July 27, 2020

New York State Department of Environmental Conservation
Division of Environmental Remediation – Region 7
615 Erie Boulevard West
Syracuse, New York 13204-2400
Attn: Mr. Michael Belveg

**RE: Remedial Design Work Plan**
**Former Coyne Textile Facility Vapor Intrusion Mitigation**
**CHA Project No.: 059294.001**
**NYSDEC Site No.: C734144**

Dear Mr. Belveg,

On behalf of Ranalli/Taylor St., LLC (Ranalli/Taylor St.), please find an enclosed copy of the Revised Remedial Design Work Plan for the Former Coyne Textile Facility located at 140 Cortland Avenue in the City of Syracuse, New York. The document has been revised to address the comments provided in the New York State Department of Environmental Conservation's (NYSDEC's) comment letter dated July 21, 2020 which includes comments from the New York State Department of Health (NYSDOH). The NYSDEC/NYSDOH comments and CHA responses/report amendments are summarized below:

**Comment 1:** Document Name: The document is labeled as a Report, but the Department sees it more as a Work Plan. Please change the documents name to Remedial Design Work Plan (RDWP).

***Response 1****:* The document title has been changed from Remedial Design Report to Remedial Design Work Plan.

**Comment 2:** Section 4.2.1 Soil Excavation (last paragraph): It is recommended that, due to the nature of contaminated soils, the duration of all stockpiled materials should be limited, particularly during higher temperatures, to control nuisance odors and potential exposures. Please revise the text to address this.

***Response 2:*** Stockpiles will be limited to the extent practical while awaiting analytical for disposal. Once analytical is received, the intent will be to direct-load trucks, therefore, minimizing the need for stockpiling of soils on-site. This paragraph in the RDWP has been revised for clarity.

**Comment 3:** Section 4.3 Treatment Zone 2 – Source Area Treatment with Soil Mixing: Please add a new subsection explaining how it will be determined if this treatment was successful. This could be done via confirmation samples or some other method demonstrating the mixture is working. It also needs to be able to provide information on any remaining contamination being left at the site.

***Response 3:*** CHA has proposed treating Treatment Zone 2 utilizing in-situ chemical reduction (ISCR) chemistry, specifically through the use of zero valent iron (ZVI). The ISCR process that happens via ZVI is a much slower process than the ISCO process in Treatment Zone 3, and therefore, an immediate reduction in the contaminant concentrations in Treatment Zone 2 is not expected. Rather, CHA anticipates that the previously collected soil and groundwater samples in Treatment Zone 2 will represent the remaining contamination immediately following the ZVI mixing process. While a significant contaminant mass decrease is expected within only a few months of the application, the iron is anticipated to continue to provide treatment of any remaining contamination for a minimum of two years following the mixing process. Since the redevelopment construction schedule in Treatment Zone 2 precludes subsequent soil sampling in this area, CHA recommends that the performance of the remedial action for this zone be evaluated based upon a groundwater monitoring program immediately down-gradient of Treatment Zone 2. CHA will coordinate the NYSDEC/NYSDOH on the long-term monitoring requirements during the execution of the remedial action and prior to the preparation of the Site Management Plan (SMP) and Final Engineering Report (FER).

The amount of ZVI (4 percent by dry soil weight) proposed to be mixed with the site soils is what was used in the bench test which indicates an overall reduction of volatile organic compounds (VOCs) as further described within the RDWP. For quality control in the field, the contractor will be required to determine the amount of ZVI (in pounds) required to meet the 4 percent requirement during the soil mixing process based upon the proposed cell size of 20-feet by 18-feet (which could vary and will need to be determined for each cell if a non-standard size is utilized).

**Comment 4:** Section 4.3.3 Zero-Valent Iron Treatment & Mixing: Please revise to explain how VOCs/vapors will be controlled during soil mixing to be consistent with Section 5 of the Decision Document, which indicates that capture of released VOCs will be assessed during remedial design.

***Response 4:*** This section has been revised to explain that soil mixing will be completed in cells approximately 20-feet by 18-feet in size (total of 10 cells) which will reduce the amount of soil exposed at one time. Additionally, the soil being mixed with ZVI is located within the saturated zone, therefore the water at the surface of the mixing zone is anticipated to also reduce the rate of volatilization in the mixing area. VOC emission will be monitored continuously via handheld photoionization detector (PID) and community air monitoring program (CAMP) stations in accordance with the CAMP.

**Comment 5a:** Section 4.5 Soil Vapor Mitigation: As stated, the sub-slab depressurization system (SSDS) design will be submitted separately for DEC/DOH review and approval, due to ongoing building demolition/construction work. Please include in the design and state in the text that enough permanent vapor monitor points will be included in the SSDS design so full slab depressurization can be confirmed during system testing. Note: This will also facilitate sub-slab vapor evaluation if needed without puncturing the vapor barrier (for instance, if any part of the SSDS is proposed to be shut down in the future).

***Response 5a:*** Section 4.5 (third paragraph) has been revised to include that monitoring points for evaluating system testing during startup will be included as part of the future SSDS design. Permanent sub-slab points for use in evaluating system shutdown will also be evaluated and discussed in the design that will be submitted under a separate cover to NYSDEC/NYSDOH once the foundation plans for the new building are finalized.

**Comment 5b:** Section 4.5 Soil Vapor Mitigation: A new subsection should be added to the end of this section to describe how the SSDS will be tested (i.e. with physical and chemical testing). It should detail how pressure field extension testing will be conducted and include vapor/vacuum monitoring points. Additionally, due to documented indoor air impacts, indoor air sampling is needed to show that the system is working effectively to prevent potential inhalation exposures via soil vapor intrusion. The indoor air sampling should be conducted in accordance with the October 2006 *Guidance for Evaluating Soil Vapor Intrusion in the State of New York* (with updates) and detailed in this new section. Additionally, the sampling should be scheduled at least 30 days after the system is determined to be operating as designed (to allow for equilibration and to allow any potential indoor air sources to dissipate) *and* prior to occupancy (preferably during the heating season if possible). Please revise.

***Response 5b:*** The SSDS for this project has not yet been designed. The intent of Section 4.5 is to describe the components that will be included as part of the design. Pressure field extension testing, monitoring points, indoor air impacts, etc. will be addressed as part of the full design package that will be submit to NYSDEC and

NYSDOH under separate cover once the foundation plans for the new building are finalized. This design will be similar in nature to the Office Vapor IRMWP that was previously submit and approved by the Department in June 2019. This section has been revised to state that the design will be part of a work plan for the installation and subsequent monitoring of the SSDS.

**Comment 6:** Section 4.5.5 System Fans: Revise to state that the fans will induce a vacuum beneath the *entire* floor slab, which will be determined by the pressure field extension test.

***Response 6**:* This section has been revised to indicate that the entire floor slab footprint of the new building will be mitigated via an induced vacuum.

**Comment 7:** Section 4.6.2 New Monitoring Well Installation: Please consult with the NYSDEC and the NYSDOH on the new well locations before installing them.

***Response 7:*** The NYSDEC and NYSDOH will be consulted prior to identifying locations for and installing any new permanent wells for long-term groundwater monitoring. As this is a fast-paced project, CHA and Ranalli/Taylor St. will meet with the NYSDOH and NYSDEC upon completion of the building design, prior to the construction/installation of concrete floors. The design plans and this meeting are anticipated to take place before the conclusion of the remedial construction and prior to the preparation of the SMP/FER.

If you have any questions, please do not hesitate to contact me at (315) 257-7145.

Sincerely,

Samantha J. Miller

Samantha J. Miller, P.E., CPESC-IT
Assistant Project Engineer III

ecc: Mr. Harry Warner, NYSDEC
Ms. Angela Martin, NYSDOH
Ms. Gail Cawley, JMA/GEC Consulting
Mr. James Trasher, CHA Consulting, Inc.

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# Remedial Design Work Plan

## Former Coyne Textile Facility
## 140 Cortland Avenue
## Syracuse, New York

## NYSDEC BCP Site No. C734144

*CHA Project Number: 059294.001*

***Prepared for:***
***JMA Wireless d/b/a GEC Consulting***
*168 Brampton Road*
*Syracuse, New York 13205*

***Prepared by:***


CHA

*300 South State Street, Suite 600*
*Syracuse, New York 13202*
*Phone: (315) 471-3920*


***June 2020***
***Last Revised: July 27, 2020***

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I, the undersigned, certify that I am currently a NYS registered professional engineer as defined in 6 NYCRR Part 375 and that this Remedial Design Report was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10) and that all activities were performed in full accordance with the DER-approved work plan and any DER-approved modifications.

I certify that all information and statements in this certification form are true. I understand that a false statement made herein is punishable as a Class "A" misdemeanor, pursuant to Section 210.45 of the Penal Law. I, the undersigned, of CHA Consulting, Inc. have been designated by the Site owner to sign this certification for the Site.

**For CHA Consulting, Inc.:**

(Professional Seal)


Scott M. Smith, P.E.
Printed Name of Certifying Engineer

Signature of Certifying Engineer

July 27, 2020
Date of Certification

083885
NYS Professional Engineer Registration Number

CHA Consulting, Inc.
Company

Associate Vice President
Title

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# LIST OF ACRONYMS & ABBREVIATIONS

| | |
|---|---|
| 1,2 -DCE | 1,2 -Dichloroethene |
| 3D | Three-Dimensional |
| AAR | Alternatives Analysis Report |
| ARA | Absolute Resource Associates, LLC |
| AST | Aboveground Storage Tank |
| ASTM | American Society of Testing & Materials |
| AWQS | Ambient Water Quality Standard |
| BCA | Brownfield Cleanup Agreement |
| BCP | Brownfield Cleanup Program |
| bgs | Below the Ground Surface |
| C&D | Construction & Demolition |
| CAMP | Community Air Monitoring Plan |
| Cascade | Cascade Environmental |
| CCR | Construction Completion Report |
| CERP | Community & Environmental Response Plan |
| CHA | CHA Consulting, Inc. |
| COC | Contaminant of Concern |
| DER | Division of Environmental Remediation |
| DPT | Direct Push Technology |
| ELAP | Environmental Laboratory Approval Program |
| ESA | Environmental Site Assessment |
| FER | Final Engineering Report |
| FID | Flame Ionization Detector |
| FSP | Field Sampling Plan |
| GAC | Granulated Activated Carbon |
| GEC | GEC Consulting, LLC |
| GZA | GZA GeoEnvironmental of New York |
| HASP | Health and Safety Plan |
| HVAC | Heating, Ventilation & Air-Conditioning |
| IRM | Interim Remedial Measure |
| IRMWP | Interim Remedial Measure Work Plan |
| ISCO | In-situ Chemical Oxidation |
| ISCR | In-situ Chemical Reduction |
| JMA | JMA Wireless |
| LGAC | Liquid-phase Granular Activated Carbon |
| MIHPT | Membrane Interface Hydraulic Profiling Tool |
| MIP | Membrane Interface Probe |
| NTU | Nephelometric Turbidity Unit |
| NYCRR | New York Code, Rules and Regulations |
| NYSDEC | New York State Department of Environmental Conservation |
| NYSDOH | New York State Department of Health |
| OCDWEP | Onondaga County Department of Water Environment Protection |
| PBS | Petroleum Bulk Storage |
| PCB | Polychlorinated Biphenyl |

| | |
|---|---|
| PCE | Tetrachloroethylene |
| PDWP | Pre-Design Work Plan |
| PEC | Paragon Environmental Protection, Inc. |
| PFAS | Per- and Polyflouroalkyl Substances |
| PID | Photoionization Detector |
| PPE | Personal Protective Equipment |
| PVC | Polyvinyl Chloride |
| QA | Quality Assurance |
| QAPP | Quality Assurance Project Plan |
| QC | Quality Control |
| RAO | Remedial Action Objective |
| RCRA | Resource Conservation Recovery Act |
| RDWP | Remedial Design Work Plan |
| REC | Recognized Environmental Condition |
| RI | Remedial Investigation |
| ROI | Radius of Influence |
| SBR | Sequencing Batch Reactor |
| SCG | Standards, Criteria and Guidance |
| SCO | Soil Cleanup Objective |
| SMI | Seneca Meadows, Inc. |
| SMP | Site Management Plan |
| SOP | Standard Operating Procedure |
| SSDS | Sub-slab Depressurization System |
| SVOC | Semivolatile Organic Compound |
| SWPPP | Stormwater Pollution Prevention Plan |
| TAL | Target Analyte List |
| TCE | Trichloroethene |
| TCL | Target Compound List |
| TCLP | Toxicity Characteristic Leaching Procedure |
| TMP | Tax Map Parcel |
| TOD | Total Oxidant Demand |
| TOGS | Technical and Operational Guidance Series |
| USDA | United States Department of Agriculture |
| USDOT | United States Department of Transportation |
| USEPA | United States Environmental Protection Agency |
| USGS | United States Geological Survey |
| UST | Underground Storage Tank |
| VOC | Volatile Organic Compound |
| XDD | XDD Environmental, Inc. |
| XSD | Halogen Specific Detector |
| ZVI | Zero Valence Iron |

## LIST OF UNIT ABBREVIATIONS

| | |
|---|---|
| °C | Degrees Celsius |
| CY | Cubic Yard |
| g/kg | Grams per Kilogram |
| g/L | Grams per Liter |
| gpm | Gallons per Minute |
| mg/Kg | Milligram per Kilogram |
| $NaMnO_4$ | Sodium Permanganate |
| psi | Pounds per Square Inch |
| SF | Square Feet |
| µg/L | Microgram per Liter |
| µg/$m^3$ | Microgram per Cubic Meter |
| µm | Micron (micrometer) |

# 1.0 INTRODUCTION

The Former Coyne Textile Facility (Site) is located at 140 Cortland Avenue in Syracuse, New York (Figure 1). The Site owner, Ranalli/Taylor St., LLC (Ranalli/Taylor St.), entered into a Brownfield Cleanup Agreement (BCA) in September 2017 through the New York State Department of Environmental Conservation's (NYSDEC's) Brownfield Cleanup Program (BCP). The Site consists of three tax map parcels (TMP's) as shown on Figure 2 and is registered as BCP Site No. C734144. In December 2019, JMA Wireless (JMA) doing business as GEC Consulting, LLC (GEC), purchased Ranalli/Taylor St. LLC. The remainder of the BCP work will still be completed under the Ranalli/Taylor St. LLC entity, as a volunteer as defined in Title 6 of the New York Codes, Rules and Regulations (6 NYCRR) Part 375. New owner contact information has been provided to the NYSDEC following the transfer of the corporate ownership.

CHA Consulting, Inc. (CHA) was retained by GEC to prepare a Remedial Design Work Plan (RDWP) to develop the recommended remedial approach outlined in the Alternatives Analysis Report (AAR) prepared by CHA, dated January 2020 and last revised on March 26, 2020. After reviewing the AAR for completeness, the NYSDEC issued a fact sheet and opened the public comment period for the AAR document from May 13, 2020 through June 27, 2020. To expedite the BCP process, CHA began development of the remedial design concurrent with the public comment period. This remedial design includes the details and specifications for addressing contamination within three primary treatment zones, as further described in Section 2.3.

## 1.1 REPORT ORGANIZATION

The RDWP is divided into seven (7) major sections, including:

- Section 1: Provides an introduction of the project along with a summary of the Site background and past investigations.
- Section 2: Provides a summary of the selected remedy for the Site.
- Section 3: Provides a summary of the pre-design investigation activities conducted to provide design data, including bench scale studies, pilot testing results, and sub-slab communication testing.
- Section 4: Provides a summary of each major element of the remedial design, including the documents that will be utilized for implementation of the remedy.
- Section 5: Provides a summary of required permits and authorizations.
- Section 6: Provides a summary of the anticipated scheduled for implementation of the remedy.

Section 7: Provides a description of post construction plans and reports that will be required for the long-term use and monitoring of the Site.

## 1.2 SITE BACKGROUND

### 1.2.1 Site Description

The Former Coyne Textile Facility is located in an urban area at 140 Cortland Avenue in the City of Syracuse, Onondaga County, New York (Figure 1). The Site is currently unoccupied, contains one building with an approximately 52,000-square foot (SF) footprint, and is zoned for commercial use. The Site is identified as two non-contiguous areas (Figure 2) as described below:

- The former main laundry facility and offices are known as 140 Cortland Avenue (Tax Map No. 094.-05-06.0) and consists of one parcel of land totaling approximately 1.75-acres in size. This parcel will be referred to as the main parcel. The parcel consists of the currently vacant former laundering facility and offices, and concrete sidewalks. The building is a concrete block building with a slab-on-grade foundation.
- The park area and employee parking area are known as 1002-1022 South Salina Street/Cortland Avenue (Tax Map No. 094.-20-01.0) and 10247-1040 South Salina Street/Tallman Street (Tax Map No. 094.-20-02.0) and consist of two parcels totaling approximately 1.70-acres (0.57 and 1.13 acres, respectively) in size. These parcels consist of a small park and a fenced in asphalt parking lot, referred to as Coyne Park and the former employee parking area, respectively.

### 1.2.2 Site History

The 140 Cortland Avenue property was historically utilized as an industrial laundering facility since the mid-1930s under various entities of Coyne Textile Services. Coyne Textile Services filed for bankruptcy and ceased operations in late 2015.

Dry-cleaning activities using tetrachloroethylene (PCE) and Stoddard solvent (a petroleum mixture made from distilled alkanes, cycloalkanes (naphthenes) and aromatic compounds) were conducted at the property until 2000. These dry-cleaning liquids were noted to be stored in aboveground storage tanks (ASTs). Additionally, three underground storage tanks (USTs) were located beneath the dry-cleaning room floor (containing Stoddard solvent) and the boiler room at 140 Cortland Avenue. A gasoline filling station was present in the southern portion of the Site in the 1980s.

The former employee parking lot and park located east of the former laundering facility was owned by Coyne Textile Services from 1989 to 2016. Prior to Coyne Textile Services, previous Site uses included bus storage and repairs, the Syracuse Streetcar Barn, retail stores, and a gasoline filling station (circa 1950-1970).

### 1.2.3 Site Geology & Hydrogeology

According to the United States Department of Agriculture (USDA) Web Soil Survey, the soil beneath the Site is indicative of Urban Land, which is soil material having a non-agricultural, manmade surface layer that has been produced by mixing and filling in urban and suburban areas. Surficial geology consists mostly of lacustrine silts and clays. Bedrock at the Site is mapped by the United States Geological Survey (USGS) as the Syracuse formation, which consists of dolostone, shale, gypsum, and salts.

Field observations and stratigraphic cross sections provided in the Remedial Investigation Report (RI Report) (CHA, February 2019) confirmed the presence of urban fill to a depth of approximately 8 to 10 feet below ground surface (bgs). Generally, silts and clays are present beneath the urban fill to a depth of approximately 13 to 15 feet bgs. Alternating lacustrine silts and clays, then sands and gravel, were encountered beneath the fill material to the end of each boring. At least two silt and clay layers, one below the urban fill and one at varying depths, but approximately 26 to 30 feet bgs, are likely to act as semi-confining layers to impede the vertical transport of groundwater and contamination, however they may not act as impermeable barriers.

Based on groundwater elevations measured on April 19, 2018, the depth to groundwater at the Site is typically less than 10 feet bgs. Beneath the building, groundwater contours are at a nearly flat gradient, apart from the northwestern portion of the building where slightly elevated groundwater levels indicates a localized flow path from the north-western portion of the building toward the center of the building. Regional groundwater flow is westerly towards Onondaga Creek, located approximately 0.2 miles west of the Site.

### 1.2.4 Previous Reports and Investigations

#### 1.2.4.1 Phase I Environmental Site Assessment

A Phase I Environmental Site Assessment (ESA) was prepared in 2014 by GZA GeoEnvironmental of New York (GZA) in general accordance with the American Society for Testing and Materials (ASTM) Standard Practice E 1527-13. Based on historic use and conditions observed during the Phase I ESA, recognized environmental conditions (RECs) were identified and subsequent investigation activities were completed.

#### 1.2.4.2 Initial Subsurface Investigations

Under the direction of the previous Site owner, multiple Site investigations were conducted in 2014 and 2015. The results of these investigations were detailed in the RI Report prepared by CHA and dated February 7, 2019. In short, these investigations are summarized as follows:

1. *November 2014 Phase II Subsurface Investigation by GZA:* Based on the results including high vapor concentrations as indicated by elevated photoionization detector (PID) readings, petroleum odors, black stained soil, and an oil-like sheen on groundwater samples from the Phase II, GZA recommended additional soil and groundwater sampling to further define the extent of contamination at the Site. Additionally, it was suggested to pursue additional sampling in areas where boring installation was unsuccessful, particularly where floor trenches and drains are located in the former chemical storage and distribution room, and near the laundry machines. The primary contaminants of concern identified in the subsurface soil and groundwater included chlorinated solvents (e.g., PCE and trichloroethene (TCE)) and benzene.
2. *March 2015 Phase III Subsurface Investigation by GZA:* This investigation focused on delineation of the vertical and horizontal extent of petroleum contamination near temporary monitoring well TMW-2 and to further evaluate the soil and groundwater conditions near the boiler room and dry-cleaning area.
3. *2015 Vapor Intrusion Investigation by GZA:* A total of ten indoor air, samples were collected approximately four to five feet above the concrete floor, ten sub-slab vapor samples were collected within ten feet of the indoor air samples, and one outdoor air sample was collected from an exterior upwind location. The investigation revealed that PCE and its breakdown daughter products were present in the northern portion of the existing building on the Site where the laundering activities were conducted. The vapors were detected at concentrations that would require mitigation under New York State Department of Health (NYSDOH) Guidance for Evaluating Soil Vapor Intrusion, dated 2006 guidelines. Monitoring and/or source identification and exposure measures were determined to be necessary throughout the remainder of the Site building. GZA recommended the installation of a vapor mitigation system, to address the potential vapor intrusion conditions.

The historical sample locations referenced above are shown on Figures 3 through 5.

#### 1.2.4.3 Remedial Investigation

Ranalli/Taylor St. retained CHA to conduct a RI at the Site in 2018 to identify environmental concerns and provide additional information necessary for the AAR. The RI used the data provided in the GZA reports to identify locations where additional investigation was required. The RI included a geophysical survey, surface soil sampling at Coyne Park, subsurface soil sampling at 24 boring locations (Figure 3), the installation and subsequent sampling of groundwater from six permanent groundwater monitoring wells, groundwater sampling from three existing permanent monitoring wells (Figure 4), indoor air sampling at two locations, and vapor intrusion sampling from six temporary sub-slab vapor points (Figure 5). The following summarizes the findings of the investigation:

- Human exposure to Site media such as soil and groundwater is limited due to the Site being primarily covered with buildings and paved asphalt parking areas and the presence of municipal water and sewer at and in the vicinity of the Site.
- The presence of two silty clay layers (beneath the fill material and at a depth of approximately 26 to 30 feet bgs) which have a relatively low hydraulic conductivity and have acted as a confining later to impede the vertical migration of contamination into the more permeable sand and gravel layers at depth.
- Subsurface soils are impacted with volatile organic compounds (VOCs) exceeding the Part 375 Commercial soil cleanup objectives (SCOs) in the approximate location of historical USTs near the northwest corner of the building (Source Area).
- Semivolatile organic compounds (SVOCs) were not detected in soil at concentrations exceeding the Part 375 Commercial SCOs since 2014. These historical exceedances were located beneath the northeastern portion of building and the former employee parking area.
- Metals in soil, detected at concentrations exceeding the Part 375 Commercial SCO, were located beneath the central portion of the building (barium in 2018) and the former employee parking lot area (arsenic in 2014).
- Polychlorinated biphenyls (PCBs) were detected at concentrations less than the Part 375 Commercial SCO beneath the central/northern portion of the building.
- VOCs, including PCE, were detected at concentrations exceeding the Class GA ambient water quality standards provided in the NYSDEC's Division of Water Technical and Operational Guidance Series *Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations* (TOGS 1.1.1). in groundwater. The highest concentrations of VOCs were adjacent to or downgradient of where historical USTs containing dry cleaning solvents were reportedly "closed in place". However, there was a lack of appropriate closure documentation for these USTs.
- Breakdown "daughter" products of PCE, including TCE, 1,2-dichloroethene (1,2-DCE), and vinyl chloride, were detected in groundwater beneath the building at concentrations exceeding TOGS 1.1.1 and are considered the contaminants of concern (COC) for the Site.
- A plume of VOC groundwater contamination originates from the northwestern portion of the building and has spread laterally beneath the building. This investigation was completed at a time of year when the groundwater table is typically high. Additionally, the location of physical structures beneath the slab are not well known. While there are many floor drains and vaults visible along the north end of the building, there is the potential that additional vaults or drains may be present throughout the building that have been filled in place and could be potential preferential pathways influencing the direction of groundwater flow beneath the slab.

- Metals, including aluminum, iron, magnesium, and manganese, were detected in groundwater at concentrations exceeding the TOGS 1.1.1. These compounds are commonly identified in groundwater and are relatively non-toxic.
- Per-and polyfluoroalkyl substances (PFAS) and 1,4-dioxane were detected at select groundwater monitoring wells.
- Elevated concentrations of PCE and TCE were identified in all ambient vapor and sub-slab vapor points. As a result, the sub-slab vapor and indoor air quality in the Building has been impacted by soil vapor intrusion. According to the NYSDOH Decision Matrices (including the May 2017 updates), mitigation is the recommended action.
- Soil vapor points in the employee parking lot and asphalt area to the north of the building were not found to have contaminants associated with the NYSDOH Decision Matrices. Therefore, the parking areas are not impacted by soil vapor intrusion.

Based on the RI and the proposed Site redevelopment plans, CHA recommended the development of an interim remedial measure work plan (IRMWP) to address the soil contamination in the Source Area (refer to Section 1.4 for additional detail) as well as to mitigate the soil vapor intrusion in both the Office and Warehouse areas.

## 1.3 AREAS OF CONCERN

As a result of the RI four primary AOCs were identified, as shown on Figure 6. The four AOCs are defined as: (1) the Former UST Area (Source Area); (2)Site-wide groundwater; (3) Office vapor; and (4) Warehouse vapor. A discussion of the nature and extent of contamination in the soil, groundwater, and sub-surface vapor within these AOCs is provided in the following sections.

### 1.3.1 Former UST Area (Source Area)

The Former UST Area is in the northwestern portion of the building. Several subsurface soil samples, several groundwater samples, and soil vapor samples have been collected in this area.

Historical subsurface soil sampling identified the presence of chlorinated VOC contamination, namely PCE, 1,2-DCE, and vinyl chloride, in soil samples SB-32 and SB-33, at concentrations exceeding their respective Part 375 Commercial SCO, which is consistent with the findings of the RI. During the RI, PCE was identified at concentrations exceeding its respective Part 375 Commercial SCO in sample SOIL-116 and lesser concentrations of TCE, 1,2-DCE, and vinyl chloride in samples SOIL-116 and SOIL-119. PCE was detected in excess of the Part 375 Commercial SCO throughout this area. Metals (mercury and lead) and total PCBs exceeded the

Part 375 Unrestricted SCOs in this area but were detected at concentrations that are less than the respective Part 375 Commercial SCOs.

Historical groundwater sampling in this area identified the presence of chlorinated VOC contamination, including PCE, TCE, 1,2-DCE, and vinyl chloride, in the wells directly adjacent to the Former UST Area. During the RI, well Temp-GW001 and the well cluster at GW-103 were located within and adjacent to the Former UST Area, respectively. COC concentrations of PCE, TCE, 1,2-DCE, and vinyl chloride, among others, were detected at concentrations exceeding their applicable TOGS 1.1.1 groundwater standards and guidance values.

