	IDLH: Ca [1000 ppm]
Conversion: 1 ppm = 5.37 mg/m^3	**DOT:** 1710 160			
Synonyms/Trade Names: Ethylene trichloride, TCE, Trichloroethene, Trilene				

Exposure Limits:
NIOSH REL: Ca
See Appendix A
See Appendix C
OSHA PEL†: TWA 100 ppm
C 200 ppm
300 ppm (5-minute maximum peak in any 2 hours)

Measurement Methods (see Table 1):
NIOSH 1022, 3800
OSHA 1001

Physical Description: Colorless liquid (unless dyed blue) with a chloroform-like odor.

Chemical & Physical Properties:
MW: 131.4
BP: 189°F
Sol: 0.1%
Fl.P: ?
IP: 9.45 eV
Sp.Gr: 1.46
VP: 58 mmHg
FRZ: -99°F
UEL(77°F): 10.5%
LEL(77°F): 8%
Combustible Liquid, but burns with difficulty.

Personal Protection/Sanitation (see Table 2):
Skin: Prevent skin contact
Eyes: Prevent eye contact
Wash skin: When contam
Remove: When wet or contam
Change: N.R.
Provide: Eyewash
Quick drench

Respirator Recommendations (see Tables 3 and 4):
NIOSH
¥: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba
Escape: GmFOv/ScbaE

Incompatibilities and Reactivities: Strong caustics & alkalis; chemically-active metals (such as barium, lithium, sodium, magnesium, titanium & beryllium)

Exposure Routes, Symptoms, Target Organs (see Table 5):
ER: Inh, Abs, Ing, Con
SY: Irrit eyes, skin; head, vis dist, lass, dizz, tremor, drow, nau, vomit; derm; card arrhy, pares; liver inj; [carc]
TO: Eyes, skin, resp sys, heart, liver, kidneys, CNS [in animals: liver & kidney cancer]

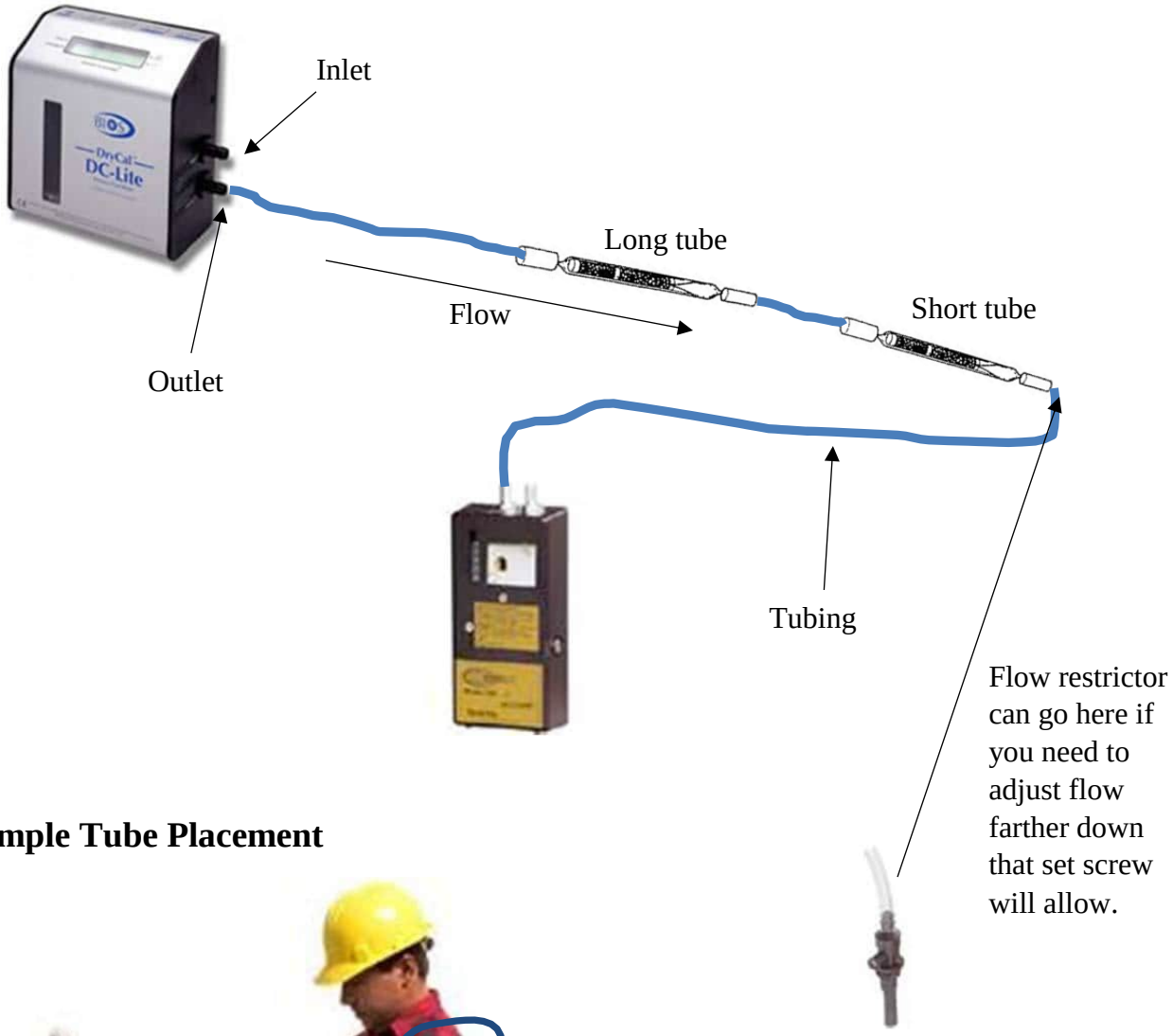
First Aid (see Table 6):
Eye: Irr immed
Skin: Soap wash prompt
Breath: Resp support
Swallow: Medical attention immed

Vinyl chloride	Formula: CH_2=CHCl	CAS#: 75-01-4	RTECS#: KU9625000	IDLH: Ca [N.D.]
Conversion: 1 ppm = 2.56 mg/m^3	**DOT:** 1086 116P (inhibited)			
Synonyms/Trade Names: Chloroethene, Chloroethylene, Ethylene monochloride, Monochloroethene, Monochloroethylene, VC, Vinyl chloride monomer (VCM)				
Exposure Limits: **NIOSH REL:** Ca See Appendix A **OSHA PEL:** [1910.1017] TWA 1 ppm C 5 ppm [15-minute]			**Measurement Methods (see Table 1):** **NIOSH** 1007 **OSHA** 4, 75	
Physical Description: Colorless gas or liquid (below 7°F) with a pleasant odor at high concentrations. [**Note:** Shipped as a liquefied compressed gas.]				
Chemical & Physical Properties: **MW:** 62.5 **BP:** 7°F **Sol(77°F):** 0.1% **Fl.P:** NA (Gas) **IP:** 9.99 eV **RGasD:** 2.21 **VP:** 3.3 atm **FRZ:** -256°F **UEL:** 33.0% **LEL:** 3.6% Flammable Gas	**Personal Protection/Sanitation (see Table 2):** **Skin:** Frostbite **Eyes:** Frostbite **Wash skin:** N.R. **Remove:** When wet (flamm) **Change:** N.R. **Provide:** Frostbite wash		**Respirator Recommendations (see Tables 3 and 4):** **NIOSH** **¥:** ScbaF:Pd,Pp/SaF:Pd,Pp:AScba **Escape:** GmFS/ScbaE **See Appendix E** (page 351)	
	Incompatibilities and Reactivities: Copper, oxidizers, aluminum, peroxides, iron, steel [**Note:** Polymerizes in air, sunlight, or heat unless stabilized by inhibitors such as phenol. Attacks iron & steel in presence of moisture.]			
Exposure Routes, Symptoms, Target Organs (see Table 5): **ER:** Inh, Con (liquid) **SY:** Lass; abdom pain, GI bleeding; enlarged liver; pallor or cyan of extremities; liquid: frostbite; [carc] **TO:** Liver, CNS, blood, resp sys, lymphatic sys [liver cancer]			**First Aid (see Table 6):** **Eye:** Frostbite **Skin:** Frostbite **Breath:** Resp support	

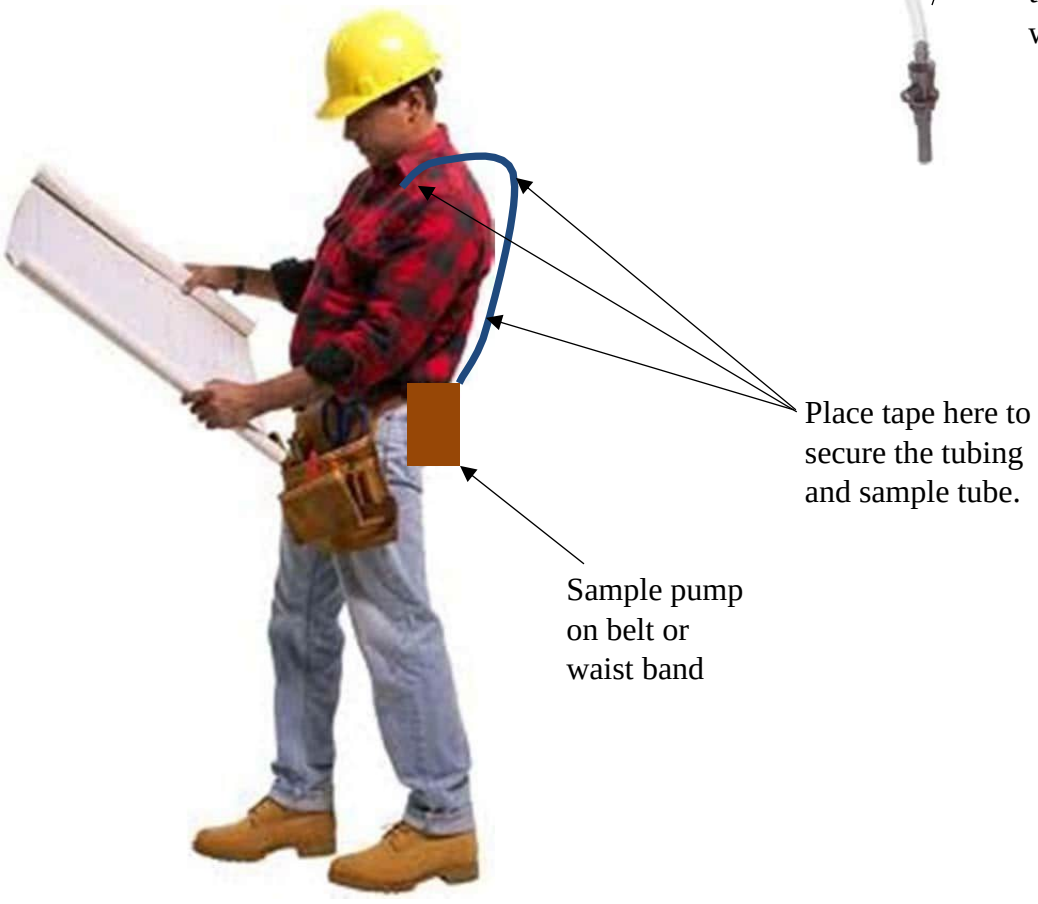
APPENDIX

C PERSONAL SAMPLING PUMP PROCEDURES

Vinyl Chloride Calibration Setup



Sample Tube Placement



CH_2=CHCl MW: 62.50 CAS: 75-01-4 RTECS: KU9625000

METHOD: 1007, Issue 2 **EVALUATION: FULL** **Issue 1: 15 February 1984**
Issue 2: 15 August 1994

OSHA : 1 ppm; C 5 ppm
NIOSH: lowest feasible; carcinogen
ACGIH: 5 ppm; carcinogen
(1 ppm = 2.56 mg/m^3 @ NTP)

PROPERTIES: BP -14 °C; vapor density 2.2 (air = 1); lower explosive limit = 4% v/v in air

SYNONYMS: chloroethylene; chloroethethene.

SAMPLING

SAMPLER: SOLID SORBENT TUBE
(2 tandem tubes, each with 150 mg activated coconut charcoal)

FLOW RATE: 0.05 L/min

VOL-MIN: 0.7 L
-MAX: 5 L

SHIPMENT: separate primary and backup tubes and cap each

SAMPLE STABILITY: 10 days @ 25 °C

BLANKS: 2 to 10 field blanks per set

ACCURACY

RANGE STUDIED: 1 to 64 mg/m^3 [1]

BIAS: - 6%

OVERALL PRECISION ($\hat{S}_{rT}$): 0.06 [1]

ACCURACY: ± 17.8%

MEASUREMENT

TECHNIQUE: GAS CHROMATOGRAPHY, FID

ANALYTE: vinyl chloride

DESORPTION: 1 mL carbon disulfide; 30 min

INJECTION ALIQUOT: 5 µL

COLUMN: stainless steel, 6.1 m x 3.2 mm, 10% SE-30 on 80/100 mesh Chromosorb W (AW-DMCS)

CARRIER GAS: He, 40 mL/min

TEMPERATURE-INJECTOR: 230 °C
-DETECTOR: 230 °C
-COLUMN: 60 °C

CALIBRATION: solutions of vinyl chloride in CS_2

RANGE: 2 to 200 µg per sample [1]

ESTIMATED LOD: 0.04 µg per sample [1]

PRECISION ($\hat{S}_r$): not determined

APPLICABILITY: The working range is 0.4 to 40 mg/m^3 (0.16 to 16 ppm) for a 5-L air sample. The method is applicable to 15-min samples at concentrations of 1 ppm or higher.

INTERFERENCES: Other than the possibility of loss of sample upon storage of two weeks or more at room temperature, none have been noted.

OTHER METHODS: This is a revision of P&CAM 178 [2].

REAGENTS:

1. Carbon disulfide,* chromatographic quality.
2. Vinyl chloride,*, 99.9%, in lecture bottle fitted with valve and septum.
3. Calibration stock solutions 0.26 mg/mL.
   a. Insert the tip of a gas syringe containing 1 mL vinyl chloride gas under the surface of 5 mL CS_2 in a 10-mL volumetric flask.
   b. Open the valve of the syringe and withdraw the plunger to pull CS_2 into the barrel. (As vinyl chloride dissolves, a vacuum will be created, pulling CS_2 into the syringe.)
   c. Push the solution from the syringe into the flask. Rinse the syringe twice with 1-mL portions of CS_2 and add the washings to the flask.
   d. Dilute to the mark with CS_2.
4. Helium, purified.
5. Hydrogen, purified.
6. Air, filtered.

* See SPECIAL PRECAUTIONS.

EQUIPMENT:

1. Sampler: two tandem glass tubes, 7 cm long, 6-mm OD, 4-mm ID, flame-sealed ends, each containing 150 mg of 20/40 mesh activated (600 °C) coconut shell charcoal. A silylated glass wool plug precedes the charcoal beds and a 3-mm urethane foam plug follows the charcoal beds. Plastic caps are included for sealing after use. Pressure drop across each tube at 1 L/min airflow must be less than 3.4 kPa.
   NOTE: A pair of two-section (100 mg/50 mg) tubes may be used. (SKC ST226-01, or equivalent).
2. Personal sampling pump, 0.05 L/min, with flexible connecting tubing.
3. Gas chromatograph, flame ionization detector, integrator and column (page 1007-1).
4. File.
5. Bent wire for removing plugs from sampling tube.
6. Vials, 2-mL, glass with PTFE-lined septa and crimp-on seals.
7. Volumetric flasks, 10-mL, with polyethylene stoppers.
8. Pipettes, delivery, 1.0-mL, graduated in 0.1-mL increments, 2- and 5-mL, with pipet bulb.
9. Air sampling bags, Tedlar, 10-L.
10. Gas syringe, with gas-tight valve, 0.1- and 1-mL.
11. Syringe, 10-µL, with 0.1-µL graduations.

SPECIAL PRECAUTIONS: Carbon disulfide is toxic and an acute fire and explosion hazard (flash point = -30 °C); work with it only in a hood.

Vinyl chloride is a human carcinogen [3].

SAMPLING:

1. Calibrate each personal sampling pump with a representative sampler in line.
2. Break the ends of the tubes immediately before sampling. Attach two tubes, with ends touching, with a short piece of tubing. Label one tube as the back tube and insert the back tube into the flexible tubing attached to the personal sampling pump.
3. Sample at 0.05 L/min for 15 to 100 min. Do not sample more than 5 L of air.
4. Separate the primary and backup tubes and cap each tube for shipment.

SAMPLE PREPARATION:

5. Add 1.0 mL CS_2 to an empty vial. Loosely cap the vial.
6. Score each sampler tube with a file in front of the glass wool plug. Break the tube at the score line.
7. Transfer the charcoal from the front and back tubes to separate vials. Discard the glass wool and foam plugs. Seal the vials with septum caps immediately.
8. Allow to stand for 30 min, with occasional agitation. Analyze the sample within the next 30-min period.

CALIBRATION AND QUALITY CONTROL:

9. Calibrate with at least six working standards covering the range 0.2 to 200 µg per sample.
   a. Add known amounts of calibration stock solution to CS_2 in 10-mL volumetric flasks and dilute to the marks, using serial dilution as appropriate.
      NOTE: Working standards can be stored at -20 °C for at least three days.
   b. Analyze together with samples and blanks (steps 12 and 13).
   c. Prepare calibration graphs of peak area vs. quantity (µg) of vinyl chloride per tube and peak area vs. quantity (ng) per injection.
10. Determine desorption efficiency (DE) at least once for each lot of charcoal used in the calibration range (step 9). Prepare three tubes at each of five levels plus three media blanks.
    a. Prepare three atmospheres of vinyl chloride in air by injecting 0.01, 0.08, and 0.2 mL vinyl chloride gas into 10 L air in Tedlar bags. The resulting concentrations are approximately 2.6, 21 and 52 mg/m^3.
    b. Following steps 1 through 4, sample these atmospheres according to the following scheme:

Concentration in Bag (mg/m^3)	Volume Sampled (L)	Quantity of Vinyl Chloride (µg)
2.6	0.8	2
	2.2	6
21	0.8	17
	2.2	46
52	2.5	130

    Obtain three samples at each level.
    c. Desorb (steps 6 through 8) and analyze together with working standards (steps 12 and 13). No vinyl chloride should be found on the back tubes.
    d. Analyze the atmospheres in the bags (steps 12 and 13) using 1-mL gas samples to verify concentration.
    e. Prepare a graph of DE vs. µg of vinyl chloride recovered.
11. Analyze three quality control blind spikes and three analyst spikes to ensure that the calibration graph and DE graph are in control.

MEASUREMENT:

12. Set the gas chromatograph according to manufacturer's instructions and to conditions given on page 1007-1. Inject sample aliquot manually using solvent flush technique or with autosampler. The retention time of vinyl chloride is about 1.7 min.
    NOTE: If peak area is above the linear range of the working standards, dilute with CS_2, reanalyze and apply the appropriate dilution factor in calculations.
13. Measure peak area.

CALCULATIONS:

14. Determine the mass, µg (corrected for DE) of vinyl chloride found in the sample front (W_f) and back (W_b) tubes, and in the average media blank (B).
    NOTE: If $W_b > W_f/10$, report breakthrough and possible sample loss.
15. Calculate concentration, C, of vinyl chloride in the air volume sampled, V (L):

$$C = \frac{(W_f + W_b - 2B)}{V}, \text{ mg/m}^3.$$

EVALUATION OF METHOD:

The method was evaluated with single 150-mg coconut shell charcoal tubes (100-mg front beds and 50-mg back) [1]. Atmospheres were generated at four concentrations between 1 and 64 mg/m ^{3}. Recoveries, based on atmosphere concentrations calculated from the volumes of vinyl chloride and dilution air, averaged 94% with a pooled relative standard deviation ($\hat{S}_{rT}$) of 0.06. Samples at the 3-µg level showed no loss of vinyl chloride when stored for 12 days at room temperature or 19 days at -20 °C. There may be significant loss of vinyl chloride from samples stored for 14 days at room temperature [4]. The 1% breakthrough capacity for a 150-mg bed of coconut charcoal, challenged at 100 mL/min with vinyl chloride in air at 16 mg/m ^{3} and a relative humidity of 70%, was 4.6 L [5].

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[4] Cuddeback, J. E., W. R. Burg, and S. R. Birch, Environ. Sci. Technol., 9, 1168-1171 (1975).
[5] Matsumura, Y. Ind. Health, 18, 61-67 (1980).

METHOD WRITTEN BY:

A. W. Teass, Ph.D., NIOSH/DBBS.

Method no.:	75
Matrix:	Air
Target concentration:	1.0 ppm (2.56 mg/m^3) OSHA PEL
Procedure:	Air samples are collected by drawing known volumes of air through glass sampling tubes containing Carbosieve S-III (carbon based molecular sieve) adsorbent. Samples are desorbed with a mixture of 99:1 (v/v) carbon disulfide (CS_2)/dimethylformamide (DMF) in the presence of magnesium sulfate. Samples are analyzed by GC using a flame ionization detector.
Recommended air volume and sampling rate:	3 L at 0.05 L/min
Reliable quantitation limit:	0.020 ppm (0.051 mg/m^3)
Standard error of estimate at the target concentration: (Section 4.7)	6.70%
Special requirements:	Samples are to be stored at reduced temperature after they have been received at the analytical laboratory.
Status of method:	Evaluated method. This method has been subjected to the established evaluation procedures of the Organic Methods Evaluation Branch.

Date: April 1989 Chemist: Donald Burright

Organic Methods Evaluation Branch
OSHA Analytical Laboratory
Salt Lake City, Utah

1. General Discussion

1.1 Background

1.1.1 History

In the past, the procedure for monitoring the employee's exposure required that two standard size charcoal tubes, each containing a total of 150 mg of activated charcoal, be used in series for 20 min at 0.05 L/min. The analysis for vinyl chloride was performed on a GC equipped with a flame ionization detector. (Refs. 5.2 and 5.3)

To eliminate the inconvenience of using two sampling tubes in series, a Carbosieve S-III tube containing 130 mg in the front section and 65 mg in the back section is recommended in this method. This sampling tube also reduces the migration of vinyl chloride during storage to the back section.

Several capillary columns were tested to replace the column packed with SE-30 on Supelcoport that had been used for many years to analyze for vinyl chloride. None of the new capillary columns had as much flexibility to move the vinyl chloride peak as a column packed with SP-1000 on Carbopack B. The ability to move a peak by varying the analytical conditions is important if another compound interferes with the quantification of vinyl chloride.

1.1.2 Toxic effects (This section is for information only and should not be taken as the basis of OSHA policy.)

The following information is quoted from a monograph from the International Agency for Research on Cancer.

> Vinyl chloride is a human carcinogen. Its target organs are the liver, brain, lung and hemo-lymphopoietic system. Similar carcinogenic effects were first demonstrated in rats and were later confirmed in mice and hamsters. Although evidence of a carcinogenic effect of vinyl chloride in humans has come from groups occupationally exposed to high doses of vinyl chloride, there is no evidence that there is an exposure level below which no increased risk of cancer would occur in humans.
>
> Epidemiological reports regarding clastogenic effects among vinyl chloride-exposed workers and a single study of increased fetal mortality among the wives of workers who had been exposed to vinyl chloride suggest that vinyl chloride could be mutagenic to humans. Additional support for this suggestion derives from experimental evidence of its mutagenicity. (Ref. 5.4)

OSHA's health standards for exposure to air contaminants require that an employee's exposure to vinyl chloride not exceed an 8-h time-weighted average of 1.0 ppm (2.56 mg/m^3) in workplace air. During any work shift, an employee's exposure may not exceed a ceiling concentration limit of 5 ppm (12.8 mg/m^3), averaged over any period not to exceed 15 min. (Ref. 5.1)

1.1.3 Workplace exposure

Since vinyl chloride is a gas at room temperature and pressure, the common route of toxic exposure is by inhalation. As with many liquidified gases, contact of the skin or eyes with escaping compressed vinyl chloride can produce freezing frostbite. (Ref. 5.5) An undetermined number of workers are potentially exposed in the workplace to vinyl chloride.

In 1976, over 95% of the vinyl chloride used in the United States was for the production of vinyl chloride homopolymer and copolymer resins. The largest use of polyvinyl chloride resins is in the production of plastic piping and conduit. Other important uses are in floor coverings, in consumer goods, in electrical applications and in transportation applications. (Ref. 5.4) In 1981, over 3 million tons of vinyl chloride were produced in the United States which had a production capacity of 4.4 million tons. (Ref. 5.6)

1.1.4 Physical properties and other descriptive information (Ref. 5.6, unless otherwise stated)

CAS no.:	75-01-4
molecular weight:	62.50

molecular formula:	C_2H_3Cl
melting point:	-153.8℃
boiling point:	-13.4℃
vapor pressure:	164 kPa (1230 mm Hg) at 0℃ 337 kPa (2530 mm Hg) at 20℃ (Ref. 5.4)
vapor density:	2.2 (air = 1) (Ref. 5.4)
specific gravity:	0.969 at -14.2/4℃
flash point:	-77.75℃ (open cup) -78℃ (closed cup) (Ref. 5.4)
explosive limit:	4-22%
self-ignition temperature:	472℃
solubility:	slightly soluble in water; soluble in hydrocarbons, oils, chlorinated solvents, and most common organic liquids
synonyms:	chloroethylene; chloroethene; ethylene monochloride; VC; VCM
structural formula:	

The analyte air concentrations throughout this method are based on the recommended sampling and analytical parameters. Air concentrations listed in ppm are referenced to 25℃ and 760 mm Hg.

1.2 Limit defining parameters

1.2.1 Detection limit of the analytical procedure

The detection limit of the analytical procedure is 0.760 ng per injection. This is the amount of analyte which gave a vinyl chloride peak whose height is about 9 times the height of a trace contaminant peak. (Section 4.1)

1.2.2 Detection limit of the overall procedure

The detection limit of the overall procedure is 0.152 µg per sample (0.051 mg/m^3 or 0.020 ppm). This is the amount of analyte spiked on the sampling device which allows recovery of an amount equivalent to the detection limit of the analytical procedure. (Section 4.2)

1.2.3 Reliable quantitation limit

The reliable quantitation limit is 0.152 µg per sample (0.051 mg/m^3 or 0.020 ppm). This is the smallest amount of analyte spiked on the sampling device which can be quantitated within the requirements of a recovery of at least 75% and a precision (±1.96 SD) of ±25% or better. (Section 4.3)

The reliable quantitation limit and detection limits reported in the method are based upon optimization of the instrument for the smallest possible amount of the analyte. When the target concentration of the analyte is exceptionally higher than these limits, they may not be attainable at the routine operating parameters.

1.2.4 Instrument response to the analyte

The instrument response over the concentration range of 0.43 to 2 times the target concentration is linear. (Section 4.4)

1.2.5 Recovery

The recovery of vinyl chloride from samples used in the 15-day storage test remained above 103.8% when the samples were stored in a refrigerator at about 4℃. (Section 4.5) The recovery of an analyte from the collection medium during storage must be 75% or greater.

1.2.6 Precision (analytical procedure only)

The pooled coefficient of variation obtained from replicate injections of analytical standards at 0.43, 1 and 2 times the target concentration is 0.011. (Section 4.6)

1.2.7 Precision (overall procedure)

The precision at the 95% confidence level for the refrigerated 15-day storage test is ±13.1%. (Section 4.7) This includes an additional ±5% for sampling error. The overall procedure must provide results at the target concentration that are ±25% or better at the 95% confidence level.

1.2.8 Reproducibility

Six samples, spiked with vinyl chloride, and a draft copy of this procedure were given to a chemist unassociated with this evaluation. The samples were analyzed after 1 day of storage at about 22°C. No individual sample result deviated from its theoretical value by more than the precision reported in Section 1.2.7. (Section 4.8)

1.3 Advantages

1.3.1 This sampling procedure has improved storage stability over existing coconut shell charcoal samplers due to the lower migration rate to the back section.

1.3.2 The recommended air volume has been increased to 3 L over the old procedtire's 1-L air volume. This allows for fewer samples to taken and results in lower costs.

1.4 Disadvantages

1.4.1 Currently the Carbosieve S-III tube is commercially available only by special order from Supelco Inc.

1.4.2 The fine mesh size of Carbosieve S-III (60/80) results in a greater pressure drop across the sample tube than occurs with the conventional coconut shell charcoal sampling tube. This results in the need for the 0.05 L/min sampling rate.

2. Sampling Procedure

2.1 Apparatus

2.1.1 Samples are collected by use of a personal sampling pump that can be calibrated to within ±5% of the recommended flow rate with the sampling device attached.

2.1.2 Samples are collected on 4-mm i.d. × 6-mm o.d. × 70 mm sampling tubes packed with two sections of 60/80 mesh Carbosieve S-III. The tubes are packed with 130 mg and 65 mg of adsorbent in the front and back sections respectively. Silanized glass wool plugs are used in the middle and at both ends of the tube to separate and contain the two sections. The sampling tubes are sealed with 7/32 in. plastic caps.

2.2 Reagents

No sampling reagents are required.

2.3 Sampling technique

2.3.1. Attach the sampling device to the sampling pump with plastic tubing such that the large front section of the sampling tube is exposed directly to the atmosphere. Do not place any tubing in front of the sampler. Attach the sampler vertically in the worker's breathing zone in such a manner that it does not impede work performance or safety.

2.3.2 After sampling for the appropriate time, remove the sampling device and seal the tube with plastic end caps. Wrap each sample end-to-end with a Form OSHA-21 seal.

2.3.3 With each set of samples submit at least one blank sample. Handle the blank sample in the same manner as the other samples except draw no air through it.

2.4 Sampler capacity

The sampling capacity of the front section of a Carbosieve S-Ill sampling tube was determined by sampling a test atmosphere of 2.57 ppm (6.57 mg/m^3) vinyl chloride at ambient temperature and 81% relative humidity. The sampling rate was 0.05 L/min. The 5% breakthrough air volume was

5.3 L. The breakthrough for each air volume tested (2.5 - 8.5 L) was determined by dividing the amount found on the back section by the amount found on the entire tube. (Section 4.9)

2.5 Desorption efficiency

2.5.1 The average desorption efficiency for vinyl chloride over the range of 0.43 to 2 times the target concentration from Carbosieve S-III adsorbent was 100.0%. (Section 4.10)

2.5.2 Desorbed samples, after 24 h, show a loss of about 12.6%. (Section 4.10)

2.6 Recommended air volume and sampling rate

2.6.1 The recommended air volume is 3 L.

2.6.2 The recommended air sampling rate is 0.05 L/min.

2.6.3 When short-term air samples are required, the reliable quantitation limit for a 15-min sample is 0.24 ppm (0.63 mg/m^3) at the recommended sampling rate.

2.7 Interferences (sampling)

Suspected interferences should be reported to the laboratory with submitted samples.

2.8 Safety precautions (sampling)

2.8.1 The sampling equipment should be attached to the worker in such a manner that it will not interfere with work performance or safety.

2.8.2 All safety practices that apply to the work area being sampled should be followed.

3. Analytical Procedure

3.1 Apparatus

3.1.1 A GC equipped with a flame ionization detector (FID). For this evaluation a Hewlett-Packard 5890 Cas Chromatograph equipped with a 7673A Autosampler and an FID was used.

3.1.2 A GC column capable of separating the vinyl chloride peak from potential interferences. A 10-f t × 1/4-in. o.d. × 2-mm i.d. glass column packed with 1% SP-1000 on 60/80 Carbopack B (Supelco Inc.) was used in this evaluation.

3.1.3 An electronic integrator or other suitable means of measuring detector response. A Hewlett-Packard 5895A GC Chem-Station was used in this evaluation.

3.1.4 Two-milliliter vials with PTFE-lined caps were used for sample desorption and standard preparation.

3.2 Reagents

3.2.1 Vinyl chloride. The vinyl chloride used in this evaluation to prepare standards was 99.9% pure. The concentration of the vinyl chloride cylinder used to generate a dynamic test atmosphere was 101 ppm in nitrogen. Both tanks were purchased from Alphagaz Liquid Air (Walnut Creek, CA).

3.2.2 Carbon disulfide. Reagent grade or better CS_2 should be used. In this evaluation, benzene-free CS_2 was used. The CS_2 had been passed through Molecular Sieve 13X (45/60 mesh) to remove the benzene contamination. Fifty grams of molecular sieve will remove the benzene from 1 L of carbon disulfide.

3.2.3 Dimethylformamide Reagent grade or better should be used.

3.2.4 Magnesium sulfate, anhydrous powder, is used as a drying agent. The magnesium sulfate used in this evaluation was purchased from Aldrich Chemical (Milwaukee, WI).

3.2.5 Desorbing solution. This consists of a solution of 99:1 (v/v) benzene-free CS_2/dimethylformamide. An internal standard such as n-heptane can be used.

3.2.6 n-Heptane. This was used as the internal standard in the desorbing solution. The solution is prepared by adding 5 µL of n-heptane to 1 L of desorbing solution. The n-heptane was purchased from Burdick & Jackson (Muskegon, MI).

3.3 Standard preparation

3.3.1 Prepare analytical standards by injecting microliter amounts of pure vinyl chloride gas into capped 2-mL vials containing 130 mg of Carbosieve S-III adsorbent. Force the vinyl chloride gas from the syringe with the opening of the needle under the adsorbent. A standard containing 7.69 µg/mL (at 23℃ and 650 mm Hg) could be prepared by injecting 3.5 µL of vinyl chloride onto the adsorbent.

Analytical standards can also be prepared by bubbling vinyl chloride gas from a syringe into a vial containing desorbing solution. This procedure was used to determine the desorption efficiency and was not used for the rest of the tests.

3.3.2 The mass of vinyl chloride gas which was used to prepare standards can be determined by use of the following equations:

MV = (22.41)(760/BP)(273+T)/(273)

where MV = ambient molar volume, L/mole
BP ambient barometric pressure, mmHg
T = ambient temperature, ℃
µg/µL = 62.50/MV

µg = (µg/µL)(µL of vinyl chloride injected)(purity)

3.3.3 Wait for 30 min and uncap the vial. Add 1.0 mL of desorbing solution to the vial and immediately recap it.

3.3.4 Shake the vials vigorously by hand several times during the next 30 min.

3.3.5 Prepare at least three standards to generate a calibration curve. Ensure that the amount of vinyl chloride found in the samples is within the range of the standards. Prepare additional standards if necessary.

3.4 Sample preparation

3.4.1 Remove the plastic caps from the sample tube and carefully transfer each section of the adsorbent to separate vials.

3.4.2 Add approximately 150 mg of anhydrous magnesium sulfate powder to each sample.

3.4.3 Add 1.0 mL of desorbing solution to each vial and seal the vials with PTFE-lined caps.

3.4.4 Shake the vials vigorously by hand several times during the next 30 min.

3.5 Analysis

3.5.1 Analytical conditions

GC conditions

temperatures:	40℃ (column) 200℃ (injector) 220℃ (detector)
temp program:	hold initial temp 1.0 min, increase temp at 5℃/min to 60℃, then increase temp at 50℃/min to 240℃, hold temp for 10 min
column gas flow:	30 mL/min (nitrogen) septum
purge:	1.5 mL/min (nitrogen)
injection size:	5.0 µL

column: 10-ft × 1/4-in. o.d. × 2-mm i.d. glass column containing 1% SP-1000 on 60/80 mesh Carbopack B
retention times: 4.8 min (vinyl chloride) 15.5 min (n-heptane)

FID conditions

hydrogen flow: 30 mL/min
air flow: 450 mL/min

chromatogram: Figure 3.5.1

3.5.2 Measure detector response using a suitable method such as electronic integration.

3.5.3 Use an internal standard (ISTD) procedure to prepare a calibration curve using several freshly prepared standards over a range of concentrations. Bracket the samples with analytical standards.

3.6 Interferences (analytical)

3.6.1 Any compound having a similar retention time as the analyte is a potential interference. Generally, chromatographic conditions can be altered to separate an interference from the analyte.

3.6.2 Retention time on a single column is not proof of chemical identity. Analysis by an alternate GC column or confirmation by mass spectrometry are additional means of identification.

3.7 Calculations

3.7.1 When an ISTD method is used, the vinyl chloride concentration of an analytical standard is determined by the following equation.

$$C_a = (A_a)(R_a)(C_i)/(A_i)(R_i)$$

where C = concentration
A = area or peak height
R = response factor
a = analyte
i = internal standard

3.7.2 Prepare calibration curves by plotting the vinyl chloride concentration determined from an ISTD method versus the theoretical analytical standard concentrations. Determine the best-fit line through the data points.

3.7.3 Determine the concentration of a sample by comparing its concentration determined by the ISTD method to the calibration curve. Perform blank corrections for each section before adding the results together. Add any amount of vinyl chloride found on the back section to the amount found on the front section.

3.7.4 The air concentration of vinyl chloride can be expressed in mg/m^3 by using the following equation:

$$mg/m^3 = (A)(B)/(C)$$

where A = µg/mL of vinyl chloride from Section 3.7.2
B = desorption volume (1 mL)
C = liters of air sampled

No desorption correction is required because standards are prepared in the presence of Carbosieve S-III adsorbent.

3.7.5. Convert vinyl chloride results in mg/m^3 to ppm using the following equation:

$$ppm = (mg/m^3)(24.46)/(62.50)$$

where mg/m^3= results from 3.7.3
24.46= molar volume at 760 mm Hg and 25°C

62.50= molecular weight of vinyl chloride

3.8 Safety precautions (analytical)

3.8.1 CAUTION. VINYL CHLORIDE IS OR SHOULD BE CONSIDERED CARCINOGENIC TO HUMANS. Restrict use of pure compounds and concentrated standards to regulated areas. Avoid skin contact and inhalation of all chemicals.

3.8.2 Restrict the use of all chemicals to a fume hood if possible.

3.8.3 Wear safety glasses and a lab coat at all times while in the laboratory areas.

4. Backup Data

4.1 Detection limit of the analytical procedure

The detection limit of the analytical procedure is 0.760 ng per injection, based on a 5.0-µL injection of a 0.152 µg/mL standard. This amount produced a vinyl chloride peak whose height is about 9 times the height of a trace contaminant peak in the chromatogram. A chromatogram of the detection limit of the analytical procedure is shown in Figure 4.1.

4.2 Detection limit of the overall procedure

The detection limit of the overall procedure is 0.152 µg per sample (0.051 mg/m^3 or 0.020 ppm). The injection size recommended in the analytical procedure (5.0 µL) was used in the determination of the detection limit of the overall procedure. Eight vials containing 130 mg of Carbosieve S-III resin were spiked with a syringe containing 0.152 µg of pure vinyl chloride gas. The samples were desorbed about 1 h after being spiked.

Table 4.2
Detection Limit of the Overall Procedure

sample number	theoretical amount µg	amount recovered µg
1	0.152	0.128
2	0.152	0.146
3	0.152	0.157
4	0.152	0.129
5	0.152	0.147
6	0.152	0.119
7	0.152	0.155
8	0.152	0.118

4.3 Reliable quantitation limit data

The reliable quantitation limit is 0.152 µg per sample (0.051 mg/m^3 or 0.020 ppm). The injection size recommended in the analytical procedure (5.0 µL) was used in the determination of the reliable quantitation limit. Eight vials containing 130 mg of Carbosieve S-III resin were vapor-spiked with 0.152 µg of vinyl chloride. Because the recovery of vinyl chloride from the spiked samples was greater than 75% and had a precision of $\pm$25 or better, the detection limit of the overall procedure and reliable quantitation limit are the same.

Table 4.3
Reliable Quantitation Limit
(Based on samples and data of Table 4.2)

percent recovered	statistics
84.2	
96.1	$\bar{X}$ = 90.4
103.3	SD = 10.4
84.9	Precision = (1.96)(±10.4)
96.7	= ±20.4
78.3	
102.0	
77.6	

4.4 Instrument response to vinyl chloride

The instrument response to vinyl chloride over the range of 0.43 to 2 times the target concentration is linear with a slope of 322 area counts per microgram per milliliter. The precision of the response to vinyl chloride was determined by multiple injections of vinyl chloride standards. The data below is presented graphically in Figure 4.4.

Table 4.4
Instrument Response to Vinyl Chloride

× target concn µg/sample	0.43× 3.32	1× 7.75	2× 15.51
area counts	975.3	2444.4	4899.4
	963.3	2440.1	4962.5
	961.8	2419.5	4939.7
	962.5	2416.2	4854.8
	955.3	2374.2	4851.1
	946.9	2374.5	4840.8
$\bar{X}$	960.9	2411.5	4891.4

4.5 Storage data

Forty-eight storage samples were collected by sampling a dynamic-ally generated atmosphere containing 4.95 mg/m^3 or 1.94 ppm of vinyl chloride and 81% relative humidity for 30 min at 0.05 L/min. One-half of the tubes was stored in a refrigerator (4℃) and the other half was stored in a closed drawer at ambient temperature (about 22℃). At 2-4 day intervals, four samples were selected from each of the two storage sets and analyzed. The results are listed below and shown graphically in Figures 4.5.1 and 4.5.2.

Table 4.5
Storage Test

storage time (days)	% recovery (ambient)				% recovery (refrigerated)			
0	110.9	108.5	106.8	110.4	110.9	108.5	106.8	110.4
	106.7	108.1	109.2	100.1	106.7	108.1	109.2	100.1
2	101.1	98.8	101.3	101.3	97.2	96.4	96.2	101.3
6	103.1	101.5	100.9	102.1	103.7		101.4	102.8
9	105.3	101.6	106.4	107.7	112.0	110.4	107.5	106.8
12	103.0	102.3	101.6	13.3	101.7	103.6	104.8	101.5
15	100.5	103.8	102.7	102.8	101.6	102.8	105.6	102.9

The analysis of the back sections of the samples generated for the storage test indicate that the samples do not have to be shipped at reduced temperature but should be stored at reduced temperature because the vinyl chloride starts to migrate to the back section after 9 days of storage at ambient temperature. The average amount of vinyl chloride found on the back sections was 2.5% after 12 days of storage and 5% after 15 days. No vinyl chloride was found on any of the refrigerated back sections.

4.6 Precision (analytical method only)

The precision of the analytical procedure is defined as the pooled coefficient of variation determined from replicate injections of vinyl chloride standards at 0.43, 1 and 2 times the PEL. Based on the data of Table 4.4, the coefficients of variation (CV) for the three levels and the pooled coefficient of variation ($\overline{CV}$) were calculated and are listed below.

Table 4.6
Precision of the Analytical Method
(Based on the Data of Table 4.4)

× target concn µg/sample	0.43× 3.32	1× 7.75	2× 15.5
SD[1]	9.4	30.8	50.9
CV	0.0098	0.0128	0.0104
$\overline{CV}$	0.0111		

[1]standard deviation is in area counts

4.7 Precision (overall procedure)

The precision of the overall procedure is determined from the storage data. The determination of the standard error of estimate (SEE) for a regression line plotted through the graphed storage data allows the inclusion of storage time as one of the factors affecting overall precision. The SEE is similar to the standard deviation except it is a measure of dispersion of data about a regression line instead of about a mean. It is determined with the following equation:

$$SEE = \sqrt{\frac{\Sigma(Y_{obs} - Y_{est})^2}{n - k}}$$

where

n = total number of data points
k = 2 for linear regression
k = 3 for quadratic regression
Y_{obs} = observed % recovery at a given time
Y_{est} = estimated % recovery from the regression line at the same given time

An additional 5% for pump error is added to the SEE by the addition of variances. The precision at the 95% confidence level is obtained by multiplying the SEE (with pump error included) by 1.96 (the z-statistic from the standard normal distribution at the 95% confidence level). The 95% confidence intervals are drawn about their respective regression lines in the storage graphs as shown in Figure 4.5.2. The data for Figure 4.5.2 was used to determine the SEE of ±6.70% for vinyl chloride.

4.8 Reproducibility data

Six samples, collected from a dynamically generated atmosphere containing vinyl chloride, were given to a chemist unassociated with this study. The samples were analyzed after being' stored for 1 day at 22℃. No sample result had a percent deviation greater than the precision of the overall procedure, which is ±13.1%.

Table 4.8
Reproducibility Data

µg spiked	µg recovered	% recovered	% deviation
6.36	7.11	111.8	37.8
6.36	6.63	104.3	
6.36	6.96	109.4	
6.36	6.57	103.3	
6.36	6.84	107.6	
6.36	6.45	101.4	

4.9 Sampler capacity

Sampler capacity was determined by sampling from a dynamically generated atmosphere of about 2.57 ppm (6.57 mg/m^3) vinyl chloride with whole Carbosieve S-III sampling tubes. The relative humidity of the test atmosphere was 81%. The percentage of breakthrough was calculated by dividing the amount found on the back sect ion by the amount found on the entire tube. This percentage was plotted versus the air volume (Figure 4.9) to determine the five percent breakthrough air volume of 5.6 L. These samples were collected over 2 days from different dynamically generated test atmospheres.

Table 4.9
Breakthrough on the Carbosieve S-III Tube

air volume (L)	front section (µg)	back section (µg)	total (µg)	breakthrough (%)
2.5	15.73	0	15.73	0
3.5	20.25	0	20.25	0
4.0	25.47	0	25.47	0
4.5	29.13	0	29.13	0
5.0	34.32	1.05	35.37	2.97
5.5	35.82	1.01	36.83	2.74
6.0	34.42	4.04	38.46	10.5
6.5	38.19	8.17	46.36	17.6
7.0	42.09	4.85	46.94	10.3
7.5	43.09	8.27	51.36	16.1
8.0	43.41	9.80	53.21	18.4
8.5	43.78	11.48	55.26	20.8

4.10 Desorption efficiency and stability of desorbed samples

4.10.1 Desorption efficiency

The desorption efficiency (DE) of vinyl chloride was determined by vapor-spiking 130-mg portions of Carbosieve S-III adsorbent with vinyl chloride at 0.43 to 2 times the target concentration. These samples were stored overnight and then desorbed with desorbing solution and analyzed. The average desorption efficiency over the studied range was 100.0%. The analytical standards used to analyze the desorption efficiency samples were made in vials containing desorbing solution that had been vapor-spiked with vinyl chloride.

Table 4.10.1
Desorption Efficiency of Vinyl Chloride

× target concn µg/sample	0.43× 3.33	1× 7.77	2× 15.6
DE, %	95.4	100.8	99.4
	99.2	100.4	102.2
	104.9	98.4	98.2
	103.1	101.3	101.0
	97.9	98.3	100.9
	98.9	99.4	98.9
	101.1	101.4	100.8
	98.7	101.5	98.2
$\overline{X}$	99.9	100.2	100.0

4.10.2 Stability of desorbed samples

The stability of desorbed samples was investigated by reanalyzing storage test samples, from Day 6, 24 h after initial analysis. The original analysis had been per formed overnight and the vials were recapped the next morning. The samples were reanalyzed with fresh standards. The average recovery, compared to the average recovery of the original analysis, was 88.7% or a -13.5% change.

Table 4.10.2
Stability of Desorbed Samples

initial recovery (percent)	recovery after 24 h (percent)	percent change
103.1	90.3	-12.8
101.5	86.1	-15.4
100.9	87.7	-13.2
102.1	89.6	-12.5
103.7	90.6	-13.1
101.4	89.5	-11.9
102.8	86.8	-16.0

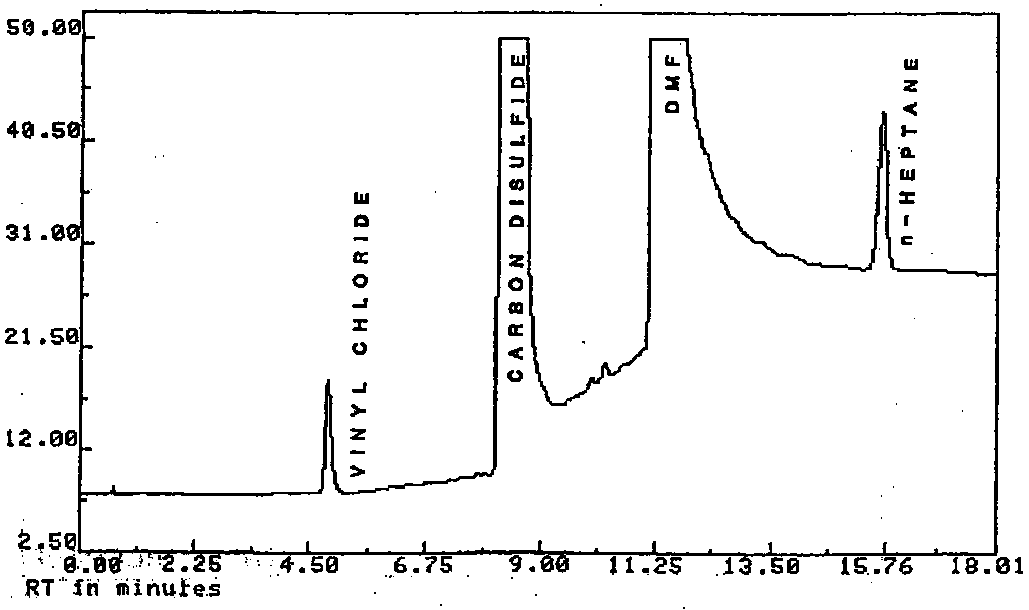

Figure 3.5.1. Chromatogram of vinyl chloride at the target concentration.

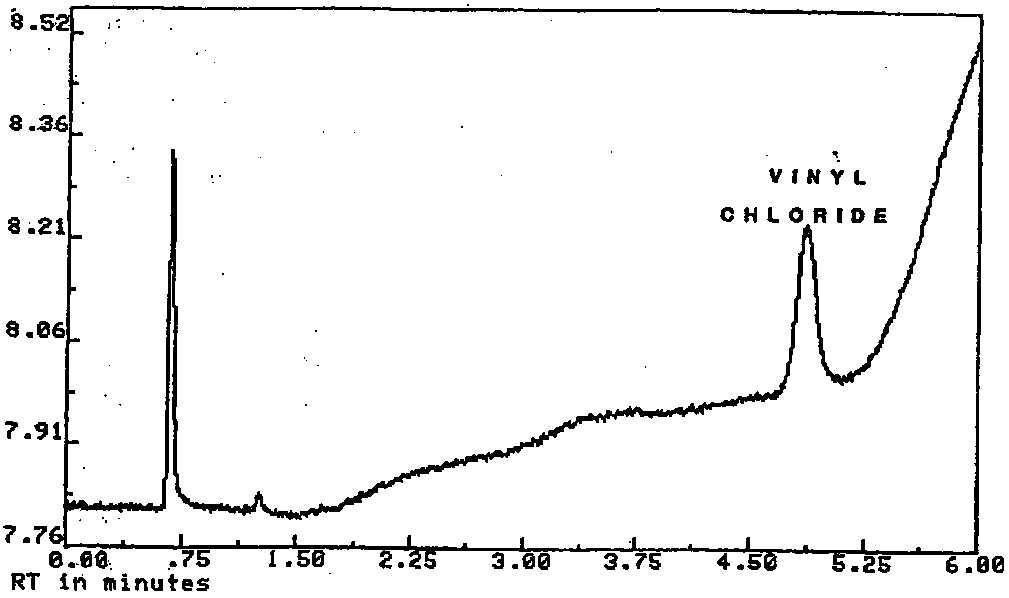

Figure 4.1. Chromatogram of vinyl chloride at the detection limit, 0.760 ng per injection.