### 1.3.2 Site-Wide Groundwater

The groundwater samples collected as part of the RI confirmed the presence of VOCs and metals at concentrations exceeding their respective TOGS 1.1.1 groundwater standards and guidance values within the northwestern portion of the building. Chlorinated VOCs in groundwater were primarily found in the location of the former dry-cleaning room (Former UST Area/Source Area) and are consistent with the findings from historical Site investigations. The most recent analytical results for PCE indicates a decrease from the historical high of 2,420,000 micrograms per liter (µg/L) in well SB-32 to 21,400 µg/L in nearby temporary well Temp GW-001, and 7.1µg/L in GW-103S. While the concentration of PCE has decreased since the historical investigation, the concentrations of daughter products TCE, DCE, and vinyl chloride have increased, likely due to some natural attenuation. SVOCs were not detected in groundwater during the RI, apart from bis(2-Elthylhexyl)phthalate, which was detected at a concentration exceeding the TOGS 1.1.1. groundwater standards and guidance values for ambient water quality in temporary well Temp-GW001.

The groundwater samples collected as part of the RI confirmed the presence of VOCs, SVOCs and metals at concentrations exceeding their respective TOGS 1.1.1 groundwater standards and guidance values beneath the building.

The shallow monitoring well (GW-101S) was found to have groundwater contamination exceeding applicable TOGS 1.1.1 groundwater standards and guidance values, but the deeper wells (GW-101I and GW-101D) were found to have either no appreciable contamination or are at levels not exceeding applicable TOGS 1.1.1 groundwater standards and guidance values. The silty clay layer was relatively uniform across the Site and has most likely impeded contamination from reaching the intermediate and deeper portions of the aquifer.

The groundwater samples collected from the employee parking lot as part of the RI confirmed the presence of VOCs and metals. However, the concentrations exceeding the applicable TOGS 1.1.1 groundwater standards and guidance values in the employee parking lot are petroleum compounds, notably benzene, isopropyl benzene, and xylene, rather than chlorinated VOCs identified beneath the Site building. Additionally, the presence of contaminants in well GW-105D indicates that deep groundwater may be impacted from an off-site source.

### 1.3.3 Office Vapor

As shown on Figure 6, the soil vapor impacts to the Office area is another AOC. It is located on the southern portion of the Site where there was an expansion (circa 1980) of the building. This area is in the location of the former gasoline station and historically contained offices on the second and third floors while Coyne Textile was in operation. A concrete block wall with an overhead door and a wall cut-out separates the open space on the first floor from the Warehouse in the older section of the building. One man-door separates the lobby entrance from the Warehouse in the older section of the building.

Current and historical soil vapor intrusion samples indicate that the presence of VOCs is impacting the indoor air quality in the office portion of the building. Ambient indoor air quality sampling identified PCE at a concentration of 34.1 micrograms per cubic meter ($\mu g/m^3$), which exceeds the NYSDOH guidance value for indoor air. Although the concentration does not require immediate action, reasonable and practical actions to reduce exposure should be taken, and therefore, it was recommended that an active sub-slab depressurization system (SSDS) be installed in this portion of the building prior to occupancy.

### 1.3.4 Warehouse Vapor

The soil vapor impacts to the Warehouse area is the last AOC, located within the older portion of the building (Figure 6), is currently separated from the Office by a concrete block wall with an overhead door, a wall cut-out, and a man-door.

Current and historical soil vapor intrusion sampling indicates that the presence of VOCs is impacting the indoor air quality in the warehouse portion of the building as well. Ambient indoor air quality sampling identified PCE concentration of 50.9 $\mu g/m^3$, which exceed the NYSDOH guidance value for indoor air. Concentrations of TCE were identified at 1.1 µg/m³, which does not exceed the guidance value. Although the concentration of PCE does not require immediate action, reasonable and practical actions to reduce exposure should be taken, and therefore, it was recommended that an active SSDS be installed under this portion of the building as well prior to building occupancy.

## 1.4 INTERIM REMEDIAL MEASURES

### 1.4.1 Source Removal IRM

A Source Removal IRMWP (CHA, May 2019) was approved by the NYSDEC in June 2019 that addressed contaminant source removal via excavation within the Former UST/Source Area. In late June 2019, three USTs within the Former UST/Source Area were removed and transported off-site at a disposal facility, along with approximately 253.9 tons of contaminated material. Excavation of contaminated soil within the area was limited to maintain structural integrity of the building. Prior to backfilling, confirmation samples were collected along the sidewalls and bottom of the excavation, and indicate residual contamination exceeding Commercial SCOs remains. A complete summary of the work completed can be found within the Construction Completion Report (CCR) submitted and approved by the NYSDEC in October 2019. The remaining contamination in the Source Area is addressed as part of this RDWP.

### 1.4.2 Office Vapor IRM

In April 2019 diagnostic pressure field testing was conducted within the office area AOC to determine the most effective system components, pressure gradient, installation methods, and vapor extraction locations for the vapor mitigation design. The Office Vapor IRMWP (CHA, June 2019), was approved by the NYSDEC in June 2019 and provides a design for an active SSDS for that portion of the building. The design includes three active systems, each having its' own extraction fan and dedicated exhaust stack. The SSDS is designed to be operated in its entirety or in any combinations of sub-systems, thus enabling certain sub-systems to be shut down over time as conditions allow and with NYSDEC/NYSDOH approval.

The IRMWP also outlines post-installation testing, sampling, and monitoring as well as the requirements to be included in the CCR to be prepared after the installation of the SSDS and the post-installation system testing. At this time, the SSDS has not yet been installed at the Site. Since the submission of the Office Vapor IRMWP, the owner has decided that the they will be raising the elevation of the floor in the Office area by adding fill, and therefore, a redesigned SSDS for the Office area is discussed as part of this RDWP.

# 2.0 SUMMARY OF SELECTED REMEDY

## 2.1 REMEDIAL ACTION OBJECTIVES

The remedial action objectives (RAOs) for the Site are media-specific objectives that are established for the protection of human health and the environment. RAOs are typically narrative statements that identify the contaminants and environmental media of concern, the potential exposure pathways to be addressed by remedial actions relative to the exposed populations and environmental receptors to be protected, as well as the acceptable contaminant concentrations/remediation goals for each environmental medium. The RAOs for this Site are described in the following sections.

### 2.1.1 Surface & Subsurface Soil

***RAOs for Public Health Protection***

- Prevent ingestion/direct contact with contaminated soil.
- Prevent inhalation of or exposure from contaminants volatilizing from contaminants in soil.

***RAOs for Environmental Protection***

- Prevent migration of contaminants that would result in groundwater or surface water contamination.

### 2.1.2 Groundwater

***RAOs for Public Health Protection***

- Prevent ingestion of groundwater with contaminant levels exceeding drinking water standards.
- Prevent contact with, or inhalation of volatiles, from contaminated groundwater.

***RAOs for Environmental Protection***

- Remove the source of ground or surface water contamination.
- Restore groundwater aquifer to pre-disposal/pre-release conditions, to the extent practicable.

### 2.1.3 Soil Vapor

***RAOs for Public Health Protection***

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

## 2.2 REMEDIAL GOALS

Remedial goals (or targets) are often considered the maximum acceptable contaminant concentrations in each environmental medium that the remedial actions must meet. Remedial goals are usually based on the 6 NYCRR Part 375 applicable standards, criteria and guidance (SCGs) unless SCGs are not available for a particular chemical or media, or the SCGs are not considered sufficiently protective of human health and the environment. For this project, the appropriate SCGs for soil remediation are the Part 375 Commercial SCOs, which is consistent with the zoning of the property, the proposed reuse of the Site as a manufacturing facility, and the anticipated future institutional controls that will be placed on the Site. Similarly, the SCGs for groundwater are the NYSDEC's TOGS 1.1.1 ambient water quality standards and guidance values for Class GA groundwaters.

The goal of the remediation is to reduce or eliminate human exposure to the extent practical in a timely manner. In addition, the remediation should remove the source material and significantly reduce contaminant migration to groundwater, soil vapor migration into the subsoil, and migration of contaminated groundwater to downgradient surface water bodies.

Remedial goals focus on chlorinated VOCs, namely PCE and its breakdown compounds TCE, 1,2-DCE, and vinyl chloride, in sub-slab vapor, subsurface soil, and groundwater. The maximum remediation target depth is estimated at 26 feet below the surface where the first confining layer was observed during the RI. Given that contamination in exceedance of Unrestricted SCOs may still exist in the top 15 feet of the subsurface soils immediately following the implementation of the remedy, the overall goal of the remedial action is to achieve a Track 4 cleanup in accordance with 6 NYCRR Part 375.

## 2.3 DESCRIPTION OF SITE REMEDY

Though not initially anticipated, the discovery of a petroleum AST within the former boiler room and potential associated contamination will be addressed as part of the remedial activities. Treatment Zone 1 will include the removal of an approximately 10,000-gallon fuel oil tank and associated contamination. To address the AOCs identified in Section 1.3, two different remedial activities will take place; Treatment Zone 2 will consist of soil mixing with ZVI injection to address the additional contamination within the Former UST/Source Area AOC, and groundwater recirculation with permanganate injection within Treatment Zone 3 will address the groundwater AOC. The treatment zones are further described in the following sections. As mentioned in later sections, the warehouse and office vapor AOCs will also be discussed as part of this report, however the design for mitigation systems will be provided upon a more defined building layout for the redevelopment of the building and Site.

### 2.3.1 Petroleum Tank & Contaminated Soil Removal – Treatment Zone 1

As further discussed in Section 3.1.1, petroleum contamination was identified during the pre-design subsurface investigation activities related to delineation of the chlorinated compounds at the Site. After a detailed site walk, a fill port was identified in the boiler room and is anticipated to be associated with a former fuel tank. While this discovery was made following submission of the AAR, the previously closed in-place tank along with any grossly contaminated soils around the tank will be excavated and removed for off-site disposal as part of the remedial action, as detailed in Section 4.2.

### 2.3.2 Source Area Treatment with Soil Mixing – Treatment Zone 2

As shown on Figure 7, the Source Area consists of an area approximately 4,925 square feet in size. Within this area, soil contamination was observed above Part 375 Commercial SCOs and groundwater was observed above TOGS 1.1.1 ambient water quality standards (AWQS) and guidance values for Class GA waters. The Source Area extends beyond the previous IRM excavation both vertically and horizontally, but further removal was not feasible at the time without undermining the existing building foundation.

Soil mixing will be utilized and involves the mechanical agitation of subsurface soils while blending in the treatment reagents. The mechanical agitation breaks apart the natural soil structure, homogenizes the soils, and helps to distribute the chemical additive, establishing more uniform contact between chemical additive and the contaminants. Given the heterogenous soils on Site, including silts and clays, soil mixing is considered a particularly useful strategy for successful treatment and provides a high certainty of effective treatment. Success of this remedy is dependent on contact with the contaminant mass and does not require advection or diffusion to distribute the oxidant to the contaminant. In an area such as the Source Area, this is a critical component to effectively treating the high levels of soil and groundwater contaminants and reduce further migration of contamination.

Soil within the Source Area will be remediated via soil mixing while injecting a slurry of zero valent iron (ZVI). While the AAR considered injection of sodium permanganate in this area to treat the contaminants via in-situ chemical oxidation (ISCO), , results of the bench scale treatability study (see Section 3.1.2) indicated that excessive chemical additives would be necessary to treat this area. Therefore, a second bench scale study was completed using ZVI to treat the contaminants via in-situ chemical reduction (ISCR) and it was determined that ISCR was a more practical approach to address this area. The soil mixing area has been divided into three sub-areas with different initial excavation depths and mixing intervals as further described in Section 4.3.

### 2.3.3 Groundwater Treatment & Recirculation – Treatment Zone 3

As indicated on Figure 7, an approximately 20,300-square foot plume area (outside of the Source Area footprint) along the east side of the main property is proposed to be treated using ISCO chemistry. Specifically, this area of the Site will be treated via groundwater recirculation with the addition of sodium permanganate. Using this strategy, contaminated groundwater will be removed through extraction wells, mixed with the sodium permanganate, and reinjected into the subsurface through a series of injection wells. However, prior to mixing the water with sodium permanganate, the water will pass through liquid-phase granular activated carbon (LGAC) to remove benzene and other contaminants that may not be treated via permanganate. The LGAC units must be placed in front of the permanganate introduction to avoid the adverse impacts the permanganate would have on the carbon beds.

### 2.3.4 Soil Vapor Mitigation

Elevated soil vapor concentrations were detected beneath the existing building sub-slab during previous investigation activities. As previously indicated, the vapor concentrations beneath the building warrant mitigation. Perforated vapor collection pipes and/or suction points will be distributed throughout the footprint of the new building and vertical exhaust stacks will be routed above the roof where extraction fans will be installed to draw vacuum beneath the slab. Additionally, a vapor barrier will be installed beneath the new concrete slab systems. Additional details regarding the vapor mitigation systems are described in Section 4.5 of this report.

### 2.3.5 Soil Cover Systems

Only the main property with the existing building will be modified at this time. Specifically, the approximately northern two-thirds of the existing building (e.g. the warehouse) is scheduled for demolition but the impervious concrete floor will be restored or replaced as part of the construction. Portions of the existing asphalt lot north of the building will remain in place but some areas will be removed and replaced. All portions of the Site that are *disturbed* will meet the following minimum cover system requirements:

1. Impervious Areas: All impervious surfaces will include concrete or asphalt pavement installed at a minimum of four inches in thickness. The impervious surfaces will act as a surface cover to significantly reduce infiltration and limit exposure to future Site occupants.
2. Green Space Areas: All green space areas will include a minimum of a one-foot thick layer of imported, clean material (e.g. topsoil) placed above a demarcation barrier that will provide a physical barrier to any potential remaining contamination in existing Site soils. The demarcation barrier will consist of a 6-ounch non-woven geotextile or similar.

No remedial action is planned for some portions of the Site, and therefore, the following existing cover systems will remain in place and will be maintained as part of the remedial work:

1. Coyne Park parcel: The existing soil and vegetation will be maintained in this area.
2. Employee Parking Lot: The existing asphalt pavement will be maintained in this area.
3. Office Building: The south end of the existing building is scheduled for renovation. Any penetrations made through the existing concrete slab in this area will be patched as part of the redevelopment construction.

If these areas are to be disturbed during Site redevelopment, prior to the approval of a Site Management Plan (SMP), the following procedures, at a minimum will be followed:

- Excavation of Site soil will be managed with 40-hour trained HAZWOPER personnel
- Site soil will be characterized and hauled off-Site to a permitted facility
- Cover systems will be installed as discussed above

# 3.0 PRE-DESIGN INVESTIGATIONS

The Pre-Design Investigation activities were performed in accordance with the *Pre-Design Work Plan* (PDWP) prepared by CHA and dated February 2020. The results from these investigative activities were utilized to provide additional information necessary for completing the remedial design.

### 3.1.1 MIPHT Investigation

To more accurately define the horizontal and vertical extents of contamination within the groundwater plume, CHA conducted additional investigation using Membrane Interface Hydraulic Profiling Tool (MIHPT) technology. CHA retained Cascade Environmental (Cascade) to implement MIHPT using a membrane interface probe (MIP) inserted using direct-push technology (DPT) in the form of a Geoprobe®. The locations shown on Figure 8 were chosen for purposes of further delineating the plume area.

The MIP system operates by heating the soil and groundwater adjacent to the probe to 120-degrees Celsius (°C) to volatilize VOCs in the immediate vicinity of the MIP membrane. The volatilized VOCs diffuse across the membrane into a closed, inert gas loop that carries the vapors to a series of detectors housed at the surface. Each detector produces a continuous profile, plotted with respect to depth, to indicate the presence of various VOC compounds. The MIP continuously measures halogens with a halogen specific detector (XSD), VOCs with a PID and/or flame ionization detector (FID), and electrical conductivity. Additionally, the system is designed to evaluate the hydraulic behavior of unconsolidated materials by injecting clean water into the subsurface and recording changes in the associated pressure to calculate hydraulic conductivity. The MIHPT system provided real-time information that allowed CHA and Cascade the ability to make field-based decisions and more accurately delineate the plume. As data was obtained from each of the points in the transect, CHA worked with Cascade to determine representative “step-out” locations to complete the delineation. Upon completion of the investigation, the data was converted into a three-dimensional (3D) model and vertical profiles which are provided in Appendix A.

During the investigation, evidence of petroleum-based contamination, indicated by significantly high PID and FID readings near the top of the water table, was identified at several locations including MIP-2, MIP-3, MIP-11, and MIP-17. A record review for the Site identified the presence of an approximately 10,000-gallon tank used to store No. 6 fuel oil located in a subterranean vault with physical access for inspections that was utilized for the storage of No. 6 fuel oil. Upon further inspection, a fill port was observed within the former boiler room but no vault or manway for access could be located. Previous investigations primarily identified chlorinated solvents as the Site-wide contaminant of concern, so the presence of petroleum contamination identified during the MIHPT investigation altered the overall design to include the removal of the fuel oil tank and excavation of petroleum contaminated soils to the depth of groundwater, as further discussed in Section 4.2.

Vertical profile information from the XSD, which identifies chlorinated solvents, was used to verify the depth of contamination within and adjacent to the Source Area. This information assisted with the design of soil mixing treatment zones by expanding the soil mixing area and identifying appropriate target depths for treatment.

Additionally, the groundwater plume treatment area was better constrained through the information gathered during the MIHPT investigation. Impacts from chlorinated solvents were not identified at MIP-9 and MIP-15. This information was compared to the results of previous investigations and it was determined the impacted groundwater plume is smaller than previously estimated, thus reducing the size of the required treatment area.

### 3.1.2 Bench-Scale Treatability Study

After completion of the MIHPT investigation, CHA collected soil and groundwater samples from the Site for use in a bench-scale treatability study conducted by XDD Environmental, LLC (XDD). The purpose of the bench test was to evaluate the following:

- Permanganate stability and total oxidant demand (TOD) in the Source Area; and,
- Permanganate stability and groundwater kinetics in the plume area.

#### 3.1.2.1 Permanganate Stability and TOD

The stability test evaluated the persistence of permanganate in the presence of Site soil and groundwater in a series of duplicate test reactors. The stability test was performed using sodium permanganate at two initial target concentrations and potassium permanganate at one initial target concentration. Approximately 1.5 pore volumes of reagent were applied to the soil. The residual permanganate in each reactor was evaluated at 1, 7, and 14 days. Throughout the test, the soil was periodically mixed in a manner to simulate soil mixing in field application. XDD used the data generated during the permanganate stability test to evaluate oxidant demand. TOD includes the demand from the contaminants, reduced metals, and any additional non-target demand on the oxidant that may be present in the soils. Therefore, the TOD of the oxidant in the presence of a representative contaminated soil sample was used to determine oxidant loading for the remedial design.

Soil collected from the Source Area was found to have a substantially higher TOD than anticipated, with an estimated value of 250 grams per kilogram (g/kg). TOD for a second soil sample with similar soil classification but from an area known to be less contaminated was analyzed for comparison. This sample was found to have an estimated TOD of 150 g/kg. Therefore, a significant portion of the TOD is from natural oxidant demand. Typically, a TOD less than 20 g/kg is appropriate for permanganate to be effective. The unusually high TOD for Site soils and the excessive quantity of permanganate needed to satisfy the TOD resulted in a determination that the use of permanganate in the Source Area would cost over $5,000,000 in chemicals alone, and therefore, was considered impractical.

Based on this information, CHA requested XDD evaluate the use of ZVI in lieu of the permanganate as the additive for the soil mixing treatment of the Source Area. ZVI is considered a chemical reducing agent which can initiate an abiotic oxidation-reduction reaction, which often bypasses the reduction to more harmful daughter products (e.g. vinyl chloride). When PCE, or other ions/molecules like oxygen (i.e., the "oxidizing agent"), meet ZVI, the ZVI loses electrons and PCE gains electrons. This electron transfer causes the breakdown of PCE. As the ZVI is exposed to target contaminants, as well as other non-target constituents in the groundwater, the ZVI surface will eventually become oxidized (typically forming surficial ferric oxide or ferric oxyhydroxide). This can be seen visually as corrosion or rust formation on the surface of the ZVI. As the iron oxide film forms on the surface of the ZVI particle, it will start to impact the performance of the ZVI. This oxidation-reduction process will lead to the eventual passivation of the ZVI surface, at which point the capacity of the ZVI will be exhausted.

As discussed in the AAR, ZVI was eliminated as an option for groundwater plume remediation due to the required direct contact between the ZVI surface and contaminant mass and longer timeframe needed for treatment due to inefficiencies during injection. However, direct contact is more easily achieved in soil mixing compared to injection. Due to direct contact between the fine-grained ZVI and contaminated soil, it is estimated the reduction reactions will begin to occur quickly (a matter of days or weeks) and ZVI will remain in the subsurface for up to seven years.

#### 3.1.2.2 ZVI Bench Test

The objective of the bench scale testing was to determine the required ZVI material loading for direct source treatment via soil mixing and to account for contaminant mass and non-target constituents that could passivate the ZVI and reduce long-term efficacy. XDD evaluated two loadings of Ferox Flow, 2 percent and 4 percent by weight of soil, and one loading of Ferox Target, 2 percent by weight of soil. Both Ferox Flow and Ferox Target ZVI materials are trade names of Hepure Technologies, Inc., a ZVI vendor headquartered in Hillsborough, New Jersey. The difference between these two types of ZVI is the particle size/available surface area of the iron particles. Ferox Flow has an average particle size of 125 microns (µm) while Ferox Target has an average particle size of 44 µm. In general, the smaller the particle size the more available surface area on the iron is available to expedite the reduction reactions; however, with a smaller particle size, the ZVI is also consumed in a shorter timeframe. Typically, the kinetics of ZVI is a slower process than ISCO as the reactions require time for the contaminants to reach the surface of the ZVI.

Soil from the Source Area was provided to XDD for the bench scale testing. Baseline analysis of VOCs showed lower than typical concentrations found in the Source Area, so the soil was spiked to approximate concentrations of historical samples. XDD spiked the soil sample with approximately 2,500 milligrams per kilogram (mg/kg) PCE and approximately 300 mg/kg 1,2-DCE.

The bench testing was conducted in a series of batch reactors at approximately 20 °C. Each batch reactor consisted of Source Area soil saturated with one pore volume of groundwater to be representative of the lower, saturated soil layer. This simulated a conservative, worst-case scenario for the Source Area soil mixing since some of the contaminants in groundwater are expected to partition onto soil. Two loadings of Ferox Flow (2 percent and 4 percent by weight of soil) and one loading of Ferox Target (2 percent by weight of soil) was applied to the treated test conditions. Control reactors consisted of saturated soil without ZVI and were carried through the same procedures as the test reactors. The reactors were periodically mixed over the four-week test period. After four weeks, all reactors were sacrificed for the laboratory analysis of VOCs by United States Environmental Protection Agency (USEPA) Method 8260.

The results of the ZVI treatability study are shown on Table 1 included in Appendix B. In summary, the greatest reduction in PCE concentrations was observed at a 4 percent loading of Ferox Flow ZVI. The PCE concentration was reduced by over 52 percent in approximately 37 days of operation. CHA notes that while the cis-1,2-DCE concentration only decreased by 2.8 percent during this time, it is expected that some of the PCE degraded to cis-1,2-DCE during the course of the evaluation and that results are only indicative of a net decrease. CHA also considered utilizing a higher dose of the Ferox Target ZVI; however, CHA selected Ferox Flow for this project to reduce the potential for passivation of the ZVI to occur too soon following the soil mixing.

#### 3.1.2.3 Groundwater Kinetics for Permanganate

In-situ chemical oxidation using recirculation was proposed as part of the AAR for treating the groundwater plume. In a recirculation system, groundwater is extracted and mixed with a chemical oxidant in an aboveground treatment tank. The extracted groundwater and the oxidant are allowed sufficient contact time to treat the VOCs before re-injection into the subsurface. The minimum residence time will vary depending on the oxidant concentration, and the concentration of VOCs in groundwater.

To determine the residence time and the quantity of oxidant required CHA provided XDD with 2.5 liters of groundwater collected from the Site. XDD then submitted a baseline sample of Site groundwater for VOC analysis by Absolute Resource Associates, LLC (ARA) using USEPA Method 8260. Baseline analytical results indicated the concentration of VOCs was lower than typically identified on the Site. Therefore, XDD spiked the groundwater with cis-1,2-DCE to a concentration of approximately 154 µg/L and benzene to a concentration of approximately 70 µg/L, which are the average results observed from historical samples collected on Site. XDD tested the kinetics of Site groundwater with three concentrations of sodium permanganate: 5 grams per liter (g/L), 10 g/L, and 20 g/L.

XDD evaluated the rate of degradation of VOCs in groundwater for each oxidant concentration tested. The residual concentrations of permanganate and VOCs were evaluated at 0, 10, 30 and 60 minutes of contact time for each oxidant concentration. At each time point, the permanganate oxidation reaction was stopped by adding ascorbic acid to duplicate sacrificial reactors. The neutralized reactors were submitted for laboratory analysis of VOCs by USEPA Method 8260. Residual permanganate concentrations for each test condition were also measured at each time point using iodometric titration.

Results of the groundwater kinetics study are provided in Table 3.1. The results indicate the lowest concentration of sodium permanganate (5 g/L) was capable of reducing the concentration of cis-1,2-DCE to below the analytical method detection limit of 2 µg/L in the shortest amount of contact time (10 minutes). Note that the analytical method detection limit for1,2-DCE is lower than the TOGS 1.1.1 ambient groundwater quality limit of 5 µg/L. Therefore, the aboveground treatment system can be designed to sufficiently treat the contaminated groundwater while continuously recirculating given the short contact time. Additionally, the results indicate benzene is unaffected by sodium permanganate treatment even at the highest concentration and longest contact time. This confirms the requirement to add a granular activated carbon step in the overall treatment system prior to re-injection in order to meet TOGS 1.1.1. standards.

**Table 3.1 Groundwater Kinetics Results**

| Test Condition | Time Point | Concentration of Spiked COC (µg/L) | |
|---|---|---|---|
| | | cis-1,2-DCE | Benzene |
| Control | 0 | 180 | 35 |
| | 10 | 170 | 30 |
| | 30 | 180 | 28 |
| | 60 | 175 | 33 |
| Sodium Permanganate 5 g/L | 10 | <2.0 | 34 |
| | 30 | <2.0 | 32 |
| | 60 | <2.0 | 34 |
| Sodium Permanganate 10 g/L | 10 | <2.0 | 34 |
| | 30 | <2.0 | 33 |
| | 60 | <2.0 | 34 |
| Sodium Permanganate 20 g/L | 10 | <2.0 | 34 |
| | 30 | <2.0 | 29 |
| | 60 | <2.0 | 32 |

### 3.1.3 Groundwater Recirculation Pilot Test

After completion of the MIHPT investigation, two pilot test wells (wells PT-MW-01 and PW-MW-02) were installed at representative areas within the target groundwater treatment zone. Additionally, a piezometer (PT-PZ-01) was installed approximately 6.2 feet southeast of well PT-MW-02 in order to monitor drawdown or mounding in the subsurface. The previously installed well GW-102 used for the same purpose adjacent to well PT-MW-01 and was located approximately 13.7 feet southwest of the test well.

The objectives of the pilot test were to evaluate Site-specific hydraulics to develop full-scale design parameters including:

- Injection and extraction radius of influence (ROI) to determine the number and spacing of injection and extraction wells.
- Achievable injection and extraction rates (without significant mounding or drawdown) to determine estimated duration, cost of the permanganate application, and identify potential failure points (i.e., oxidant surfacing or short-circuiting).
- Potential impact of subsurface heterogeneities that may impact chemical distribution.

The pilot test was specifically completed to determine the maximum injection flow rate that can be sustained at the Site without oxidant solution surfacing and to determine if a comparable extraction rate can be sustained without excessive groundwater drawdown. Results of the pilot test were used to establish the optimal injection and extraction rates for the full-scale ISCO design, as further discussed in Section 4.4.

During the injection phase of the pilot test, approximately 2,000 gallons of potable water was injected into the two test wells simultaneously from a polyethylene storage tank. The rate of injection started at approximately 2.5 gallons per minute (gpm) and was gradually increased to approximately 4.5 gpm. No significant mounding of the groundwater table and short-circuiting of the subsurface soils was observed. Generally, during the course of the test, the groundwater elevation in the nearby monitoring wells GW-102 and PT-PZ-100 increased by 2.01 feet and 1.61 feet, respectively. The injection phase was completed over an approximately five-hour period.