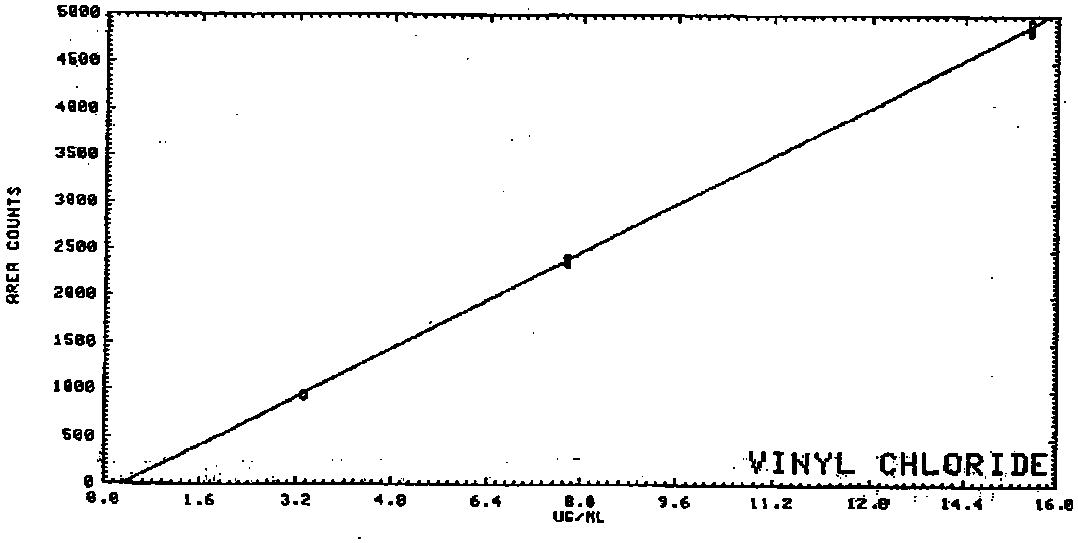

Figure 4.4. Instrument response curve for vinyl chloride, slope = 322 area counts per micrograms per milliliter.

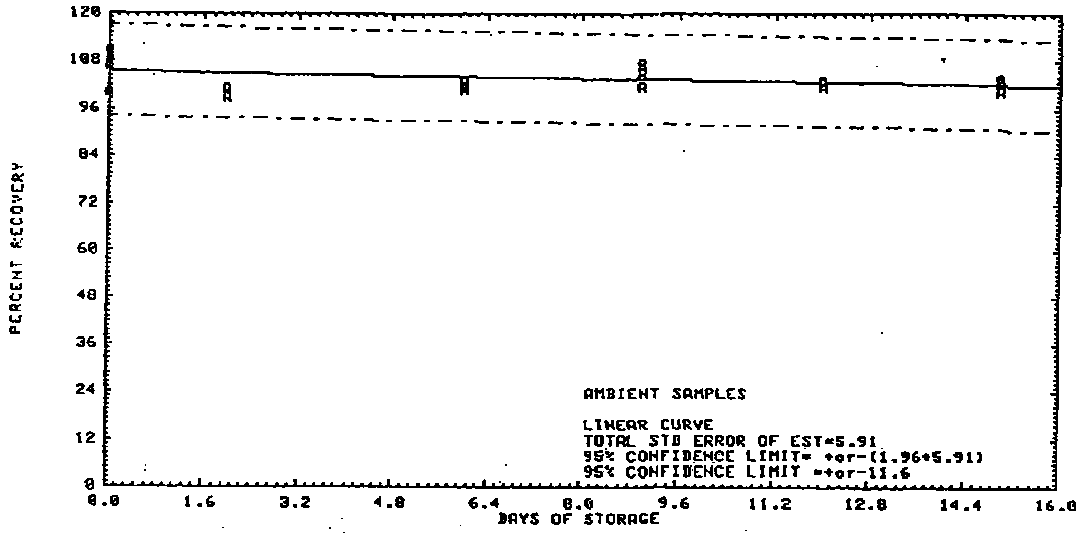

Figure 4.5.1. Ambient storage test for vinyl chloride.

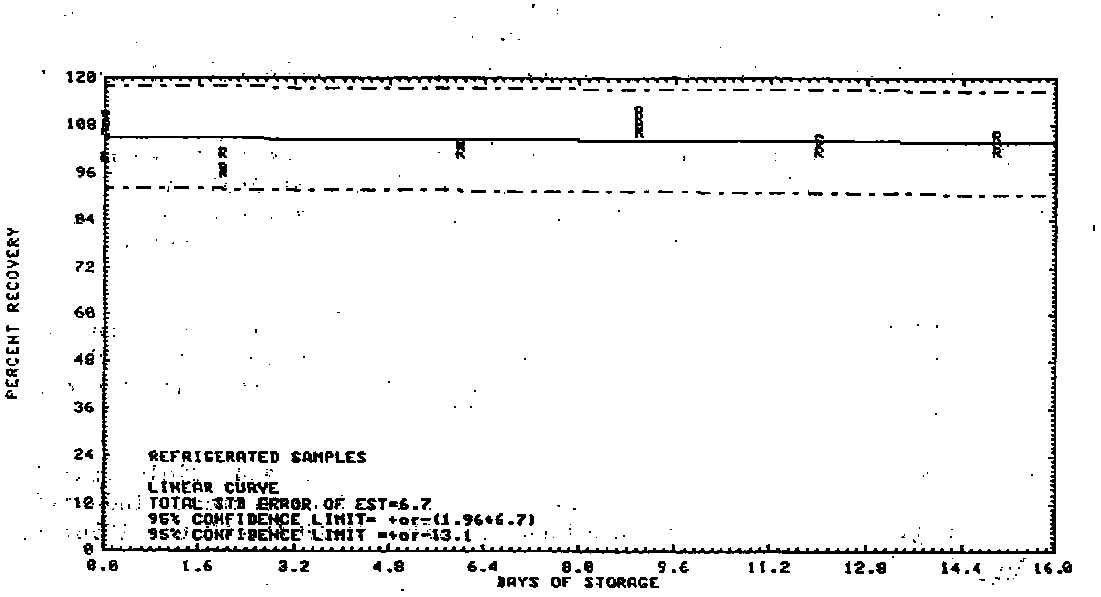

Figure 4.5.2. Refrigerated storage test for vinyl chloride.

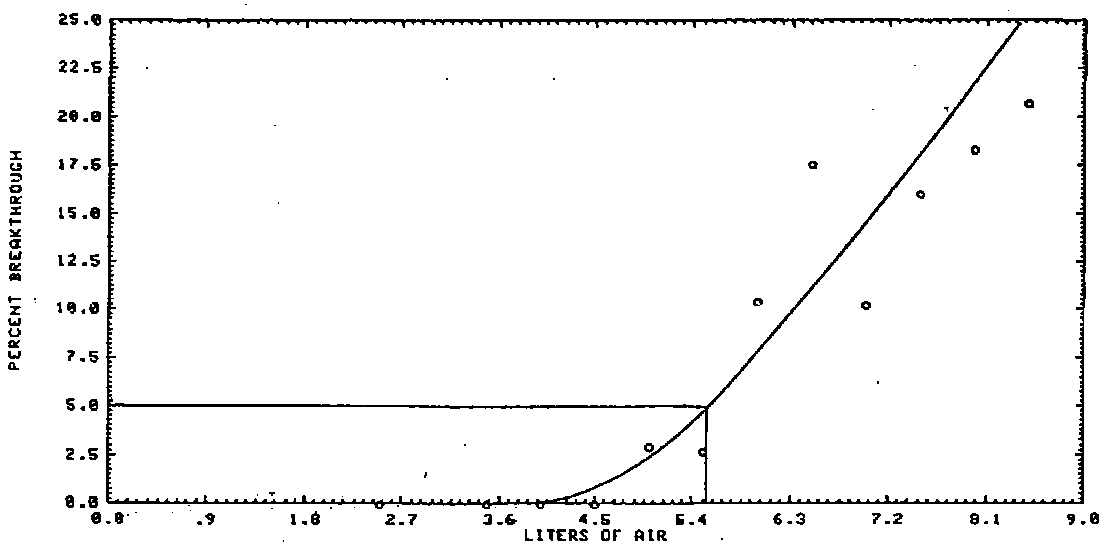

Figure 4.9. Determination of the 5% breakthrough air volume.

5. References

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5.2 "NIOSH Manual of Analytical Methods", 3rd ed.; U.S. Department of Health and Human Services, Center for Disease Control, NIOSH; Cincinnati, OH, 1984, Vol. 2, Method 1007, DHHS (NIOSH) Publ. No. 84-100.

5.3 "OSHA Analytical Methods Manual"; U.S. Department of Labor, Occupational Safety and Health Administration; OSHA Analytical Laboratory: Salt Lake City, UT, 1985; Method 4; American Conference of Government Industrial Hygienists (ACCIH): Cincinnati, ISBN: 0-936712-66-X.

5.4 International Agency for Research on Cancer, "IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Humans: Some Monomers, Plastics and Synthetic Elastomers, and Acrolein", IARC, Lyon, 1979, Vol. 19, pp. 377-419.

5.5 "Documentation of the Threshold Limit Values and Biological Indices", 5th ed.; American Conference of Government Industrial Hygienists (ACCIH): Cincinnati, ISBN: 0-036712-68-6, 1986; pp. 623-626.

5.6 Cowfer, J.A.; Magistro, A.J. in "Kirk-Othmer Encyclopedia of Chemical Technology"; 3rd ed.; Crayson, M., Ed.; John Wiley & Sons, New York, 1983, Vol. 23, pp. 865-884.

APPENDIX

D HEAT AND COLD STRESS MONITORING AND PREVENTION

HEAT STRESS AND HEAT STRESS MONITORING

Heat is one of the most common (and potentially serious) illnesses at hazardous waste sites where PPE is worn; therefore, regular monitoring and other preventive precautions are vital. Shelter from the sun will be provided during rest periods. Below is a list of the signs and symptoms of heat stress. Initial work schedules will be approximately 90 minutes of work followed by 15 minutes of rest. Work intervals will be adjusted to shorter periods based on the assessment of the SHSC Monitoring for heat stress will be conducted by visual observation by the individual team members.

SIGNS AND SYMPTOMS OF HEAT STRESS

Heat rash may result from continuous exposure to heat or humid air.

— Heat cramps are caused by heavy sweating with inadequate electrolyte replacement. Signs and symptoms include:
— muscle spasms
— pain in the hands, feet, and abdomen

Heat exhaustion occurs from increased stress on various body organs, including inadequate blood circulation caused by cardiovascular insufficiency or dehydration. Signs and symptoms include:

— pale, cool, moist skin
— heavy sweating
— dizziness
— nausea
— fainting

Heat stroke is the most serious form of heat stress. Temperature regulation fails, and the body temperature rises to critical levels. Immediate action must be taken to cool the body before serious injury and death occur. Competent medical help must be obtained. Signs and symptoms include:

— red, hot, usually dry skin
— lack of or reduced perspiration
— nausea
— dizziness and confusion
— strong, rapid pulse
— coma

First-aid remedies for heat stress and heat stroke include removing the worker to a cool place, providing cool water or a commercial sport drink, loosening tight clothing, and calling for an ambulance if victim vomits or starts to lose consciousness.

COLD STRESS PREVENTION

The types of cold-related stress are frostbite, hypothermia, and immersion or trench foot. Personnel performing field tasks in the winter months should be aware of the signs and symptoms of cold-related stress so they can take precautionary measures to avoid cold-induced injury and illness. The following is a brief synopsis of each type of cold-related stress.

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FROSTBITE

Frostbite results when cells are cooled until ice crystals form inside them. Most injuries from frostbite are localized to the exposed part of the body.

- First degree frostbite or frostnip usually strikes the tips of fingers, toes, ears, nose, and chin or cheeks. It is usually painless, and the victim is often unaware of it. The skin turns pale or white from first degree frostbite.
- Second degree frostbite can occur in skin and its underlying tissue. The skin becomes firm and white, waxy, or translucent. As the third injured areas warm, it will become numb, and then will turn blue or purple and swell. The superficial capillaries have been injured, and edema fluid will leak out into the tissue. Stinging and burning pain and superficial blisters may develop. The throbbing, aching, and burning may last for some weeks, and the body part may become permanently red and be extremely sensitive if again exposed to the cold.
- Third degree frostbite involves freezing not only the skin and subcutaneous tissue but even muscle and bone. This serious injury usually involves the hands and feet. The tissues are cold, pale, and frozen to the touch. The injured area usually turns purple or blue and is extremely painful after thawing. Large blisters and tissue death (gangrene) may occur within the first day or two.

HYPOTHERMIA

Generalized, severe, progressive body cooling is known as systemic hypothermia. This may occur at outside temperatures above freezing as well as below freezing. It occurs when the core temperature of the body falls below 95°F (35°C) and results when the body temperature controlling mechanism is overwhelmed. At 96.8°F, the body attempts to compensate for the cold. As core temperatures fall below 95°F, the body is unable to rewarm itself without assistance because of the failure of the temperature control system.

Hypothermia may be of acute duration if someone is suddenly immersed in cold water. Subacute hypothermia may occur in otherwise healthy people, such as skiers, mountain climbers, or lost hunters, subject to prolonged cold exposure and physical exertion. Chronic hypothermia may occur in old people or those who are ill.

Hypothermia may be mild to moderate, when the core temperature is between 81°F and 95°F and the patient is conscious, or it may be severe, when the core temperature is below 80°F and the patient is unconscious.

The symptoms of hypothermia depend on the core temperature and become progressively more severe as the core temperature drops. Between 95°F and 98.6°F, the first symptom is shivering, a subconscious attempt of the body to generate more heat through muscular action. In addition, certain semiconscious activities occur, such as stamping the foot and dancing up and down. Below 95°F, difficulty in speaking, lack of coordination, stumbling, falling, and an inability to use the hands occur. It is at this point that the loss of temperature control occurs and the body is unable to rewarm itself. Below 90°F, shivering decreases and the muscles become progressively rigid. Below 85°F, the victim becomes irrational and may fall into a coma. The pulse and respiration slow. Below 80°F, unconsciousness occurs. The pulse is weaker, and cardiac arrhythmia may be noted. Below 78°F, the respiratory and cardiovascular centers fail, with resulting pulmonary edema and ventricular fibrillation and then cardiac standstill. Ventricular fibrillation is the usual cause of death in these victims.

Even without a thermometer, the level of hypothermia may be noted by observing the victim's mental state. With a few degrees' drop in core temperature, the victim may become withdrawn, discouraged, or mildly depressed. As the temperature drops a few degrees more, to 94°F or below, the victim may become indecisive, confused, or disoriented and may make incorrect decisions. Below 86°F, sleepiness, lethargy, and confusion are obvious. These progressively become more sever until coma occurs. The comatose state, if allowed to continue, results in death. The stages of hypothermia may progress rapidly after the victim's temperature falls below 90°F.

TRENCH FOOT

Trench foot or immersion foot occurs from the wet cooling of an extremity over hours or days at a temperature just above freezing while remaining relatively immobile. It used to been commonly in shipwrecked sailors or soldiers forced to remain in trenches for days at a time. The extremity is cold, swollen, waxy, mottled, and may be numb.

PREVENTIVE WORK GUIDELINES

1. Exposure to cold will be terminated immediately when severe shivering becomes evident.
2. When air temperature falls below 30°F, dry bulb temperature and wind speed will be measured periodically, and the wind chill factor will be calculated. (Weather radios are an adequate substitute.)
3. All work except for emergencies will be terminated when the wind chill is below -18°F.
4. Metal tool handles will be covered with thermal insulating material at temperatures below 30°F.
5. When work is performed continuously in the cold at a wind chill of below 20°F, heated shelter will be made available. A vehicle can be used for shelter if it is kept idling with the heater on.
6. Work will be arranged in such a way that sitting or standing for long periods of time is minimized.
7. Keep warm, dry, and keep moving, but do not become overheated while working in the cold. Exercise fingers and toes.

APPENDIX

E PROCEDURES FOR PUTTING ON AND DECONTAMINATING PERSONAL PROTECTIVE EQUIPMENT (PPE)

PROCEDURES FOR PUTTING ON AND DECONTAMINATING PERSONAL PROTECTIVE EQUIPMENT (PPE)

1. Park vehicles outside work boundaries.
2. During the pre-work safety meeting, the SHSC will provide the following information:
   - a description of the site and known problem areas
   - the level of protection required
   - emergency medical information
   - the locations of the first aid kit and fire extinguisher
3. Use the nearest lavatory.
4. Lay out and check safety gear.
5. Check and don modified Level D PPE
6. For work in Level C PPE, put on safety gear in the following order:
   - Coveralls
   - Steel-toed work boots
   - Connect suit and boots with tape
   - Outer booties, if used
   - Air purifying respirators (APRs), if required
7. For work in Level C PPE, put on APRs as follows:
   - Inspect:
     - Inspect before each use to ensure that they have been cleaned adequately.
     - Check material conditions for signs of pliability, deterioration, or distortion.
     - Examine cartridges and ensure that they are the correct type for the intended use, that the expiration date has not passed, and that they have not been opened or used previously.
     - Check face shields for cracks or fogginess.
   - Loosen all harness strap adjustments.
   - Place chin in chin cup and draw back evenly on strap adjustments – the two bottom straps first, then the two top straps, and the center top strap last.
   - Check that the respirator is centered evenly on the face and that the straps are not uncomfortably tight.
   - Check for leaks or proper facial seals.
     - To conduct a negative pressure test, close the inlet part with the palm of the hand so it does not pass air, and gently inhale for about 10 seconds. Any inward rush of air indicates a poor fit. Note that a leaking facepiece may be drawn tightly to the face to form a good seal, giving a false indication of adequate fit.
     - To conduct a positive pressure test, gently exhale while covering the exhalation valve to ensure that a positive pressure can be built up. Failure to build a positive pressure indicates a poor fit.
8. Put on the rest of the gear in the following order:
   - Raise hood
   - Hard hat
   - Surgical gloves
   - Outer gloves
   - Connect gloves and suit with tape
9. Select a buddy to act as a safety backup.
10. Check your buddy's equipment and have your buddy check yours for rips, tears, or malfunctions. Pay special attention to respirators, making sure that seals are good and that cartridges are securely in place.
11. If any equipment or gear gets damaged or if your suit tears badly, GO BACK.
12. If you experience physical discomfort, breathing difficulties, light headedness, dizziness, or other abnormalities, GO BACK.
13. When you return, have your buddy check for external accumulation of contamination and remove it. Also check gear for damage.

DECONTAMINATION WILL BE PERFORMED IN STEPS AS FOLLOWS (AS APPROPRIATE FOR THE PPE BEING UTILIZED):

Step 1 – Segregated Equipment Drop: Deposit equipment used onsite (tools, sampling devices and containers, monitoring instruments, clipboards, etc.) in different containers with plastic liners. Each may be contaminated to a different degree. Segregation at the drop reduces the probability of cross-contamination. This equipment may be reused if properly decontaminated.

Equipment:

- various sizes of containers
- plastic drop cloths

Step 2 – Boot Cover and Outer Glove Wash and Rinse: (Optional – will be used at the SHSC's discretion.)

Equipment:

- pesticide sprayer with nozzle
- two wash basins or tubs
- scrub brush
- water
- Liquinox® non-phosphate soap solution (1%)

Step 3 – Tape Removal: Remove tape around boots and gloves, and deposit in container with plastic liner. Remove boot covers, then outer gloves, and place them in the container.

Equipment:

- container (30-50 gallons)
- plastic liners
- folding chairs

Step 4 – Safety Boot Wash and Rinse: (Optional – will be used at SHSC's discretion.)

Equipment:

- two wash basins or tubs
- scrub brush
- water
- Liquinox® non-phosphate soap solution (1%)

Step 5 – Protective Coverall Removal: With the assistance of a helper, remove protective coverall. Deposit in container with plastic liner.

Equipment:

- container (30-50 gallons)
- folding chairs
- plastic liners

Step 6 – Respirator Removal: Remove facepiece. Avoid touching face with gloves. If work is completed for the day, discard cartridges in lined container, and wash and rinse respirator.

Equipment:

- container (30-50 gallons)
- plastic liners

Step 7 – Inner Glove Removal: Remove inner gloves and deposit in container with plastic liner.

Equipment:

- container (20-30 gallons)
- plastic liners

14 Respirators will be cleaned daily by hand washing with MSA cleaner-sanitizer solution followed by a thorough rinse and air-drying. NEVER ALLOW A RESPIRATOR TO DRY WITH THE STRAPS PLACED FORWARD ACROSS THE FACESHIELD, BECAUSE THIS MAY CAUSE CHANGES IN THE FACE-TO- RESPIRATOR SEAL SURFACE. The specific procedures to be employed are as follows:

- Remove all cartridges (canisters) and filters plus gaskets and seals not permanently affixed to their seats.
- Loosen harness adjustment straps.
- Remove exhalation valve cover.
- Remove inhalation and exhalation valves.
- Remove protective faceshield cover.
- Wash facepiece in MSA cleaner/sanitizer powder mixed with warm water, preferably at a temperature of 120ºF. Wash components separately from facepiece. Heavy soil may be removed from the facepiece surface using a medium-soft handbrush.
- Remove all parts from the wash solution, and rinse twice in clean, warm water.
- Air-dry all parts in a designated clean area.
- Pat facepieces, valves, and seats to remove any remaining soap residue, water, or other foreign material with a clean, damp, lint-free cloth.
- Reassemble respirator.
- Place respirator in a plastic bag and the respirator box or otherwise store the respirator to prevent exposure to dust, moisture, sunlight, damaging chemicals, extreme temperatures, and impact.

15 IDW will be handled as follows:

- Expendable material, such as tape, boot covers, inner and outer gloves, coveralls, and expendable sampling items, will be placed in a lined 30- to 33-gallon garbage can. When the container is full, the garbage sack will be removed and promptly placed in a contaminated soil stockpile or placed directly into licensed waste hauler trucks for offsite disposal.
- Wash and rinse waters from personal and equipment decontamination will be containerized in 55-gallon drums.
- All drummed wastes will be labeled "Property of [company name]." Drummed liquids will be treated onsite in an activated carbon system. If drums must be transported offsite, they will be labeled in accordance with DOT shipping regulations contained in 49 CFR Parts 171-179 and transported offsite by a licensed waste hauler.