Following injection, the extraction phase of the pilot test was conducted. Approximately 2,000 gallons of groundwater was extracted from the two test wells simultaneously and pumped into a polyethylene storage tank. The rate of extraction started at approximately 2.5 gpm and was increased to a maximum flow of approximately 4.6 gpm. Groundwater elevation in the nearby monitoring wells GW-102 and PT-PZ-100 decreased by 2.27 feet and 2.43 feet, respectively. The extraction phase was complete over an approximately six-hour period.

Overall, no significant mounding or draw-down and short-circuiting were encountered during the pilot study. The results indicate that both the injection and extraction rates of 4 gpm or more was sustainable and could be used for the design of the full-scale system. CHA does not expect more significant groundwater mounding or drawdown due to the fact that injection and extraction will be performed simultaneously during full scale operations.

The groundwater collected in the polyethylene tank during the extraction phase was sampled for waste disposal parameters guided by the Onondaga County Department of Water Environment

Protection (OCDWEP) requirements. Paragon Environmental Construction, Inc. (PEC) was retained to remove the groundwater from the tank using a vacuum truck and dispose of the groundwater at an OCDWEP permitted facility. A fully executed manifest for the groundwater disposal from the pilot study is provided in Appendix C.

#### 3.1.4 Sub-Slab Communication Test

Sub-slab communication testing for the installation of a sub-slab depressurization system using suction points was conducted by Alpine Environmental for the office and warehouse sections of the building on April 8$^{th}$ and 9$^{th}$, 2019 and February 11$^{th}$ and 12$^{th}$, 2020, respectively. However, due to changes in the Site redevelopment and the plan to import clean fill to raise the Site grades, the results of the communication testing are no longer valid and will not be utilized for design purposes.

# 4.0 REMEDIAL DESIGN

The following subsections outline the major elements of the remedial design. The design drawings associated with the design are included in Appendix D and the technical specifications have been included in Appendix E.

## 4.1 SITE PREPARATION

### 4.1.1 Site Controls

Site controls including site access, site security and work zones will be established during the Site preparation activities as detailed below.

#### 4.1.1.1 Site Access

Site access is currently restricted by a combination of secured doorways on the existing building and perimeter fencing with locked gates. As portions of the existing building are demolished, additional perimeter fencing will be installed, and access will be limited through secured gates to the areas of active remedial construction. If access to the remedial areas encroaches into the adjacent right of ways for access to the remedial areas, the construction manager will be responsible for securing the appropriate permits from the City of Syracuse.

#### 4.1.1.2 Site Security

The need for additional site security beyond site fencing (e.g. security cameras, overnight guards) will be provided at the discretion of the construction manager.

#### 4.1.1.3 Work Zone Establishment

<u>Exclusion Zone</u>

An exclusion zone will be established around the areas of intrusive construction activities (excavation activities, drilling of wells, soil mixing, etc.) but the limits of the exclusion zone will be adjusted throughout the remedial construction to limit the size of the exclusion zone and allow other non-remedial construction activities to occur on the Site outside the exclusion zone. Orange construction fencing or other similar moveable barricades, along with appropriate signage (e.g. “Restricted Area – Authorized Personnel Only”), will be installed around the perimeter of exclusion zone to keep unauthorized personnel away from intrusive and/or excavation activities. If possible, soil will be pre-characterized by the remedial contractor and direct loaded into dump trucks for off-site disposal at a permitted facility. However, smaller quantities of soil requiring off-site disposal (e.g. drill cuttings) will be placed into roll-off containers, or similar, and covered while awaiting waste characterization and disposal. If necessary, temporary soil containment pads will be constructed within the exclusion zone to stage materials awaiting characterization and/or off-site disposal. Soil containment pads are further described in the Technical Specifications included in Appendix E.

Contamination Reduction Zone

A Contamination Reduction Zone will be established in a location immediately adjacent to the work area to facilitate the decontamination of the personnel and equipment that encounter contaminated soils. Personnel working inside the exclusion zone will decontaminate or dispose of soiled clothing in the contamination reduction zone each time the exclusion zone is exited.

Appropriate equipment, supplies, and personal protective equipment (PPE) will be made available in the contamination reduction zone to facilitate the protection and decontamination of personnel working in the exclusion zone. Decontamination of equipment and personnel will be handled in accordance with CHA Standard Operating Procedures (SOPs) Nos. 501, 503, 505, and 507 included in Appendix F. Other SOPs have been included for items such as documentation requirements, collection of samples, etc. CHA SOPs are to be followed by CHA personnel and are considered guidance for Contractors.

Prior to commencing intrusive activities, the heavy equipment will be visually inspected for cleanliness. At the discretion of CHA’s site representative, additional decontamination of the equipment will be performed in accordance with the protocols established in the SOPs included in Appendix F prior to start of the intrusive actives. Additionally, equipment will be decontaminated at the conclusion of intrusive activities and prior to demobilizing equipment from the project Site. Appropriate precautions will be taken throughout the intrusive processes to limit contact with contaminated soil. Only parts of equipment that have contacted the soil will require decontamination. Examples of such precautions for the soil excavation activities include:

- Efforts will be made to advance the excavation face towards the excavator such that the tracks on the machine do not track impacted soils across the Site.
- Where possible, all roll-off containers or trucks will be loaded adjacent to the excavation. Care will be taken such that impacted soil is not spilled on the sides of the containers/trucks as they are loaded and that the trucks do not drive through contaminated soils. If wet soils are encountered, dry soils will be placed near the swing gate of the container (rear tailgate of the truck) and wetter soils will be placed near the front of the container/truck. If the soils are saturated, either polyethylene sheeting or tub liners will need to be installed in the

container or truck dump boxes or the soils will be stabilized on containment pads prior to loading to avoid spillage or liquids dripping out of the truck/container during the hauling process.

- Efforts will be made to minimize the amount of equipment and machinery that contacts the impacted soils. This includes placing polyethylene sheeting between the excavation and the container/truck during loading to limit incidental spillage onto a clean surface.

Non-disposable personal protective clothing will be decontaminated by first washing the soiled items with a non-phosphate detergent and potable water mixture, followed by potable water and distilled water rinse. Disposable/expendable clothing will be placed into plastic trash bags for off-site disposal at a solid waste facility. Equipment that contacts contaminated soil will be decontaminated with a high-pressure steam cleaner.

The Contamination Reduction Zone setup will involve the construction of up to two temporary decontamination pads. The primary decontamination pad will be used for decontaminating large equipment. The pad will be constructed with a minimum of two-layers of 10-mil polyethylene sheeting with raised berms and overspray guards around the perimeter to maintain wash fluids on the pad. A portable spill containment pad with drive through berms and side panels or similar equipment may be used in lieu of the building a temporary equipment decontamination pad. All wash water from the decontamination pads will be collected in a low spot and managed in accordance with the Technical Specifications included in Appendix E. A second, smaller decontamination pad will be constructed, if necessary, for the decontamination of personnel and small hand tools.

#### 4.1.1.4 Erosion & Sediment Controls

Work surfaces for the proposed remedial construction activities consists of existing concrete slabs on grade. The area of disturbance will be maintained to less than one acre during the remedy. Therefore, a full Stormwater Pollution Prevention Plan (SWPPP) will not be prepared for the Site and only semi-permanent erosion control measures and best management practices will be utilized. These include:

- The installation of SiltSoxx™ around the perimeter of open excavations associated with the removal of an existing fuel oil storage tank and the soil mixing areas.
- Placement of filter fabric or other inlet protection around any catch basins within the work zone (e.g. potential catch basins along South Clinton Street).
- Soil cuttings associated with the installation of the injection and extraction wells will be contained on the concrete slab and transferred to a roll-off container, drums, or soil

containment pad. Given that the wells will be installed with surface seals and the cuttings will be placed within containment while awaiting disposal, no special erosion and sediment controls will be required for the well installation.

Erosion and sediment controls associated with the overall redevelopment construction as well as permanent erosion and sediment controls will be addressed under a separate set of contract documents.

#### 4.1.1.5 Truck Routing

Truck traffic leaving the Site will typically be along Cortland Avenue on the east side of the Site to South Salina Street. From there, trucks are expected to travel north on South Salina Street approximately 0.5-miles to Adams Street. Truck traffic is then expected to follow the following routes:

- **Westbound traffic:**
  - Turn left on West Adams Street and travel approximately 0.2 miles to the traffic light.
  - Continue straight onto Seymour Street for approximately 0.2 miles.
  - Turn right on South West Street and continue approximately 0.9 miles northward to Interstate 690 West.
- **Eastbound/Northbound/Southbound traffic:**
  - Turn right onto East Adams Street and travel approximately 0.5 miles eastward.
  - Southbound traffic will turn right onto the on Interstate 81 South ramp.
  - Northbound and eastbound traffic will turn left onto the I-690 Westbound ramp and then follow the signs for Interstate 81 North and Interstate 690 East, respectively.

Incoming truck traffic is expected to follow the same general routes in reverse.

### 4.1.2 Remedial Action Project Plans

The following project plans are incorporated within the RDWP as appendices:

- Health and Safety Plan (HASP)
- Community and Environmental Response Plan (CERP) and Community Air Monitoring Plan (CAMP)
- Field Sampling Plan (FSP)
- Quality Assurance Project Plan (QAPP)
- Monitoring Well Decommissioning Specification

#### 4.1.2.1 Health and Safety Plan

A site-specific HASP was prepared to provide specific guidelines and establish procedures for the protection of on-site personnel during remedial construction activities. The HASP is included in Appendix G. Contractors and subcontractors on-site during the remedial activities will develop, implement, and maintain their own site-specific HASP in accordance with the specifications included in Appendix E. While the HASP in Appendix G provides the minimum guidelines for worker safety for the project, each contractor must develop a detailed plan that addresses the specific job hazards their personnel will encounter during implementation of the remedy.

#### 4.1.2.2 Community and Environmental Response Plan and Community Air Monitoring Plan

A combination CERP and CAMP was prepared to address the potential for short-term impacts to the surrounding community or environmental resources. In summary, air monitoring will be performed during the intrusive remedial activities in accordance with the NYSDOH *Generic Community Air Monitoring Plan*. The CERP/CAMP plan includes measures for monitoring both fugitive dust and organic vapors. In addition, the CERP/CAMP identifies action levels during construction and appropriate mitigation methods to address any exceedances of the action levels. A copy of the CAMP is included in Appendix H.

#### 4.1.2.3 Field Sampling Plan

Field sampling will be conducted during the remedial activities in accordance with the field sampling procedures including progress monitoring and end point sampling included in the QAPP. A copy of the FSP is included in Appendix I.

#### 4.1.2.4 Quality Assurance Project Plan

A QAPP has been prepared to present the policies, organization, objectives, functional activities and specific Quality Assurance (QA) and Quality Control (QC) activities designed to achieve the specific data quality goals associated with the Site. The QAPP identifies the procedures for sample preparation and handling, sample chain-of-custody, laboratory analyses, and reporting requirements to confirm the accuracy and integrity of the data generated during the investigation. The QAPP is provided in Appendix J.

#### 4.1.2.5 Monitoring Well Decommissioning Plan

Eight existing monitoring wells require decommissioning as part of the remedial action and proposed Site redevelopment. Two of the existing monitoring wells are located within Treatment Zone 2 and the bottom depths of the monitoring wells are at a higher elevation than the targeted soil mixing zone as subsequently discussed in this RDWP. Therefore, these shallow wells will be completely removed/destroyed as part of the soil mixing process, but the remaining six existing monitoring wells will be decommissioned in accordance with the latest version of the NYSDEC's Policy "CP-43: Groundwater Monitoring Well Decommissioning Policy." Currently, it is anticipated that each monitoring well will be decommissioned by grouting in-place. A well decommissioning specification is included in Appendix E. Additionally, all extraction (32) and injection (29) locations will be decommissioned upon completion of the remedial action prior to Site redevelopment in accordance with the same procedures.

### 4.1.3 Utility Services

<u>Electrical Service</u>

A temporary electrical service will be made available for the remedial contractor's use during the remedial construction. The electrical service will be used for providing power to miscellaneous transfer pumps and the contractor's power tools. However, the pumps included in the ISCO recirculation system will consist of air-driven double diaphragm pumps. The remedial contractor will be responsible for mobilizing an air compressor to operate these pumps.

<u>Water Service</u>

The Site is currently serviced with water service from the City of Syracuse. Any potable water required for the remedial construction (e.g. mixing of grout for the injection/extraction wells, decontamination, etc.) will be provided from a water service within the office building. Alternatively, the remedial contractor may secure a hydrant permit from the City of Syracuse to obtain potable water from a hydrant adjacent to the Site. The use of a City hydrant, if required, will require a backflow prevention device to be connected directly to the hydrant and any hoses to be connected to the backflow prevention device.

<u>Sanitary Sewer Service</u>

No dedicated sanitary service is anticipated to be necessary for this phase of the project. If existing restrooms in the office building are not available during the remedial construction, temporary, portable toilets will be setup at the Site.

## 4.2 TREATMENT ZONE 1 - EXCAVATION AND REMOVAL OF FUEL OIL TANK

### 4.2.1 Soil Excavation

Upon completion of Site preparation activities, soil removal will commence in Treatment Zone 1 as shown on Figure 7 to prepare for the removal of the estimated 10,000-gallon tank. As part of the preparation for Treatment Zone1, the existing concrete slab within an approximately 5,750-square foot (SF) area will be sawcut and removed exposing the Site soils beneath. The removed concrete will be disposed of off-site at a properly permitted facility as construction and demolition (C&D) debris. Following the removal of the concrete, the Site soils will be excavated to expose the top and sides of the AST and/or the vault. The tank and a portion of the vault will them be removed in accordance with Section 4.2.2.

Following removal of the tank, petroleum-contaminated soils are expected to be encountered based upon previous investigation results. Therefore, additional soil will be excavated beneath the tank to approximate depth of nine feet below the ground surface where the groundwater table has previously been encountered. However, the remedial contractor will be directed to attempt to remove the "smear zone" at the interface of the vadose and saturated zones if significant contamination is observed. The exact limits of the excavation will be based upon field screening of the soils for visual, olfactory and photoionic evidence of contamination in accordance with the Technical Specifications included in Appendix E. However, it estimated that a maximum of approximately 1,900 cubic yards (CY) of soil will be removed from Treatment Zone 1. Additional excavation may be necessary to provide safe slopes such that personnel can access the excavation to inspect the subgrade and complete in-place nuclear density testing prior to and during the backfill operations.

All excavated soil will be directly loaded into dump trucks and/or roll off containers for off-site disposal if pre-excavation waste characterization samples are collected and a waste profile is accepted by the disposal facility prior to commencing the excavation activities. In the event soils cannot be directly loaded into dump trucks/containers, soil will be staged on temporary soil containment pads in accordance with the Technical Specifications included in Appendix E. Stockpiles will be limited to the extent practical while awaiting analytical for off-site disposal. Each temporary soil containment pad will be of sufficient size to store up to the maximum amount of soil that can be excavated in one day and will be lined with a minimum of 20-mil polyethylene sheeting. A one-foot high berm will be constructed around the perimeter of the pads to control runoff/run-on to and from the stockpiles. All stockpiles will be covered with 10-mil thick polyethylene sheeting while awaiting loading and off-site disposal to prevent the contaminants from volatilizing into the air and/or causing potential odor problems around the project Site and/or to prevent surface water from potentially conveying contaminants away from the project Site. All sheeting used to cover stockpiles will be properly weighted down to prevent tearing and wind damage.

### 4.2.2 Tank Removal

The former Coyne Textile Services facility is identified a Petroleum Bulk Storage (PBS) Site No. 7-072842 by the NYSDEC. Based upon the registration, Tank No. 001 is a 10,000-gallon No. 6 fuel oil tank that is listed as closed in-place. No detailed information regarding the tank closure was made available to CHA. Therefore, it is unknown how the tank was decommissioned (e.g. whether sludge was removed prior to filling, type of fill material, etc.) and the current condition of the vault.

As part of the excavation process in Treatment Zone 1, the existing fuel oil tank will be decommissioned and removed in accordance with the Technical Specifications included in Appendix E. In summary, removal of the tank will include:

- Purging of any product lines back to the tank
- Cutting and capping of any utilities and product pipelines connected to the tank
- Inerting of the tank headspace
- Removal and disposal of fill material (if present), remaining product, and sludge from the tank
- Cleaning of the inside of the tank and proper off-site disposal of decontamination fluids
- Removal of the tank
- Cutting and/or crushing of the tank to render it unusable
- Off-site disposal/recycling of the tank carcass

### 4.2.3 Fluids Management

While dewatering of the Site will not be necessary as part of the remedial construction activities, construction-derived wastewater/fluids collected from soil containment pads and decontamination pads will required collection and proper characterization for off-site disposal. Any fluids generated during the remedial processes will be placed in United States Department of Transportation (USDOT)-approved containers, labelled, characterized/profiled and properly disposed off-site.

All wastewater shall be managed in accordance with applicable federal, state and local regulations. The Contractor will provide a container (e.g., drums, polyethylene tanks, frac tank or similar) for temporary on-site water storage followed by transport to an off-site disposal facility. Following collection, the Contractor will be responsible for the collection of appropriate waste characterization samples. Water samples will be analyzed, at a minimum, for the following:

- Target Compound List (TCL) VOCs by USEPA Method 8260;
- TCL SVOCs by USEPA Method 8270;
- TCL PCBs by USEPA Method 8082;
- Target Analyte List (TAL) metals and cyanide by USEPA Methods 6010, 7471 and 9012;
- Pesticides via USEPA method 8081;
- Herbicides via USEPA method 8151; and,
- pH.

Additional characterization may be necessary prior to transporting for off-site disposal and will be confirmed by the remedial contractor prior to sampling. Samples will be stored in a cooler with ice and submitted to an Environmental Laboratory Approval Program (ELAP) certified laboratory under chain-of-custody protocols. Water will be transported for disposal in accordance with all USDOT requirements as well as NYSDEC Part 364 requirements.

Appropriate controls will be used to prevent spills and overflows, including but not limited to, monitoring, gauging, quick-close shut-off valves, and secondary containment. Storage containers will be decontaminated following disposal or discharge activities. Residual sediment in the storage containers will be dewatered/stabilized, if necessary, and disposed of off-site in a similar manner as the contaminated soils being disposed of off-site.

### 4.2.4 Waste Characterization Sampling

As previously indicated, all soils requiring off-site disposal will require appropriate waste characterization and profiling prior to transport. The specific analytical waste characterization requirements of the waste disposal facility may vary and will be verified prior to sampling. Sampling frequency is anticipated to be one sample for every 1,000 CY of soil disposed. The waste characterization samples will be submitted to a laboratory certified under the NYSDOH's ELAP for analysis following appropriate chain-of-custody protocols. The parameters likely required by the waste disposal facility may include the following:

- Toxicity Characterization Leaching Procedure (TCLP) VOCs by USEPA Method 8260;

- TCLP SVOCs by USEPA Method 8270;
- TCLP Resource Conservation and Recovery Act (RCRA) 8 Metals by USEPA Methods 6010;
- TCLP Pesticides via USEPA Method 8081;
- TCLP Herbicides via USEPA Method 8151;
- Total PCBs via USEPA Method 8082;
- Ignitability (flashpoint);
- Corrosivity (pH);
- Reactivity; and,
- Percent Solids.

### 4.2.5 Material Transport & Disposal Off-Site

Following characterization and receipt of an approved waste profile from the selected disposal facility, the soil excavated for off-site disposal will be transported and disposed of in accordance with all local, State (including 6 NYCRR Part 360) and Federal regulations. Actual disposal quantities and associated documentation will be reported to the NYSDEC in the Final Engineering Report (FER). This documentation will include waste profiles, test results, facility acceptance letters, manifests/bills of lading and facility receipts/weight tickets.

All transport of materials requiring off-site disposal at a permitted facility 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 loaded vehicles leaving the Site will be appropriately lined, tarped, securely covered, manifested, and placarded in accordance with appropriate Federal, State, and local requirements. Material transported by trucks exiting the Site will be secured with tight-fitting covers. Loose-fitting canvas and/or mesh-type truck covers will be prohibited. Trucks will be prohibited from transporting saturated soil. Rather, saturated soil should be placed on a containment pad to facilitate dewatering prior to shipment.

### 4.2.6 Confirmation Sampling

Once soil is removed from the excavation, confirmation soil sampling will be conducted in accordance with the NYSDEC Division of Environmental Remediation Program Policy 10 (DER-10), Section 5.5. One soil sample will be collected from near the bottom of the sidewalls from the interior area of the excavation support system, for every 30 linear feet of sidewall. A minimum of one bottom of excavation sample will be collected at a depth from zero to two feet below the bottom of excavation for every 900 square feet of the excavation. Based on estimated size of the excavation, approximately 17 confirmation soil samples will be collection from the excavation at completion, including approximately ten sidewall samples and six bottom samples. It is noted that the required number of bottom samples is based upon the areal extent of the excavation rather than the length of tank given that the extent of the excavation is intended to extend beyond the footprint of the tank. Based upon the conditions encountered following tank removal and contaminated soil excavation, additional samples may be required based upon several factors, including but not limited to, observed contamination remaining in the excavation. All samples will be submitted to an ELAP approved laboratory, following proper chain-of-custody protocols and analyzed for the following parameters:

- TCL VOCs via USEPA Method 8260;
- TCL SVOCs via USEPA Method 8270;

Analytical methods, sample volumes, preservation techniques and holding times associated with the above samples are provided in the QAPP included as Appendix J.

The analytical results of the confirmation sampling will be provided to the NYSDEC and NYSDOH once available from the laboratory. The decision to backfill the excavation will be determined in consultation with the NYSDEC based upon the analytical results meeting the 6 NYCRR Part 375 Commercial SCOs and/or the feasibility of continued excavation (e.g., proximity to building foundation footers, property boundaries, etc.).

#### 4.2.7 Imported Material

Material proposed for import onto the Site will meet the requirements set forth in NYSDEC DER-10 prior to receipt at the Site. Material from industrial sites, spill sites, other environmental remediation sites or other potentially contaminated sites will not be imported to the Site. The types of clean fill that will need to be imported as part of the project include:

- Structural fill material for general backfill material and pavement subbase.
- Topsoil for restoration of green space areas.
- Asphalt (binder and top courses) for restoration of paved areas.

Before fill materials are brought onto the Site, the Contractor will supply the Engineer with the name, location, a brief site operational history, and certified analytical test results for soils originating at the proposed site or facility for review and approval. No imported soils or fill will be allowed onto the Site before they are accepted by the Engineer. The fill must be free of organic matter, wood, trash, etc. which cannot be properly compacted in accordance with the Technical Specifications. Materials containing less than ten percent passing a No. 80 sieve (fines), such as washed gravels, will not require analytical testing if the material originates from a permitted quarry and a letter from the facility owner is submitted indicating that the facility processes virgin material only and is not known to have ever supported commercial or industrial use.

Sampling is required for all imported soil for use as backfill or cover material that has ten or more percent of the material by weight passing the No. 80 sieve. In accordance with NYSDEC DER-10, Table 5.4(e)10, the following table indicates the number of samples required for importation of soil to the Site.

**Table 4.1 Imported Fill Sample Quantity Requirements**

| Soil Quantity (cubic yards) | Grab Sample | Composite Sample |
|---|---|---|
| 0-50 | 1 | 1 |
| 50-100 | 2 | 1 |
| 100-200 | 3 | 1 |
| 200-300 | 4 | 1 |
| 300-400 | 4 | 2 |
| 400-500 | 5 | 2 |
| 500-800 | 6 | 2 |
| 800-1,000 | 7 | 2 |
| >1,000 | 2 additional grab samples every 1,000 cubic yards or consult with NYSDEC | 1 additional composite sample every 1,000 cubic yards or consult with NYSDEC |

Samples will be analyzed for the same parameters as virgin soils, each grab sample will be analyzed for TCL VOCs and each composite sample will be analyzed for TCL SVOCs, TCL pesticides, TCL herbicides, PCBs, PFAS, 1,4-Dioxane, and TAL metals.

## 4.3 TREATMENT ZONE 2 - SOURCE AREA TREATMENT WITH SOIL MIXING

### 4.3.1 Excavation & Handling of Clean Stone

As mentioned previously to address the contamination within the Former UST/Source Area AOC during the implementation of the Source Removal IRM near the northwest corner of the existing building, approximately 253.9 tons of non-hazardous soil was excavated and disposed of off-site at Seneca Meadows, Inc. (SMI), as documented in the Source Removal IRM CCR prepared by CHA and dated October 14, 2019. The limits of excavation were approximately 21.5 feet by 24.5 feet, which was the footprint of the Former UST Area room less approximately 18-inches around the perimeter of room and is considered Treatment Zone 2B, as shown on Figure 7. The depth of excavation was nine feet bgs, several feet below a footer that was exposed. To prevent damage to the building foundation from potential undermining, the excavation was terminated at this depth.

Following completion of the excavation, the contractor placed an eight-ounce non-woven geotextile across the bottom and along the sides of the excavation to serve as a demarcation barrier. The excavation was backfilled with approximately 218.1 tons of No. 2 stone containing less than ten percent by weight of material passing through a No. 80 sieve as well as 42.3 tons of crusher run imported from T.H. Kinsella, Inc.'s quarry located in Jamesville, New York.

Prior to commencing with the soil mixing activities in this area of the Site, this virgin aggregate placed above the demarcation barrier will be excavated and staged in an area of the Site away from the remedial activities for eventual reuse. While the demarcation barrier will reduce comingling of the this imported material from Site soils, any material that does become cross-contaminated with Site soils will be segregated and disposed of off-site with the other material removed from the Source Area. Additionally, while the virgin aggregate is anticipated to have been placed above the groundwater table, any material below the water table will be left in place or disposed of off-site due to the potential for cross-contamination.

### 4.3.2 Excavation & Handling of Overburden Site Soil

As indicated on Figure 7, Treatment Zone 2 has been divided into three sub-treatment zones. Treatment Zone 2A borders the south and west sides of the former Source Area excavation and will be pre-excavated to a depth of two feet below the ground surface (approximately 6-inches of concrete and 18-inches of soil) to accommodate swelling during the soil mixing process which will include the addition of ZVI as further described in subsequent sections of this report. Treatment Zone 2C is located along the north side of Treatment Zones 2A and 2B and will also be pre-excavated to a depth of two feet (approximately 6-inches of concrete and 18-inches of soil) to accommodate the anticipated swelling during the soil mixing process. A portion this material will be stockpiled in accordance with the Drawings and Technical Specifications for re-use as backfill in Treatment Zone 2B. Soil not used as backfill will be sampled for waste characterization purposes, profiled and disposed of at a properly permitted off-site facility as previously described in Sections 4.2.1 and 4.2.5.

### 4.3.3 Zero-Valent Iron Treatment & Mixing

As result of the bench scale testing, it was determined that reduction chemistry was a more effective strategy for addressing the remaining contamination in Treatment Zone 2. The Ferox

Flow ZVI (or equivalent sized ZVI) will be mixed into the existing soil using soil mixing techniques. The means and methods for the soil mixing implementation will ultimately be determined by the Contractor; however, it is anticipated that ZVI will be delivered to the Site in a dry powder form in either super sacks (1,000 kilograms each) or drums. The material will be batched with potable water so that it is sufficiently fluidized for pumping and injected at the target depth at the mixing head. The soil mixing with ZVI treatment zones will include the following:

- Treatment Zone 2A – 2,450 SF area mixed from 9 to 16 feet bgs (approximately 640 CY)
- Treatment Zone 2B – 450 SF area mixed from 9 to 16 feet bgs (approximately 120 CY)
- Treatment Zone 2C – 2,025 SF area mixed from 9 to 26 feet bgs (approximately 1,275 CY)

As indicated above, the vertical extent of most of the contamination is a maximum of 16 feet bgs. However, the maximum depth of the contamination in Treatment Zone 2C extends to a depth of up to 26 feet bgs.

The typical methods for mixing the ZVI with the existing Site soils includes either a single shaft vertical auger system or a traverse rotary tool blender (e.g. Alpine & Lang mixing tools). With the auger system, the drilling shaft typically includes a cutting head with a bottom discharge for the injection of the ZVI mixture, discontinuous auger flights and/or mixing paddles to improve the mixing efficiency. With a rotary tool blender, the main drill stem turns on a vertical axis while the drums on the bottom of the drill stem counter-rotate on a horizontal axis creating a powerful mixing action. The ZVI would be injected through the main drill stem to the mixing head to maximize contact with the Site soils. With both approaches, the treatment zones will each be divided into cells, which are typically sized based upon the amount of area that can be treated in one workday. Within each column, the soil will be mixed with the ZVI in an overlapping column pattern to obtain the desired dosing and distribution of the ZVI. By working in columns/grids, the amount of soil that is exposed at one time will be limited. The anticipated cell size is approximately 20-feet by 18-feet in size. Additionally, the soil being mixed with ZVI is located within the saturated zone, and therefore, water at the surface of the mixing zone is anticipated to also reduce the rate of volatilization within the mixing area. VOC emissions will be monitored via handheld PID and CAMP stations in accordance with the CAMP included in Appendix H.

To add compressive strength to the unsaturated zone soils (approximately 2 to 9 feet bgs) following the ZVI mixing process in the saturated zone and provide a reasonably stable surface to facilitate construction for the Site redevelopment, Portland cement will be added to the soil within the unsaturated zone. A temporary batch plant will be erected on Site and will consist of fresh water in poly tanks and bulk cement. The cement will be stored in silos or hoppers and fed through a calibrated valve for agitation and circulation. The mixing system will be calibrated against time to deliver a predetermined weight, water will be controlled by flow meter(s) and volume indicators within the colloidal mixer. The soil mixing with cement treatment zones will include the following:

- Treatment Zone 2A – 2,450 SF area mixed from 2 to 9 feet bgs (approximately 640 CY)
- Treatment Zone 2B – 450 SF area mixed from 2 to 9 feet bgs (approximately 120 CY)
- Treatment Zone 2C – 2,025 SF area mixed from 2 to 9 feet bgs (approximately 525 CY)

Given that cement will not be added within the ZVI treatment interval, the geotechnical engineering design is currently planning to utilize deep foundation techniques for the new building construction within this area of the Site.

#### 4.3.4 Unconfined Compressive Strength Testing & Core Drilling

Per the Technical Specifications included in Appendix E, at least one set of mixed soil/cement samples will be collected for each active day of mixing whenever cement is used. Each sample will be tested for unconfined compressive strength via ASTM Method C-39. The Portland cement and soil mixture will be required to achieve a minimum unconfined compressive strength of 50 pounds per square inch (psi) at 7 days and 75 psi at 28 days.

### 4.4 TREATMENT ZONE 3 - GROUNDWATER TREATMENT & RECIRCULATION

Treatment Zone 3 is an approximately 20,000 SF area that encompasses a large portion of the existing building footprint as shown on Figure 7. To address the VOC groundwater contamination in this area a groundwater recirculation system with ISCO will be used. The remedial action for Treatment Zone 3 will include the installation of 32 extraction wells and 29 injection wells installed within the plume area. The groundwater will be pumped from the extraction wells, passed through bag filters to remove larger soil particles that may be extracted through the wells, run through LGAC, mixed with sodium permanganate ($NaMnO_4$), and then reinjected into the subsurface following treatment, as further detailed below. It is anticipated that approximately 22 days of recirculation and treatment would be required to complete the treatment of the groundwater in Treatment Zone 3, which excludes startup calibration time, equipment change overs, anticipated downtime, etc.

#### 4.4.1 Installation of Groundwater Extraction/Injection Wells

As previously indicated, all equipment will be decontaminated prior to demobilization from the Site; however, decontamination of equipment between each borehole will not be required for this project. Soil cuttings will be collected and placed into a covered roll-off container or drums for characterization and off-site disposal. Soil cuttings from drilling operations will not be used as backfill in any of the monitoring wells.

The extraction and injection wells will be constructed in accordance with the Drawings included in Appendix D and will include the following:

- A minimum 6-inch dimeter borehole will be advanced to a depth of 25 feet bgs
- 2-inch diameter, 0.010-inch slot Schedule 40 polyvinyl chloride (PVC) well screen with a screened interval of 15 to 25 feet bgs
- 2-inch diameter, Schedule 40 PVC riser extended approximately 30 to 36 inches above the ground surface
- Following installation of the riser, it will be immediately capped to keep out foreign debris until other equipment associated with the recirculation system is installed
- A No. 0 sand pack will be installed in the annular space around the well screen to an elevation of approximately one foot above the well screen and a one-foot layer of fine choke sand will be placed over the sand pack
- A 12-inch layer of hydrated bentonite chips will be placed over the sand back and fine sand choke
- The remaining annular space with be tremie grouted to the ground surface using a cement-bentonite grout

The newly installed wells will be developed until the turbidity of the groundwater is less than 50 nephelometric turbidity unit (NTUs), or for a maximum of two hours each, whichever comes first.

#### 4.4.2 Groundwater Recirculation & Treatment

##### 4.4.2.1 Design Parameters & Operational Sequencing

Based upon the bench scale results as previously described in Section 3.0 of this report and the calculations provided in Tables K-1 through K-5 in Appendix K, the following design parameters were selected for the recirculation and treatment system:

1. Pore volume: 336,623 gallons (based upon effective porosity)
2. No. pore volumes to treat: 2 each
3. Total volume treated: 673,246 gallons

4. No. of injection wells: 32 each
5. No. of extraction wells: 29 each
6. No. wells in operation: 16 extraction/16 injection (simultaneously)
7. Minimum injection rate: 4 gpm per well
8. Total min. injection rate: 64 gpm
9. Hours of injection per day: 8 hours
10. Volume injected per day: 30,720 gallons (4 batches of 7,680 gallons each)
11. Expected injection duration: 11 days (for 16 wells and two pore volumes)
12. Total injection duration: 22 days (for all 32 wells and two pore volumes)
13. $NaMnO_4$ injection conc.: 5.0 grams per liter (g/L)
14. Mass of $NaMnO_4$ required: 28,968 pounds (normalized to 275-gallon totes)

Since only 16 extraction wells (half of the well field) and 16 injection wells will be operated at one time, it will be necessary to operate the injection/extraction system for approximately 22 days, not including the time for making switchovers in the wellfield. However, to allow for reaction time between each pore volume, the system will be operated in the following sequence:

1. The first set of 16 extraction wells and 16 of the injection wells will be operated simultaneously to treat the *first pore volume* in the first half of the wellfield.
2. The second set of 16 extraction wells and 16 of the injection wells will be operated simultaneously to treat the *first pore volume* in the second half of the wellfield.
3. The first set of 16 extraction wells and 16 of the injection wells will be operated simultaneously to treat the *second pore volume* in the first half of the wellfield.
4. The second set of 16 extraction wells and 16 of the injection wells will be operated simultaneously to treat the *second pore volume* in the second half of the wellfield.

Since only 29 injection wells will be installed in the wellfield, it will be necessary to utilize three of the injection wells when treating both halves of the wellfield.

#### 4.4.2.2 Groundwater Extraction & Treatment System Overview

Groundwater from Treatment Zone 3 will be pumped from the plume area through 32 extraction wells. The well field extraction equipment will include:

1. A ¾-inch diameter suction line consisting of braided/reinforced tubing with a check valve/screen located at the end of the tube and approximately 12-inches off of the bottom of the well.

2. Two ¾-inch diameter suction tubes will be connected to ¾-inch diameter Schedule 80 PVC pipe via quick-connect camlocks. The PVC piping will be equipped with ball valves that are then connected to a pump. One of the ball valves on each branch would be “normally open” to allow withdraw of water from the well connected to the pump while the other ball valve would be “normally closed” in an off position. This configuration will allow the contractor to control which wells are operated during each phase of the recirculation and treatment process. A total of 16 extraction pumps will be installed as part of the extraction side of the recirculation system.
3. The rigid Schedule 80 PVC pipe will be connected to an air-driven double diaphragm pump. The pumps will be Sandpiper® S1F non-metallic pumps fitted with chemically compatible seals or equal. Each pump will be equipped with a regulator to control the air pressure delivered to the pump and a needle valve to control the air flow rate to the pump.
4. The pump discharge will be connected to 3/4-inch diameter Schedule 80 PVC pipe and include:
    a. Ball valves to allow isolation of a particular extraction system branch
    b. A flow meter (Signet 2551 Magmeter by GF Piping Systems © or equal) to monitor the discharge flow rate from each pump and allow field adjustments to each individual branch of the well field
    c. A gate valve to allow adjustments to the discharge flow rate from the pump and provide back pressure if need to improve the pump operation
    d. A check valve to prevent water from backflowing into a well should it run dry
    e. A sight glass to allow for visual observation of significant turbidity that may be coming from a particular well and the visual evidence of the recirculation of the sodium permanganate (e.g. purple coloration of the water)
5. A group of four pumps will be connected to a two-inch diameter Schedule 80 PVC sub-header. A total of four sub-headers will then be connected to a two-inch Schedule 80 PVC header. The header piping will receive water from up to 16 pumps within the well field at one time. At the proposed extraction rate of approximately 4 gpm per well based upon the results of the pilot study, the design rate for the treatment train is a minimum of 64 gpm.
6. The suction hoses will be grouped together on one end of the containment area and a minimum of an eight-foot wide temporary ramp system will be installed over the hoses to protect them from small equipment traffic as well as reduce the tripping hazards immediately adjacent to the treatment train.

#### 4.4.2.3 Bag Filter System

The header pipe conveying the combined flow from the extraction wells will first pass through a flow meter and a 25- µm bag filter system to reduce the amount of any solids that come from any extraction wells. While only one bag filter will be utilized at a time, two bag filters will be installed in parallel such that the system can remain operation when the filter on one of the units is being replaced. Each bag filter will be able to be isolated via ball valves.

#### 4.4.2.4 Activated Carbon Treatment

Following the filtration, the water will flow through two LGAC vessels to remove certain VOC compounds (e.g. petroleum-related compounds, PFAS, and 1,4-dioxane) that will not be oxidized by the sodium permanganate oxidation chemistry. The LGAC units will be plumbed in series so that they can be operated in a lead/lag pattern. Each LGAC unit will include a 2,000-lb carbon bed that will accommodate the design flow rate of 64 gpm and provide a residence time of approximately 7.8 minutes. CHA has specified that Model No. TW 72 GAC units as manufactured by Calgon Carbon Corporation, or equal, will be utilized as part of the treatment system. At the design flow of 64 gpm, the estimated pressure drop for each carbon vessel is approximately 1.6 pounds per square inch (psi). The LGAC units have been sized for 26 days of constant (i.e. 24/7) use before breakthrough. Given that the estimated time for the remedy is 22 days breakthrough is not anticipated. However, if the lead unit has breakthrough, it will be switched to the lag position and the granular activated carbon (GAC) in the lead vessel will be replaced. Once the carbon is changed, the lead vessel will become the new lag vessel.

The GAC will also remove some of the 1,2-DCE (vinyl chloride adsorption is anticipated to be negligible) therefore, the units have been upsized to accommodate the removal of this compound. While CHA had initially planned to install the GAC units following the addition of the sodium permanganate, a quick bench scale study indicated that the GAC would significantly reduce any residual permanganate concentration after completion of one batch (batching is discussed in the next section), and thus, the design was modified to include the GAC units ahead of the sodium permanganate. While much of the sodium permanganate will be consumed during the batching process, there is a benefit to having a residual concentration in the water that is injected into the subsurface to address any contamination that is bound to soil particles.

#### 4.4.2.5 Sodium Permanganate Treatment

A solution of 40-percent sodium permanganate will be injected into the water piping following the bag filter system using another double-diaphragm pump and the chemical will be mixed with the raw water by passing it through an in-line static mixer. Based upon the bench scale treatability study and average contaminant concentrations, it was determined that the addition of sodium permanganate at a dosage rate of 5 g/L with an exchange of two pore volumes within the plume area will reduce the target contaminants by approximately 85 percent overall.

The average starting concentrations of VOCs utilized in the treatability study were artificially high due to the fact that the water provided from the predesign investigation had little VOCs present and XDD had to spike the water utilized in the study. Based upon the actual average groundwater VOC concentrations anticipated to be present in the plume and the fact that there will be residual permanganate in the groundwater that is reinjected into the plume, the actual percent mass reduction is expected to be higher. CHA notes that as part of the bench scale study, all of the VOCs were reduced below the applicable groundwater standards and guidance values with the exception of vinyl chloride. The concentration of vinyl chloride was reduced to 3.3 µg/L versus a groundwater standard of 2 µg/L overall. However, while the vinyl chloride concentration was reduced during the study, it is expected that there was some creation of vinyl chloride during the oxidation process as vinyl chloride is a daughter product of some of the Site COCs.

CHA has selected a sequencing batch reactor (SBR) approach for the treatment process to simplify the controls required for the remedial system as well as to facilitate closer monitoring of the dosing of the sodium permanganate mixed with the raw water from the plume. At a targeted flow rate of 64 gpm, a two-hour batch would generate 7,680-gallons of water per batch that will be pumped into an approximately 8,400-gallon polyethylene reaction tank that is properly vented. To achieve the targeted injection concentration of 5 g/L, approximately 70.5-gallons of 40 percent $NaMnO_4$ will be added to the extracted water via piping and passed through a static mixer to blend the chemical and water together. Following the static mixer, the combined flow will be injected into the reaction tank for a total batch volume of 7,750.5 gallons. To treat two full pore volumes (673,246 gallons), the recirculation operation will include 88 batches. The tank inlet will be located approximately six inches off the bottom of the tank and will be horizontal such that the water stream will create additional mixing (i.e. swirling) within the tank.

Two polyethylene reaction tanks will be necessary for efficiency in the recirculation system. As one batch tank is being filled, the mixed water in a second reaction tank will be injected into the wellfield. The 40 percent sodium permanganate solution will be delivered to the Site in 275-gallon totes (263 gallons per tote) and a maximum of 14-totes will be included per shipment. Based upon the total volume of 40 percent sodium permanganate solution required to treat two pore volumes within the plume area (see Table K-5 in Appendix K), a minimum of 24 totes will be necessary to complete the Treatment Zone 3 remediation.

#### 4.4.2.6 Groundwater Injection

After each batch is completed and allowed a reaction time of up to ten minutes following the addition of water and chemical into the tank, a double-diaphragm pump (S20 Non-Metallic 2-inch pump as manufactured by Sandpiper® pump, or equal) will be utilized to inject the mixed water back into the wellfield utilizing 16-injection wells simultaneously. A nozzle located on the bottom of each tank will be plumbed to the pump with a ball valve system to control flow from only one tank at a time. To direct flow to each of the injection wells, the treated water will pass into to a three-inch Schedule 80 PVC well header where the flow will be split to direct flow to the desired injection wells. Each branch of the injection header will include:

1. A flow meter that will be utilized to estimate the flow rate into each branch.
2. A ¾-inch tee fitting and 90-degree elbows to split the flow from the flow meter two different wellheads.
3. A ball valve on each sub-branch. Typically, one valve would be "normally open" and one valve would be "normally closed" so that only half of the wells are being utilized for injection at one time.
4. A gate valve would be included on each leg as well so that the flow can be controlled for each leg and create backpressure of the pump, if necessary.
5. Following the valves, ¾-inch diameter braided/reinforced injection tubing will be attached to the PVC piping via a quick-connect camlock and each tube will be connected to a wellhead.
6. At each injection wellhead, the tubing will be connected to a rigid pipe assembly, including a check valve, a pressure gauge, a sample port that can be utilized to bleed air in the line if necessary, a clear sight glass, and a threaded coupling for attachment to the well riser.
7. The injection hoses will be grouped together on one end of the containment area and a minimum of an eight-foot wide temporary ramp system will be installed over the hoses to protect them from small equipment traffic as well as reduce the tripping hazards immediately adjacent to the treatment train.

### 4.4.3 Confirmation Sampling

Although grab water samples may be collected during the operation of the of the recirculation system to evaluate the removal efficiency of the targeted VOC compounds, no confirmation sampling will be utilized to determine when the recirculation operation is complete. Rather, the end point will be based upon the time required to treat two pore volumes within the groundwater plume at the targeted injection concentration of 5 g/L as previously described. Long-term groundwater monitoring will be conducted following the completion of the remedial action to facilitate evaluation of the reduction of the VOC mass over time. However, the long-term groundwater monitoring will be included as a requirement in the SMP that is developed after the implementation of the remedy and is not detailed in this document.

## 4.5 SOIL VAPOR MITIGATION

As previously indicated, the planned redevelopment construction at the Site includes raising the existing Site grades by at least two feet with imported fill, including a top layer of open-graded stone as further discussed below. Therefore, the soil vapor mitigation system(s) will be designed for new construction rather than a system that would be consistent with a building retrofit system. Specifically, to reduce the number of overall systems and the number of vertical exhaust stacks required to mitigate the entire building footprint, the system will include perforated, horizontal pipe runs in lieu of suction points only. The system is anticipated to be an active system which will include system fans and alarms.

The SSDS design will be comprised of multiple sub-systems, each of which will have a system fan and distinct exhaust stack. The system can be operated in its entirety or in any combination of sub-systems, thus enabling certain sub-systems to be shut down over time, as conditions allow and as the NYSDEC/NYSDOH approve such modifications. Monitoring points for evaluating the system will be evaluated and presented with the SSDS design which will be submitted under a separate cover to NYSDEC/NYSDOH once the foundation plans for the new building are finalized.

Prior to the installation of the SSDS, the Owner will be consulted for the most recent floor plan of the new building. That layout will then be used to design the SSDS and identify and evaluate any potential conflicts. Though not anticipated, conflicts will be resolved prior to installation of the system, and any changes made that impact the system layout/configuration as designed will be presented to NYSDEC/NYSDOH for approval prior to installation. Given that the building redevelopment plans are still currently underway, the SSDS design is not included in this RDWP. CHA will submit the SSDS design plan showing each sub-system to NYSDEC/NYSDOH under separate cover. The sections below provide an overview of the minimum components anticipated to be included as part of the SSDS system. The SSDS design will comply with the latest ANSI CC-1000 Standard.

### 4.5.1 Venting Stone

A minimum of a 12-inch thick gas venting layer of crushed stone will be installed immediately beneath the floor slabs of the structure(s). A crushed stone with 10 percent or less fines (material passing a No. 200 sieve) is required to facilitate air movement and good communication beneath the building slab(s). A mixture of 50 percent NYSDOT, Size No. 1 and 50 percent NYSDOT, Size No. 2 stone will be specified for this project.

### 4.5.2 Vapor Barrier

A Class A, 15-mil polyethylene resin vapor barrier meeting or exceeding all requirements of ASTM 1745-17 will be specified above the gas vapor collection system and beneath the slab-on-grade. The vapor will be in direct contact with the slab beneath the office areas and manufacturing areas. A combination of vapor barrier boots, pressure sensitive seam tape, and mastic, as specified, will be utilized to seal the barrier around penetrations in the vapor barrier. It should also be noted that the vapor barrier is sufficiently puncture- resistant to allow the placement of reinforcing steel directly on the barrier prior to the placement of concrete.

### 4.5.3 Piping and Extraction Points

The SSDS piping and extraction points will be installed in accordance with the following procedures:

<u>Horizontal Piping</u>

- A minimum of a 4-inch diameter, perforated Schedule 40 PVC piping will be installed beneath the proposed slab-on-grade to facilitate the extraction of vapors beneath the slab. The piping network will include horizontal laterals with a spacing of one pipe every 40 feet on center. Appropriate PVC tees, bends, etc. will be incorporated into the design to complete the pipe network. All pipe, fittings, and valve connections will be solvent welded.
- The horizontal pipe runs shall be no more than six inches beneath the concrete slab. Other utilities will be installed beneath the collection system so that the collection pipes are closest to the slab where vapor accumulation is most likely. A minimum of four inches of stone will be placed above and below the PVC pipe to protect the pipe from excessive stresses. A heavier duty pipe (e.g. Schedule 80 PVC, HDPE pipe, etc.) will be required where the venting stone is not maintained at the minimum 12-inches in thickness.
- The horizontal pipes will be laid flat.
- The proposed layout attempts to maintain the collection pipes five feet from exterior walls to minimize the potential for drawing air into the system from beyond the building footprint.
- If grade beams or other subsurface obstructions exist, a six-inch steel sleeve or similar will be cast in the concrete to allow the perforated pipe to be installed following form removal and reduce the potential for isolated areas that are not mitigated. Continuity of the stone media is crucial to maintain airflow beneath the entire building footprint. Additional vertical exhaust stacks may be added in areas where maintaining continuity is not possible (e.g. obstructions, foundation walls, etc.).

<u>Vertical Piping/Exhaust Stacks</u>

- Exhaust stacks will consist of a minimum of 4-inch diameter, solid Schedule 40 PVC pipe and shall be included approximately every 150 linear feet along the horizontal pipe runs. All pipe, fittings, and valve connections will be solvent welded, with the exception of fan connections, which will be connected utilizing flexible rubber couplings.
- A minimum of a 12'x12"x12" (one cubic foot) stone sump will be installed at the bottom of each vertical exhaust stack beneath the slab to facilitate percolation of any condensate draining downward from the exhaust stack.
- Vertical exhaust pipes shall be enclosed within a pipe chase within the office space and are not permissible in the occupied/habitable space. Exposed pipes within the manufacturing and warehouse areas of the building are permissible as long as the pipes are appropriate protected from damage (e.g. within the web of a steel column).
- If horizontal pipe runs are needed abovegrade (e.g. below the roof deck) to route the exhaust stack penetration to a different location on the roof or if the stacks are grouped prior to penetration through the roof, the horizontal pipe(s) will be sloped back towards the extraction point in the slab to facilitate drainage of condensate.
  - All bends, if necessary, will be fabricated form 45-degree bends to reduce frictional losses in the piping network.
  - Horizontal pipe runs will be sloped toward the extraction points or a moisture discharge point at a minimum of 1/16-inch per linear foot (0.5 percent). No water traps will be permissible.
- Horizontal and vertical pipes will be secured to the roofing system and walls at intervals in accordance with the New York State Building codes. At a minimum, pipes will be supported every eight feet vertically and every six feet horizontally.
- To avoid entry of subsurface vapors into the building, the exhaust/discharge pipe shall be:
  - A minimum of 18 to 24 inches above the surface of the roof (preferably above the highest level of the roof)
  - At least ten feet above the ground level
  - At least ten feet away from any opening that is less than 2 feet below the exhaust point
  - At least ten feet from any adjoining or adjacent buildings, or heating, ventilation and air conditioning (HVAC) intakes or supply registers
  - All exhaust pipes will be fitted with a protective screen or cover to reduce the potential for water and vector intrusion.
  - All pipes will be properly supported to prevent potential wind damage, such as constructing a uni-strut system to mount the fans onto.

### 4.5.4 Pathway Sealing

All joints, penetrations, and termination points within the concrete slab will be sealed with self-leveling polyurethane caulking (Sikaflex® - 1c SL, Geocel 3300 or equivalent) to make the slab airtight. Gaps up to 5/8-inches wide may be sealed with caulk only; however, gaps larger than 5/8-inches wide will be sealed with at least two rows of closed-cell foam backer rod followed by caulking. Hydraulic cement can be used to seal gaps wider than one inch in the slab(s).

#### 4.5.5 System Fans

Each sub-system will include a fan which, together will be installed to induce a vacuum beneath the entire floor slab and induce a pressure gradient between the sub-slab of the building and the interior space. The fan specified for each sub-system will be the Fantech Rn4 Inline Radon Fan, or similar. All fans will be installed on the exterior of the building and will be installed in accordance with the manufacturers' installation instructions.

#### 4.5.6 System Monitoring

The systems will be monitored via monitoring panels. The monitoring systems will include a pressure gauge for each of the sub-system fans that will measure the real time pressure after each extraction point. The pressure gauges and low-pressure alarms will be connected to a monitoring panel and will be powered with one 110-volt electrical receptacle.

#### 4.5.7 System Labeling

Vapor mitigation system piping and components will be clearly labeled as follows to facilitate accurate identification for operation, maintenance and monitoring purposes:

- Exhaust stacks will be labeled with permanent stick-on labels which will correspond to an as-built drawing. Additionally, each pressure gauge/alarm pair will be labelled at the monitoring panel and each fan will be labelled with a weather and ultraviolet resistant label that corresponds with the exhaust stack number/extraction point number.
- Above slab piping will be labeled at least once every 20-feet, at least once per room, and at least once every floor. The label will state "Vapor Mitigation System" and will be readable from a distance of three (3) feet.
- Electrical circuit breakers will be labeled "Vapor Mitigation Fan #" (# will be replaced by the corresponding sub-system).
- A label stating the name of the system installer, date of the system installation, and a phone number for system service shall be affixed on or immediately adjacent to each monitoring panel.

#### 4.5.8 Electrical Service

Electrical service and connection work associated with the electrical components of the SSDS will be conducted as follows:

- Electrical connection of all electrical components will comply with local electrical code and manufacturer requirements.

- Each fan will include an electrical disconnect within six feet of the fan mounting location.
- Electrical inspection will be obtained by the SSDS installer and all necessary conditions will be met to obtain satisfactory inspection and permit closing.
- Fan electrical connection will comply with manufacturer requirements.
- A dedicated electrical circuit breaker will be installed for the fan electrical connections, although multiple fans can be on the same circuit, provided the circuit has sufficient capacity.
- One 110-volt electrical outlet with four-outlet connections will be installed within two feet of the monitoring panel and must be connected to a circuit that is separate from the mitigation fans.

## 4.6 SITE RESTORATION

### 4.6.1 Injection/Extraction Well Decommissioning

The injection and extraction wells installed in Treatment Zone 3 will be decommissioned in accordance with NYSDEC's Policy CP-43 as previously described in Section 4.1.2.5 following completion of the recirculation program.

### 4.6.2 New Monitoring Well Installation

Following completion of the Treatment Zone 3 remedial action, two permanent monitoring wells will be installed within or as close to the plume area as possible without inhibiting future Site operations in order to facilitate long-term groundwater monitoring. The details of the long-term groundwater plan will be further described in the SMP prepared following the remedial construction. The exact location of the post-remediation monitoring wells will be identified in the FER; however, given that the wells will be within the footprint of the building and the floor plans were not finalized at the time the design report was completed, the locations of the new monitoring wells have not been shown on the Design Drawings included in Appendix D.

### 4.6.3 Surface Restoration & Cover Systems

As previously indicated, the existing cover systems will be maintained on the Coyne Park parcel as well as the employee parking lot during the remedial construction. While much of the existing building will be demolished prior to commencement of the remedial action, the current owner of the Site intends to renovate the office building and reconstruct the northern approximately two-thirds of the building. As part of these construction efforts, additional fill will be placed on the

Site to raise the existing grades and a new concrete slab will be constructed above the remnants of the existing slab.  The new concrete slab will be a minimum of four inches thick.

As previously indicated, should other areas of the Site be disturbed as part of the Site redevelopment, the cover systems will include:

1. Impervious Areas:  All impervious surfaces will include concrete or asphalt pavement installed at a minimum of four inches  in thickness. The impervious surfaces will act as a surface cover to significantly reduce infiltration and limit exposure to future Site occupants.
2. Green Space Areas:  All green space areas will include a minimum of a one-foot thick layer of imported, clean material (e.g. topsoil) placed above a demarcation barrier that will provide a physical barrier to any potential remaining contamination in existing Site soils. The demarcation barrier will consist of a 6-ounch non-woven geotextile or similar.

If the Site redevelopment commences prior to the approval of a Site Management Plan (SMP), the following procedures, at a minimum will be followed:

- Excavation of Site soil will be managed with 40-hour trained HAZWOPER personnel
- Site soil will be characterized and hauled off-Site to a permitted facility
- Cover systems will be installed as discussed above

# 5.0 REQUIRED PERMITS

In accordance with DER-10, this document identifies the required permits and/or exempted permits, or other authorizations required to implement the remedial action at the Site. The necessary permits are summarized in the subsections below.