APPENDIX

F JOB HAZARD ANALYSIS

Prepared By:	Prepared Date:
Erin Huntley	8/2/2018
Approved By:	**Approved Date:**
Glen Rieger	10/3/2018

JOB HAZARD ANALYSIS
WATER & ENVIRONMENT

Project Name:	Project No:	Project Location:	Project/Task Description:	Project/Task Equipment:
Former Emerson Power Transmission	31400551	Ithaca, NY	Concrete coring and cutting oversight	Concrete core or saw

Chemicals of Concern:	Site-Specific Hazards:	Action Levels:
See HASP Section 2.5	Site is located on a steep hillside	Organic Vapors - < 10.6 eV = 1 ppm, > 10.6 eV = 5 ppm; Particulates - 2 mg/m^3

Level D PPE:	PPE Upgrades:	Health & Safety Equipment:
Work clothes, steel toe boots, high visibility vest, hearing protection, safety glasses, work gloves, nitrile gloves	Full face respirator with combination cartridge, chemical resistant coveralls	PID (10.6 eV and 11.7 eV), particulate aerosol monitor

Basic Job Step	Potential Hazards (From HASP)																											Baseline Risk Score			Hazard Controls Protection Measures	Controlled Risk Score			Persons Affected
	Explosion (Chemical Reaction)	Explosion (Over Pressurization)	Electrical (Shock/Short Circuit)	Electrical (Fire)	Electrical (Static)	Electrical (Loss of Power)	Ergonomics (Strain)	Ergonomics (Human Error)	Excavation (Collapse)	Fall (Slip, Trip)	Fire/Heat	Mechanical/Vibration (Chafing/Fatigue)	Mechanical Failure	Mechanical	Noise	Struck By (Mass Acceleration)	Struck Against	Chemical (Toxic)	Chemical (Ignitable)	Chemical (Corrosive)	Chemical (Volatile)	Respirable Particulate	Radiation (Ionizing)	Radiation (Non-Ionizing)	Temperature Extreme (Heat/Cold)	Visibility	Weather Phenomena (Snow/Rain/Wind/Ice)	Biological Hazards (Venomous/Disease-Carrying Animals/Insects, Poisonous Plants)	Severity	Likelihood	Risk Score	Color Key: §No shading indicates acceptable risk - no action needed. §Green shading indicates low risk - review the operation/activity and take any steps necessary to reduce & control the risks. §Yellow shading indicates medium risk - inform H&S management & seek further advice before proceeding any further with the operation/activity. §Red shading indicates high risk - HALT the activity immediately, review and reduce the risks identified.	Severity	Likelihood	Risk Score	
Mobilize/Demobilize					X	X	X	X		X	X	X	X	X		X	X		X							X	X		6	3	18	Inspect vehicle for unsafe conditions; Stay alert; Be aware of other traffic; Obey traffic laws; Do not drive when tired; Reduce speed in inclement weather; Park WSP vehicle outside of work zone.	6	2		WSP & Subcontractor
Load/Unload equipment							X			X			X	X		X	X								X	X	X	X	X	6	2	12	Use proper lifting techniques; Stay alert; Park in designated parking/loading area; Wear work gloves and steel toe boots; Wear high visibility vest in high traffic areas; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET	3	1		WSP & Subcontractor
Tailgate meeting (daily)										X																X	X	X	X	X	3	1	3	Wear steel toe boots; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET	3	1		WSP & Subcontractor
Locate and mark locations										X																X	X	X	X	X	3	2	6	Stay alert; Wear steel toe boots; Wear high-visibility vest in high traffic areas; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET	3	1		WSP & Subcontractor
Clear location for utilities							X			X			X	X			X									X	X	X	X	X	3	2	6	Follow SOPs; Use proper lifting techniques; Stay alert; Wear steel toe boots; Wear high-visibility vest in high traffic areas; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET	3	1		WSP & Subcontractor
Set equipment and core or saw concrete				X		X	X			X	X	X	X	X	X	X	X					X				X	X	X	X	X	6	2	12	Stay alert; Inspect concrete corer for unsafe conditions; Use GFCI; Engineering, work practice controls, and required respiratory protection specified in OSHA's Respirable Crystalline Silica standard for general industry must be implemented; Perform air monitoring as per HASP; Wear steel toe boots, hearing protection, and safety glasses; Wear work gloves when handling equipment or concrete; Wear high-visibility vest in high traffic areas; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET	6	1		Subcontractor

Prepared By:	Prepared Date:
Erin Huntley	8/2/2018
Approved By:	**Approved Date:**
Glen Rieger	10/3/2018

JOB HAZARD ANALYSIS
WATER & ENVIRONMENT

Project Name:	Project No:	Project Location:	Project/Task Description:	Project/Task Equipment:
Former Emerson Power Transmission	31400551	Ithaca, NY	Concrete coring and cutting oversight	Concrete core or saw

Chemicals of Concern:	Site-Specific Hazards:	Action Levels:
See HASP Section 2.5	Site is located on a steep hillside	Organic Vapors - < 10.6 eV = 1 ppm, > 10.6 eV = 5 ppm; Particulates - 2 mg/m^3

Level D PPE:	PPE Upgrades:	Health & Safety Equipment:
Work clothes, steel toe boots, high visibility vest, hearing protection, safety glasses, work gloves, nitrile gloves	Full face respirator with combination cartridge, chemical resistant coveralls	PID (10.6 eV and 11.7 eV), particulate aerosol monitor

Basic Job Step	Potential Hazards (From HASP)																											Baseline Risk Score			Hazard Controls Protection Measures	Controlled Risk Score			Persons Affected
	Explosion (Chemical Reaction)	Explosion (Over Pressurization)	Electrical (Shock/Short Circuit)	Electrical (Fire)	Electrical (Static)	Electrical (Loss of Power)	Ergonomics (Strain)	Ergonomics (Human Error)	Excavation (Collapse)	Fall (Slip, Trip)	Fire/Heat	Mechanical/Vibration (Chafing/Fatigue)	Mechanical Failure	Mechanical	Noise	Struck By (Mass Acceleration)	Struck Against	Chemical (Toxic)	Chemical (Ignitable)	Chemical (Corrosive)	Chemical (Volatile)	Respirable Particulate	Radiation (Ionizing)	Radiation (Non-Ionizing)	Temperature Extreme (Heat/Cold)	Visibility	Weather Phenomena (Snow/Rain/Wind/Ice)	Biological Hazards (Venomous/Disease-Carrying Animals/Insects, Poisonous Plants)	Severity	Likelihood	Risk Score		Severity	Likelihood	Risk Score	
Decontamination		X	X	X			X			X	X	X	X	X	X	X	X	X	X		X			X	X	X	X	X	4	3	12	Stay alert; Wear nitrile gloves, steel toe boots, hard hat (if pressure washer in use), hearing protection (if pressure washer in use), and safety glasses or goggles (if pressure washer in use); Wear high-visibility vest in high traffic areas; Perform air monitoring as per HASP; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET	4	1		Subcontractor
Waste management		X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X			X	X		X	X	X	X	X	6	3	18	Inspect equipment before use; Use equipment in accordance with manufacturer's instructions; Use trained operators (if using heavy equipment or forklifts); Use proper lifting techniques; Perform air monitoring as per HASP; Stay alert; Wear steel toe boots, hard hat (if using heavy equipment or forklifts), and safety glasses (if using heavy equipment or forklifts); Wear high-visibility vest in high traffic areas; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET	4	1		WSP & Subcontractor

Color Key:
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§Yellow shading indicates medium risk - inform H&S management & seek further advice before proceeding any further with the operation/activity.
§Red shading indicates high risk - HALT the activity immediately, review and reduce the risks identified.

Prepared By:	Prepared Date:
Erin Huntley	8/2/2018
Approved By:	**Approved Date:**
Glen Rieger	10/3/2018

JOB HAZARD ANALYSIS
WATER & ENVIRONMENT

Project Name:	Project No:	Project Location:	Project/Task Description:	Project/Task Equipment:
Former Emerson Power Transmission	31400551	Ithaca, NY	Video survey (sewers, manholes, etc.) oversight	Pipe inspection camera, monitor, recording device

Chemicals of Concern:	Site-Specific Hazards:	Action Levels:
See HASP Section 2.5	Site is located on a steep hillside	Organic Vapors - < 10.6 eV = 1 ppm, > 10.6 eV = 5 ppm

Level D PPE:	PPE Upgrades:	Health & Safety Equipment:
Work clothes, steel toe boots, high visibility vest, work glove, nitrile gloves	Full face respirator with combination cartridge, chemical resistant coveralls	PID (10.6 eV and 11.7 eV)

Basic Job Step	Potential Hazards (From HASP)																											Baseline Risk Score			Hazard Controls Protection Measures	Controlled Risk Score			Persons Affected
	Explosion (Chemical Reaction)	Explosion (Over Pressurization)	Electrical (Shock/Short Circuit)	Electrical (Fire)	Electrical (Static)	Electrical (Loss of Power)	Ergonomics (Strain)	Ergonomics (Human Error)	Excavation (Collapse)	Fall (Slip, Trip)	Fire/Heat	Mechanical/Vibration (Chafing/Fatigue)	Mechanical Failure	Mechanical	Noise	Struck By (Mass Acceleration)	Struck Against	Chemical (Toxic)	Chemical (Ignitable)	Chemical (Corrosive)	Chemical (Volatile)	Respirable Particulate	Radiation (Ionizing)	Radiation (Non-Ionizing)	Temperature Extreme (Heat/Cold)	Visibility	Weather Phenomena (Snow/Rain/Wind/Ice)	Biological Hazards (Venomous/Disease-Carrying Animals/Insects, Poisonous Plants)	Severity	Likelihood	Risk Score	Color Key: §No shading indicates acceptable risk - no action needed. §Green shading indicates low risk - review the operation/activity and take any steps necessary to reduce & control the risks. §Yellow shading indicates medium risk - inform H&S management & seek further advice before proceeding any further with the operation/activity. §Red shading indicates high risk - HALT the activity immediately, review and reduce the risks identified.	Severity	Likelihood	Risk Score	
Mobilize/Demobilize					X	X	X	X		X	X	X	X	X		X	X		X							X	X		6	3	18	Inspect vehicle for unsafe conditions; Stay alert; Be aware of other traffic; Obey traffic laws; Do not drive when tired; Reduce speed in inclement weather; Park WSP vehicle outside of work zone.	6	2	12	WSP & Subcontractor
Load/Unload equipment							X			X			X	X		X	X							X	X	X	X	X	6	2	12	Use proper lifting techniques; Stay alert; Park in designated parking/loading area; Wear work gloves and steel toe boots; Wear high visibility vest in high traffic areas; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET	3	1	3	WSP & Subcontractor
Tailgate meeting (daily)										X														X	X	X	X	X	3	1	3	Wear steel toe boots; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET	3	1	3	WSP & Subcontractor
Set up equipment and survey feature							X			X			X	X		X	X				X			X	X	X	X	X	6	3	18	Stay alert; Wear work glove, nitrile gloves (when retrieving camera), and steel toe boots; Wear high-visibility vest in high traffic areas; Perform air monitoring as per HASP; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET	4	1	4	Subcontractor
Decontamination							X			X	X			X			X	X	X		X			X	X	X	X	X	6	3	18	Stay alert; Wear nitrile gloves, steel toe boots; Wear high-visibility vest in high traffic areas; Perform air monitoring as per HASP; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET	4	1	4	Subcontractor
Waste management							X			X	X		X	X		X	X	X	X		X			X	X	X	X	X	6	3	18	Use proper lifting techniques; Stay alert; Wear work or nitrile gloves and steel toe boots; Use hand tools properly; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET	4	1	4	WSP & Subcontractor

Prepared By:	Prepared Date:
Erin Huntley	8/2/2018
Approved By:	**Approved Date:**
Glen Rieger	10/3/2018

JOB HAZARD ANALYSIS
WATER & ENVIRONMENT

Project Name:	Project No:	Project Location:	Project/Task Description:	Project/Task Equipment:
Former Emerson Power Transmission	31400551	Ithaca, NY	Excavation oversight	Backhoe/excavator (or similar), chain saw, dump truck

Chemicals of Concern:	Site-Specific Hazards:	Action Levels:
See HASP Section 2.5	Site is located on a steep hillside	Organic Vapors - < 10.6 eV = 1 ppm, > 10.6 eV = 5 ppm; Particulates - 2 mg/m^3

Level D PPE:	PPE Upgrades:	Health & Safety Equipment:
Work clothes, steel toe boots, high visibility vest, hard hat, hearing protection, safety glasses, work gloves, nitrile gloves	Full face respirator with combination cartridge, chemical resistant coveralls	PID (10.6 eV and 11.7 eV), particulate aerosol monitor

Basic Job Step	Potential Hazards (From HASP)																											Baseline Risk Score			Hazard Controls Protection Measures	Controlled Risk Score			Persons Affected
	Explosion (Chemical Reaction)	Explosion (Over Pressurization)	Electrical (Shock/Short Circuit)	Electrical (Fire)	Electrical (Static)	Electrical (Loss of Power)	Ergonomics (Strain)	Ergonomics (Human Error)	Excavation (Collapse)	Fall (Slip, Trip)	Fire/Heat	Mechanical/Vibration (Chafing/Fatigue)	Mechanical Failure	Mechanical	Noise	Struck By (Mass Acceleration)	Struck Against	Chemical (Toxic)	Chemical (Ignitable)	Chemical (Corrosive)	Chemical (Volatile)	Respirable Particulate	Radiation (Ionizing)	Radiation (Non-Ionizing)	Temperature Extreme (Heat/Cold)	Visibility	Weather Phenomena (Snow/Rain/Wind/Ice)	Biological Hazards (Venomous/Disease-Carrying Animals/Insects, Poisonous Plants)	Severity	Likelihood	Risk Score	Color Key: §No shading indicates acceptable risk - no action needed. §Green shading indicates low risk - review the operation/activity and take any steps necessary to reduce & control the risks. §Yellow shading indicates medium risk - inform H&S management & seek further advice before proceeding any further with the operation/activity. §Red shading indicates high risk - HALT the activity immediately, review and reduce the risks identified.	Severity	Likelihood	Risk Score	
Mobilize/Demobilize					X	X	X	X		X	X	X	X	X		X	X		X							X	X		6	3	18	Inspect vehicle for unsafe conditions; Stay alert; Be aware of other traffic; Obey traffic laws; Do not drive when tired; Reduce speed in inclement weather; Park WSP vehicle outside of work zone.	6	2	12	WSP & Subcontractor
Load/Unload equipment							X	X		X			X	X		X	X								X	X	X	X	X	6	2	12	Use proper lifting techniques; Stay alert; Park in designated parking/loading area; Wear work gloves and steel toe boots; Wear high visibility vest in high traffic areas; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET	3	1	3	WSP & Subcontractor
Tailgate meeting (daily)										X																X	X	X	X	X	3	1	3	Wear steel toe boots; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET	3	1	3	WSP & Subcontractor
Locate and mark locations										X																X	X	X	X	X	3	2	6	Stay alert; Wear steel toe boots; Wear high-visibility vest in high traffic areas; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET	3	1	3	WSP & Subcontractor
Clear location for utilities							X			X			X	X			X									X	X	X	X	X	3	2	6	Follow SOPs; Use proper lifting techniques; Stay alert; Wear steel toe boots; Wear high-visibility vest in high traffic areas; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET	3	1	3	WSP & Subcontractor
Fuel vehicles and equipment					X			X		X			X	X			X	X	X							X	X	X	X	X	6	2	12	No smoking; Use DOT approved containers; Turn off equipment before fueling; dispense fuel into containers placed on the ground surface; Wear steel toe boots; Wear high-visibility vest in high traffic areas; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropirate lighting; Use insect repellant containing DEET	6	1	6	Subcontractor
Set up erosion and sedimentation controls		X	X	X		X	X	X		X	X	X	X	X	X	X	X					X			X	X	X	X	X	6	3	18	Inspect equipment before use; Use equipment in accordance with manufacturer's instructions; Use trained operators; Use proper lifting techniques; Stay alert; Wear steel toe boots, hard hat, and safety glasses; Wear high-visibility vest in high traffic areas; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET	6	1	6	Subcontractor

Prepared By:	Prepared Date:
Erin Huntley	8/2/2018
Approved By:	**Approved Date:**
Glen Rieger	10/3/2018

JOB HAZARD ANALYSIS
WATER & ENVIRONMENT

Project Name:	Project No:	Project Location:	Project/Task Description:	Project/Task Equipment:
Former Emerson Power Transmission	31400551	Ithaca, NY	Excavation oversight	Backhoe/excavator (or similar), chain saw, dump truck

Chemicals of Concern:	Site-Specific Hazards:	Action Levels:
See HASP Section 2.5	Site is located on a steep hillside	Organic Vapors - < 10.6 eV = 1 ppm, > 10.6 eV = 5 ppm; Particulates - 2 mg/m^3

Level D PPE:	PPE Upgrades:	Health & Safety Equipment:
Work clothes, steel toe boots, high visibility vest, hard hat, hearing protection, safety glasses, work gloves, nitrile gloves	Full face respirator with combination cartridge, chemical resistant coveralls	PID (10.6 eV and 11.7 eV), particulate aerosol monitor

Basic Job Step	Potential Hazards (From HASP)																										Baseline Risk Score			Hazard Controls Protection Measures	Controlled Risk Score			Persons Affected
	Explosion (Chemical Reaction)	Explosion (Over Pressurization)	Electrical (Shock/Short Circuit)	Electrical (Fire)	Electrical (Static)	Electrical (Loss of Power)	Ergonomics (Strain)	Ergonomics (Human Error)	Excavation (Collapse)	Fall (Slip, Trip)	Fire/Heat	Mechanical/Vibration (Chafing/Fatigue)	Mechanical Failure	Mechanical	Noise	Struck By (Mass Acceleration)	Struck Against	Chemical (Toxic)	Chemical (Ignitable)	Chemical (Corrosive)	Chemical (Volatile)	Respirable Particulate	Radiation (Ionizing)	Radiation (Non-Ionizing)	Temperature Extreme (Heat/Cold)	Visibility	Weather Phenomena (Snow/Rain/Wind/Ice)	Biological Hazards (Venomous/Disease-Carrying Animals/Insects, Poisonous Plants)	Severity	Likelihood	Risk Score		Severity	Likelihood	Risk Score	
Clearing		X	X	X		X	X	X		X	X	X	X	X	X	X	X							X	X	X	X	X	6	3	18	Inspect equipment before use; Use equipment in accordance with manufacturer's instructions; Use trained operators; Use proper lifting techniques; Stay alert; Wear steel toe boots, hard hat, and safety glasses; Wear high-visibility vest in high traffic areas; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET	6	1	6	Subcontractor
Drainage ditch bypass		X	X	X		X	X	X		X	X	X	X	X	X	X	X					X		X	X	X	X	X	6	2	12	Inspect equipment before use; Use equipment in accordance with manufacturer's instructions; Use trained operators; Use proper lifting techniques; Perform air monitoring as per HASP; Stay alert; Wear steel toe boots, hard hat, and safety glasses; Wear high-visibility vest in high traffic areas; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET	6	1	6	Subcontractor
Excavation and segragation		X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X				X	X		X	X	X	X	X	6	3	18	Follow OSHA Excavation standards; Engineering, work practice controls, and required respiratory protection specified in OSHA's Respirable Crystalline Silica standard for general industry must be implemented; Inspect equipment before use; Use equipment in accordance with manufacturer's instructions; Use trained operators; Use proper lifting techniques; Perform air monitoring as per HASP; Stay alert; Wear steel toe boots, hard hat, and safety glasses; Wear high-visibility vest in high traffic areas; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET	6	1	6	WSP & Subcontractor
Water managment		X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X			X			X	X	X	X	X	6	2	12	Inspect equipment before use; Use equipment in accordance with manufacturer's instructions; Use trained operators; Use proper lifting techniques; Perform air monitoring as per HASP; Stay alert; Wear steel toe boots, hard hat, and safety glasses; Wear high-visibility vest in high traffic areas; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET	6	1	6	WSP & Subcontractor

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Prepared By:	Prepared Date:
Erin Huntley	8/2/2018
Approved By:	**Approved Date:**
Glen Rieger	10/3/2018

JOB HAZARD ANALYSIS
WATER & ENVIRONMENT

Project Name:	Project No:	Project Location:	Project/Task Description:	Project/Task Equipment:
Former Emerson Power Transmission	31400551	Ithaca, NY	Excavation oversight	Backhoe/excavator (or similar), chain saw, dump truck

Chemicals of Concern:	Site-Specific Hazards:	Action Levels:
See HASP Section 2.5	Site is located on a steep hillside	Organic Vapors - < 10.6 eV = 1 ppm, > 10.6 eV = 5 ppm; Particulates - 2 mg/m^3

Level D PPE:	PPE Upgrades:	Health & Safety Equipment:
Work clothes, steel toe boots, high visibility vest, hard hat, hearing protection, safety glasses, work gloves, nitrile gloves	Full face respirator with combination cartridge, chemical resistant coveralls	PID (10.6 eV and 11.7 eV), particulate aerosol monitor

Basic Job Step	Potential Hazards (From HASP)																										Baseline Risk Score			Hazard Controls Protection Measures	Controlled Risk Score			Persons Affected
	Explosion (Chemical Reaction)	Explosion (Over Pressurization)	Electrical (Shock/Short Circuit)	Electrical (Fire)	Electrical (Static)	Electrical (Loss of Power)	Ergonomics (Strain)	Ergonomics (Human Error)	Excavation (Collapse)	Fall (Slip, Trip)	Fire/Heat	Mechanical/Vibration (Chafing/Fatigue)	Mechanical Failure	Mechanical	Noise	Struck By (Mass Acceleration)	Struck Against	Chemical (Toxic)	Chemical (Ignitable)	Chemical (Corrosive)	Chemical (Volatile)	Respirable Particulate	Radiation (Ionizing)	Radiation (Non-Ionizing)	Temperature Extreme (Heat/Cold)	Visibility	Weather Phenomena (Snow/Rain/Wind/Ice)	Biological Hazards (Venomous/Disease-Carrying Animals/Insects, Poisonous Plants)	Severity	Likelihood	Risk Score		Severity	Likelihood	Risk Score	
Field Screening							X	X	X	X				X			X	X			X			X	X	X	X	X	6	2	12	Inspect equipment before use; Use equipment in accordance with manufacturer's instructions; Use proper lifting techniques; Perform air monitoring as per HASP; Stay alert; Wear steel toe boots, hard hat, and safety glasses; Wear high-visibility vest in high traffic areas; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET	6	1	6	WSP & Subcontractor
Confirmation Sampling							X	X	X	X				X			X	X			X			X	X	X	X	X	6	2	12	Follow SOPs; Inspect equipment before use; Use equipment in accordance with manufacturer's instructions; Use proper lifting techniques; Perform air monitoring as per HASP; Stay alert; Wear steel toe boots, hard hat, and safety glasses; Wear high-visibility vest in high traffic areas; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET	6	1	6	WSP & Subcontractor
Transport and disposal		X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X			X	X		X	X	X	X	X	6	3	18	Inspect equipment before use; Use equipment in accordance with manufacturer's instructions; Use trained operators; Use proper lifting techniques; Perform air monitoring as per HASP; Stay alert; Wear steel toe boots, hard hat, and safety glasses; Wear high-visibility vest in high traffic areas; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET	6	1	6	WSP & Subcontractor
Backfilling and compaction		X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X				X		X	X	X	X	X	6	2	12	Engineering, work practice controls, and required respiratory protection specified in OSHA's Respirable Crystalline Silica standard for general industry must be implemented; Inspect equipment before use; Use equipment in accordance with manufacturer's instructions; Use trained operators; Use proper lifting techniques; Perform air monitoring as per HASP; Stay alert; Wear steel toe boots, hard hat, and safety glasses; Wear high-visibility vest in high traffic areas; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET	6	1	6	Subcontractor

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Prepared By:	Prepared Date:
Erin Huntley	8/2/2018
Approved By:	**Approved Date:**
Glen Rieger	10/3/2018

JOB HAZARD ANALYSIS
WATER & ENVIRONMENT

Project Name:	Project No:	Project Location:	Project/Task Description:	Project/Task Equipment:
Former Emerson Power Transmission	31400551	Ithaca, NY	Excavation oversight	Backhoe/excavator (or similar), chain saw, dump truck

Chemicals of Concern:	Site-Specific Hazards:	Action Levels:
See HASP Section 2.5	Site is located on a steep hillside	Organic Vapors - < 10.6 eV = 1 ppm, > 10.6 eV = 5 ppm; Particulates - 2 mg/m^3

Level D PPE:	PPE Upgrades:	Health & Safety Equipment:
Work clothes, steel toe boots, high visibility vest, hard hat, hearing protection, safety glasses, work gloves, nitrile gloves	Full face respirator with combination cartridge, chemical resistant coveralls	PID (10.6 eV and 11.7 eV), particulate aerosol monitor

Basic Job Step	Potential Hazards (From HASP)																											Baseline Risk Score			Hazard Controls Protection Measures	Controlled Risk Score			Persons Affected
	Explosion (Chemical Reaction)	Explosion (Over Pressurization)	Electrical (Shock/Short Circuit)	Electrical (Fire)	Electrical (Static)	Electrical (Loss of Power)	Ergonomics (Strain)	Ergonomics (Human Error)	Excavation (Collapse)	Fall (Slip, Trip)	Fire/Heat	Mechanical/Vibration (Chafing/Fatigue)	Mechanical Failure	Mechanical	Noise	Struck By (Mass Acceleration)	Struck Against	Chemical (Toxic)	Chemical (Ignitable)	Chemical (Corrosive)	Chemical (Volatile)	Respirable Particulate	Radiation (Ionizing)	Radiation (Non-Ionizing)	Temperature Extreme (Heat/Cold)	Visibility	Weather Phenomena (Snow/Rain/Wind/Ice)	Biological Hazards (Venomous/Disease-Carrying Animals/Insects, Poisonous Plants)	Severity	Likelihood	Risk Score	Color Key: §No shading indicates acceptable risk - no action needed. §Green shading indicates low risk - review the operation/activity and take any steps necessary to reduce & control the risks. §Yellow shading indicates medium risk - inform H&S management & seek further advice before proceeding any further with the operation/activity. §Red shading indicates high risk - HALT the activity immediately, review and reduce the risks identified.	Severity	Likelihood	Risk Score	
Cap and soil cover		X	X	X		X	X	X		X	X	X	X	X	X	X	X	X				X		X	X	X	X	X	6	2	12	Engineering, work practice controls, and required respiratory protection specified in OSHA's Respirable Crystalline Silica standard for general industry must be implemented; Inspect equipment before use; Use equipment in accordance with manufacturer's instructions; Use trained operators; Use proper lifting techniques; Perform air monitoring as per HASP; Stay alert; Wear steel toe boots, hard hat, and safety glasses; Wear high-visibility vest in high traffic areas; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET	6	1	6	Subcontractor
Restoration		X	X	X		X	X	X		X	X	X	X	X	X	X	X	X						X	X	X	X	X	6	2	12	Inspect equipment before use; Use equipment in accordance with manufacturer's instructions; Use trained operators; Use proper lifting techniques; Stay alert; Wear steel toe boots, hard hat, and safety glasses; Wear high-visibility vest in high traffic areas; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET	6	1	6	Subcontractor

Prepared By:	Prepared Date:
Erin Huntley	9/18/2018
Approved By:	**Approved Date:**
Glen Rieger	10/3/2018

JOB HAZARD ANALYSIS
WATER & ENVIRONMENT

Project Name:	Project No:	Project Location:	Project/Task Description:	Project/Task Equipment:
Former Emerson Power Transmission	31400551	Ithaca, NY	DPE System OM&M	

Chemicals of Concern:	Site-Specific Hazards:	Action Levels:
See HASP Section 2.5	Site is located on a steep hillside	Organic Vapors - < 10.6 eV = 1 ppm, > 10.6 eV = 5 ppm

Level D PPE:	PPE Upgrades:	Health & Safety Equipment:
Work clothes, steel toe boots, hearing protection (when system running in treatment building), safety glasses/goggles (when system running in treatment building), work	Full face respirator with combination cartridge, chemical resistant coveralls	PID (10.6 eV and 11.7 eV)

Basic Job Step	Potential Hazards (From HASP)																													Baseline Risk Score			Hazard Controls Protection Measures	Controlled Risk Score			Persons Affected
	Explosion (Chemical Reaction)	Explosion (Over Pressurization)	Electrical (Shock/Short Circuit)	Electrical (Fire)	Electrical (Static)	Electrical (Loss of Power)	Ergonomics (Strain)	Ergonomics (Human Error)	Excavation (Collapse)	Fall (Slip, Trip)	Fire/Heat	Mechanical/Vibration (Chafing/Fatigue)	Mechanical Failure	Mechanical	Noise	Struck By (Mass Acceleration)	Struck Against	Chemical (Toxic)	Chemical (Ignitable)	Chemical (Corrosive)	Chemical (Volatile)	Respirable Particulate	Radiation (Ionizing)	Radiation (Non-Ionizing)	Temperature Extreme (Heat/Cold)	Visibility	Weather Phenomena (Snow/Rain/Wind/Ice)	Biological Hazards (Venomous/Disease-Carrying Animals/Insects, Poisonous Plants)	Severity	Likelihood	Risk Score	Color Key: §No shading indicates acceptable risk - no action needed. §Green shading indicates low risk - review the operation/activity and take any steps necessary to reduce & control the risks. §Yellow shading indicates medium risk - inform H&S management & seek further advice before proceeding any further with the operation/activity. §Red shading indicates high risk - HALT the activity immediately, review and reduce the risks identified.	Severity	Likelihood	Risk Score	
Mobilize/Demobilize					X	X	X	X		X	X	X	X	X		X	X		X							X	X		6	3	18	Inspect vehicle for unsafe conditions; Stay alert; Be aware of other traffic; Obey traffic laws; Do not drive when tired; Reduce speed in inclement weather; Park WSP vehicle outside of work zone.	6	2	12	WSP & Subcontractor
Load/Unload equipment							X	X		X			X	X		X	X								X	X	X	X	X	6	2	12	Use proper lifting techniques; Stay alert; Park in designated parking/loading area; Wear work gloves and steel toe boots; Wear high visibility vest in high traffic areas; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET	3	1	3	WSP & Subcontractor
Inspect DPE well vaults (check instrumentation, adjust values, remove accumulated water)		X	X	X	X		X			X		X	X	X			X	X	X		X				X	X	X	X	X	5	3	15	Inspect work area for unsafe conditions; Use proper lifting techniques; Stay alert; Wear work gloves and steel toe boots; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET	3	2	6	WSP & Subcontractor
Inspect treatment building equipment (skids, piping, pumps, fans, carbon vessel, air stripper, vacuum blower)		X	X	X	X		X			X	X	X	X	X	X		X	X	X		X				X	X	X	X	6	3	18	Inspect work area and equipment for unsafe conditions; Use proper lifting techniques; Stay alert; Wear work gloves, safety glasses, hearing protection, and steel toe boots; Wear weather-appropriate clothing; Work with appropriate lighting	3	2	6	WSP & Subcontractor
Remove dirt and grease from equipment							X			X	X			X			X	X	X		X				X	X	X	X	3	3	9	Use proper lifting techniques; Utilize lockout tagout; Stay alert; Wear work or nitrile gloves, safety glasses, hearing protection, and steel toe boots; Wear weather-appropriate clothing; Work with appropriate lighting	2	2	4	WSP & Subcontractor
Disassemble and clean air stripper trays							X	X		X			X	X			X	X	X		X				X	X	X	X	4	3	12	Power off air stripper (utilize lockout tagout); Perform air monitoring as per HASP; Use proper lifting techniques; Stay alert; Wear nitrile gloves, safety goggles, and steel toe boots; Wear weather-appropriate clothing; Work with appropriate lighting	3	2	6	WSP & Subcontractor
Collect influent and effluent samples		X			X		X			X					X		X	X	X	X	X				X	X	X	X	3	2	6	Follow SOPs; Perform air monitoring as per HASP; Stay alert; Wear nitrile gloves, safety glasses, hearing protection, steel toe boots; Perform air monitoring as per HASP; Wear weather-appropriate clothing	2	2	4	WSP & Subcontractor

Prepared By:	Prepared Date:
Erin Huntley	9/18/2018
Approved By:	**Approved Date:**
Glen Rieger	10/3/2018

JOB HAZARD ANALYSIS
WATER & ENVIRONMENT

Project Name:	Project No:	Project Location:	Project/Task Description:	Project/Task Equipment:
Former Emerson Power Transmission	31400551	Ithaca, NY	Vapor Mitigation System OM&M	Smoke kit, caulk

Chemicals of Concern:	Site-Specific Hazards:	Action Levels:
See HASP Section 2.5	Located in off-site residences	Organic Vapors - < 10.6 eV = 1 ppm, > 10.6 eV = 5 ppm

Level D PPE:	PPE Upgrades:	Health & Safety Equipment:
Work clothes, steel toe boots, safety glasses, work gloves, nitrile gloves	Full face respirator with combination cartridge, chemical resistant coveralls	PID (10.6 eV and 11.7 eV)

Basic Job Step	Potential Hazards (From HASP)																											Baseline Risk Score			Hazard Controls Protection Measures	Controlled Risk Score			Persons Affected
	Explosion (Chemical Reaction)	Explosion (Over Pressurization)	Electrical (Shock/Short Circuit)	Electrical (Fire)	Electrical (Static)	Electrical (Loss of Power)	Ergonomics (Strain)	Ergonomics (Human Error)	Excavation (Collapse)	Fall (Slip, Trip)	Fire/Heat	Mechanical/Vibration (Chafing/Fatigue)	Mechanical Failure	Mechanical	Noise	Struck By (Mass Acceleration)	Struck Against	Chemical (Toxic)	Chemical (Ignitable)	Chemical (Corrosive)	Chemical (Volatile)	Respirable Particulate	Radiation (Ionizing)	Radiation (Non-Ionizing)	Temperature Extreme (Heat/Cold)	Visibility	Weather Phenomena (Snow/Rain/Wind/Ice)	Biological Hazards (Venomous/Disease-Carrying Animals/Insects, Poisonous Plants)	Severity	Likelihood	Risk Score	Color Key: §No shading indicates acceptable risk - no action needed. §Green shading indicates low risk - review the operation/activity and take any steps necessary to reduce & control the risks. §Yellow shading indicates medium risk - inform H&S management & seek further advice before proceeding any further with the operation/activity. §Red shading indicates high risk - HALT the activity immediately, review and reduce the risks identified.	Severity	Likelihood	Risk Score	
Mobilize/Demobilize					X	X	X	X		X	X	X	X	X		X	X		X							X	X		6	3	18	Inspect vehicle for unsafe conditions; Stay alert; Be aware of other traffic; Obey traffic laws; Do not drive when tired; Reduce speed in inclement weather; Park WSP vehicle outside of work zone.	6	2	12	WSP
Load/Unload equipment							X	X		X			X	X		X	X							X	X	X	X	X	6	2	12	Use proper lifting techniques; Stay alert; Park in designated parking/loading area; Wear work gloves and steel toe boots; Wear high visibility vest in high traffic areas; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET	3	1	3	WSP
Inspect system			X	X			X	X		X		X	X	X												X	X	X	4	1	4	Meet and discuss inspection procedure with homeowner; Inspect system and work area for unsafe conditions; Stay alert; Wear work gloves and steel toe boots; Wear weather-appropriate clothing; Work with appropriate lighting	3	1	3	WSP
Smoke test							X	X		X				X			X									X	X	X	3	1	3	Use smoke kit in accordance with manufacterers instructions; Stay alert; Wear work gloves and steel toe boots; Wear weather-appropriate clothing; Work with appropriate lighting	2	1	2	WSP
Repair leaks							X	X		X				X			X									X	X	X	3	1	3	Use caulk in accordance with manufacterers instructions; Stay alert; Wear work gloves, safety glasses and steel toe boots; Wear weather-appropriate clothing; Work with appropriate lighting	2	1	2	WSP

Prepared By:	Prepared Date:
Erin Huntley	9/17/2018
Approved By:	**Approved Date:**
Glen Rieger	10/3/2018

JOB HAZARD ANALYSIS
WATER & ENVIRONMENT

Project Name:	Project No:	Project Location:	Project/Task Description:	Project/Task Equipment:
Former Emerson Power Transmission	31400551	Ithaca, NY	Groundwater Sampling	Sample collection equipment (bailer, electric submerisble pump, pneumatic pump), water level tape, water quality meter, sample containers, gasoline generator (as needed), compressed carbon dioxide (as needed), air compressor (as needed)

Chemicals of Concern:	Site-Specific Hazards:	Action Levels:
See HASP Section 2.5; calibration reagents; sample preservatives	Site is located on a steep hillside	Organic Vapors - < 10.6 eV = 1 ppm, > 10.6 eV = 5 ppm

Level D PPE:	PPE Upgrades:	Health & Safety Equipment:
Chemical resistant coveralls, steel toe boots, work gloves, nitrile gloves, high visibility vest (as needed)	Full face respirator with combination cartridge, chemical resistant coveralls	PID (10.6 eV and 11.7 eV)

Basic Job Step	Potential Hazards (From HASP)																											Baseline Risk Score			Hazard Controls Protection Measures	Controlled Risk Score			Persons Affected
	Explosion (Chemical Reaction)	Explosion (Over Pressurization)	Electrical (Shock/Short Circuit)	Electrical (Fire)	Electrical (Static)	Electrical (Loss of Power)	Ergonomics (Strain)	Ergonomics (Human Error)	Excavation (Collapse)	Fall (Slip, Trip)	Fire/Heat	Mechanical/Vibration (Chafing/Fatigue)	Mechanical Failure	Mechanical	Noise	Struck By (Mass Acceleration)	Struck Against	Chemical (Toxic)	Chemical (Ignitable)	Chemical (Corrosive)	Chemical (Volatile)	Respirable Particulate	Radiation (Ionizing)	Radiation (Non-Ionizing)	Temperature Extreme (Heat/Cold)	Visibility	Weather Phenomena (Snow/Rain/Wind/Ice)	Biological Hazards (Venomous/Disease-Carrying Animals/Insects, Poisonous Plants)	Severity	Likelihood	Risk Score	Color Key: §No shading indicates acceptable risk - no action needed. §Green shading indicates low risk - review the operation/activity and take any steps necessary to reduce & control the risks. §Yellow shading indicates medium risk - inform H&S management & seek further advice before proceeding any further with the operation/activity. §Red shading indicates high risk - HALT the activity immediately, review and reduce the risks identified.	Severity	Likelihood	Risk Score	
Mobilize/Demobilize					X	X	X	X		X	X	X	X	X		X	X		X							X	X		6	3	18	Inspect vehicle for unsafe conditions; Stay alert; Be aware of other traffic; Obey traffic laws; Do not drive when tired; Reduce speed in inclement weather; Park WSP vehicle outside of work zone.	6	2	12	WSP
Load/Unload equipment							X			X			X	X		X	X								X	X	X	X	X	6	2	12	Use proper lifting techniques; Stay alert; Park in designated parking/loading area; Wear work gloves and steel toe boots; Wear high visibility vest in high traffic areas; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET	3	1	3	WSP
Tailgate meeting (daily)										X																X	X	X	X	X	3	1	3	Stay alert; Wear steel toe boots; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET	3	1	3	WSP
Calibrate equipment			X				X			X			X	X				X		X						X	X	X	X	X	3	1	3	Follow SOPs; Inspect equipment; Use proper lifting techniques; Stay alert; Wear steel toe boots; Wear weather-appropriate clothing; Wear nitrile gloves; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET	3	1	3	WSP
Remove absorbent sock							X			X			X	X		X	X	X	X		X					X	X	X	X	X	3	1	3	Perform air monitoring as per HASP; Stay alert; Wear nitrile gloves, chemical resistant coveralls, goggles, steel toe boots; Wear high visibility vest in high traffic areas; Perform air monitoring as per HASP; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET	3	1	3	
Gauge well			X				X			X			X	X		X	X	X	X		X					X	X	X	X	X	6	3	18	Follow SOPs; Inspect equipment; Perform air monitoring as per HASP; Stay alert; Wear nitrile gloves, chemical resistant coveralls, goggles, steel toe boots; Wear high visibility vest in high traffic areas; Perform air monitoring as per HASP; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET	6	1	6	WSP
Bail well		X	X	X			X	X		X	X	X	X	X	X	X	X	X	X		X					X	X	X	X	X	6	3	18	Perform air monitoring as per HASP; Stay alert; Wear nitrile gloves, chemical resistant coveralls, goggles, steel toe boots; Wear high visibility vest in high traffic areas; Perform air monitoring as per HASP; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET	6	1	6	WSP

Prepared By:	Prepared Date:
Erin Huntley	9/17/2018
Approved By:	**Approved Date:**
Glen Rieger	10/3/2018

JOB HAZARD ANALYSIS
WATER & ENVIRONMENT

Project Name:	Project No:	Project Location:	Project/Task Description:	Project/Task Equipment:
Former Emerson Power Transmission	31400551	Ithaca, NY	Groundwater Sampling	Sample collection equipment (bailer, electric submerisble pump, pneumatic pump), water level tape, water quality meter, sample containers, gasoline generator (as needed), compressed carbon dioxide (as needed), air compressor (as needed)

Chemicals of Concern:	Site-Specific Hazards:	Action Levels:
See HASP Section 2.5; calibration reagents; sample preservatives	Site is located on a steep hillside	Organic Vapors - < 10.6 eV = 1 ppm, > 10.6 eV = 5 ppm

Level D PPE:	PPE Upgrades:	Health & Safety Equipment:
Chemical resistant coveralls, steel toe boots, work gloves, nitrile gloves, high visibility vest (as needed)	Full face respirator with combination cartridge, chemical resistant coveralls	PID (10.6 eV and 11.7 eV)

Basic Job Step	Potential Hazards (From HASP)																											Baseline Risk Score			Hazard Controls Protection Measures	Controlled Risk Score			Persons Affected
	Explosion (Chemical Reaction)	Explosion (Over Pressurization)	Electrical (Shock/Short Circuit)	Electrical (Fire)	Electrical (Static)	Electrical (Loss of Power)	Ergonomics (Strain)	Ergonomics (Human Error)	Excavation (Collapse)	Fall (Slip, Trip)	Fire/Heat	Mechanical/Vibration (Chafing/Fatigue)	Mechanical Failure	Mechanical	Noise	Struck By (Mass Acceleration)	Struck Against	Chemical (Toxic)	Chemical (Ignitable)	Chemical (Corrosive)	Chemical (Volatile)	Respirable Particulate	Radiation (Ionizing)	Radiation (Non-Ionizing)	Temperature Extreme (Heat/Cold)	Visibility	Weather Phenomena (Snow/Rain/Wind/Ice)	Biological Hazards (Venomous/Disease-Carrying Animals/Insects, Poisonous Plants)	Severity	Likelihood	Risk Score		Severity	Likelihood	Risk Score	
Install absorbent sock							X			X				X		X	X	X	X		X			X	X	X	X	X	6	3	18	Perform air monitoring as per HASP; Stay alert; Wear nitrile gloves, steel toe boots; Wear high visibility vest in high traffic areas; Perform air monitoring as per HASP; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET	6	1	6	WSP
Decontamination							X			X				X			X	X	X		X			X	X	X	X	X	3	3	9	Follow SOPs; Perform air monitoring as per HASP; Stay alert; Wear nitrile gloves, chemical resistant coveralls, goggles, steel toe boots; Perform air monitoring as per HASP; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET	3	1	3	WSP
Waste management							X			X			X	X			X	X	X		X			X	X	X	X	X	3	3	9	Follow SOPs; Perform air monitoring as per HASP; Use proper lifting techniques; Stay alert; Wear work or nitrile gloves, chemical resistant coveralls, goggles, and steel toe boots; Use hand tools properly; Wear weather-appropriate clothing; Work with appropriate lighting	3	1	3	WSP

Color Key:
§No shading indicates acceptable risk - no action needed.
§Green shading indicates low risk - review the operation/activity and take any steps necessary to reduce & control the risks.
§Yellow shading indicates medium risk - inform H&S management & seek further advice before proceeding any further with the operation/activity.
§Red shading indicates high risk - HALT the activity immediately, review and reduce the risks identified.

Prepared By:	Prepared Date:
Erin Huntley	9/12/2018
Approved By:	**Approved Date:**
Glen Rieger	10/3/2018

JOB HAZARD ANALYSIS
WATER & ENVIRONMENT

Project Name:	Project No:	Project Location:	Project/Task Description:	Project/Task Equipment:
Former Emerson Power Transmission	31400551	Ithaca, NY	Soil sampling, monitoring well installation oversigint and development	Drill rig (geoprobe, HSA, air, sonic), soil/rock sampler, well construction materials, sample containers, pump (electric submersible, inertial) with tubiring or bailer, surge block, water quality probe, water level tape

Chemicals of Concern:	Site-Specific Hazards:	Action Levels:
See HASP Section 2.5	Site is located on a steep hillside.	Organic Vapors - < 10.6 eV = 1 ppm, > 10.6 eV = 5 ppm; Particulates - 2 mg/m^3

Level D PPE:	PPE Upgrades:	Health & Safety Equipment:
Work clothes, steel toe boots, high visibility vest, hard hat, hearing protection, safety glasses, work gloves, nitrile gloves	Full face respirator with combination cartridge, chemical resistant coveralls	PID (10.6 eV and 11.7 eV), particulate aerosol monitor

Basic Job Step	Potential Hazards (From HASP)																											Baseline Risk Score			Hazard Controls Protection Measures	Controlled Risk Score			Persons Affected
	Explosion (Chemical Reaction)	Explosion (Over Pressurization)	Electrical (Shock/Short Circuit)	Electrical (Fire)	Electrical (Static)	Electrical (Loss of Power)	Ergonomics (Strain)	Ergonomics (Human Error)	Excavation (Collapse)	Fall (Slip, Trip)	Fire/Heat	Mechanical/Vibration (Chafing/Fatigue)	Mechanical Failure	Mechanical	Noise	Struck By (Mass Acceleration)	Struck Against	Chemical (Toxic)	Chemical (Ignitable)	Chemical (Corrosive)	Chemical (Volatile)	Respirable Particulate	Radiation (Ionizing)	Radiation (Non-Ionizing)	Temperature Extreme (Heat/Cold)	Visibility	Weather Phenomena (Snow/Rain/Wind/Ice)	Biological Hazards (Venomous/Disease-Carrying Animals/Insects, Poisonous Plants)	Severity	Likelihood	Risk Score	Color Key: §No shading indicates acceptable risk - no action needed. §Green shading indicates low risk - review the operation/activity and take any steps necessary to reduce & control the risks. §Yellow shading indicates medium risk - inform H&S management & seek further advice before proceeding any further with the operation/activity. §Red shading indicates high risk - HALT the activity immediately, review and reduce the risks identified.	Severity	Likelihood	Risk Score	
Mobilize/Demobilize					X	X	X	X		X	X	X	X	X		X	X		X							X	X		6	3	18	Inspect vehicle for unsafe conditions; Stay alert; Be aware of other traffic; Obey traffic laws; Do not drive when tired; Reduce speed in inclement weather; Park WSP vehicle outside of work zone.	6	2	12	WSP & Subcontractor
Load/Unload equipment							X	X		X			X	X		X	X								X	X	X	X	X	6	2	12	Use proper lifting techniques; Stay alert; Park in designated parking/loading area; Wear work gloves and steel toe boots; Wear high visibility vest in high traffic areas; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET	3	1	3	WSP & Subcontractor
Tailgate meeting (daily)										X																X	X	X	X	X	3	1	3	Wear steel toe boots; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET	3	1	3	WSP & Subcontractor
Fuel equipment					X			X		X			X	X			X	X	X							X	X	X	X	X	6	2	12	No smoking; Use DOT approved containers; Turn off equipment before fueling; dispense fuel into containers placed on the ground surface; Wear steel toe boots; Wear high-visibility vest in high traffic areas; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropirate lighting; Use insect repellant containing DEET	6	1	6	Subcontractor
Locate and mark drilling location										X																X	X	X	X	X	3	2	6	Stay alert; Wear steel toe boots; Wear high-visibility vest in high traffic areas; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET	3	1	3	WSP & Subcontractor
Clear drilling location for utilities							X			X			X	X			X									X	X	X	X	X	3	2	6	Follow SOPs; Use proper lifting techniques; Stay alert; Wear steel toe boots; Wear high-visibility vest in high traffic areas; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET	3	1	3	WSP & Subcontractor
Park the rig on final location						X				X						X														6	2	12	Stay alert; Inspect rig and work area for unsafe conditions; Guide driver to position; Wear steel toe boots; Wear high-visibility vest in high traffic areas; Use wheel chucks (as necessary)	6	1	6	WSP & Subcontractor
Raise mast		X	X	X		X						X	X	X		X										X	X	X	X	X	6	2	12	Location should be cleared for overhead utilities as per SOPs; Notify driller of any unsafe or hazardous conditions observed; Stay alert; Wear steel toe boots, hard hat, and safety glasses; Wear high-visibility vest in high traffic areas; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET	6	1	6	Subcontactor

Prepared By:	Prepared Date:
Erin Huntley	9/12/2018
Approved By:	**Approved Date:**
Glen Rieger	10/3/2018

JOB HAZARD ANALYSIS
WATER & ENVIRONMENT

Project Name:	Project No:	Project Location:	Project/Task Description:	Project/Task Equipment:
Former Emerson Power Transmission	31400551	Ithaca, NY	Soil sampling, monitoring well installation oversight and development	Drill rig (geoprobe, HSA, air, sonic), soil/rock sampler, well construction materials, sample containers, pump (electric submersible, inertial) with tubiring or bailer, surge block, water quality probe, water level tape

Chemicals of Concern:	Site-Specific Hazards:	Action Levels:
See HASP Section 2.5	Site is located on a steep hillside.	Organic Vapors - < 10.6 eV = 1 ppm, > 10.6 eV = 5 ppm; Particulates - 2 mg/m^3

Level D PPE:	PPE Upgrades:	Health & Safety Equipment:
Work clothes, steel toe boots, high visibility vest, hard hat, hearing protection, safety glasses, work gloves, nitrile gloves	Full face respirator with combination cartridge, chemical resistant coveralls	PID (10.6 eV and 11.7 eV), particulate aerosol monitor

Basic Job Step	Potential Hazards (From HASP)																													Baseline Risk Score			Hazard Controls Protection Measures	Controlled Risk Score			Persons Affected
	Explosion (Chemical Reaction)	Explosion (Over Pressurization)	Electrical (Shock/Short Circuit)	Electrical (Fire)	Electrical (Static)	Electrical (Loss of Power)	Ergonomics (Strain)	Ergonomics (Human Error)	Excavation (Collapse)	Fall (Slip, Trip)	Fire/Heat	Mechanical/Vibration (Chafing/Fatigue)	Mechanical Failure	Mechanical	Noise	Struck By (Mass Acceleration)	Struck Against	Chemical (Toxic)	Chemical (Ignitable)	Chemical (Corrosive)	Chemical (Volatile)	Respirable Particulate	Radiation (Ionizing)	Radiation (Non-Ionizing)	Temperature Extreme (Heat/Cold)	Visibility	Weather Phenomena (Snow/Rain/Wind/Ice)	Biological Hazards (Venomous/Disease-Carrying Animals/Insects, Poisonous Plants)	Severity	Likelihood	Risk Score	Color Key: §No shading indicates acceptable risk - no action needed. §Green shading indicates low risk - review the operation/activity and take any steps necessary to reduce & control the risks. §Yellow shading indicates medium risk - inform H&S management & seek further advice before proceeding any further with the operation/activity. §Red shading indicates high risk - HALT the activity immediately, review and reduce the risks identified.	Severity	Likelihood	Risk Score	
Begin drilling		X	X	X		X	X			X	X	X	X	X	X	X	X	X	X		X	X		X	X	X	X	X	6	2	12	Location should be cleared for underground utilities as per SOPs; Notify driller of any unsafe or hazardous conditions observed; Engineering, work practice controls, and required respiratory protection specified in OSHA's Respirable Crystalline Silica standard for general industry must be implemented when drilling through bedrock; Stay alert; Wear steel toe boots, hard hat, hearing protection, and safety glasses; Wear high-visibility vest in high traffic areas; Perform air monitoring as per HASP; Wear full face respirator if chemical action levels exceeded as per HASP; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET	6	1	6	Subcontractor
Screen and describe soil sample							X			X			X	X			X	X	X		X			X	X	X	X	X	3	2	6	Follow SOPs; Stay alert; Wear nitrile gloves, steel toe boots, hard hat (when mast is raised), hearing protection (when rig is drilling), and safety glasses; Wear high-visibility vest in high traffic areas; Perform air monitoring as per HASP; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET	3	1	3	WSP
Collect soil samples for laboratory analysis							X			X			X	X			X	X	X	X	X			X	X	X	X	X	3	2	6	Follow SOPs; Inspect equipment; Stay alert; Wear nitrile gloves, steel toe boots, hard hat (when mast is raised), hearing protection (when rig is drilling), and safety glasses; Wear high-visibility vest in high traffic areas; Perform air monitoring as per HASP; Wear full face respirator if action levels exceeded as per HASP; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET	3	1	3	WSP
Install monitoring well		X	X	X			X			X	X	X	X	X		X	X	X	X	X	X			X	X	X	X	X	5	2	10	Inspect equipment; Perform air monitoring as per HASP; Stay alert; Wear nitrile gloves, steel toe boots; Wear high visibility vest in high traffic areas; Perform air monitoring as per HASP; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET	5	1	5	Subcontractor
Develop monitoring well		X	X	X			X			X	X	X	X	X	X	X	X	X	X	X	X			X	X	X	X	X	6	3	18	Inspect equipment; Perform air monitoring as per HASP; Stay alert; Wear nitrile gloves, steel toe boots; Wear high visibility vest in high traffic areas; Perform air monitoring as per HASP; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET	6	1	6	WSP & Subcontractor