## 5.1 LOCAL PERMITS

### 5.1.1 Tank Removal Permit

An *Application for Tank Removal* will be submitted to the Syracuse Fire Department Fire Prevention Bureau located at 201 East Washington Street in Syracuse, New York prior to commencement of the remedial action. The technical specifications for the tank decommissioning will meet or exceed the Bureau's requirements for closure as well as the New York State Uniform Fire Prevention and Building Code, Chapter C, Article 2, Part 1164, Section 1164.5.

### 5.1.2 Demolition Permit

The contractor completing the building demolition will be responsible for obtaining a demolition permit from the City of Syracuse Division of Code Enforcement prior to commencing the demolition of a portion of the existing building. The remedial contractor will not be required to obtain a separate demolition permit for the removal of the concrete slab and foundations in Treatment Zones 2 and 3.

### 5.1.3 Hydrant Permit for Potable Water

Potable water will be required for a number of the remedial construction activities, including:

1. Mixing of the soil and ZVI prior to injection into Treatment Zone 2
2. Hydrating of grout and mixing grout for the extraction/injection wells
3. Decontamination

If the existing water service(s) to the Site are terminated prior to the start of the remedial construction or if the remaining service is inadequate for the remedial construction activities, the contractor will be responsible for obtaining a hydrant permit from the City of Syracuse Water Department prior to use of the hydrant. If a hydrant is used for a water source, a backflow prevention device will be connected to the hydrant prior to any hoses. Use of the hydrant without a backflow prevention device will not be permitted.

### 5.1.4 Stormwater Pollution Prevention Plan

As previously indicated, the area of disturbance for the remedial construction will be maintained to less than one acre during the remedy. Therefore, a full SWPPP will not be prepared for the Site and only semi-permanent erosion control measures and best management practices will be implemented as part of the remedial construction.

## 5.2 STATE PERMITS

The NYSDEC will be advised of the intent to permanently close the fuel oil tank in Treatment Zone 1 by review and approval of this Remedial Design Report. A separate 30-day notification is not required as this action is in response to a corrective action. Within 30 days following permeant closure and removal of the tank, CHA will submit a PBS registration application to the Department indicating that the tank status is changed from “closed in-place” to “closed – removed.”

## 6.0 SCHEDULE

The following table provides the anticipated schedule for the completion of the remedial activities identified in this RDWP.

**Table 7.1 Project Schedule**

| Description | Anticipated Start Date | Anticipated Completion Date |
|---|---|---|
| Completion of the AAR Public Comment Period | -- | June 27, 2020 |
| NYSDEC issues a Decision Document following the public comment period on the AAR | -- | June 27, 2020 |
| Submission to the Remedial Design to NYSDEC | -- | June 25, 2020 |
| NYSDEC Review of the RDWP | June 26, 2020 | July 24, 2020 |
| Preparation of Bid Packages | July 1, 2020 | July 10, 2020 |
| Bidding Phase | July 13, 2020 | July 17, 2020 |
| Design of SSDS Systems | July 1, 2020 | July 17, 2020 |
| Submission of SSDS Design to NYSDEC | -- | July 17, 2020 |
| Review of Bids | July 17, 2020 | July 20, 2020 |
| Notice of Award | -- | July 20, 2020 |
| Execution of Contract Documents | July 20, 2020 | July 22, 2020 |
| Notice to Proceed | July 27, 2020 | July 30, 2020 |
| Remedial Construction | August 3, 2020 | November 27, 2020 |
| Preparation of Final Engineering Report | November 2, 2020 | January 29, 2021 |
| Preparation of Site Management Plan | November 2, 2020 | January 29, 2021 |
| NYSDEC Review of Final Engineering Report and Site Management Plan | February 1, 2021 | March 12, 2021 |
| NYSDEC Issues Certificate of Completion | -- | March 30, 2021 |

The overall progress of the remedial activities will be dependent upon several factors including, but not limited to: NYSDEC review periods, weather conditions at the time of construction, the rate at which vapor concentrations reach targeted concentrations, etc. The schedule for the installation of the SSDS systems is still being evaluated at this time. The underground components (e.g. stone media, piping and vapor barrier), will be installed and observed for compliance with the design prior to pouring the new concrete slabs. However, the complete systems and commissioning of the systems will not be completed until the building construction is nearing completion but prior to the owner’s occupancy.

The NYSDEC will be notified at least seven days prior to the proposed initiation of the remedial action.

# 7.0 POST-CONSTRUCTION PLANS

This section details plans and reports to be submitted following completion of Site remediation.

## 7.1 SITE MANAGEMENT PLAN

Since the selected remedial action will result in contamination remaining at the Site, a SMP will be prepared to manage the remaining contamination at the Site. The SMP will be updated in accordance with:

- The requirements outlined in NYSDEC "DER-10: Technical Guidance for Site Investigation and Remediation" (May 2010); and
- The guidance provided by NYSDEC.

The SMP will include an Institutional and Engineering Control Plan (e.g. environmental easement and excavation work plan), a Site Monitoring Plan (e.g. groundwater monitoring and Site-wide inspections), and an Operational and Maintenance Plan (e.g. operation and maintenance of SSDS systems). The implementation of the SMP will allow for the safe use of the Site.

The SMP will also provide information on the cover systems installed to allow for industrial use of the Site. The cover currently consists either of pavement or a soil cover in areas where the upper one foot of exposed surface soil exceeds the commercial SCOs. Where the soil cover is required, it will be a minimum of one foot of soil, meeting the SCOs for cover material specified in 6 NYCRR Part 375-6.8(b). The soil cover would be placed over a demarcation layer. The upper six inches of the soil would be of sufficient quality to maintain a vegetation layer. Pavement areas will be covered by either a paving system or concrete at least four inches thick.

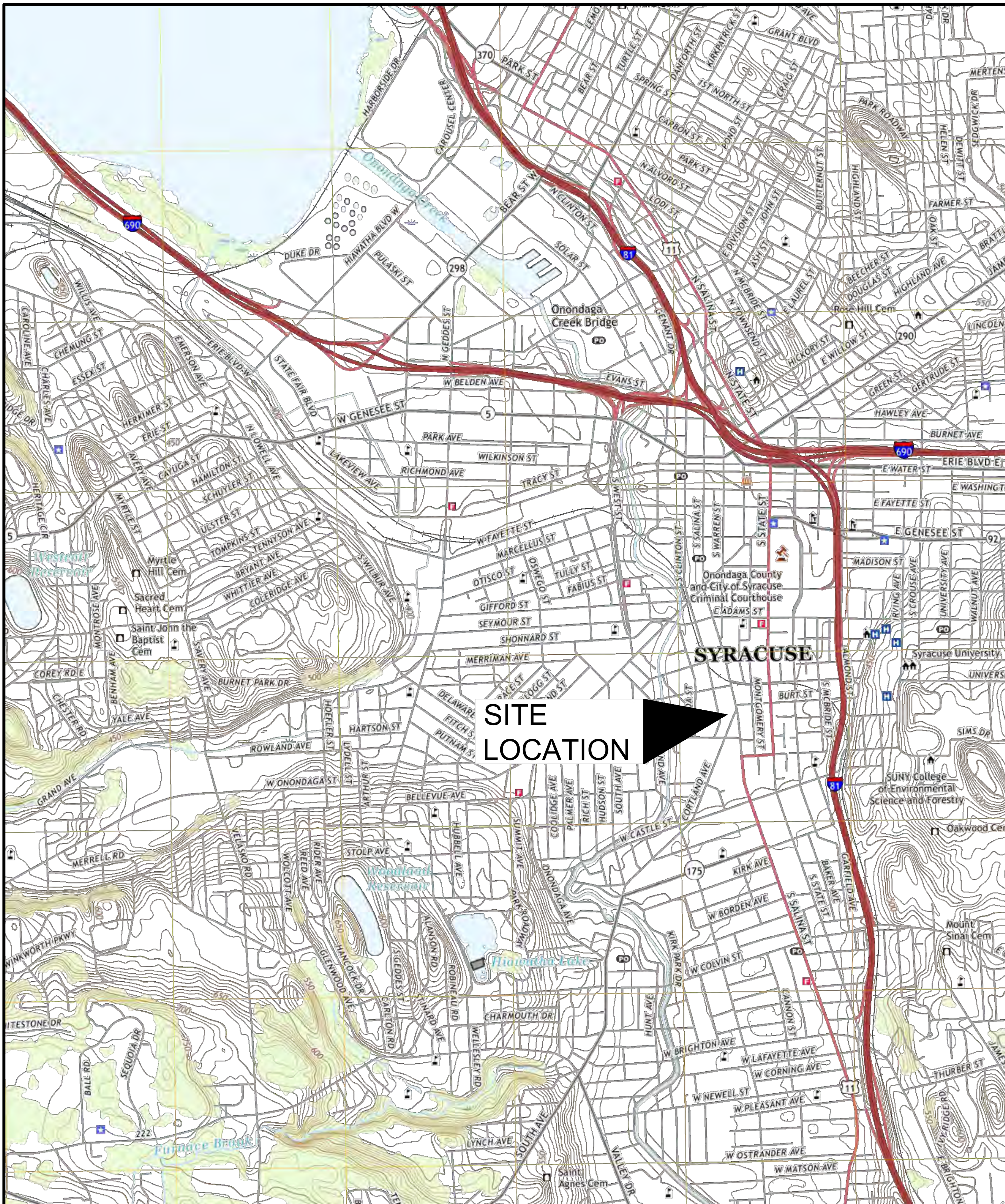
## 7.2 FINAL ENGINEERING REPORT

A FER will be prepared to document implementation of the remedial actions completed at the Site. The Source Removal CCR will be incorporated into the FER as an appendix and the major elements of the CCR will be summarized in the text of the FER. The FER will include:

- Certification requirements in accordance with applicable statute and/or regulations;
- Remedial action objectives;
- Description of the selected remedy;
- Remedial contracts;
- Description of remedial actions performed;

- Governing documents;
- Elements of the remedial program;
- Summary of contaminated materials removal, including manifests documenting off-site transport of waste material for trench spoils and auger cuttings;
- Summary of remedial performance/documentation sampling;
- Details of imported backfill;
- Remaining contamination;
- Other Engineering Controls;
- As-built drawings;
- A summary of deviations from the RDWP.

# FIGURES



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# SITE LOCATION MAP

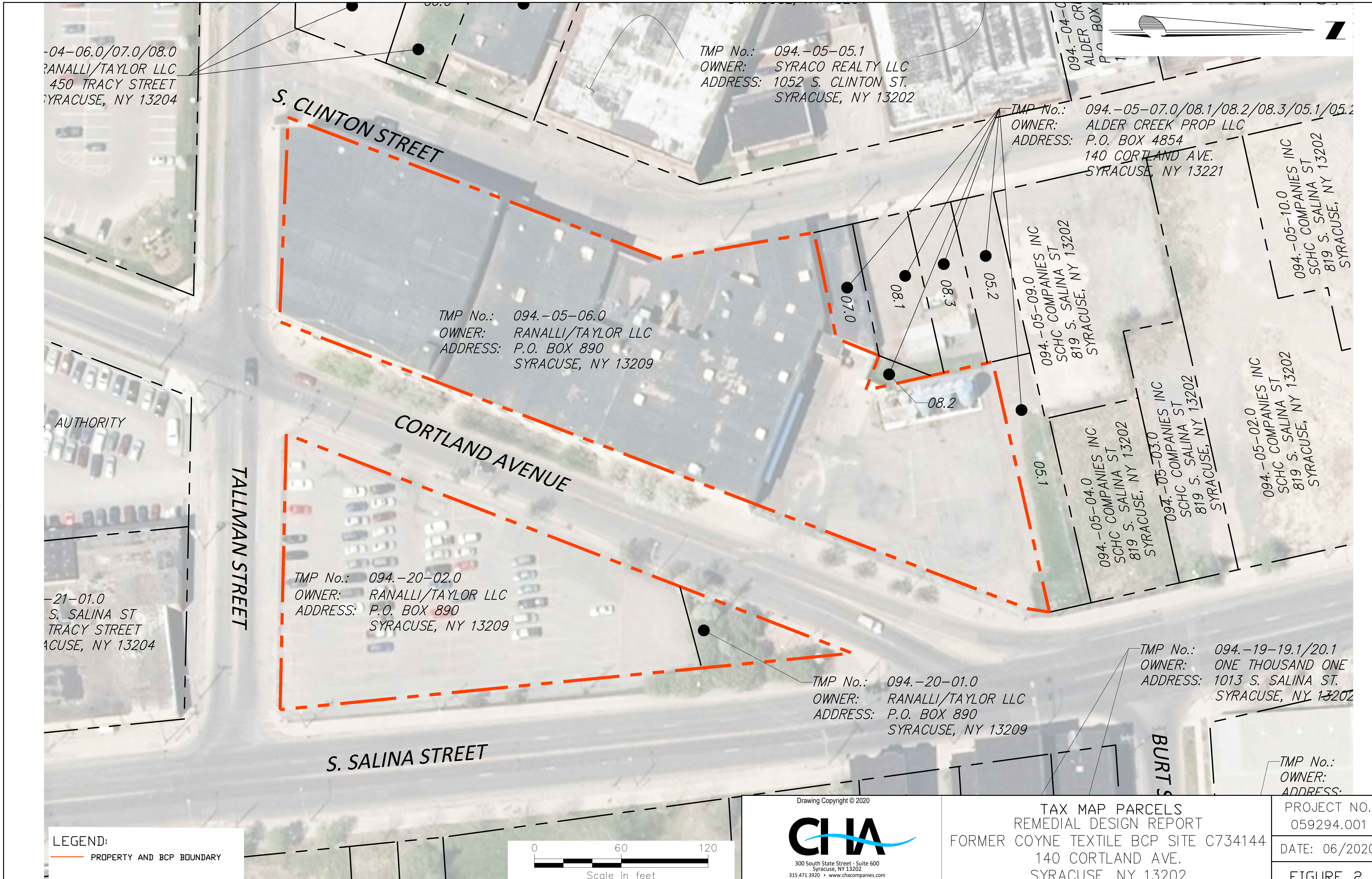
REMEDIAL DESIGN REPORT
FORMER COYNE TEXTILE BCP SITE C734144
140 CORTLAND AVE.
SYRACUSE, NEW YORK

PROJECT NO.
059294.001

DATE: 06/2020

FIGURE 1

File: V:\PROJECTS\ANY\K5\059294.001\CADD_ACAD\ENVP\COYNE\RD REPORT FIGURES.DWG Saved: 6/17/2020 12:26:40 PM Plotted: 6/18/2020 4:25:32 PM Current User: Miller, Samantha LastSavedBy: 4187

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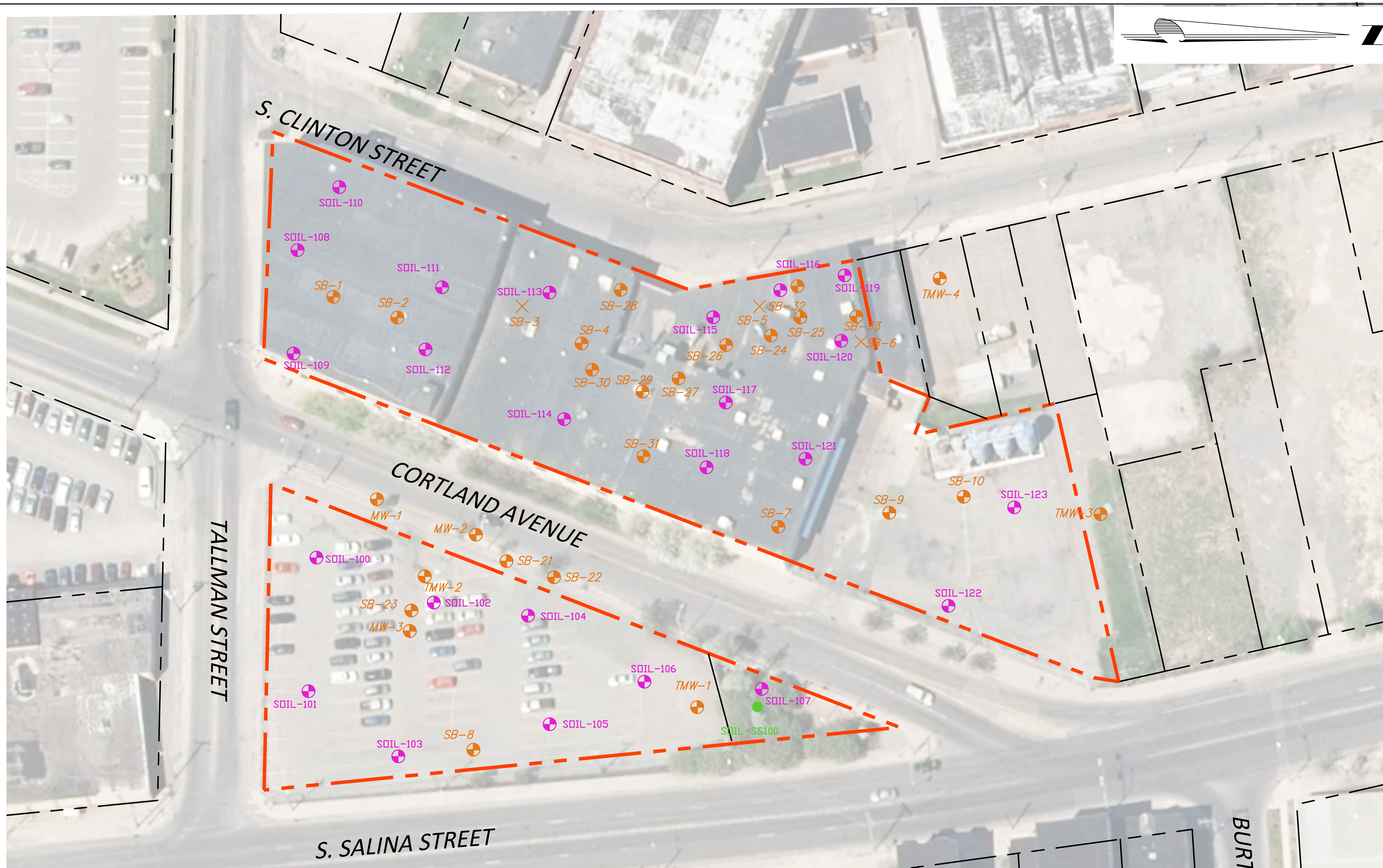
TAX MAP PARCELS
REMEDIAL DESIGN REPORT
FORMER COYNE TEXTILE BCP SITE C734144
140 CORTLAND AVE.
SYRACUSE, NY 13202

PROJECT NO. 059294.001

DATE: 06/2020

FIGURE 2




LEGEND:
- GZA 2014/2015 SOIL BORING LOCATIONS
- GZA 2014/2015 ATTEMPTED SOIL BORING
- CHA 2018/2019 RI SOIL BORING LOCATIONS
- CHA 2018/2019 RI SURFACE SOIL BORING LOCATIONS

0 60 120
Scale in feet



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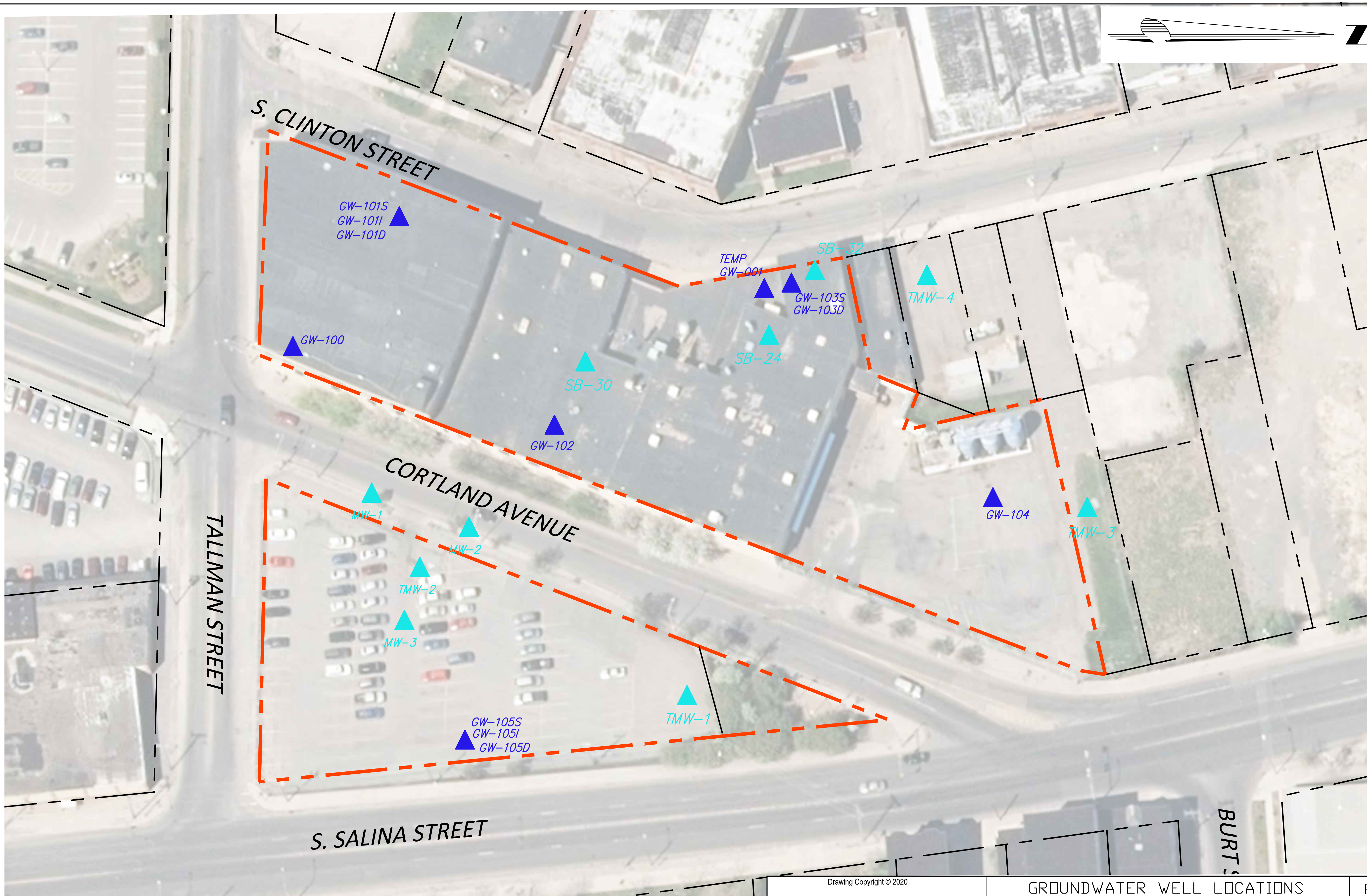
SOIL SAMPLE LOCATIONS
ALTERNATIVES ANALYSIS REPORT
FORMER COYNE TEXTILE BCP SITE C734144
140 CORTLAND AVE.
SYRACUSE, NY 13202

PROJECT NO. 059294.001

DATE: 06/2020

FIGURE 3

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GROUNDWATER WELL LOCATIONS
REMEDIAL DESIGN REPORT
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SYRACUSE, NY 13202

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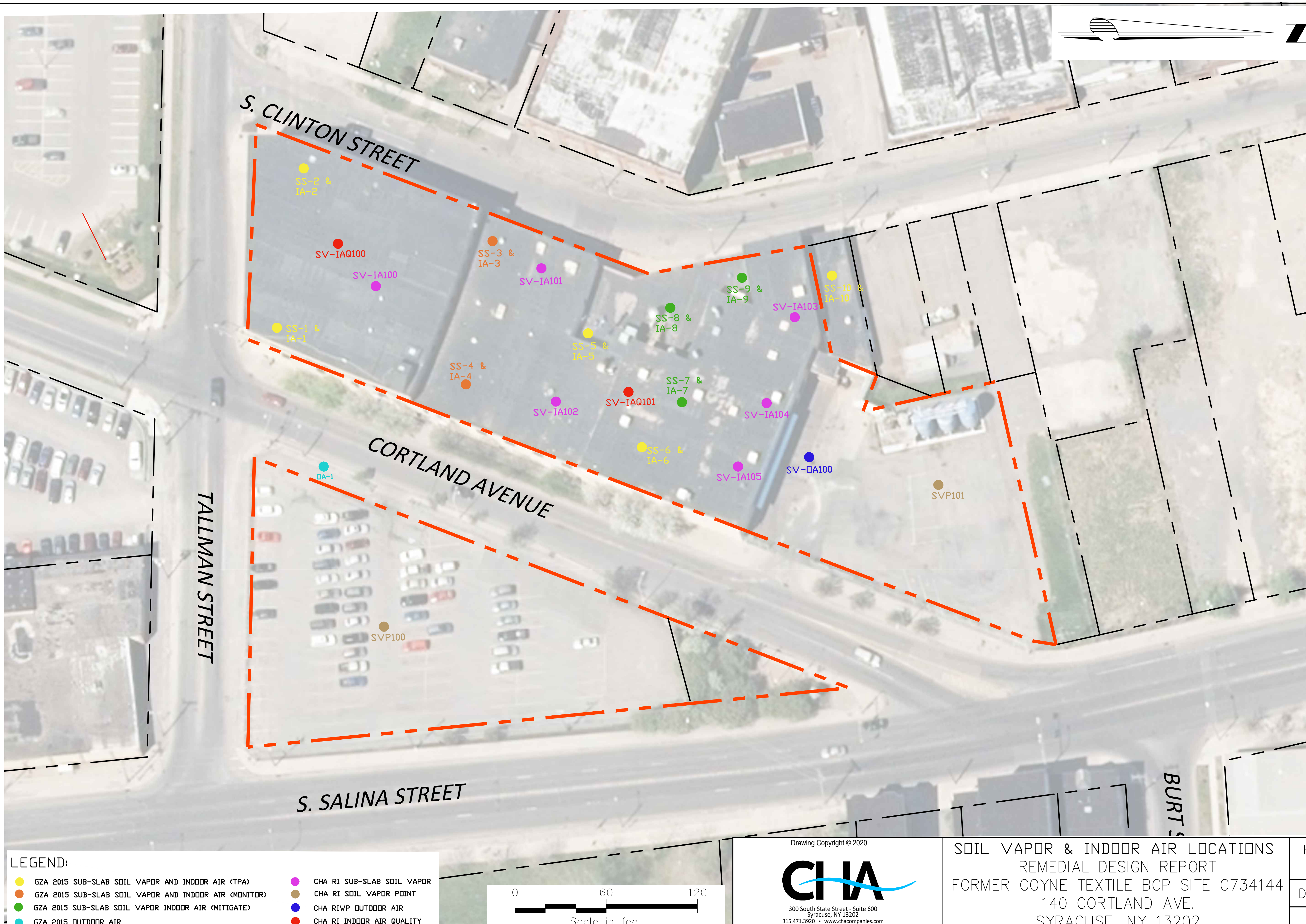
059294.001

DATE: 06/2020

FIGURE 4

File: V:\PROJECTS\ANY\K5\059294.001\CADD_ACAD\ENVP\COYNE\RD REPORT FIGURES.DWG Saved: 6/17/2020 12:26:40 PM Plotted: 6/18/2020 4:25:45 PM Current User: Miller, Samantha LastSavedBy: 4187

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SOIL VAPOR & INDOOR AIR LOCATIONS
REMEDIAL DESIGN REPORT
FORMER COYNE TEXTILE BCP SITE C734144
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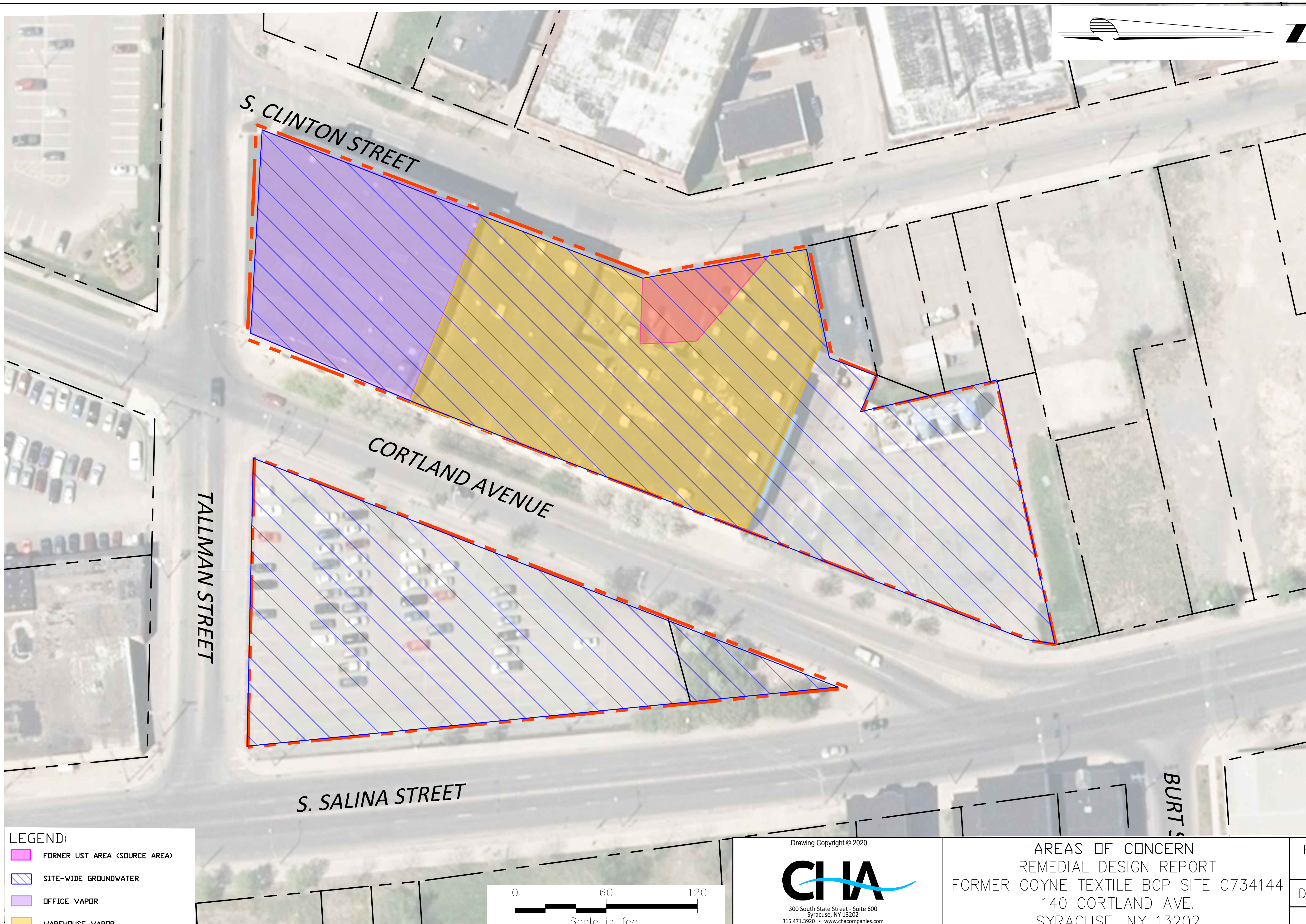
SYRACUSE, NY 13202

PROJECT NO. 059294.001

DATE: 06/2020

FIGURE 5

File: V:\PROJECTS\ANY\K5\059294.001\CADD_ACAD\ENVP\COYNE\RD REPORT FIGURES.DWG Saved: 6/17/2020 12:26:40 PM Plotted: 6/18/2020 4:25:50 PM Current User: Miller, Samantha LastSavedBy: 4187




LEGEND:

- FORMER UST AREA (SOURCE AREA)
- SITE-WIDE GROUNDWATER
- OFFICE VAPOR
- WAREHOUSE VAPOR

0 60 120
Scale in feet



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AREAS OF CONCERN
REMEDIAL DESIGN REPORT
FORMER COYNE TEXTILE BCP SITE C734144
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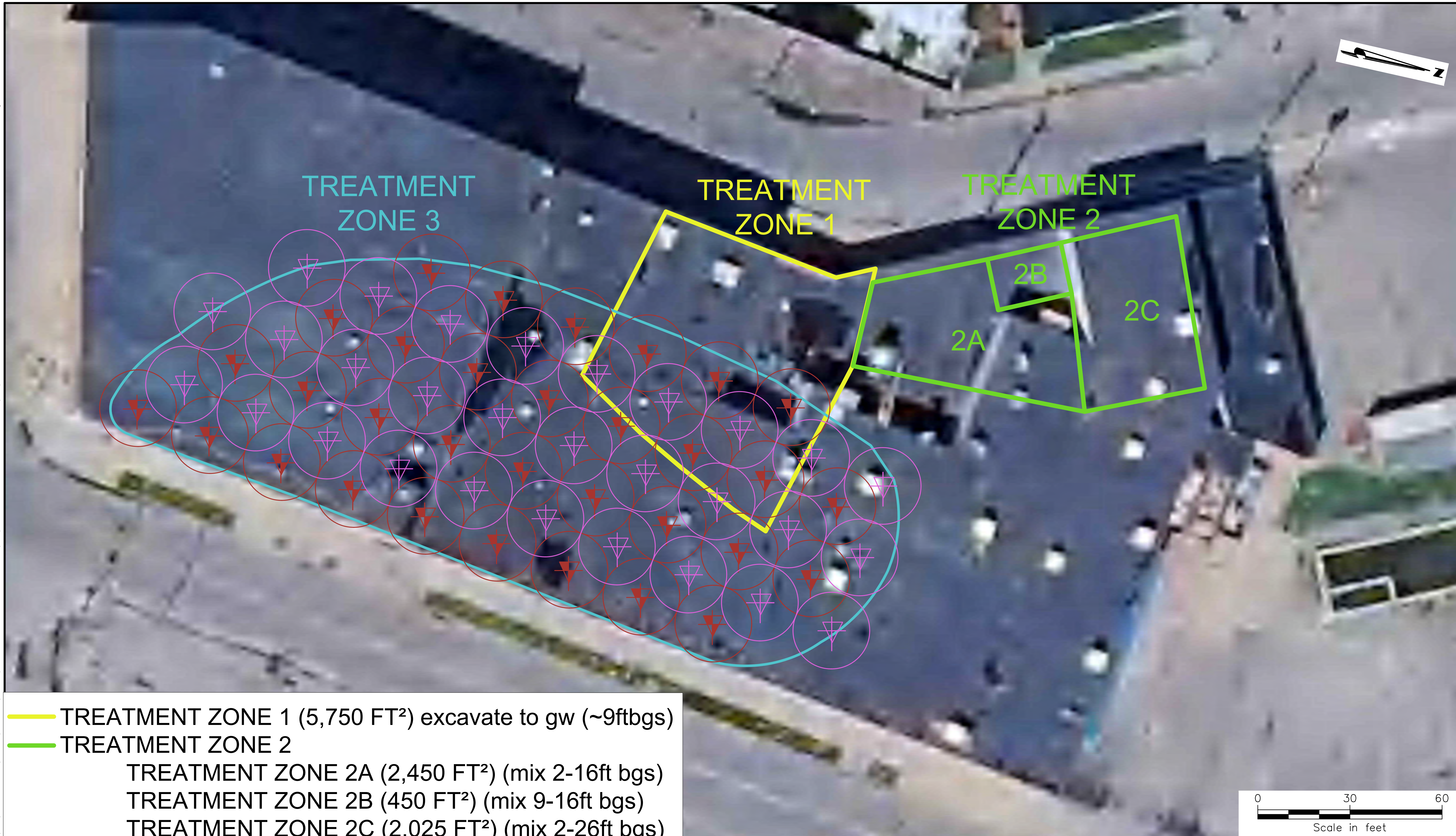
SYRACUSE, NY 13202

PROJECT NO.
059294.001

DATE: 06/2020

FIGURE 6

File: V:\PROJECTS\ANY\K5\059294.001\CADD_ACAD\ENVP\COYNE\RD REPORT FIGURES.DWG Saved: 6/17/2020 12:26:40 PM Plotted: 6/18/2020 4:25:55 PM Current User: Miller, Samantha LastSavedBy: 4187




TREATMENT ZONE 1 (5,750 FT²) excavate to gw (~9ftbgs)
TREATMENT ZONE 2
TREATMENT ZONE 2A (2,450 FT²) (mix 2-16ft bgs)
TREATMENT ZONE 2B (450 FT²) (mix 9-16ft bgs)
TREATMENT ZONE 2C (2,025 FT²) (mix 2-26ft bgs)
TREATMENT ZONE 3 (20,000FT²) screen 15-25ft interval
EXTRACTION WELLS (32)
INJECTION WELLS (29)



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TREATMENT ZONES
REMEDIAL DESIGN REPORT
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SYRACUSE, NY 13202

PROJECT NO. 059294.001
DATE: 06/2020
FIGURE 7

File: V:\PROJECTS\ANY\K5\059294.001\CADD_ACAD\ENVP\DATA POINTS.DWG Saved: 6/17/2020 5:44:01 PM Plotted: 6/18/2020 4:26:03 PM Current User: Miller, Samantha LastSavedBy: 4187


TREATMENT ZONE 1 (5,750 FT²)
TREATMENT ZONE 2
TREATMENT ZONE 2A
TREATMENT ZONE 2B
TREATMENT ZONE 2C
TREATMENT ZONE 3 (20,000FT²)
MIP LOCATION



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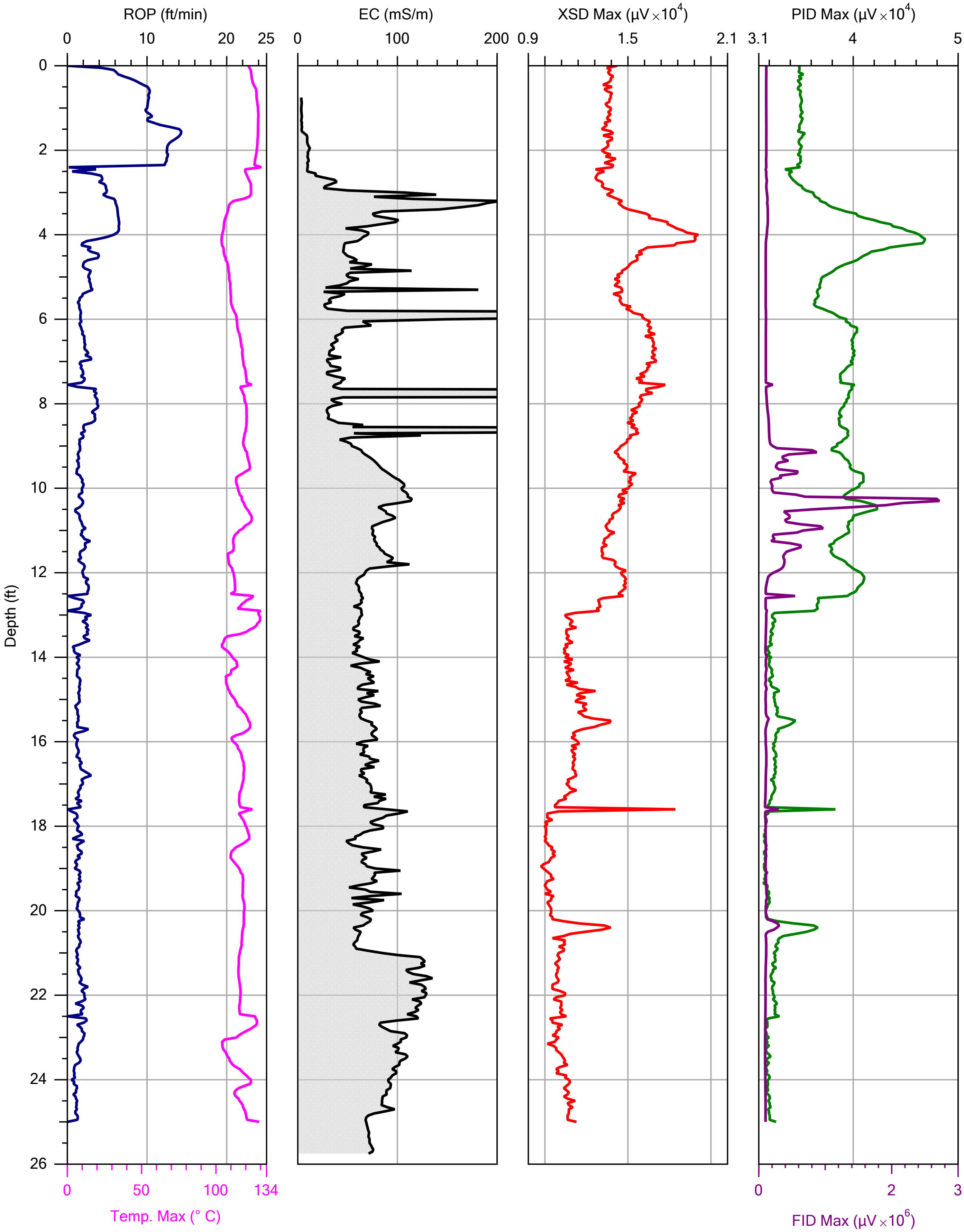
MIHPT INVESTIGATION LOCATIONS
REMEDIAL DESIGN REPORT
FORMER COYNE TEXTILE BCP SITE C734144
140 CORTLAND AVE.
SYRACUSE, NY 13202

PROJECT NO. 059294.001
DATE: 06/2020
FIGURE 8

File: V:\PROJECTS\ANY\K5\059294.001\CADD_ACAD\ENVP\DATA POINTS.DWG Saved: 6/17/2020 5:44:01 PM Plotted: 6/18/2020 4:26:05 PM Current User: Miller, Samantha LastSavedBy: 4187

# APPENDIX A

## MIHPT Results




CASCADE
DRILLING | TECHNICAL SERVICES

| | | |
|---|---|---|
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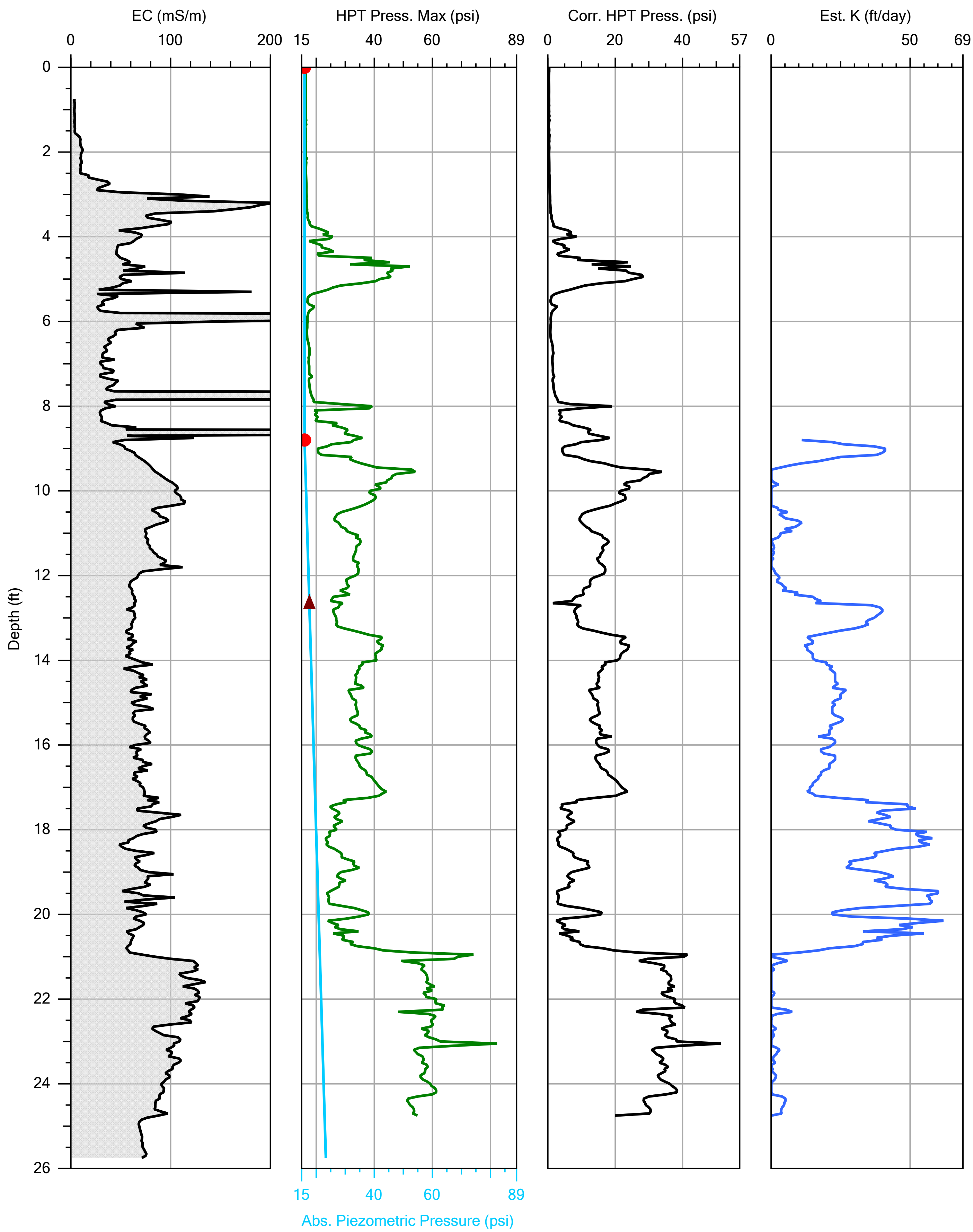
| Company: Cascade Tech Services | Operator: Z. Fordley | Date: 03/03/20 |
| Project ID: | Client: CHA | Location: SYRACUSE |




CASCADE
DRILLING | TECHNICAL SERVICES

| | | |
|---|---|---|
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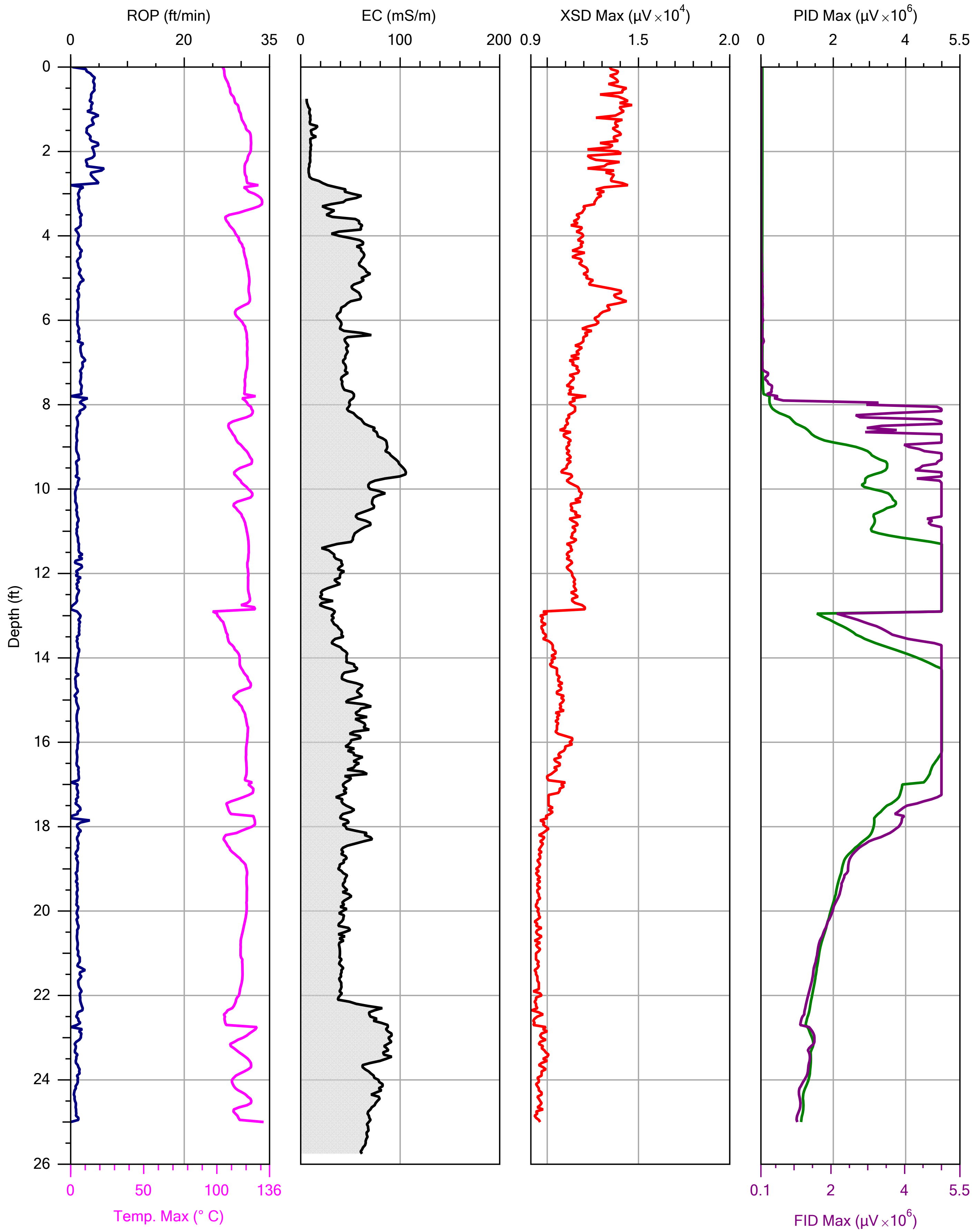
| Company: Cascade Tech Services | Operator: Z. Fordley | Date: 03/03/20 |
| Project ID: | Client: CHA | Location: SYRACUSE |




CASCADE
DRILLING | TECHNICAL SERVICES

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|---|---|---|
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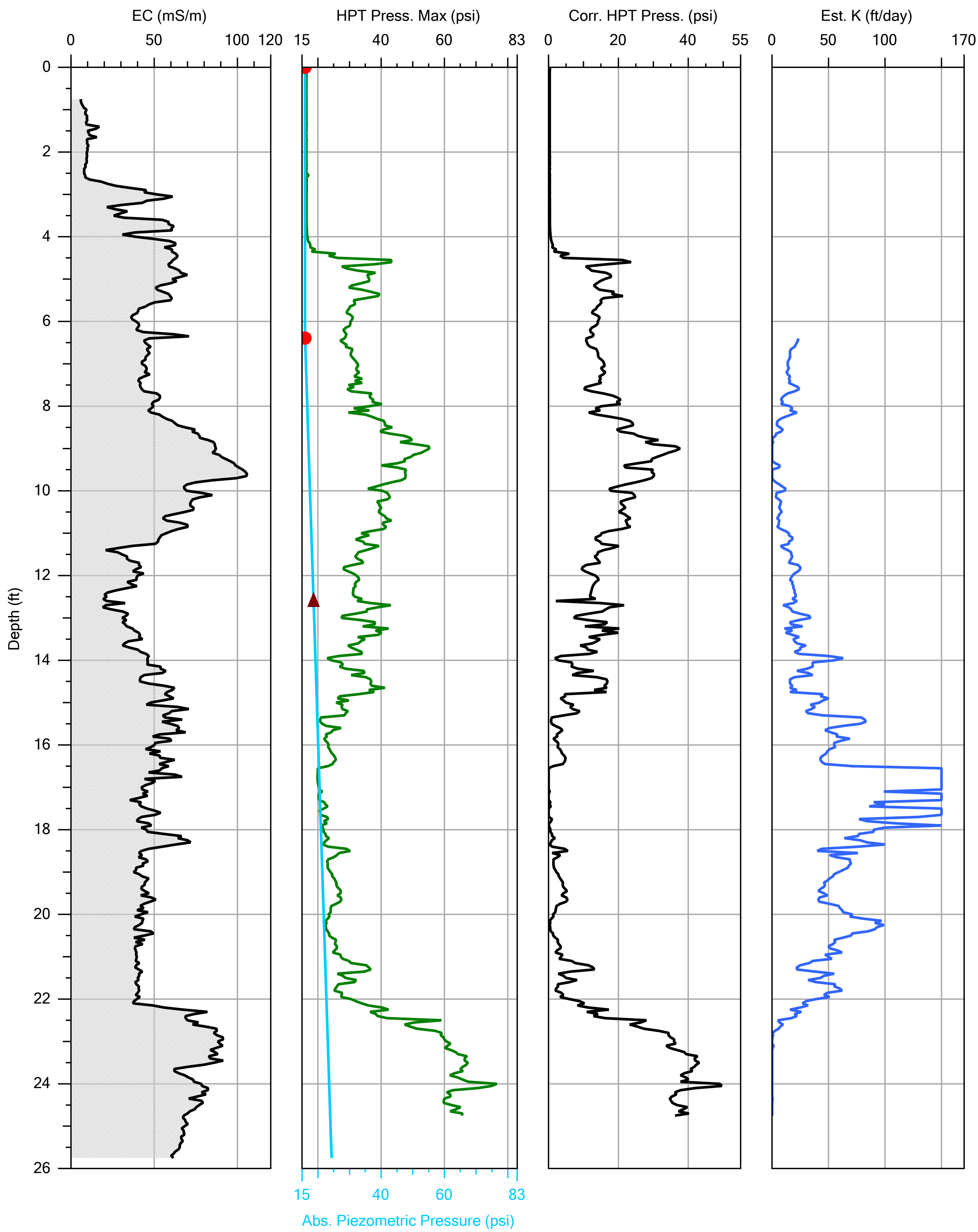
| Project ID: | Client: CHA | Location: SYRACUSE |