Prepared By:	Prepared Date:
Erin Huntley	9/12/2018
Approved By:	**Approved Date:**
Glen Rieger	10/3/2018

JOB HAZARD ANALYSIS
WATER & ENVIRONMENT

Project Name:	Project No:	Project Location:	Project/Task Description:	Project/Task Equipment:
Former Emerson Power Transmission	31400551	Ithaca, NY	Soil sampling, monitoring well installation oversight and development	Drill rig (geoprobe, HSA, air, sonic), soil/rock sampler, well construction materials, sample containers, pump (electric submersible, inertial) with tubiring or bailer, surge block, water quality probe, water level tape

Chemicals of Concern:	Site-Specific Hazards:	Action Levels:
See HASP Section 2.5	Site is located on a steep hillside.	Organic Vapors - < 10.6 eV = 1 ppm, > 10.6 eV = 5 ppm; Particulates - 2 mg/m^3

Level D PPE:	PPE Upgrades:	Health & Safety Equipment:
Work clothes, steel toe boots, high visibility vest, hard hat, hearing protection, safety glasses, work gloves, nitrile gloves	Full face respirator with combination cartridge, chemical resistant coveralls	PID (10.6 eV and 11.7 eV), particulate aerosol monitor

Basic Job Step	Potential Hazards (From HASP)																											Baseline Risk Score			Hazard Controls Protection Measures	Controlled Risk Score			Persons Affected
	Explosion (Chemical Reaction)	Explosion (Over Pressurization)	Electrical (Shock/Short Circuit)	Electrical (Fire)	Electrical (Static)	Electrical (Loss of Power)	Ergonomics (Strain)	Ergonomics (Human Error)	Excavation (Collapse)	Fall (Slip, Trip)	Fire/Heat	Mechanical/Vibration (Chafing/Fatigue)	Mechanical Failure	Mechanical	Noise	Struck By (Mass Acceleration)	Struck Against	Chemical (Toxic)	Chemical (Ignitable)	Chemical (Corrosive)	Chemical (Volatile)	Respirable Particulate	Radiation (Ionizing)	Radiation (Non-Ionizing)	Temperature Extreme (Heat/Cold)	Visibility	Weather Phenomena (Snow/Rain/Wind/Ice)	Biological Hazards (Venomous/Disease-Carrying Animals/Insects, Poisonous Plants)	Severity	Likelihood	Risk Score		Severity	Likelihood	Risk Score	
Waste management		X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X			X	X		X	X	X	X	X	6	3	18	Inspect equipment before use; Use equipment in accordance with manufacturer's instructions; Use trained operators; Use proper lifting techniques; Perform air monitoring as per HASP; Stay alert; Wear steel toe boots, hard hat, and safety glasses; Wear high-visibility vest in high traffic areas; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET	6	1	6	WSP & Subcontractor
Decontamination		X	X	X		X	X			X	X	X	X	X	X	X	X	X			X			X	X	X	X	X	6	2	12	Stay alert; Wear nitrile gloves, steel toe boots, hard hat (if pressure washer in use), hearing protection (if pressure washer in use), and safety glasses or goggles; Wear high-visibility vest in high traffic areas; Perform air monitoring as per HASP; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET	6	1	6	WSP & Subcontracot
Survey							X			X			X	X			X							X	X	X	X	X	3	2	6	Follow SOPs; Use proper lifting techniques; Stay alert; Wear steel toe boots;	3	1	3	Subcontractor

Color Key:
§No shading indicates acceptable risk - no action needed.
§Green shading indicates low risk - review the operation/activity and take any steps necessary to reduce & control the risks.
§Yellow shading indicates medium risk - inform H&S management & seek further advice before proceeding any further with the operation/activity.
§Red shading indicates high risk - HALT the activity immediately, review and reduce the risks identified.

Prepared By:	Prepared Date:
Erin Huntley	9/12/2018
Approved By:	**Approved Date:**
Glen Rieger	10/3/2018

JOB HAZARD ANALYSIS
WATER & ENVIRONMENT

Project Name:	Project No:	Project Location:	Project/Task Description:	Project/Task Equipment:
Former Emerson Power Transmission	31400551	Ithaca, NY	Monitoring well abandonment oversight	Drill rig (HSA, air, sonic) or cement mixer and grout pump, water level tape

Chemicals of Concern:	Site-Specific Hazards:	Action Levels:
See HASP Section 2.5	Site is located on a steep hillside.	Organic Vapors - < 10.6 eV = 1 ppm, > 10.6 eV = 5 ppm; Particulates - 2 mg/m^3

Level D PPE:	PPE Upgrades:	Health & Safety Equipment:
Work clothes, steel toe boots, high visibility vest, hard hat, hearing protection, safety glasses, work gloves, nitrile gloves	Full face respirator with combination cartridge, chemical resistant coveralls	PID (10.6 eV and 11.7 eV), particulate aerosol monitor

Basic Job Step	Potential Hazards (From HASP)																											Baseline Risk Score			Hazard Controls Protection Measures	Controlled Risk Score			Persons Affected
	Explosion (Chemical Reaction)	Explosion (Over Pressurization)	Electrical (Shock/Short Circuit)	Electrical (Fire)	Electrical (Static)	Electrical (Loss of Power)	Ergonomics (Strain)	Ergonomics (Human Error)	Excavation (Collapse)	Fall (Slip, Trip)	Fire/Heat	Mechanical/Vibration (Chafing/Fatigue)	Mechanical Failure	Mechanical	Noise	Struck By (Mass Acceleration)	Struck Against	Chemical (Toxic)	Chemical (Ignitable)	Chemical (Corrosive)	Chemical (Volatile)	Respirable Particulate	Radiation (Ionizing)	Radiation (Non-Ionizing)	Temperature Extreme (Heat/Cold)	Visibility	Weather Phenomena (Snow/Rain/Wind/Ice)	Biological Hazards (Venomous/Disease-Carrying Animals/Insects, Poisonous Plants)	Severity	Likelihood	Risk Score	Color Key: §No shading indicates acceptable risk - no action needed. §Green shading indicates low risk - review the operation/activity and take any steps necessary to reduce & control the risks. §Yellow shading indicates medium risk - inform H&S management & seek further advice before proceeding any further with the operation/activity. §Red shading indicates high risk - HALT the activity immediately, review and reduce the risks identified.	Severity	Likelihood	Risk Score	
Mobilize/Demobilize					X	X	X	X		X	X	X	X	X		X	X		X							X	X		6	3	18	Inspect vehicle for unsafe conditions; Stay alert; Be aware of other traffic; Obey traffic laws; Do not drive when tired; Reduce speed in inclement weather; Park WSP vehicle outside of work zone.	6	2	12	WSP & Subcontractor
Load/Unload equipment							X	X		X			X	X		X	X								X	X	X	X	X	6	2	12	Use proper lifting techniques; Stay alert; Park in designated parking/loading area; Wear work gloves and steel toe boots; Wear high visibility vest in high traffic areas; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET	3	1	3	WSP & Subcontractor
Tailgate meeting (daily)										X																X	X	X	X	X	3	1	3	Wear steel toe boots; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET	3	1	3	WSP & Subcontractor
Fuel equipment					X			X		X			X	X			X	X	X							X	X	X	X	X	6	2	12	No smoking; Use DOT approved containers; Turn off equipment before fueling; dispense fuel into containers placed on the ground surface; Wear steel toe boots; Wear high-visibility vest in high traffic areas; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropirate lighting; Use insect repellant containing DEET	6	1	6	Subcontractor
Clear drilling location for utilities (as necessary)							X			X			X	X			X									X	X	X	X	X	3	2	6	Follow SOPs; Use proper lifting techniques; Stay alert; Wear steel toe boots; Wear high-visibility vest in high traffic areas; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET	3	1	3	WSP & Subcontractor
Core concrete				X		X	X			X	X	X	X	X	X	X	X					X				X	X	X	X	X	6	2	12	Stay alert; Inspect concrete corer for unsafe conditions; Clear location for utilties; Wear steel toe boots and safety glasses; Use GFCI; Core with water for dust suppression; Wear high-visibility vest in high traffic areas; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET	6	1	6	Subcontracotr
Park the rig and raise mast (as necessary)		X	X	X		X				X		X	X	X		X										X	X	X	X	X	6	2	12	Stay alert; Inspect rig and work area for unsafe conditions; Guide driver to position; Wear steel toe boots; Wear high-visibility vest in high traffic areas; Use wheel chucks (as necessary)	6	1	6	WSP & Subcontractor

Prepared By:	Prepared Date:
Erin Huntley	9/12/2018
Approved By:	**Approved Date:**
Glen Rieger	10/3/2018

JOB HAZARD ANALYSIS
WATER & ENVIRONMENT

Project Name:	Project No:	Project Location:	Project/Task Description:	Project/Task Equipment:
Former Emerson Power Transmission	31400551	Ithaca, NY	Monitoring well abandonment oversight	Drill rig (HSA, air, sonic) or cement mixer and grout pump, water level tape

Chemicals of Concern:	Site-Specific Hazards:	Action Levels:
See HASP Section 2.5	Site is located on a steep hillside.	Organic Vapors - < 10.6 eV = 1 ppm, > 10.6 eV = 5 ppm; Particulates - 2 mg/m^3

Level D PPE:	PPE Upgrades:	Health & Safety Equipment:
Work clothes, steel toe boots, high visibility vest, hard hat, hearing protection, safety glasses, work gloves, nitrile gloves	Full face respirator with combination cartridge, chemical resistant coveralls	PID (10.6 eV and 11.7 eV), particulate aerosol monitor

Basic Job Step	Potential Hazards (From HASP)																													Baseline Risk Score			Hazard Controls Protection Measures	Controlled Risk Score			Persons Affected
	Explosion (Chemical Reaction)	Explosion (Over Pressurization)	Electrical (Shock/Short Circuit)	Electrical (Fire)	Electrical (Static)	Electrical (Loss of Power)	Ergonomics (Strain)	Ergonomics (Human Error)	Excavation (Collapse)	Fall (Slip, Trip)	Fire/Heat	Mechanical/Vibration (Chafing/Fatigue)	Mechanical Failure	Mechanical	Noise	Struck By (Mass Acceleration)	Struck Against	Chemical (Toxic)	Chemical (Ignitable)	Chemical (Corrosive)	Chemical (Volatile)	Respirable Particulate	Radiation (Ionizing)	Radiation (Non-Ionizing)	Temperature Extreme (Heat/Cold)	Visibility	Weather Phenomena (Snow/Rain/Wind/Ice)	Biological Hazards (Venomous/Disease-Carrying Animals/Insects, Poisonous Plants)	Severity	Likelihood	Risk Score	Color Key: §No shading indicates acceptable risk - no action needed. §Green shading indicates low risk - review the operation/activity and take any steps necessary to reduce & control the risks. §Yellow shading indicates medium risk - inform H&S management & seek further advice before proceeding any further with the operation/activity. §Red shading indicates high risk - HALT the activity immediately, review and reduce the risks identified.	Severity	Likelihood	Risk Score	
Begin drilling		X	X	X		X	X			X	X	X	X	X	X	X	X	X	X		X	X		X	X	X	X	X	6	2	12	Location should be cleared for underground utilities as per SOPs; Notify driller of any unsafe or hazardous conditions observed; Stay alert; Wear steel toe boots, hard hat, hearing protection, and safety glasses; Wear high-visibility vest in high traffic areas; Engineering, work practice controls, and required respiratory protection specified in OSHA's Respirable Crystalline Silica standard for general industry must be implemented when drilling through concrete or bedrock; Perform air monitoring as per HASP; Wear full face respirator if chemical action levels exceeded as per HASP; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET	6	1	6	Subcontractor
Grout borehole		X	X	X			X			X	X	X	X	X		X	X	X	X	X	X			X	X	X	X	X	5	2	10	Inspect equipment; Perform air monitoring as per HASP; Stay alert; Wear nitrile gloves, steel toe boots; Wear high visibility vest in high traffic areas; Perform air monitoring as per HASP; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET	5	1	5	Subcontracotr
Waste management		X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X			X	X		X	X	X	X	X	6	3	18	Inspect equipment before use; Use equipment in accordance with manufacturer's instructions; Use trained operators; Use proper lifting techniques; Perform air monitoring as per HASP; Stay alert; Wear steel toe boots, hard hat, and safety glasses; Wear high-visibility vest in high traffic areas; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET	6	1	6	WSP & Subcontractor
Decontamination		X	X	X		X	X			X	X	X	X	X	X	X	X	X	X		X			X	X	X	X	X	6	2	12	Stay alert; Wear nitrile gloves, steel toe boots, hard hat (if pressure washer in use), hearing protection (if pressure washer in use), and safety glasses or goggles; Wear high-visibility vest in high traffic areas; Perform air monitoring as per HASP; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET	6	1	6	Subcontractor

Prepared By:	Prepared Date:
Erin Huntley	8/2/2018
Approved By:	**Approved Date:**
Glen Rieger	10/3/2018

JOB HAZARD ANALYSIS
WATER & ENVIRONMENT

Project Name:	Project No:	Project Location:	Project/Task Description:	Project/Task Equipment:
Former Emerson Power Transmission	31400551	Ithaca, NY	Downhole geophysical survey	Downhole geophysical sonde, tripod and winch (or similar)

Chemicals of Concern:	Site-Specific Hazards:	Action Levels:
See HASP Section 2.5	Site is located on a steep hillside	Organic Vapors - < 10.6 eV = 1 ppm, > 10.6 eV = 5 ppm

Level D PPE:	PPE Upgrades:	Health & Safety Equipment:
Work clothes, steel toe boots, high visibility vest, work gloves, nitrile gloves	Full face respirator with combination cartridge, chemical resistant coveralls	PID (10.6 eV and 11.7 eV)

Basic Job Step	Potential Hazards (From HASP)																											Baseline Risk Score			Hazard Controls Protection Measures	Controlled Risk Score			Persons Affected
	Explosion (Chemical Reaction)	Explosion (Over Pressurization)	Electrical (Shock/Short Circuit)	Electrical (Fire)	Electrical (Static)	Electrical (Loss of Power)	Ergonomics (Strain)	Ergonomics (Human Error)	Excavation (Collapse)	Fall (Slip, Trip)	Fire/Heat	Mechanical/Vibration (Chafing/Fatigue)	Mechanical Failure	Mechanical	Noise	Struck By (Mass Acceleration)	Struck Against	Chemical (Toxic)	Chemical (Ignitable)	Chemical (Corrosive)	Chemical (Volatile)	Respirable Particulate	Radiation (Ionizing)	Radiation (Non-Ionizing)	Temperature Extreme (Heat/Cold)	Visibility	Weather Phenomena (Snow/Rain/Wind/Ice)	Biological Hazards (Venomous/Disease-Carrying Animals/Insects, Poisonous Plants)	Severity	Likelihood	Risk Score	Color Key: §No shading indicates acceptable risk - no action needed. §Green shading indicates low risk - review the operation/activity and take any steps necessary to reduce & control the risks. §Yellow shading indicates medium risk - inform H&S management & seek further advice before proceeding any further with the operation/activity. §Red shading indicates high risk - HALT the activity immediately, review and reduce the risks identified.	Severity	Likelihood	Risk Score	
Mobilize/Demobilize					X	X	X	X		X	X	X	X	X		X	X		X							X	X		6	3	18	Inspect vehicle for unsafe conditions; Stay alert; Be aware of other traffic; Obey traffic laws; Do not drive when tired; Reduce speed in inclement weather; Park WSP vehicle outside of work zone.	6	2	12	WSP & Subcontractor
Load/Unload equipment							X			X			X	X		X	X								X	X	X	X	X	6	2	12	Use proper lifting techniques; Stay alert; Park in designated parking/loading area; Wear work gloves and steel toe boots; Wear high visibility vest in high traffic areas; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET	3	1	3	WSP & Subcontractor
Tailgate meeting (daily)										X																X	X	X	X	X	3	1	3	Wear steel toe boots; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET	3	1	3	WSP & Subcontractor
Set up equipment and profile borehole							X			X			X	X		X	X				X					X	X	X	X	X	6	3	18	Stay alert; Wear nitrile gloves (when retrieving probe), and steel toe boots; Wear high-visibility vest in high traffic areas; Perform air monitoring as per HASP; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET	4	1	4	Subcontractor
Decontamination							X			X	X			X			X	X	X		X					X	X	X	X	X	6	3	18	Stay alert; Wear nitrile gloves, steel toe boots; Wear high-visibility vest in high traffic areas; Perform air monitoring as per HASP; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET	4	1	4	Subcontractor
Waste management							X			X			X	X			X	X	X		X						X	X	X		3	3	9	Follow SOPs; Perform air monitoring as per HASP; Use proper lifting techniques; Stay alert; Wear work or nitrile gloves and steel toe boots; Use hand tools properly; Wear weather-appropriate clothing; Work with appropriate lighting	3	1	3	WSP & Subcontractor

Prepared By:	Prepared Date:
Erin Huntley	8/2/2018
Approved By:	**Approved Date:**
Glen Rieger	10/3/2018

JOB HAZARD ANALYSIS
WATER & ENVIRONMENT

Project Name:	Project No:	Project Location:	Project/Task Description:	Project/Task Equipment:
Former Emerson Power Transmission	31400551	Ithaca, NY	Surface geophysical survey	Geophysical probes, receiver truck with instrumentation

Chemicals of Concern:	Site-Specific Hazards:	Action Levels:
See HASP Section 2.5	Site is located on a steep hillside	NA

Level D PPE:	PPE Upgrades:	Health & Safety Equipment:
Work clothes, steel toe boots, high visibility vest, work gloves	NA	NA

Basic Job Step	Potential Hazards (From HASP)																											Baseline Risk Score			Hazard Controls Protection Measures	Controlled Risk Score			Persons Affected
	Explosion (Chemical Reaction)	Explosion (Over Pressurization)	Electrical (Shock/Short Circuit)	Electrical (Fire)	Electrical (Static)	Electrical (Loss of Power)	Ergonomics (Strain)	Ergonomics (Human Error)	Excavation (Collapse)	Fall (Slip, Trip)	Fire/Heat	Mechanical/Vibration (Chafing/Fatigue)	Mechanical Failure	Mechanical	Noise	Struck By (Mass Acceleration)	Struck Against	Chemical (Toxic)	Chemical (Ignitable)	Chemical (Corrosive)	Chemical (Volatile)	Respirable Particulate	Radiation (Ionizing)	Radiation (Non-Ionizing)	Temperature Extreme (Heat/Cold)	Visibility	Weather Phenomena (Snow/Rain/Wind/Ice)	Biological Hazards (Venomous/Disease-Carrying Animals/Insects, Poisonous Plants)	Severity	Likelihood	Risk Score		Severity	Likelihood	Risk Score	
Mobilize/Demobilize					X	X	X	X		X	X	X	X	X		X	X		X							X	X		6	3	18	Inspect vehicle for unsafe conditions; Stay alert; Be aware of other traffic; Obey traffic laws; Do not drive when tired; Reduce speed in inclement weather; Park WSP vehicle outside of work zone.	6	2	12	WSP & Subcontractor
Load/Unload equipment							X			X			X	X		X	X								X	X	X	X	6	2	12	Use proper lifting techniques; Stay alert; Park in designated parking/loading area; Wear work gloves and steel toe boots; Wear high visibility vest in high traffic areas; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET	4	1	4	Subcontractor
Tailgate meeting (daily)										X																X	X	X	3	1	3	Wear steel toe boots; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET	3	1	3	WSP & Subcontractor
Set up probes/Retrive probes							X			X				X		X	X									X	X	X	6	3	18	Stay alert; Wear steel toe boots; Wear high-visibility vest in high traffic areas; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET	4	1	4	Subcontractor
Collect Data										X	X			X			X									X	X	X	3	1	3	Stay alert; Wear high-visibility vest in high traffic areas; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET	3	1	3	Subcontractor

Color Key:
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§Green shading indicates low risk - review the operation/activity and take any steps necessary to reduce & control the risks.
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Prepared By:	Prepared Date:
Erin Huntley	8/23/2018
Approved By:	**Approved Date:**
Glen Rieger	10/3/2018

JOB HAZARD ANALYSIS
WATER & ENVIRONMENT

Project Name:	Project No:	Project Location:	Project/Task Description:	Project/Task Equipment:
Former Emerson Power Transmission	31400551	Ithaca, NY	Groundwater Sampling	Sample collection equipment (bailer, electric submerisble pump, pneumatic pump), water level tape, water quality meter, sample containers, gasoline generator (as needed), compressed carbon dioxide (as needed), air compressor (as needed)

Chemicals of Concern:	Site-Specific Hazards:	Action Levels:
See HASP Section 2.5; calibration reagents; sample preservatives	Site is located on a steep hillside	Organic Vapors - < 10.6 eV = 1 ppm, > 10.6 eV = 5 ppm

Level D PPE:	PPE Upgrades:	Health & Safety Equipment:
Work clothes, steel toe boots, work gloves, nitrile gloves, high visibility vest (as needed), hearing protection (as needed)	Full face respirator with combination cartridge, chemical resistant coveralls	PID (10.6 eV and 11.7 eV)

Basic Job Step	Potential Hazards (From HASP)																											Baseline Risk Score			Hazard Controls Protection Measures	Controlled Risk Score			Persons Affected
	Explosion (Chemical Reaction)	Explosion (Over Pressurization)	Electrical (Shock/Short Circuit)	Electrical (Fire)	Electrical (Static)	Electrical (Loss of Power)	Ergonomics (Strain)	Ergonomics (Human Error)	Excavation (Collapse)	Fall (Slip, Trip)	Fire/Heat	Mechanical/Vibration (Chafing/Fatigue)	Mechanical Failure	Mechanical	Noise	Struck By (Mass Acceleration)	Struck Against	Chemical (Toxic)	Chemical (Ignitable)	Chemical (Corrosive)	Chemical (Volatile)	Respirable Particulate	Radiation (Ionizing)	Radiation (Non-Ionizing)	Temperature Extreme (Heat/Cold)	Visibility	Weather Phenomena (Snow/Rain/Wind/Ice)	Biological Hazards (Venomous/Disease-Carrying Animals/Insects, Poisonous Plants)	Severity	Likelihood	Risk Score	Color Key: §No shading indicates acceptable risk - no action needed. §Green shading indicates low risk - review the operation/activity and take any steps necessary to reduce & control the risks. §Yellow shading indicates medium risk - inform H&S management & seek further advice before proceeding any further with the operation/activity. §Red shading indicates high risk - HALT the activity immediately, review and reduce the risks identified.	Severity	Likelihood	Risk Score	
Mobilize/Demobilize					X	X	X	X		X	X	X	X	X		X	X		X							X	X		6	3	18	Inspect vehicle for unsafe conditions; Stay alert; Be aware of other traffic; Obey traffic laws; Do not drive when tired; Reduce speed in inclement weather; Park WSP vehicle outside of work zone.	6	2	12	WSP
Load/Unload equipment							X			X			X	X		X	X								X	X	X	X	X	6	2	12	Use proper lifting techniques; Stay alert; Park in designated parking/loading area; Wear work gloves and steel toe boots; Wear high visibility vest in high traffic areas; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET	3	1	3	WSP
Tailgate meeting (daily)										X																X	X	X	X	X	3	1	3	Stay alert; Wear steel toe boots; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET	3	1	3	WSP
Calibrate equipment			X				X			X			X	X				X		X					X	X	X	X	X	3	1	3	Follow SOPs; Inspect equipment; Use proper lifting techniques; Stay alert; Wear steel toe boots; Wear weather-appropriate clothing; Wear nitrile gloves; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET	3	1	3	WSP
Gauge well			X				X			X			X	X		X	X	X			X					X	X	X	X	X	6	3	18	Follow SOPs; Inspect equipment; Perform air monitoring as per HASP; Stay alert; Wear nitrile gloves, steel toe boots; Wear high visibility vest in high traffic areas; Perform air monitoring as per HASP; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET				WSP
Purge and Sample		X	X	X			X	X		X	X	X	X	X	X	X	X	X	X	X	X					X	X	X	X	X	6	3	18	Follow SOPs; Inspect equipment; Perform air monitoring as per HASP; Stay alert; Wear nitrile gloves, steel toe boots; Wear high visibility vest in high traffic areas; Perform air monitoring as per HASP; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET	6	1	6	WSP
Decontamination							X			X				X			X	X	X		X					X	X	X	X	X	3	3	9	Follow SOPs; Perform air monitoring as per HASP; Stay alert; Wear nitrile gloves, steel toe boots; Perform air monitoring as per HASP; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET	4	1	4	WSP
Waste management							X			X			X	X			X	X	X		X					X	X	X	X	X	3	3	9	Follow SOPs; Perform air monitoring as per HASP; Use proper lifting techniques; Stay alert; Wear work or nitrile gloves and steel toe boots; Use hand tools properly; Wear weather-appropriate clothing; Work with appropriate lighting	3	1	3	WSP

Prepared By:	Prepared Date:
Erin Huntley	8/23/2018
Approved By:	**Approved Date:**
Glen Rieger	10/3/2018

JOB HAZARD ANALYSIS
WATER & ENVIRONMENT

Project Name:	Project No:	Project Location:	Project/Task Description:	Project/Task Equipment:
Former Emerson Power Transmission	31400551	Ithaca, NY	Surface water and groundwater seep sampling	Sample collection equipment (transfer bottle, bailer, peristaltic pump), water quality meter, sample containers

Chemicals of Concern:	Site-Specific Hazards:	Action Levels:
See HASP Section 2.5; calibration reagents; sample preservatives	Site is located on a steep hillside	Organic Vapors - < 10.6 eV = 1 ppm, > 10.6 eV = 5 ppm

Level D PPE:	PPE Upgrades:	Health & Safety Equipment:
Work clothes, steel toe boots, rubber overboots or waders (as needed), work gloves, nitrile gloves	Full face respirator with combination cartridge, chemical resistant coveralls	PID (10.6 eV and 11.7 eV)

Basic Job Step	Potential Hazards (From HASP)																													Baseline Risk Score			Hazard Controls Protection Measures	Controlled Risk Score			Persons Affected
	Explosion (Chemical Reaction)	Explosion (Over Pressurization)	Electrical (Shock/Short Circuit)	Electrical (Fire)	Electrical (Static)	Electrical (Loss of Power)	Ergonomics (Strain)	Ergonomics (Human Error)	Excavation (Collapse)	Fall (Slip, Trip)	Fire/Heat	Mechanical/Vibration (Chafing/Fatigue)	Mechanical Failure	Mechanical	Noise	Struck By (Mass Acceleration)	Struck Against	Chemical (Toxic)	Chemical (Ignitable)	Chemical (Corrosive)	Chemical (Volatile)	Respirable Particulate	Radiation (Ionizing)	Radiation (Non-Ionizing)	Temperature Extreme (Heat/Cold)	Visibility	Weather Phenomena (Snow/Rain/Wind/Ice)	Biological Hazards (Venomous/Disease-Carrying Animals/Insects, Poisonous Plants)	Severity	Likelihood	Risk Score	Color Key: §No shading indicates acceptable risk - no action needed. §Green shading indicates low risk - review the operation/activity and take any steps necessary to reduce & control the risks. §Yellow shading indicates medium risk - inform H&S management & seek further advice before proceeding any further with the operation/activity. §Red shading indicates high risk - HALT the activity immediately, review and reduce the risks identified.	Severity	Likelihood	Risk Score	
Mobilize/Demobilize					X	X	X	X		X	X	X	X	X		X	X		X							X	X		6	3	18	Inspect vehicle for unsafe conditions; Stay alert; Be aware of other traffic; Obey traffic laws; Do not drive when tired; Reduce speed in inclement weather; Park WSP vehicle outside of work zone.	6	2	12	WSP
Load/Unload equipment							X			X			X	X		X	X								X	X	X	X	X	6	2	12	Use proper lifting techniques; Stay alert; Park in designated parking/loading area; Wear work gloves and steel toe boots; Wear high visibility vest in high traffic areas; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET	3	1	3	WSP
Tailgate meeting (daily)										X																X	X	X	X	X	3	1	3	Stay alert; Wear steel toe boots; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET	3	1	3	WSP
Calibrate equipment			X				X			X			X	X				X		X						X	X	X	X	X	3	1	3	Follow SOPs; Inspect equipment; Use proper lifting techniques; Stay alert; Wear steel toe boots; Wear weather-appropriate clothing; Wear nitrile gloves; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET	3	1	3	WSP
Locate sample location										X			X	X		X	X									X	X	X	X	X	3	2	6	Stay alert; Wear steel toe boots; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours; Use insect repellant containing DEET	3	1	3	WSP
Collect sample and field parameters			X				X			X			X	X			X	X		X	X					X	X	X	X	X	3	3	9	Follow SOPs; Inspect equipment; Perform air monitoring as per HASP; Inspect equipment; Stay alert; Wear nitrile gloves, steel toe boots; Wear rubber overboots or waders; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours; Use insect repellant containing DEET	3	1	3	WSP
Decontamination							X			X				X			X	X	X		X						X	X	X	X	X	3	3	9	Follow SOPs; Perform air monitoring as per HASP; Stay alert; Wear nitrile gloves, steel toe boots; Perform air monitoring as per HASP; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET	3	1	3	WSP
Waste management							X			X			X	X			X	X	X		X							X	X	X		3	3	9	Follow SOPs; Perform air monitoring as per HASP; Use proper lifting techniques; Stay alert; Wear work or nitrile gloves and steel toe boots; Use hand tools properly; Wear weather-appropriate clothing; Work with appropriate lighting	3	1	3	WSP

Prepared By:	Prepared Date:
Erin Huntley	8/27/2018
Approved By:	**Approved Date:**
Glen Rieger	10/3/2018

JOB HAZARD ANALYSIS
WATER & ENVIRONMENT

Project Name:	Project No:	Project Location:	Project/Task Description:	Project/Task Equipment:
Former Emerson Power Transmission	31400551	Ithaca, NY	Wastewater sampling	Sample collection equipment (transfer bottle, bailer, peristaltic pump, sample port), water quality meter, sample containers

Chemicals of Concern:	Site-Specific Hazards:	Action Levels:
See HASP Section 2.5; calibration reagents; sample preservatives	Site is located on a steep hillside	Organic Vapors - < 10.6 eV = 1 ppm, > 10.6 eV = 5 ppm

Level D PPE:	PPE Upgrades:	Health & Safety Equipment:
Work clothes, steel toe boots, rubber overboots or waders (as needed), work gloves, nitrile gloves, high visibility vest (as needed)	Full face respirator with combination cartridge, chemical resistant coveralls	PID (10.6 eV and 11.7 eV)

Basic Job Step	Potential Hazards (From HASP)																											Baseline Risk Score			Hazard Controls Protection Measures	Controlled Risk Score			Persons Affected
	Explosion (Chemical Reaction)	Explosion (Over Pressurization)	Electrical (Shock/Short Circuit)	Electrical (Fire)	Electrical (Static)	Electrical (Loss of Power)	Ergonomics (Strain)	Ergonomics (Human Error)	Excavation (Collapse)	Fall (Slip, Trip)	Fire/Heat	Mechanical/Vibration (Chafing/Fatigue)	Mechanical Failure	Mechanical	Noise	Struck By (Mass Acceleration)	Struck Against	Chemical (Toxic)	Chemical (Ignitable)	Chemical (Corrosive)	Chemical (Volatile)	Respirable Particulate	Radiation (Ionizing)	Radiation (Non-Ionizing)	Temperature Extreme (Heat/Cold)	Visibility	Weather Phenomena (Snow/Rain/Wind/Ice)	Biological Hazards (Venomous/Disease-Carrying Animals/Insects, Poisonous Plants)	Severity	Likelihood	Risk Score	Color Key: §No shading indicates acceptable risk - no action needed. §Green shading indicates low risk - review the operation/activity and take any steps necessary to reduce & control the risks. §Yellow shading indicates medium risk - inform H&S management & seek further advice before proceeding any further with the operation/activity. §Red shading indicates high risk - HALT the activity immediately, review and reduce the risks identified.	Severity	Likelihood	Risk Score	
Mobilize/Demobilize					X	X	X	X		X	X	X	X	X		X	X		X							X	X		6	3	18	Inspect vehicle for unsafe conditions; Stay alert; Be aware of other traffic; Obey traffic laws; Do not drive when tired; Reduce speed in inclement weather; Park WSP vehicle outside of work zone.	6	2	12	WSP
Load/Unload equipment							X			X			X	X		X	X								X	X	X	X	X	6	2	12	Use proper lifting techniques; Stay alert; Park in designated parking/loading area; Wear work gloves and steel toe boots; Wear high visibility vest in high traffic areas; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET	3	1	3	WSP
Tailgate meeting (daily)										X																X	X	X	X	X	3	1	3	Stay alert; Wear steel toe boots; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET	3	1	3	WSP
Calibrate equipment			X				X			X			X	X				X		X						X	X	X	X	X	3	1	3	Follow SOPs; Inspect equipment; Use proper lifting techniques; Stay alert; Wear steel toe boots; Wear weather-appropriate clothing; Wear nitrile gloves; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET	3	1	3	WSP
Locate sample location, open manhole (as necessary)										X			X	X		X	X								X	X	X	X	X	3	2	6	Stay alert; Use proper tools (as necessary) Wear steel toe boots; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET	3	1	3	WSP
Collect sample and field parameters			X				X			X			X	X			X	X		X	X					X	X	X	X	X	3	3	9	Follow SOPs; Inspect equipment; Perform air monitoring as per HASP; Inspect equipment; Stay alert; Wear nitrile gloves, steel toe boots; Wear rubber overboots or waders; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET	3	1	3	WSP
Decontamination							X			X				X		X	X	X		X						X	X	X	X	X	3	3	9	Follow SOPs; Perform air monitoring as per HASP; Stay alert; Wear nitrile gloves, steel toe boots; Perform air monitoring as per HASP; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET	3	1	3	WSP
Waste management							X			X			X	X			X	X	X		X						X	X	X		3	3	9	Follow SOPs; Perform air monitoring as per HASP; Use proper lifting techniques; Stay alert; Wear work or nitrile gloves and steel toe boots; Use hand tools properly; Wear weather-appropriate clothing; Work with appropriate lighting	3	1	3	WSP

Prepared By:	Prepared Date:
Erin Huntley	8/27/2018
Approved By:	**Approved Date:**
Glen Rieger	10/3/2018

JOB HAZARD ANALYSIS
WATER & ENVIRONMENT

Project Name:	Project No:	Project Location:	Project/Task Description:	Project/Task Equipment:
Former Emerson Power Transmission	31400551	Ithaca, NY	Sediment sampling	Sample collection equipment (shovel, hand auger, grab sampler, dredge), sample containers

Chemicals of Concern:	Site-Specific Hazards:	Action Levels:
See HASP Section 2.5; calibration reagents; sample preservatives	Site is located on a steep hillside	Organic Vapors - < 10.6 eV = 1 ppm, > 10.6 eV = 5 ppm

Level D PPE:	PPE Upgrades:	Health & Safety Equipment:
Work clothes, steel toe boots, rubber overboots or waders (as needed), work gloves, nitrile gloves, high visibility vest (as needed)	Full face respirator with combination cartridge, chemical resistant coveralls	PID (10.6 eV and 11.7 eV)

Basic Job Step	Potential Hazards (From HASP)																											Baseline Risk Score			Hazard Controls Protection Measures	Controlled Risk Score			Persons Affected
	Explosion (Chemical Reaction)	Explosion (Over Pressurization)	Electrical (Shock/Short Circuit)	Electrical (Fire)	Electrical (Static)	Electrical (Loss of Power)	Ergonomics (Strain)	Ergonomics (Human Error)	Excavation (Collapse)	Fall (Slip, Trip)	Fire/Heat	Mechanical/Vibration (Chafing/Fatigue)	Mechanical Failure	Mechanical	Noise	Struck By (Mass Acceleration)	Struck Against	Chemical (Toxic)	Chemical (Ignitable)	Chemical (Corrosive)	Chemical (Volatile)	Respirable Particulate	Radiation (Ionizing)	Radiation (Non-Ionizing)	Temperature Extreme (Heat/Cold)	Visibility	Weather Phenomena (Snow/Rain/Wind/Ice)	Biological Hazards (Venomous/Disease-Carrying Animals/Insects, Poisonous Plants)	Severity	Likelihood	Risk Score	Color Key: §No shading indicates acceptable risk - no action needed. §Green shading indicates low risk - review the operation/activity and take any steps necessary to reduce & control the risks. §Yellow shading indicates medium risk - inform H&S management & seek further advice before proceeding any further with the operation/activity. §Red shading indicates high risk - HALT the activity immediately, review and reduce the risks identified.	Severity	Likelihood	Risk Score	
Mobilize/Demobilize					X	X	X	X		X	X	X	X	X		X	X		X							X	X		6	3	18	Inspect vehicle for unsafe conditions; Stay alert; Be aware of other traffic; Obey traffic laws; Do not drive when tired; Reduce speed in inclement weather; Park WSP vehicle outside of work zone.	6	2	12	WSP
Load/Unload equipment							X			X			X	X		X	X								X	X	X	X	X	6	2	12	Use proper lifting techniques; Stay alert; Park in designated parking/loading area; Wear work gloves and steel toe boots; Wear high visibility vest in high traffic areas; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET	3	1	3	WSP
Tailgate meeting (daily)										X																X	X	X	X	X	3	1	3	Stay alert; Wear steel toe boots; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET	3	1	3	WSP
Calibrate equipment			X				X			X			X	X				X		X						X	X	X	X	X	3	1	3	Follow SOPs; Inspect equipment; Use proper lifting techniques; Stay alert; Wear steel toe boots; Wear weather-appropriate clothing; Wear nitrile gloves; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET	3	1	3	WSP
Locate sample location, open manhole (as necessary)										X			X	X		X	X									X	X	X	X	X	3	2	6	Stay alert; Wear steel toe boots; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET	3	1	3	WSP
Collect sample			X				X			X			X	X			X	X		X	X					X	X	X	X	X	3	3	9	Follow SOPs; Inspect equipment; Perform air monitoring as per HASP; Inspect equipment; Stay alert; Wear nitrile gloves, steel toe boots; Wear rubber overboots or waders; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET	3	1	3	WSP
Decontamination							X			X				X			X	X	X		X						X	X	X	X	X	3	3	9	Follow SOPs; Perform air monitoring as per HASP; Stay alert; Wear nitrile gloves, steel toe boots; Perform air monitoring as per HASP; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET	3	1	3	WSP
Waste management							X			X			X	X			X	X	X		X							X	X	X		3	3	9	Follow SOPs; Perform air monitoring as per HASP; Use proper lifting techniques; Stay alert; Wear work or nitrile gloves and steel toe boots; Use hand tools properly; Wear weather-appropriate clothing; Work with appropriate lighting	3	1	3	WSP

Prepared By:	Prepared Date:
Erin Huntley	9/12/2018
Approved By:	**Approved Date:**
Glen Rieger	10/3/2018

JOB HAZARD ANALYSIS
WATER & ENVIRONMENT

Project Name:	Project No:	Project Location:	Project/Task Description:	Project/Task Equipment:
Former Emerson Power Transmission	31400551	Ithaca, NY	Soil gas probe installation and sampling	Drill rig (geoprobe, HSA, air, sonic), probe construction materials, sample containers, pump (battery/hand operated), PID

Chemicals of Concern:	Site-Specific Hazards:	Action Levels:
See HASP Section 2.5	Site is located on a steep hillside.	Organic Vapors - < 10.6 eV = 1 ppm, > 10.6 eV = 5 ppm; Particulates - 2 mg/m^3

Level D PPE:	PPE Upgrades:	Health & Safety Equipment:
Work clothes, steel toe boots, high visibility vest, hard hat, hearing protection, safety glasses, work gloves, nitrile gloves	Full face respirator with combination cartridge, chemical resistant coveralls	PID (10.6 eV and 11.7 eV), particulate aerosol monitor

Basic Job Step	Potential Hazards (From HASP)																											Baseline Risk Score			Hazard Controls Protection Measures	Controlled Risk Score			Persons Affected
	Explosion (Chemical Reaction)	Explosion (Over Pressurization)	Electrical (Shock/Short Circuit)	Electrical (Fire)	Electrical (Static)	Electrical (Loss of Power)	Ergonomics (Strain)	Ergonomics (Human Error)	Excavation (Collapse)	Fall (Slip, Trip)	Fire/Heat	Mechanical/Vibration (Chafing/Fatigue)	Mechanical Failure	Mechanical	Noise	Struck By (Mass Acceleration)	Struck Against	Chemical (Toxic)	Chemical (Ignitable)	Chemical (Corrosive)	Chemical (Volatile)	Respirable Particulate	Radiation (Ionizing)	Radiation (Non-Ionizing)	Temperature Extreme (Heat/Cold)	Visibility	Weather Phenomena (Snow/Rain/Wind/Ice)	Biological Hazards (Venomous/Disease-Carrying Animals/Insects, Poisonous Plants)	Severity	Likelihood	Risk Score	Color Key: §No shading indicates acceptable risk - no action needed. §Green shading indicates low risk - review the operation/activity and take any steps necessary to reduce & control the risks. §Yellow shading indicates medium risk - inform H&S management & seek further advice before proceeding any further with the operation/activity. §Red shading indicates high risk - HALT the activity immediately, review and reduce the risks identified.	Severity	Likelihood	Risk Score	
Mobilize/Demobilize					X	X	X	X		X	X	X	X	X		X	X		X							X	X		6	3	18	Inspect vehicle for unsafe conditions; Stay alert; Be aware of other traffic; Obey traffic laws; Do not drive when tired; Reduce speed in inclement weather; Park WSP vehicle outside of work zone.	6	2	12	WSP & Subcontractor
Load/Unload equipment							X	X		X			X	X		X	X								X	X	X	X	X	6	2	12	Use proper lifting techniques; Stay alert; Park in designated parking/loading area; Wear work gloves and steel toe boots; Wear high visibility vest in high traffic areas; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET	3	1	3	WSP & Subcontractor
Tailgate meeting (daily)										X																X	X	X	X	X	3	1	3	Wear steel toe boots; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET	3	1	3	WSP & Subcontractor
Fuel equipment					X			X		X			X	X			X	X	X							X	X	X	X	X	6	2	12	No smoking; Use DOT approved containers; Turn off equipment before fueling; dispense fuel into containers placed on the ground surface; Wear steel toe boots; Wear high-visibility vest in high traffic areas; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropirate lighting; Use insect repellant containing DEET	6	1	6	Subcontractor
Locate and mark drilling location										X																X	X	X	X	X	3	2	6	Stay alert; Wear steel toe boots; Wear high-visibility vest in high traffic areas; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET	3	1	3	WSP & Subcontractor
Clear drilling location for utilities							X			X			X	X			X									X	X	X	X	X	3	2	6	Follow SOPs; Use proper lifting techniques; Stay alert; Wear steel toe boots; Wear high-visibility vest in high traffic areas; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET	3	1	3	WSP & Subcontractor
Core concrete				X		X	X			X	X	X	X	X	X	X	X					X				X	X	X	X	X	6	2	12	Stay alert; Inspect concrete corer for unsafe conditions; Clear location for utilties; Wear steel toe boots and safety glasses; Use GFCI; Core with water or dust suppression device; Wear high-visibility vest in high traffic areas; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET	6	1	6	Subcontractor
Park the rig on final location						X				X						X														6	2	12	Stay alert; Inspect rig and work area for unsafe conditions; Guide driver to position; Wear steel toe boots; Wear high-visibility vest in high traffic areas; Use wheel chucks (as necessary)	6	1	6	WSP & Subcontractor

Prepared By:	Prepared Date:
Erin Huntley	9/12/2018
Approved By:	**Approved Date:**
Glen Rieger	10/3/2018

JOB HAZARD ANALYSIS
WATER & ENVIRONMENT

Project Name:	Project No:	Project Location:	Project/Task Description:	Project/Task Equipment:
Former Emerson Power Transmission	31400551	Ithaca, NY	Soil gas probe installation and sampling	Drill rig (geoprobe, HSA, air, sonic), probe construction materials, sample containers, pump (battery/hand operated), PID

Chemicals of Concern:	Site-Specific Hazards:	Action Levels:
See HASP Section 2.5	Site is located on a steep hillside.	Organic Vapors - < 10.6 eV = 1 ppm, > 10.6 eV = 5 ppm; Particulates - 2 mg/m^3

Level D PPE:	PPE Upgrades:	Health & Safety Equipment:
Work clothes, steel toe boots, high visibility vest, hard hat, hearing protection, safety glasses, work gloves, nitrile gloves	Full face respirator with combination cartridge, chemical resistant coveralls	PID (10.6 eV and 11.7 eV), particulate aerosol monitor

Basic Job Step	Potential Hazards (From HASP)																											Baseline Risk Score			Hazard Controls Protection Measures	Controlled Risk Score			Persons Affected
	Explosion (Chemical Reaction)	Explosion (Over Pressurization)	Electrical (Shock/Short Circuit)	Electrical (Fire)	Electrical (Static)	Electrical (Loss of Power)	Ergonomics (Strain)	Ergonomics (Human Error)	Excavation (Collapse)	Fall (Slip, Trip)	Fire/Heat	Mechanical/Vibration (Chafing/Fatigue)	Mechanical Failure	Mechanical	Noise	Struck By (Mass Acceleration)	Struck Against	Chemical (Toxic)	Chemical (Ignitable)	Chemical (Corrosive)	Chemical (Volatile)	Respirable Particulate	Radiation (Ionizing)	Radiation (Non-Ionizing)	Temperature Extreme (Heat/Cold)	Visibility	Weather Phenomena (Snow/Rain/Wind/Ice)	Biological Hazards (Venomous/Disease-Carrying Animals/Insects, Poisonous Plants)	Severity	Likelihood	Risk Score	Color Key: §No shading indicates acceptable risk - no action needed. §Green shading indicates low risk - review the operation/activity and take any steps necessary to reduce & control the risks. §Yellow shading indicates medium risk - inform H&S management & seek further advice before proceeding any further with the operation/activity. §Red shading indicates high risk - HALT the activity immediately, review and reduce the risks identified.	Severity	Likelihood	Risk Score	
Raise mast		X	X	X		X						X	X	X		X								X	X	X	X	X	6	2	12	Location should be cleared for overhead utilities as per SOPs; Notify driller of any unsafe or hazardous conditions observed; Stay alert; Wear steel toe boots, hard hat, and safety glasses; Wear high-visibility vest in high traffic areas; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET	6	1	6	Subcontactor
Begin drilling		X	X	X		X	X			X	X	X	X	X	X	X	X	X	X		X			X	X	X	X	X	6	2	12	Location should be cleared for underground utilities as per SOPs; Notify driller of any unsafe or hazardous conditions observed; Stay alert; Wear steel toe boots, hard hat, hearing protection, and safety glasses; Wear high-visibility vest in high traffic areas; Perform air monitoring as per HASP; Wear full face respirator if chemical action levels exceeded as per HASP; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET	6	1	6	Subcontractor
Install soil gas probe							X			X			X	X			X	X	X	X	X			X	X	X	X	X	4	2	8	Follow SOPs; Stay alert; Wear nitrile gloves, steel toe boots, hard hat (when mast is raised), and safety glasses; Wear high-visibility vest in high traffic areas; Perform air monitoring as per HASP; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET	4	1	4	WSP
Leak test probe		X					X			X			X	X			X	X	X		X			X	X	X	X	X	4	2	8	Follow SOPs; Inspect equipment; Stay alert; Wear nitrile gloves, steel toe boots, Wear high-visibility vest in high traffic areas; Perform air monitoring as per HASP; Wear full face respirator if action levels exceeded as per HASP; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET	4	1	4	WSP
Purge and sample probe							X			X			X	X			X	X	X		X			X	X	X	X	X	3	2	6	Follow SOPs; Inspect equipment; Stay alert; Wear nitrile gloves and steel toe boots; Wear high-visibility vest in high traffic areas; Perform air monitoring as per HASP; Wear full face respirator if action levels exceeded as per HASP; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET	3	1	3	Subcontractor

Prepared By:	Prepared Date:
Erin Huntley	9/12/2018
Approved By:	**Approved Date:**
Glen Rieger	10/3/2018

JOB HAZARD ANALYSIS
WATER & ENVIRONMENT

Project Name:	Project No:	Project Location:	Project/Task Description:	Project/Task Equipment:
Former Emerson Power Transmission	31400551	Ithaca, NY	Soil gas probe installation and sampling	Drill rig (geoprobe, HSA, air, sonic), probe construction materials, sample containers, pump (battery/hand operated), PID

Chemicals of Concern:	Site-Specific Hazards:	Action Levels:
See HASP Section 2.5	Site is located on a steep hillside.	Organic Vapors - < 10.6 eV = 1 ppm, > 10.6 eV = 5 ppm; Particulates - 2 mg/m^3

Level D PPE:	PPE Upgrades:	Health & Safety Equipment:
Work clothes, steel toe boots, high visibility vest, hard hat, hearing protection, safety glasses, work gloves, nitrile gloves	Full face respirator with combination cartridge, chemical resistant coveralls	PID (10.6 eV and 11.7 eV), particulate aerosol monitor