CASCADE
DRILLING | TECHNICAL SERVICES

| | | |
|---|---|---|
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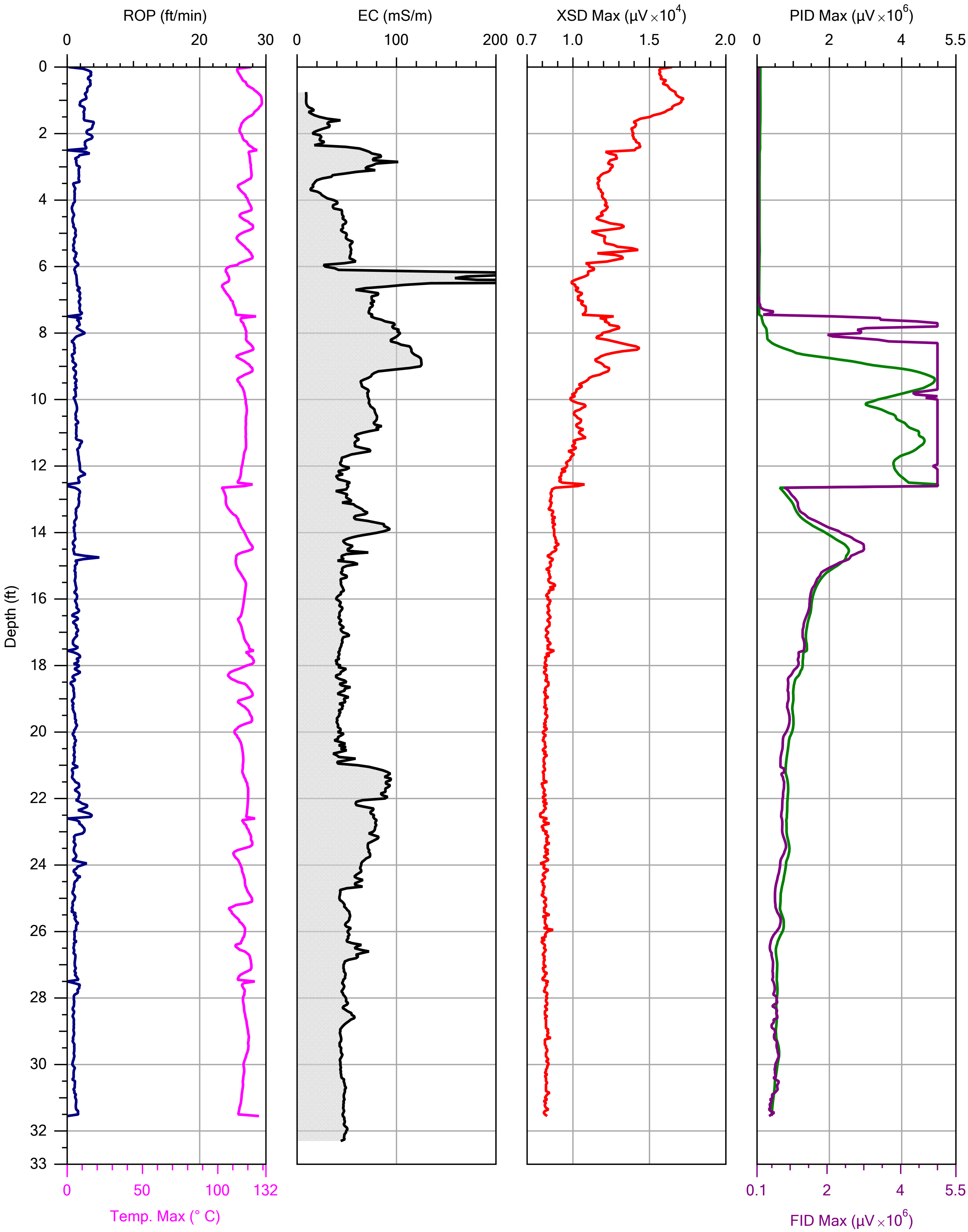
| Company: Cascade Tech Services | Operator: Z. Fordley | Date: 03/03/20 |
| Project ID: | Client: CHA | Location: SYRACUSE |




| | | |
|---|---|---|
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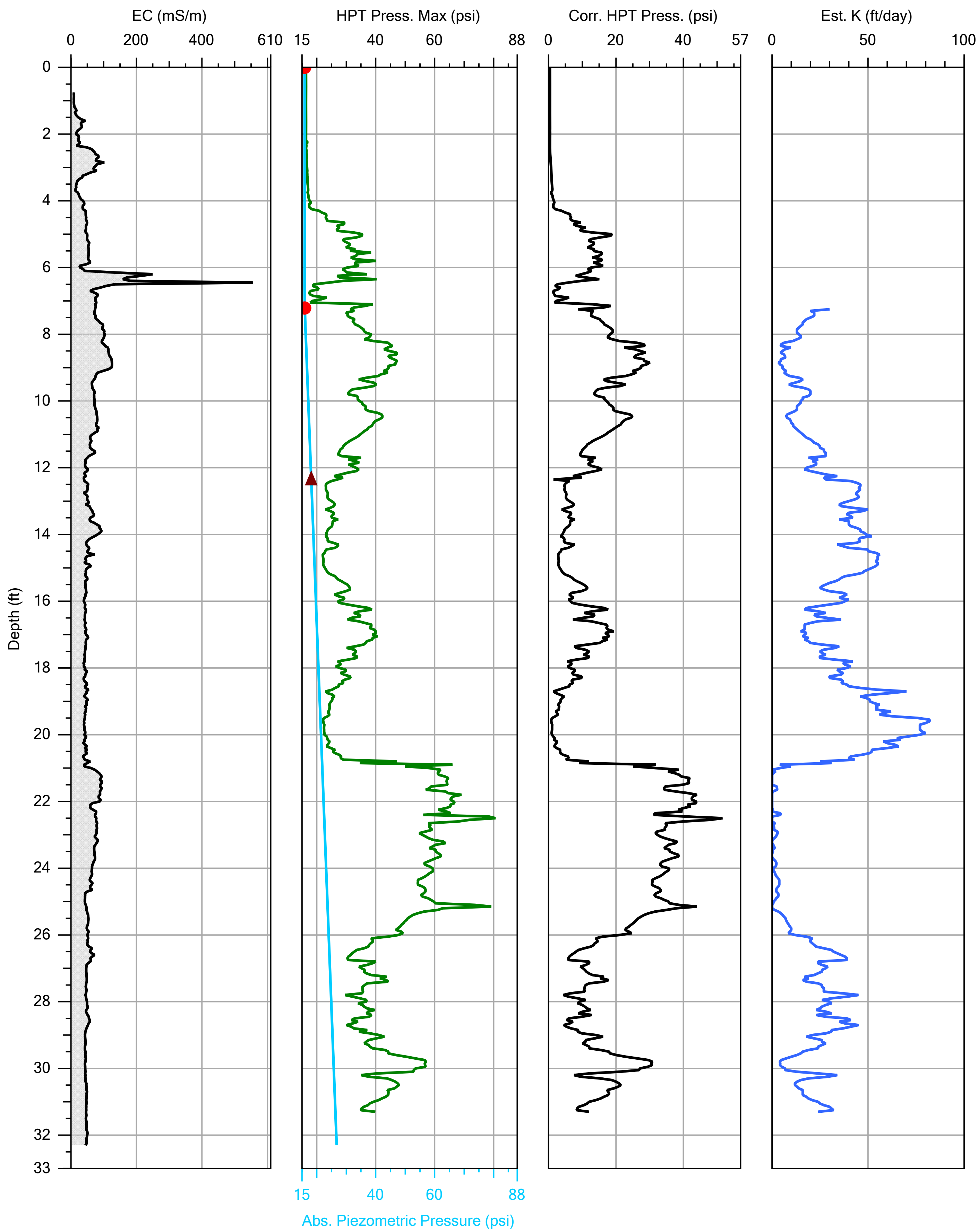
| Company: Cascade Tech Services | Operator: Z. Fordley | Date: 03/03/20 |
| Project ID: | Client: CHA | Location: SYRACUSE |




CASCADE DRILLING | TECHNICAL SERVICES

| | | |
|---|---|---|
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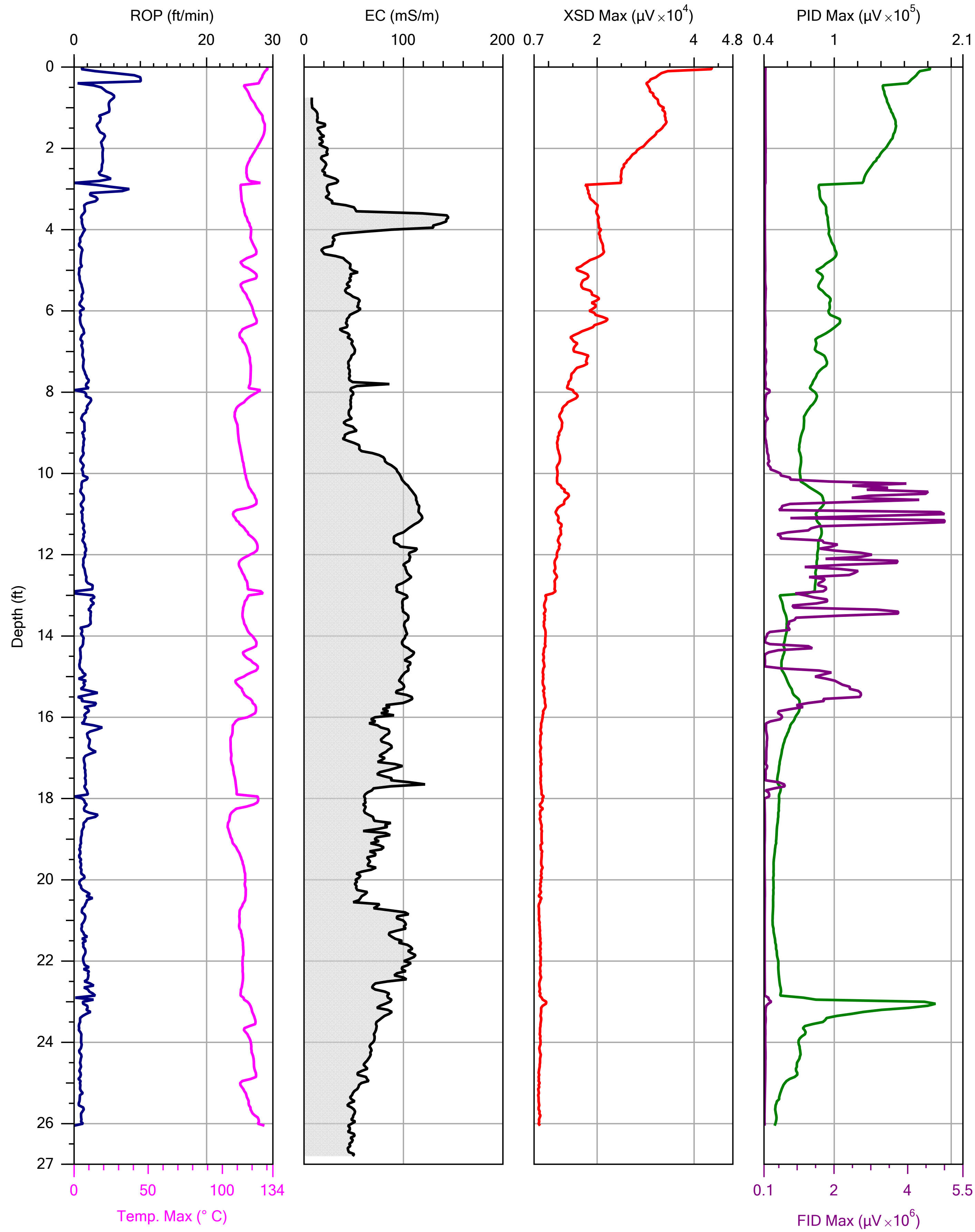
| Project ID: | Client: CHA | Location: SYRACUSE |




CASCADE
DRILLING | TECHNICAL SERVICES

| | | |
|---|---|---|
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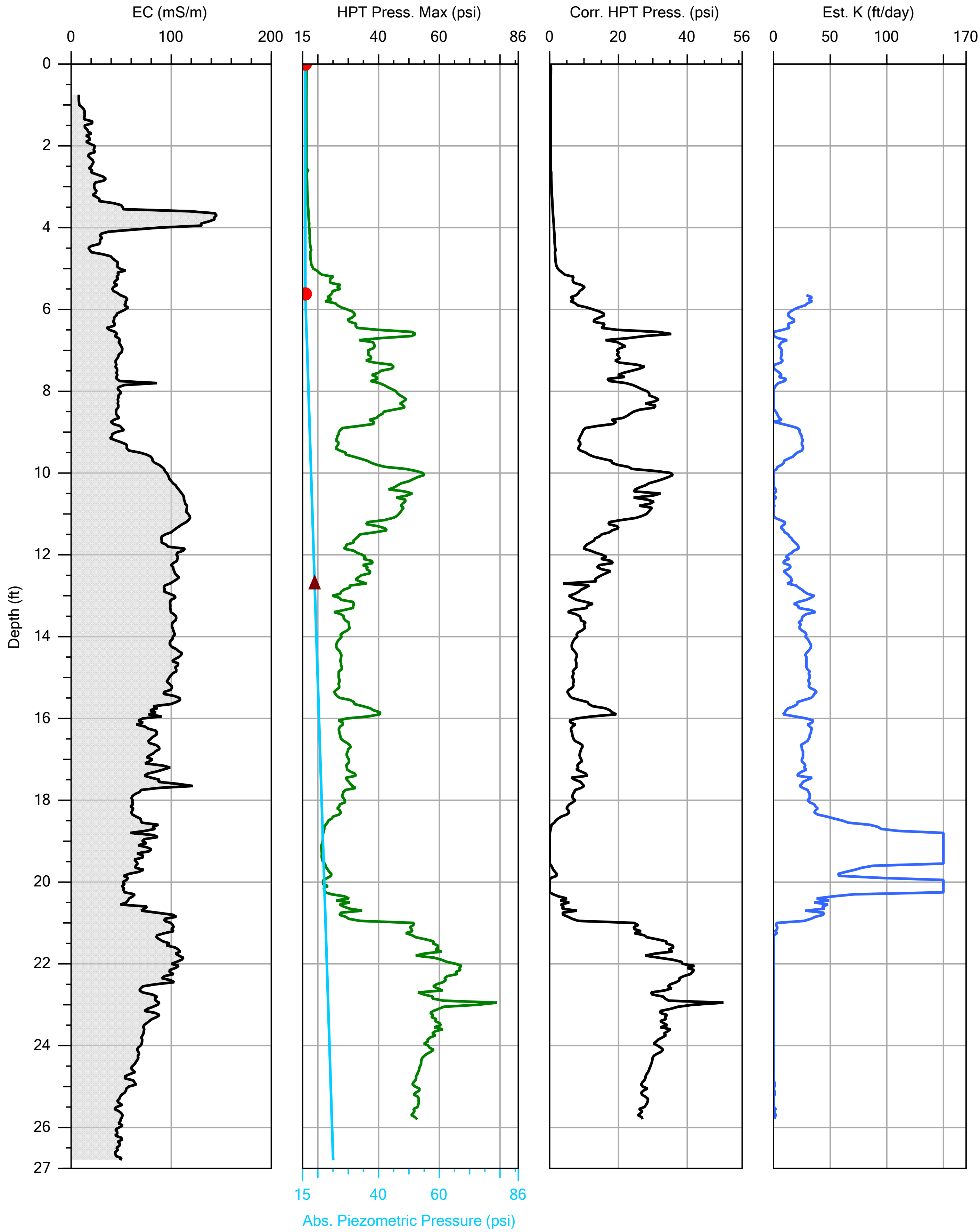


CASCADE
DRILLING | TECHNICAL SERVICES

| | | |
|---|---|---|
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| Company: Cascade Tech Services | Operator: Z. Fordley | Date: 03/03/20 |
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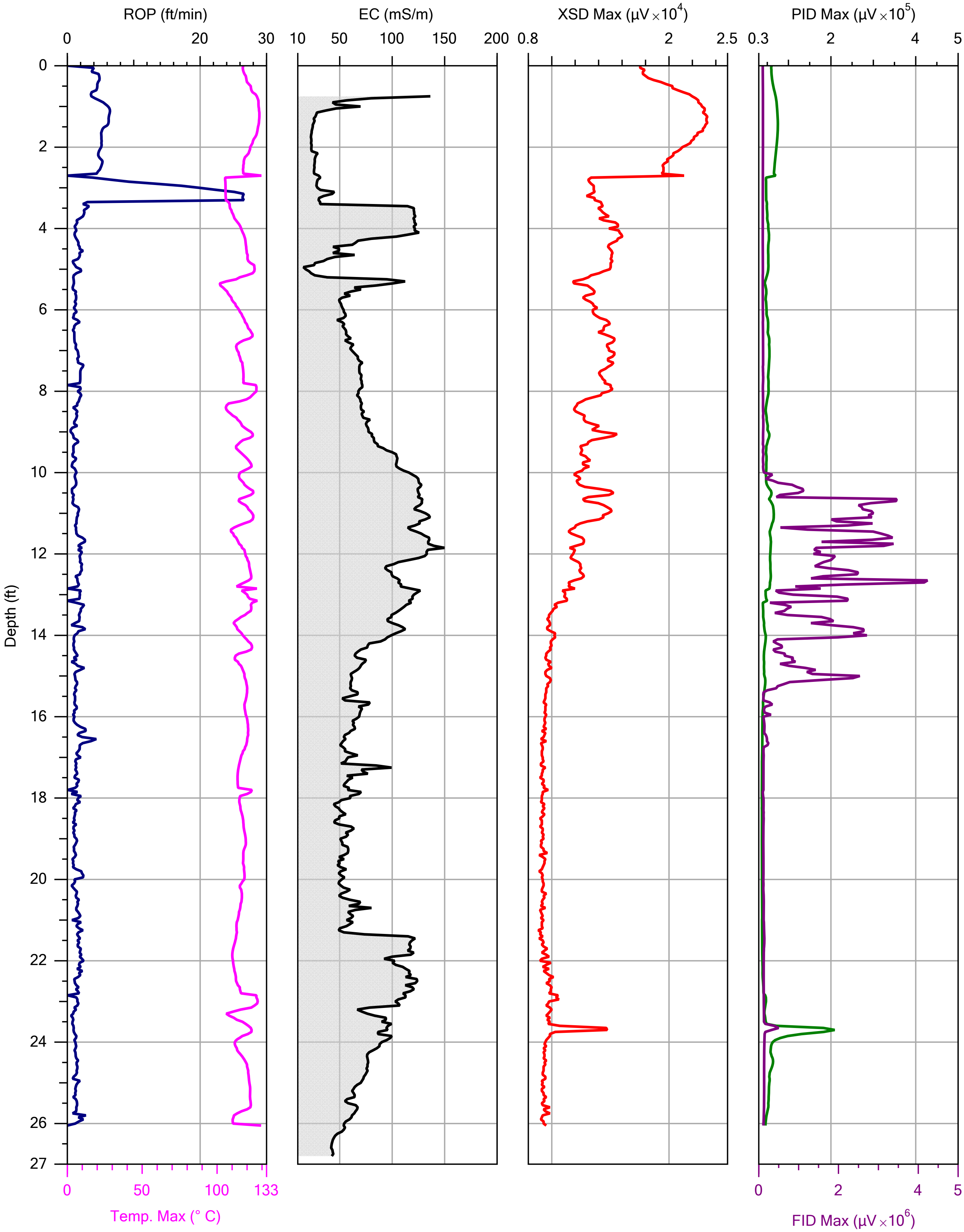


CASCADE
DRILLING | TECHNICAL SERVICES

| | | |
|---|---|---|
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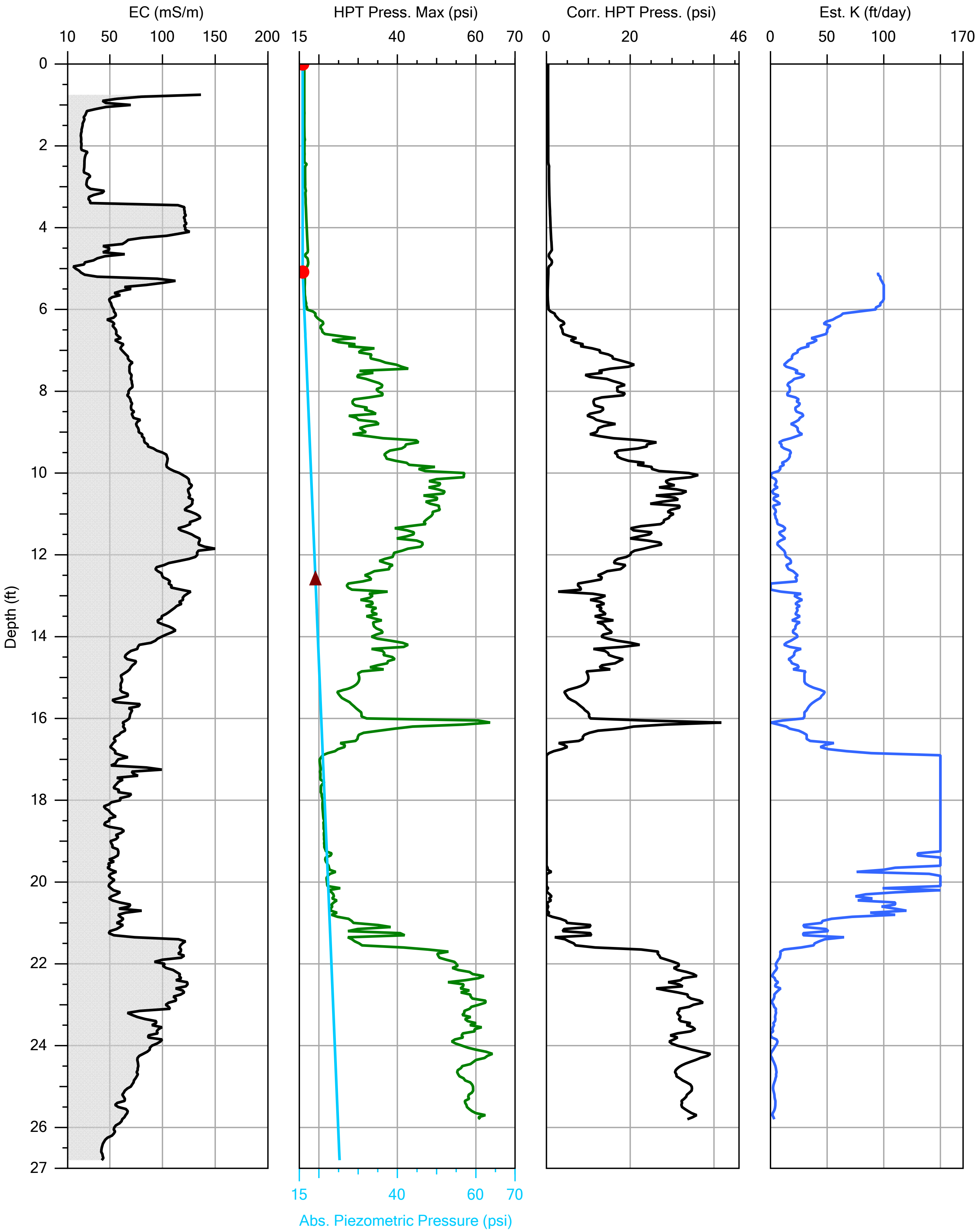
| Project ID: | Client: CHA | Location: SYRACUSE |




CASCADE
DRILLING | TECHNICAL SERVICES

| | | |
|---|---|---|
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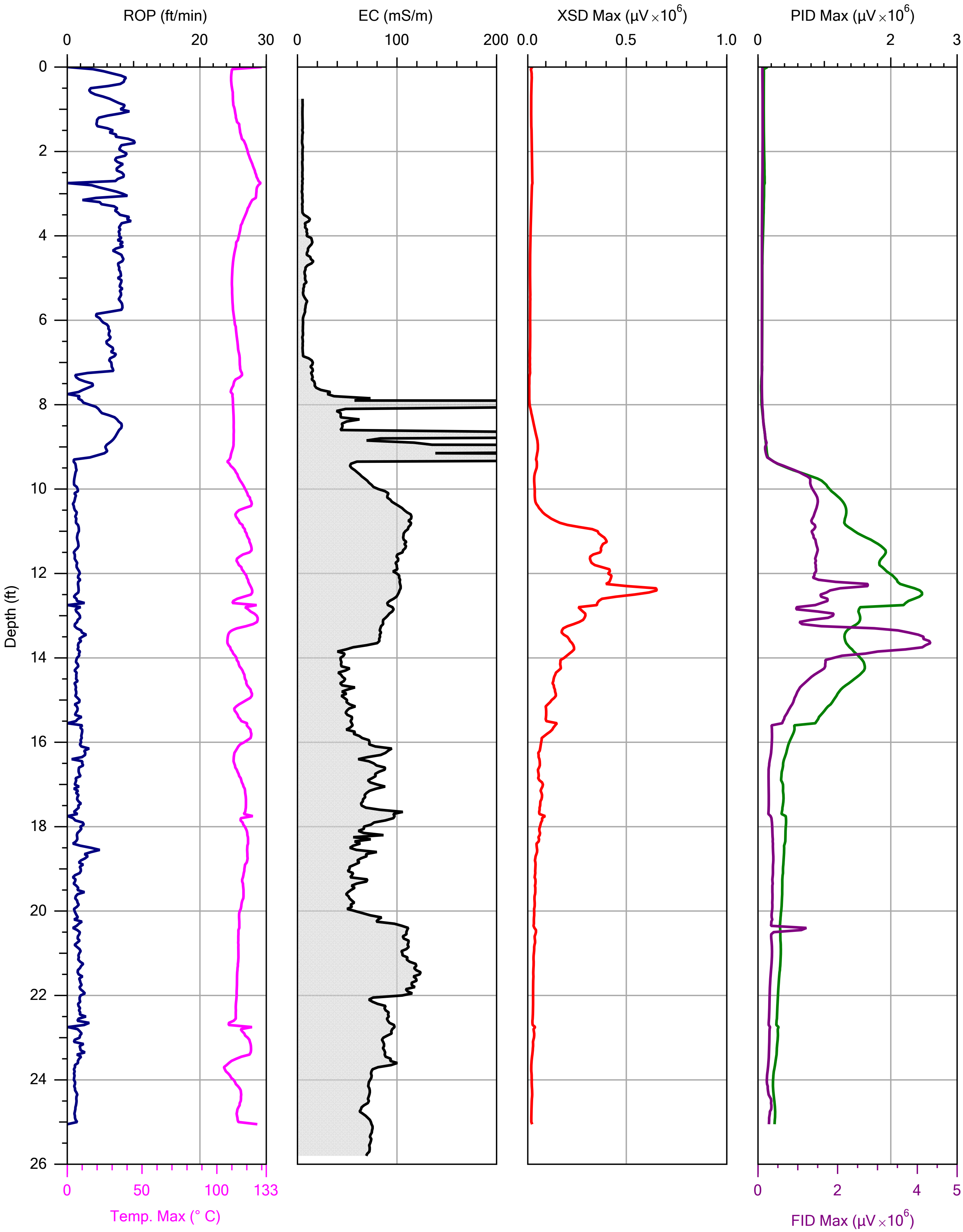
| Project ID: | Client: CHA | Location: SYRACUSE |




| Company: Cascade Tech Services | Operator: Z. Fordley | File: MIHPT-06.MHP |
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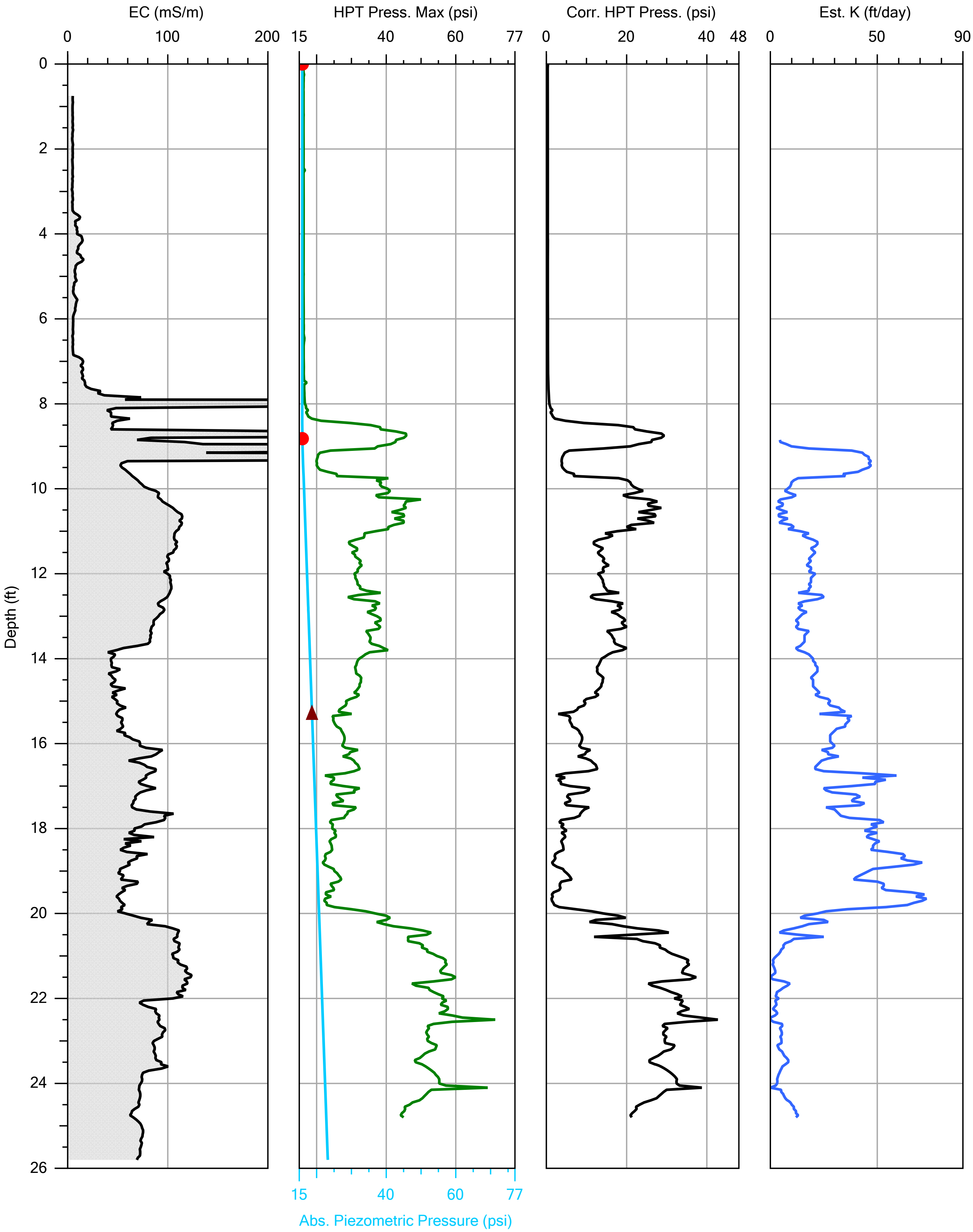
| Project ID: | Client: CHA | Location: SYRACUSE |