Basic Job Step	Potential Hazards (From HASP)																											Baseline Risk Score			Hazard Controls Protection Measures	Controlled Risk Score			Persons Affected
	Explosion (Chemical Reaction)	Explosion (Over Pressurization)	Electrical (Shock/Short Circuit)	Electrical (Fire)	Electrical (Static)	Electrical (Loss of Power)	Ergonomics (Strain)	Ergonomics (Human Error)	Excavation (Collapse)	Fall (Slip, Trip)	Fire/Heat	Mechanical/Vibration (Chafing/Fatigue)	Mechanical Failure	Mechanical	Noise	Struck By (Mass Acceleration)	Struck Against	Chemical (Toxic)	Chemical (Ignitable)	Chemical (Corrosive)	Chemical (Volatile)	Respirable Particulate	Radiation (Ionizing)	Radiation (Non-Ionizing)	Temperature Extreme (Heat/Cold)	Visibility	Weather Phenomena (Snow/Rain/Wind/Ice)	Biological Hazards (Venomous/Disease-Carrying Animals/Insects, Poisonous Plants)	Severity	Likelihood	Risk Score	Color Key: §No shading indicates acceptable risk - no action needed. §Green shading indicates low risk - review the operation/activity and take any steps necessary to reduce & control the risks. §Yellow shading indicates medium risk - inform H&S management & seek further advice before proceeding any further with the operation/activity. §Red shading indicates high risk - HALT the activity immediately, review and reduce the risks identified.	Severity	Likelihood	Risk Score	
Waste management		X	X	X		X	X	X	X	X	X	X	X	X	X	X	X	X			X	X		X	X	X	X	X	6	3	18	Inspect equipment before use; Use equipment in accordance with manufacturer's instructions; Use trained operators; Use proper lifting techniques; Perform air monitoring as per HASP; Stay alert; Wear steel toe boots, hard hat, and safety glasses; Wear high-visibility vest in high traffic areas; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET	6	1	6	WSP & Subcontractor
Decontamination		X	X	X		X	X			X	X	X	X	X	X	X	X	X	X		X			X	X	X	X	X	6	2	12	Stay alert; Wear nitrile gloves, steel toe boots, hard hat (if pressure washer in use), hearing protection (if pressure washer in use), and safety glasses or goggles; Wear high-visibility vest in high traffic areas; Perform air monitoring as per HASP; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET	6	1	6	WSP & Subcontracot
Survey							X			X			X	X			X							X	X	X	X	X	3	2	6	Follow SOPs; Use proper lifting techniques; Stay alert; Wear steel toe boots;	3	1	3	Subcontractor

Prepared By:	Prepared Date:
Erin Huntley	9/17/2018
Approved By:	**Approved Date:**
Glen Rieger	10/3/2018

JOB HAZARD ANALYSIS
WATER & ENVIRONMENT

Project Name:	Project No:	Project Location:	Project/Task Description:	Project/Task Equipment:
Former Emerson Power Transmission	31400551	Ithaca, NY	Soil gas probe installation and sampling	Drill rig (geoprobe, HSA, air, sonic), probe construction materials, sample containers, pump (battery/hand operated), PID

Chemicals of Concern:	Site-Specific Hazards:	Action Levels:
See HASP Section 2.5	Site is located on a steep hillside.	Organic Vapors - < 10.6 eV = 1 ppm, > 10.6 eV = 5 ppm; Particulates - 2 mg/m^3

Level D PPE:	PPE Upgrades:	Health & Safety Equipment:
Work clothes, steel toe boots, high visibility vest, hearing protection, safety glasses, work gloves, nitrile gloves	Full face respirator with combination cartridge, chemical resistant coveralls	PID (10.6 eV and 11.7 eV), particulate aerosol monitor

Basic Job Step	Potential Hazards (From HASP)																											Baseline Risk Score			Hazard Controls Protection Measures	Controlled Risk Score			Persons Affected
	Explosion (Chemical Reaction)	Explosion (Over Pressurization)	Electrical (Shock/Short Circuit)	Electrical (Fire)	Electrical (Static)	Electrical (Loss of Power)	Ergonomics (Strain)	Ergonomics (Human Error)	Excavation (Collapse)	Fall (Slip, Trip)	Fire/Heat	Mechanical/Vibration (Chafing/Fatigue)	Mechanical Failure	Mechanical	Noise	Struck By (Mass Acceleration)	Struck Against	Chemical (Toxic)	Chemical (Ignitable)	Chemical (Corrosive)	Chemical (Volatile)	Respirable Particulate	Radiation (Ionizing)	Radiation (Non-Ionizing)	Temperature Extreme (Heat/Cold)	Visibility	Weather Phenomena (Snow/Rain/Wind/Ice)	Biological Hazards (Venomous/Disease-Carrying Animals/Insects, Poisonous Plants)	Severity	Likelihood	Risk Score	Color Key: §No shading indicates acceptable risk - no action needed. §Green shading indicates low risk - review the operation/activity and take any steps necessary to reduce & control the risks. §Yellow shading indicates medium risk - inform H&S management & seek further advice before proceeding any further with the operation/activity. §Red shading indicates high risk - HALT the activity immediately, review and reduce the risks identified.	Severity	Likelihood	Risk Score	
Mobilize/Demobilize					X	X	X	X		X	X	X	X	X		X	X		X							X	X		6	3	18	Inspect vehicle for unsafe conditions; Stay alert; Be aware of other traffic; Obey traffic laws; Do not drive when tired; Reduce speed in inclement weather; Park WSP vehicle outside of work zone.	6	2	12	WSP & Subcontractor
Load/Unload equipment							X	X		X			X	X		X	X								X	X	X	X	X	6	2	12	Use proper lifting techniques; Stay alert; Park in designated parking/loading area; Wear work gloves and steel toe boots; Wear high visibility vest in high traffic areas; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET	3	1	3	WSP & Subcontractor
Tailgate meeting (daily)										X																X	X	X		3	1	3	Wear steel toe boots; Wear weather-appropriate clothing;Work with appropriate lighting	3	1	3	WSP & Subcontractor
Locate and mark drilling location										X																X	X	X		3	2	6	Stay alert; Wear steel toe boots; Wear high-visibility vest in high traffic areas; Wear weather-appropriate clothing;Work with appropriate lighting	3	1	3	WSP & Subcontractor
Clear drilling location for utilities							X			X			X	X			X									X	X	X		3	2	6	Follow SOPs; Use proper lifting techniques; Stay alert; Wear steel toe boots; Wear high-visibility vest in high traffic areas; Wear weather-appropriate clothing; Work with appropriate lighting	3	1	3	WSP & Subcontractor
Core or drill concrete				X		X	X			X	X	X	X	X	X	X	X						X			X	X	X		6	2	12	Stay alert; Inspect concrete corer/drill for unsafe conditions; Clear location for utilties; Wear steel toe boots and safety glasses; Use GFCI; Core/drill with water or dust suppression device; Use vacuum with HEPA filter; Wear high-visibility vest in high traffic areas; Wear weather-appropriate clothing; Work with appropriate lighting	6	1	6	Subcontractor
Install sub-slab soil gas probe							X			X			X	X			X	X	X	X	X					X	X	X		4	2	8	Follow SOPs; Use proper lifting techniques; Stay alert; Wear steel toe boots; Wear high-visibility vest in high traffic areas; Wear weather-appropriate clothing; Work with appropriate lighting	6	1	6	WSP & Subcontractor
Leak test probe		X					X			X			X	X			X	X	X		X					X	X	X		4	2	8	Follow SOPs; Inspect helium tank for damage; Use proper lifting techniques; Stay alert; Wear steel toe boots; Wear high-visibility vest in high traffic areas; Wear weather-appropriate clothing; Work with appropriate lighting	6	1	6	Subcontactor
Purge and sample probe							X			X			X	X			X	X	X		X					X	X	X		3	2	6	Follow SOPs; Use proper lifting techniques; Stay alert; Wear steel toe boots; Wear high-visibility vest in high traffic areas; Wear weather-appropriate clothing; Work with appropriate lighting	6	1	6	Subcontractor

Prepared By:	Prepared Date:
Erin Huntley	9/17/2018
Approved By:	**Approved Date:**
Glen Rieger	10/3/2018

JOB HAZARD ANALYSIS
WATER & ENVIRONMENT

Project Name:	Project No:	Project Location:	Project/Task Description:	Project/Task Equipment:
Former Emerson Power Transmission	31400551	Ithaca, NY	Soil gas probe installation and sampling	Drill rig (geoprobe, HSA, air, sonic), probe construction materials, sample containers, pump (battery/hand operated), PID

Chemicals of Concern:	Site-Specific Hazards:	Action Levels:
See HASP Section 2.5	Site is located on a steep hillside.	Organic Vapors - < 10.6 eV = 1 ppm, > 10.6 eV = 5 ppm; Particulates - 2 mg/m^3

Level D PPE:	PPE Upgrades:	Health & Safety Equipment:
Work clothes, steel toe boots, high visibility vest, hearing protection, safety glasses, work gloves, nitrile gloves	Full face respirator with combination cartridge, chemical resistant coveralls	PID (10.6 eV and 11.7 eV), particulate aerosol monitor

Basic Job Step	Potential Hazards (From HASP)																											Baseline Risk Score			Hazard Controls Protection Measures	Controlled Risk Score			Persons Affected
	Explosion (Chemical Reaction)	Explosion (Over Pressurization)	Electrical (Shock/Short Circuit)	Electrical (Fire)	Electrical (Static)	Electrical (Loss of Power)	Ergonomics (Strain)	Ergonomics (Human Error)	Excavation (Collapse)	Fall (Slip, Trip)	Fire/Heat	Mechanical/Vibration (Chafing/Fatigue)	Mechanical Failure	Mechanical	Noise	Struck By (Mass Acceleration)	Struck Against	Chemical (Toxic)	Chemical (Ignitable)	Chemical (Corrosive)	Chemical (Volatile)	Respirable Particulate	Radiation (Ionizing)	Radiation (Non-Ionizing)	Temperature Extreme (Heat/Cold)	Visibility	Weather Phenomena (Snow/Rain/Wind/Ice)	Biological Hazards (Venomous/Disease-Carrying Animals/Insects, Poisonous Plants)	Severity	Likelihood	Risk Score	Color Key: §No shading indicates acceptable risk - no action needed. §Green shading indicates low risk - review the operation/activity and take any steps necessary to reduce & control the risks. §Yellow shading indicates medium risk - inform H&S management & seek further advice before proceeding any further with the operation/activity. §Red shading indicates high risk - HALT the activity immediately, review and reduce the risks identified.	Severity	Likelihood	Risk Score	
Collect indoor/outdoor air sample										X														X	X	X	X	X	3	1	3	Follow SOPs; Use proper lifting techniques; Stay alert; Wear steel toe boots; Wear high-visibility vest in high traffic areas; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET	4	1	4	WSP
Waste management			X	X			X			X	X		X	X	X		X					X		X	X	X	X	X	6	3	18	Follow SOPs; Use proper lifting techniques; Stay alert; Wear steel toe boots; Wear high-visibility vest in high traffic areas; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET	4	1	4	WSP
Decontamination		X	X	X		X	X			X	X	X	X	X	X	X	X	X	X		X			X	X	X	X	X	6	2	12	Follow SOPs; Use proper lifting techniques; Stay alert; Wear steel toe boots; Wear high-visibility vest in high traffic areas; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET	3	1	3	Subcontractor
Survey							X			X			X	X			X							X	X	X	X	X	3	2	6	Use proper lifting techniques; Stay alert; Wear steel toe boots; Wear high-visibility vest in high traffic areas; Wear weather-appropriate clothing; Use SPF 15 or higher sunscreen; Work during daylight hours or with appropriate lighting; Use insect repellant containing DEET	6	1	6	Subcontractor

APPENDIX

G COMMUNITY AIR MONITORING PLAN

Appendix 1A
New York State Department of Health
Generic Community Air Monitoring Plan

Overview

A Community Air Monitoring Plan (CAMP) requires real-time monitoring for volatile organic compounds (VOCs) and particulates (i.e., dust) at the downwind perimeter of each designated work area when certain activities are in progress at contaminated sites. The CAMP is not intended for use in establishing action levels for worker respiratory protection. Rather, its intent is to provide a measure of protection for the downwind community (i.e., off-site receptors including residences and businesses and on-site workers not directly involved with the subject work activities) from potential airborne contaminant releases as a direct result of investigative and remedial work activities. The action levels specified herein require increased monitoring, corrective actions to abate emissions, and/or work shutdown. Additionally, the CAMP helps to confirm that work activities did not spread contamination off-site through the air.

The generic CAMP presented below will be sufficient to cover many, if not most, sites. Specific requirements should be reviewed for each situation in consultation with NYSDOH to ensure proper applicability. In some cases, a separate site-specific CAMP or supplement may be required. Depending upon the nature of contamination, chemical- specific monitoring with appropriately-sensitive methods may be required. Depending upon the proximity of potentially exposed individuals, more stringent monitoring or response levels than those presented below may be required. Special requirements will be necessary for work within 20 feet of potentially exposed individuals or structures and for indoor work with co-located residences or facilities. These requirements should be determined in consultation with NYSDOH.

Reliance on the CAMP should not preclude simple, common-sense measures to keep VOCs, dust, and odors at a minimum around the work areas.

Community Air Monitoring Plan

Depending upon the nature of known or potential contaminants at each site, real-time air monitoring for VOCs and/or particulate levels at the perimeter of the exclusion zone or work area will be necessary. Most sites will involve VOC and particulate monitoring; sites known to be contaminated with heavy metals alone may only require particulate monitoring. If radiological contamination is a concern, additional monitoring requirements may be necessary per consultation with appropriate DEC/NYSDOH staff.

Continuous monitoring will be required for all ground intrusive activities and during the demolition of contaminated or potentially contaminated structures. Ground intrusive activities include, but are not limited to, soil/waste excavation and handling, test pitting or trenching, and the installation of soil borings or monitoring wells.

Periodic monitoring for VOCs will be required during non-intrusive activities such as the collection of soil and sediment samples or the collection of groundwater samples from existing monitoring wells. “Periodic” monitoring during sample collection might reasonably consist of taking a reading upon arrival at a sample location, monitoring while opening a well cap or

overturning soil, monitoring during well baling/purging, and taking a reading prior to leaving a sample location. In some instances, depending upon the proximity of potentially exposed individuals, continuous monitoring may be required during sampling activities. Examples of such situations include groundwater sampling at wells on the curb of a busy urban street, in the midst of a public park, or adjacent to a school or residence.

VOC Monitoring, Response Levels, and Actions

Volatile organic compounds (VOCs) must be monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone) on a continuous basis or as otherwise specified. Upwind concentrations should be measured at the start of each workday and periodically thereafter to establish background conditions, particularly if wind direction changes. The monitoring work should be performed using equipment appropriate to measure the types of contaminants known or suspected to be present. The equipment should be calibrated at least daily for the contaminant(s) of concern or for an appropriate surrogate. The equipment should be capable of calculating 15-minute running average concentrations, which will be compared to the levels specified below.

1. If the ambient air concentration of total organic vapors at the downwind perimeter of the work area or exclusion zone exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities must be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities can resume with continued monitoring.

2. If total organic vapor levels at the downwind perimeter of the work area or exclusion zone persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities must be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities can resume provided that the total organic vapor level 200 feet downwind of the exclusion zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less - but in no case less than 20 feet, is below 5 ppm over background for the 15-minute average.

3. If the organic vapor level is above 25 ppm at the perimeter of the work area, activities must be shutdown.

4. All 15-minute readings must be recorded and be available for State (DEC and NYSDOH) personnel to review. Instantaneous readings, if any, used for decision purposes should also be recorded.

Particulate Monitoring, Response Levels, and Actions

Particulate concentrations should be monitored continuously at the upwind and downwind perimeters of the exclusion zone at temporary particulate monitoring stations. The particulate monitoring should be performed using real-time monitoring equipment capable of measuring particulate matter less than 10 micrometers in size (PM-10) and capable of integrating over a period of 15 minutes (or less) for comparison to the airborne particulate action level. The equipment must be equipped with an audible alarm to indicate exceedance of the action level. In addition, fugitive dust migration should be visually assessed during all work activities.

1. If the downwind PM-10 particulate level is 100 micrograms per cubic meter (mcg/m^3) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques must be employed. Work may continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed 150 mcg/m^3 above the upwind level and provided that no visible dust is migrating from the work area.

2. If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than 150 mcg/m^3 above the upwind level, work must be stopped and a re-evaluation of activities initiated. Work can resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within 150 mcg/m^3 of the upwind level and in preventing visible dust migration.

3. All readings must be recorded and be available for State (DEC and NYSDOH) and County Health personnel to review.

December 2009

Appendix 1B
Fugitive Dust and Particulate Monitoring

A program for suppressing fugitive dust and particulate matter monitoring at hazardous waste sites is a responsibility on the remedial party performing the work. These procedures must be incorporated into appropriate intrusive work plans. The following fugitive dust suppression and particulate monitoring program should be employed at sites during construction and other intrusive activities which warrant its use:

1. Reasonable fugitive dust suppression techniques must be employed during all site activities which may generate fugitive dust.

2. Particulate monitoring must be employed during the handling of waste or contaminated soil or when activities on site may generate fugitive dust from exposed waste or contaminated soil. Remedial activities may also include the excavation, grading, or placement of clean fill. These control measures should not be considered necessary for these activities.

3. Particulate monitoring must be performed using real-time particulate monitors and shall monitor particulate matter less than ten microns (PM10) with the following minimum performance standards:

(a) Objects to be measured: Dust, mists or aerosols;
(b) Measurement Ranges: 0.001 to 400 mg/m3 (1 to 400,000 :ug/m3);
(c) Precision (2-sigma) at constant temperature: +/- 10 :g/m3 for one second averaging; and +/- 1.5 g/m3 for sixty second averaging;
(d) Accuracy: +/- 5% of reading +/- precision (Referred to gravimetric calibration with SAE fine test dust (mmd= 2 to 3 :m, g= 2.5, as aerosolized);
(e) Resolution: 0.1% of reading or 1g/m3, whichever is larger;
(f) Particle Size Range of Maximum Response: 0.1-10;
(g) Total Number of Data Points in Memory: 10,000;
(h) Logged Data: Each data point with average concentration, time/date and data point number
(i) Run Summary: overall average, maximum concentrations, time/date of maximum, total number of logged points, start time/date, total elapsed time (run duration), STEL concentration and time/date occurrence, averaging (logging) period, calibration factor, and tag number;
(j) Alarm Averaging Time (user selectable): real-time (1-60 seconds) or STEL (15 minutes), alarms required;
(k) Operating Time: 48 hours (fully charged NiCd battery); continuously with charger;
(l) Operating Temperature: -10 to 50^{o} C (14 to 122^{o} F);
(m) Particulate levels will be monitored upwind and immediately downwind at the working site and integrated over a period not to exceed 15 minutes.

4. In order to ensure the validity of the fugitive dust measurements performed, there must be appropriate Quality Assurance/Quality Control (QA/QC). It is the responsibility of the remedial party to adequately supplement QA/QC Plans to include the following critical features: periodic instrument calibration, operator training, daily instrument performance (span) checks, and a record keeping plan.

5. The action level will be established at 150 ug/m3 (15 minutes average). While conservative,

this short-term interval will provide a real-time assessment of on-site air quality to assure both health and safety. If particulate levels are detected in excess of 150 ug/m3, the upwind background level must be confirmed immediately. If the working site particulate measurement is greater than 100 ug/m3 above the background level, additional dust suppression techniques must be implemented to reduce the generation of fugitive dust and corrective action taken to protect site personnel and reduce the potential for contaminant migration. Corrective measures may include increasing the level of personal protection for on-site personnel and implementing additional dust suppression techniques (see paragraph 7). Should the action level of 150 ug/m3 continue to be exceeded work must stop and DER must be notified as provided in the site design or remedial work plan. The notification shall include a description of the control measures implemented to prevent further exceedances.

6. It must be recognized that the generation of dust from waste or contaminated soil that migrates off-site, has the potential for transporting contaminants off-site. There may be situations when dust is being generated and leaving the site and the monitoring equipment does not measure PM10 at or above the action level. Since this situation has the potential to allow for the migration of contaminants off-site, it is unacceptable. While it is not practical to quantify total suspended particulates on a real-time basis, it is appropriate to rely on visual observation. If dust is observed leaving the working site, additional dust suppression techniques must be employed. Activities that have a high dusting potential--such as solidification and treatment involving materials like kiln dust and lime--will require the need for special measures to be considered.

7. The following techniques have been shown to be effective for the controlling of the generation and migration of dust during construction activities:

(a) Applying water on haul roads;
(b) Wetting equipment and excavation faces;
(c) Spraying water on buckets during excavation and dumping;
(d) Hauling materials in properly tarped or watertight containers;
(e) Restricting vehicle speeds to 10 mph;
(f) Covering excavated areas and material after excavation activity ceases; and
(g) Reducing the excavation size and/or number of excavations.

Experience has shown that the chance of exceeding the 150ug/m3 action level is remote when the above-mentioned techniques are used. When techniques involving water application are used, care must be taken not to use excess water, which can result in unacceptably wet conditions. Using atomizing sprays will prevent overly wet conditions, conserve water, and provide an effective means of suppressing the fugitive dust.

8. The evaluation of weather conditions is necessary for proper fugitive dust control. When extreme wind conditions make dust control ineffective, as a last resort remedial actions may need to be suspended. There may be situations that require fugitive dust suppression and particulate monitoring requirements with action levels more stringent than those provided above. Under some circumstances, the contaminant concentration and/or toxicity may require additional monitoring to protect site personnel and the public. Additional integrated sampling and chemical analysis of the dust may also be in order. This must be evaluated when a health and safety plan is developed and when appropriate suppression and monitoring requirements are established for protection of health and the environment.

APPENDIX

H WSP PERSONNEL TRAINING RECORDS

APPENDIX

MODIFICATION FORM

MODIFICATION OF THE HEALTH AND SAFETY PLAN

Site :	Former EPT Facility
Location :	Ithaca, New York
Change Number :	
Date :	
Section(s) of HASP Affected :	

Modification:

Approved:

_____ _____

Nathaniel Winston — Date

Site Health and Safety Coordinator

_____ _____

Lisa Bryda — Date

Site Coordinator

APPENDIX

F COMMUNITY AIR MONITORING PLAN

COMMUNITY AIR MONITORING PLAN
AOC 1 DPE SYSTEM EXPANSION
FORMER EMERSON POWER TRANSMISSION FACILITY
ITHACA, NEW YORK

This Community Air Monitoring Plan (CAMP) has been prepared for the Dual Phase Extraction (DPE) System Expansion into Area of Concern 1 located in Operable Unit 2 at the former Emerson Power Transmission Facility in Ithaca, New York.

A CAMP requires real-time monitoring for volatile organic compounds (VOCs) and particulates (i.e., dust) at the downwind perimeter of each designated work area when certain activities (e.g., excavation, soil management, backfilling, loading) are in progress at contaminated sites. The CAMP is not intended for use in establishing action levels for worker respiratory protection. Rather, its intent is to provide a measure of protection for the downwind community (i.e., off-site receptors including residences and businesses and on-site workers not directly involved with the subject work activities) from potential airborne contaminant releases as a direct result of investigative and remedial work activities.

VOC MONITORING, RESPONSE LEVELS, AND ACTIONS

Volatile organic compounds (VOCs) will be monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone) on a continuous basis or as otherwise specified. Upwind concentrations will be measured at the start of each workday and periodically thereafter to establish background conditions, particularly if wind direction changes. The monitoring work will be performed using a photoionization detector (PID), capable of calculating 15-minute running average concentrations. The PID will be calibrated at least daily with isobutylene.

1. If the ambient air concentration of total organic vapors at the downwind perimeter of the work area or exclusion zone exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities will be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities can resume with continued monitoring.
2. If total organic vapor levels at the downwind perimeter of the work area or exclusion zone persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities will be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities can resume provided that the total organic vapor level 200 feet downwind of the exclusion zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less - but in no case less than 20 feet, is below 5 ppm over background for the 15-minute average.
3. If the organic vapor level is above 25 ppm at the perimeter of the work area, activities will be shutdown.
4. All 15-minute readings and instantanrous readings will be recorded and be available for New York State Department of Environmental Conservation (NYSDEC) and Department of Health (NYSDOH) personnel to review.

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PARTICULATE MONITORING, RESPONSE LEVELS, AND ACTIONS

Particulate concentrations should be monitored continuously at the upwind and downwind perimeters of the exclusion zone at temporary particulate monitoring stations. The particulate monitoring will be performed using real-time monitoring equipment capable of measuring particulate matter less than 10 micrometers in size (PM-10) and capable of integrating over a period of 15 minutes (or less) for comparison to the airborne particulate action level. The equipment will be equipped with an audible alarm to indicate exceedance of the action level.

Fugitive dust migration will be visually assessed during all work activities. The excavation surfaces will be maintained damp and additional dust suppressant will be applied, as needed, to prevent or reduce dust emissions resulting from construction activities. Dust suppressant will be applied when exposed ground surfaces are dry and wind or vehicular traffic result in visible dust generation. Dust suppressant applications will consist of applying potable water via a mobile broadcast applicator in a controlled manner.

1. If the downwind PM-10 particulate level is 100 micrograms per cubic meter ($\mu g/m^3$) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques must be employed. Work may continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed 150 $\mu g/m^3$ above the upwind level and provided that no visible dust is migrating from the work area.
2. If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than 150 $\mu g/m^3$ above the upwind level, work must be stopped and a re-evaluation of activities initiated. Work can resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within 150 $\mu g/m^3$ of the upwind level and in preventing visible dust migration.
3. All readings must be recorded and be available for NYSDEC, NYSDOH, and County Health personnel to review.