| Company: Cascade Tech Services | Operator: Z. Fordley | File: MIHPT-06.MHP |
|---|---|---|
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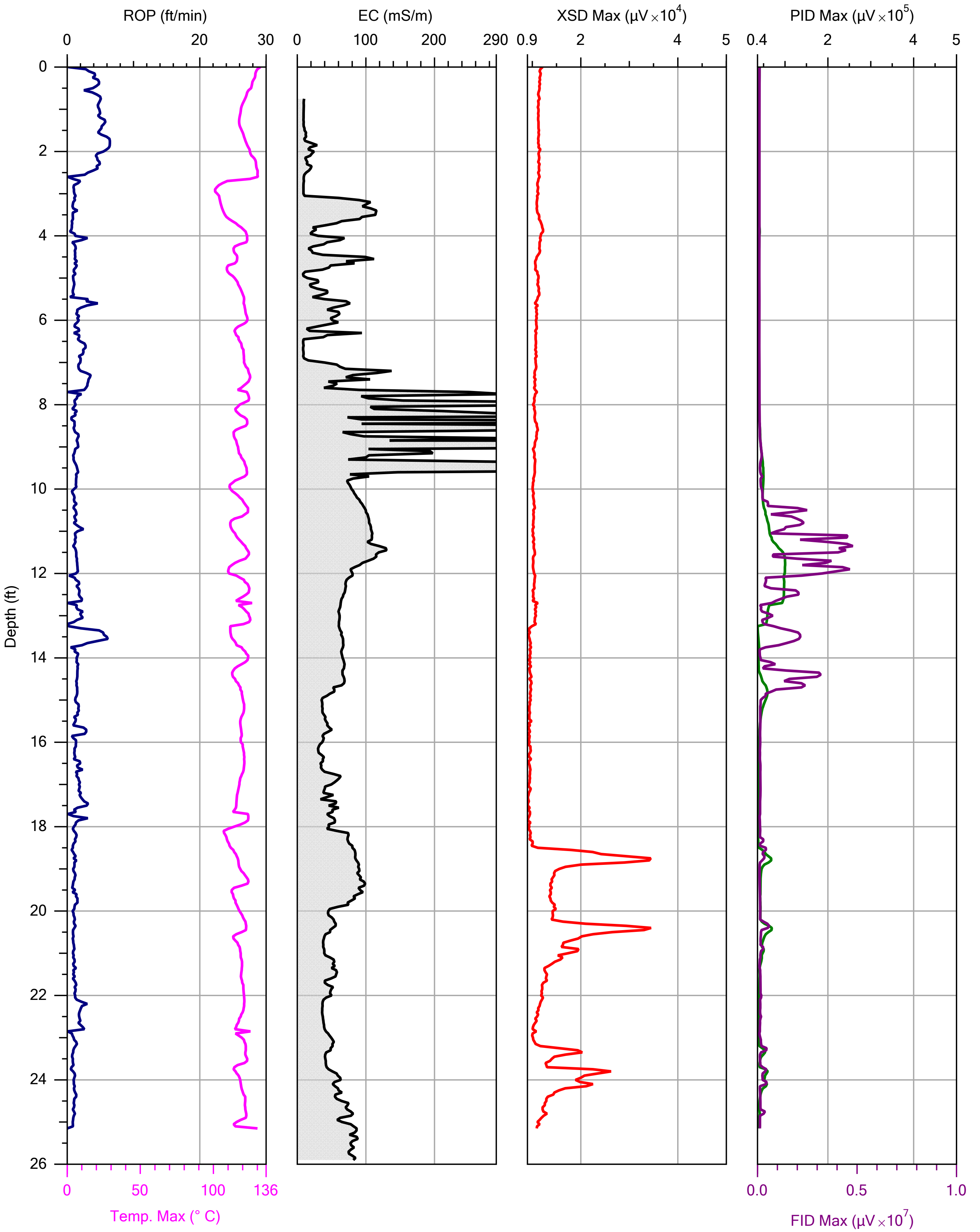
| Project ID: | Client: CHA | Location: SYRACUSE |




CASCADE
DRILLING | TECHNICAL SERVICES

| | | |
|---|---|---|
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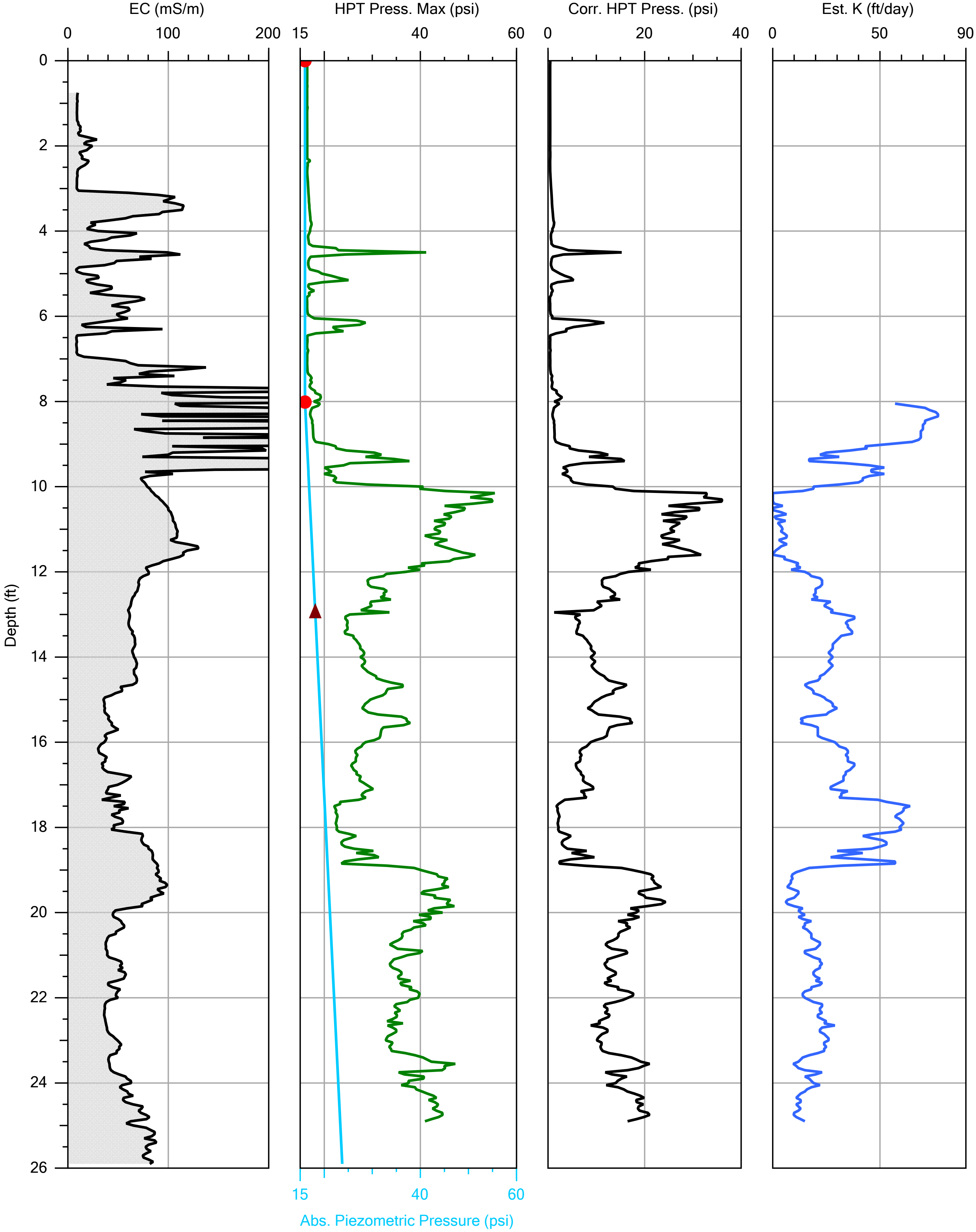
| Company: Cascade Tech Services | Operator: Z. Fordley | Date: 03/04/20 |
| Project ID: | Client: CHA | Location: SYRACUSE |




CASCADE DRILLING | TECHNICAL SERVICES

| | | |
|---|---|---|
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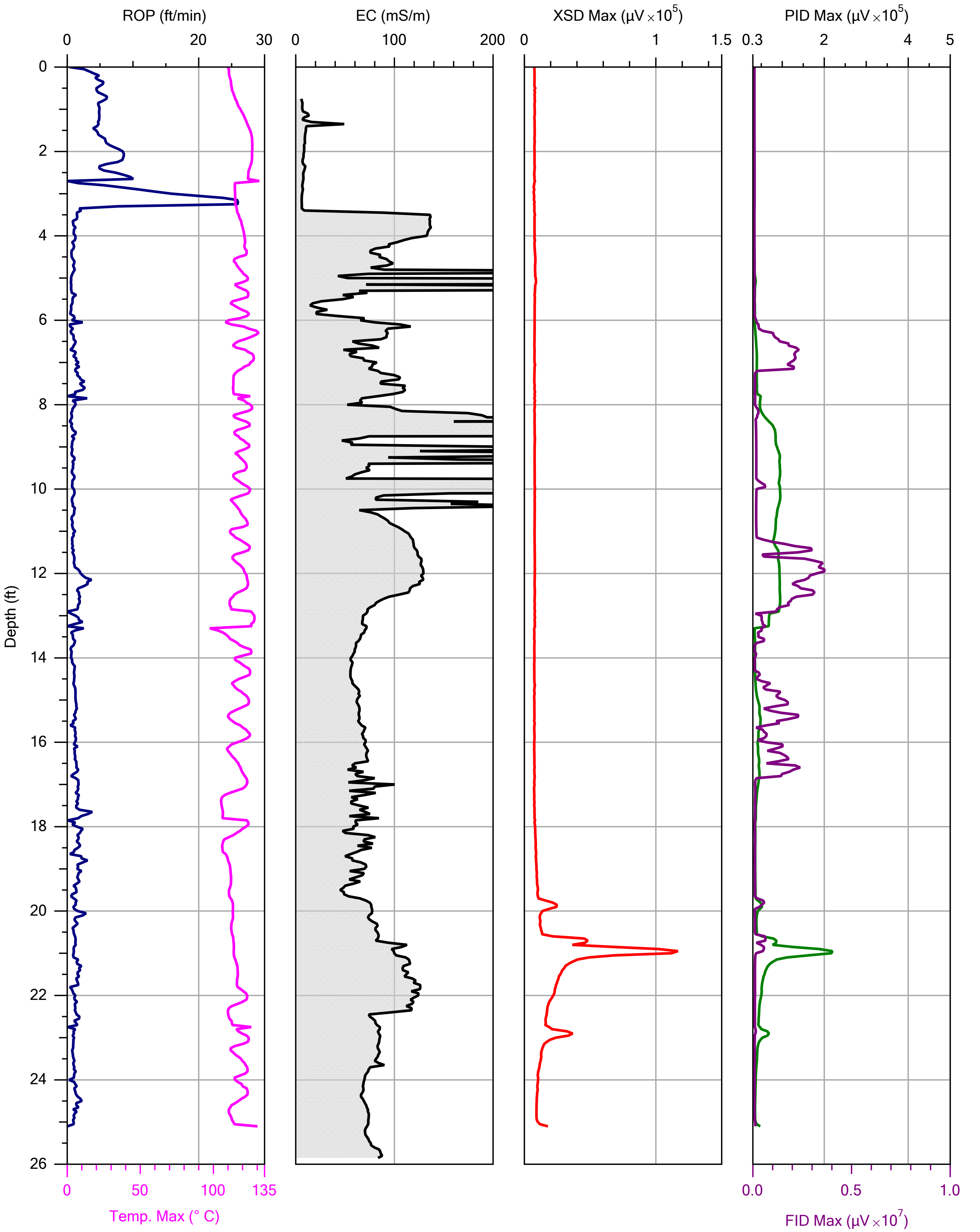
| Company: Cascade Tech Services | Operator: Z. Fordley | Date: 03/04/20 |
| Project ID: | Client: CHA | Location: SYRACUSE |




CASCADE
DRILLING | TECHNICAL SERVICES

| | | |
|---|---|---|
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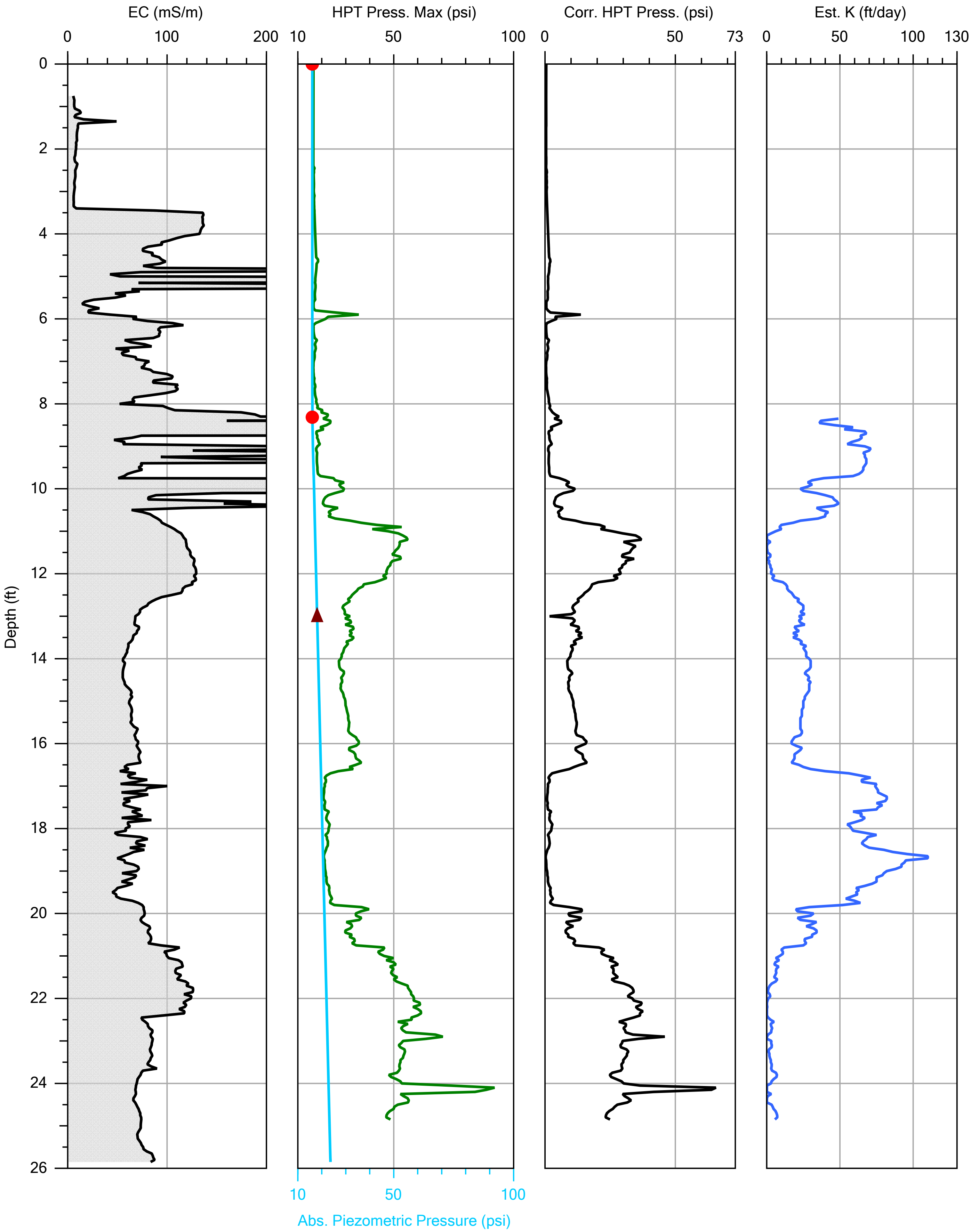


| Company: Cascade Tech Services | Operator: Z. Fordley | File: MIHPT-08.MHP |
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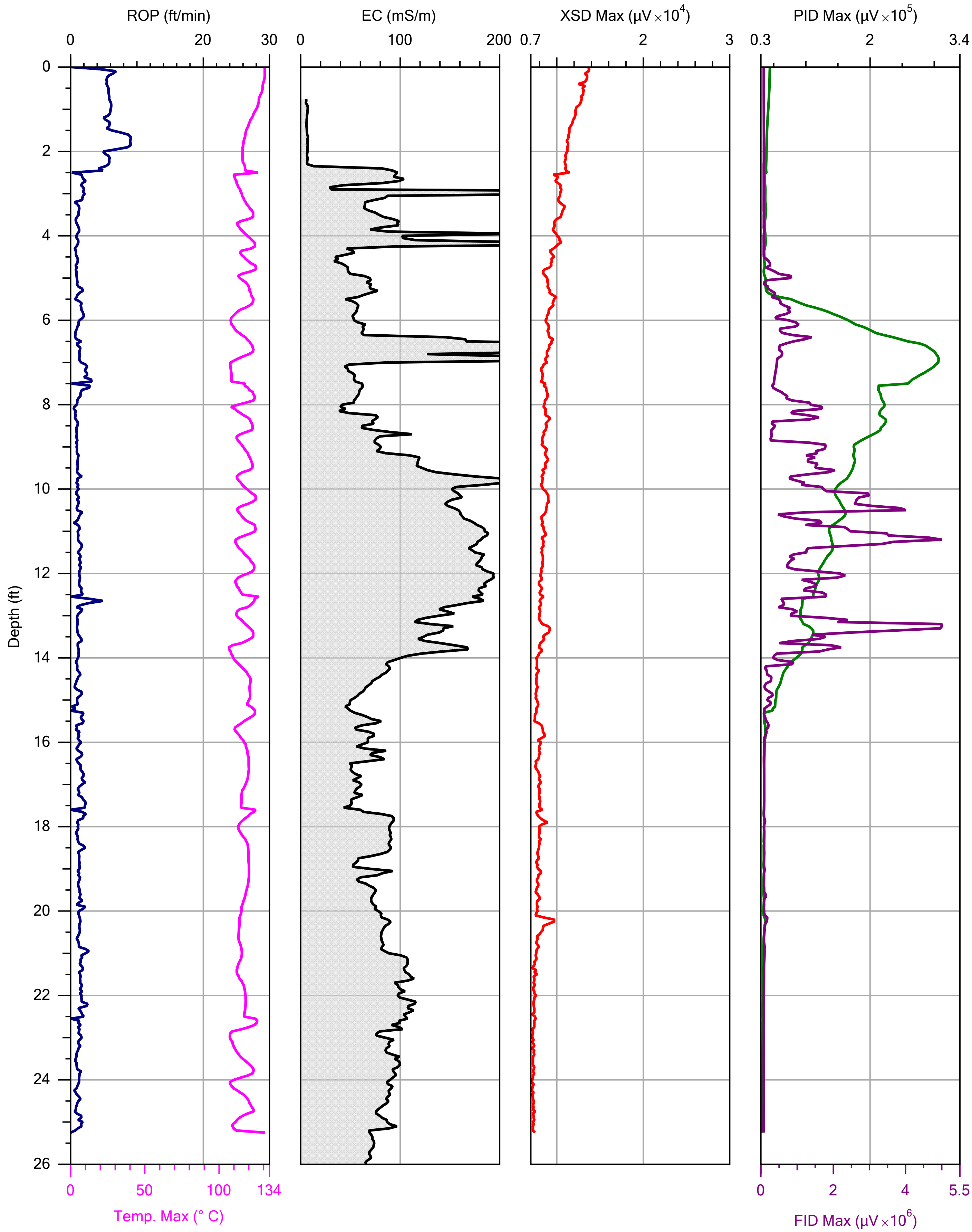
| Project ID: | Client: CHA | Location: SYRACUSE |




CASCADE DRILLING | TECHNICAL SERVICES

| | | |
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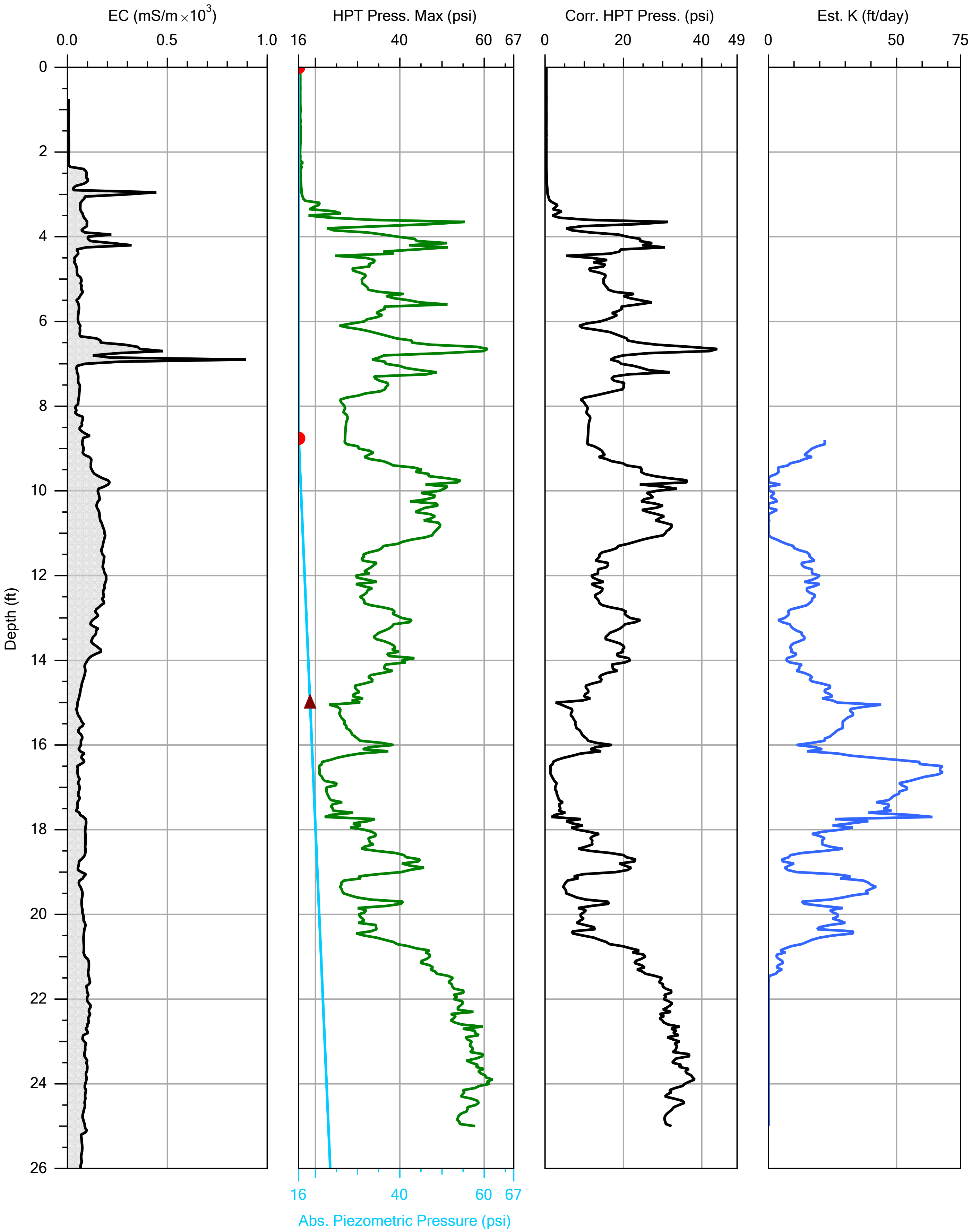
| Project ID: | Client: CHA | Location: SYRACUSE |




CASCADE
DRILLING | TECHNICAL SERVICES

| | | |
|---|---|---|
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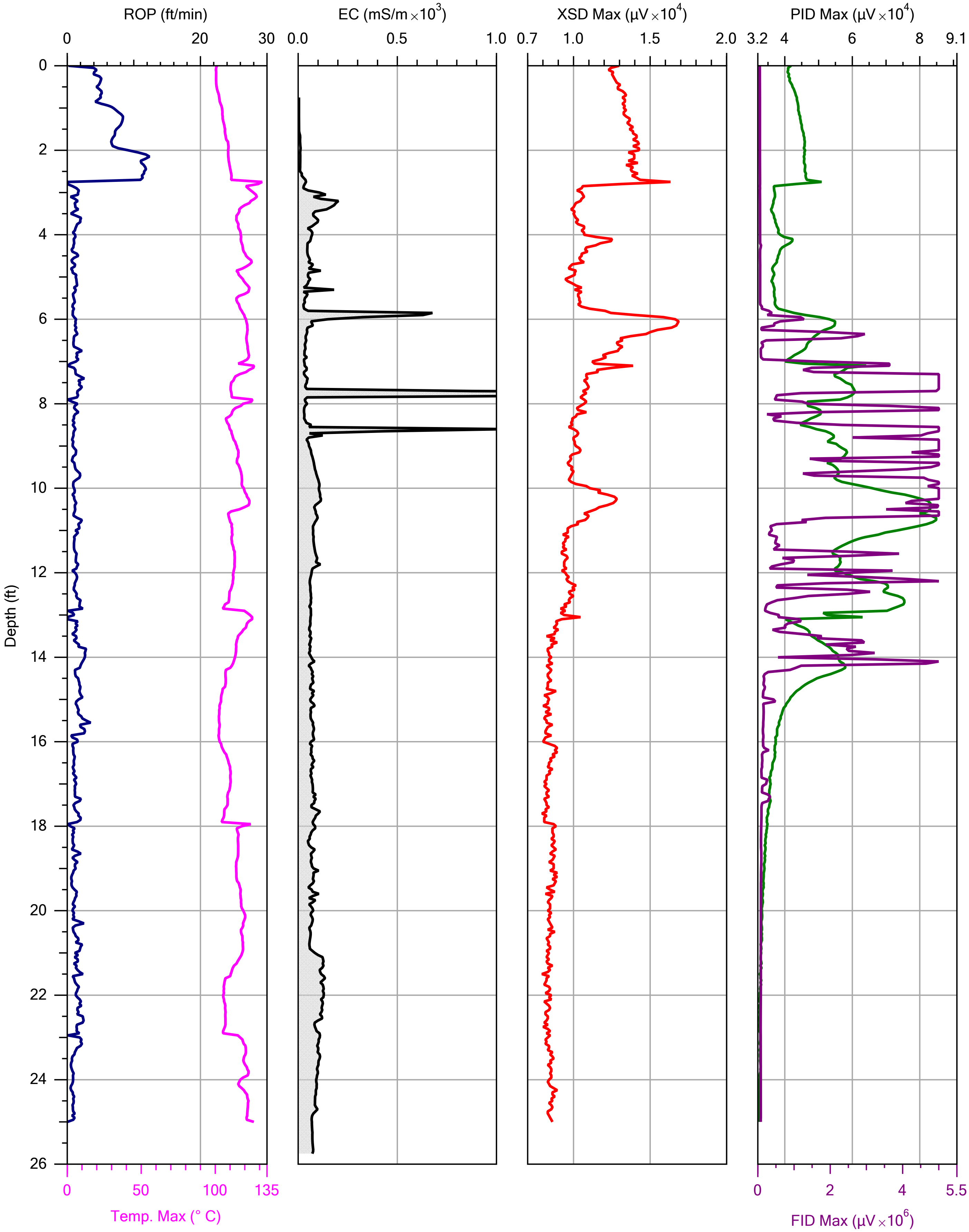
| Company: Cascade Tech Services | Operator: Z. Fordley | Date: 03/04/20 |
| Project ID: | Client: CHA | Location: SYRACUSE |




CASCADE DRILLING | TECHNICAL SERVICES

| | | |
|---|---|---|
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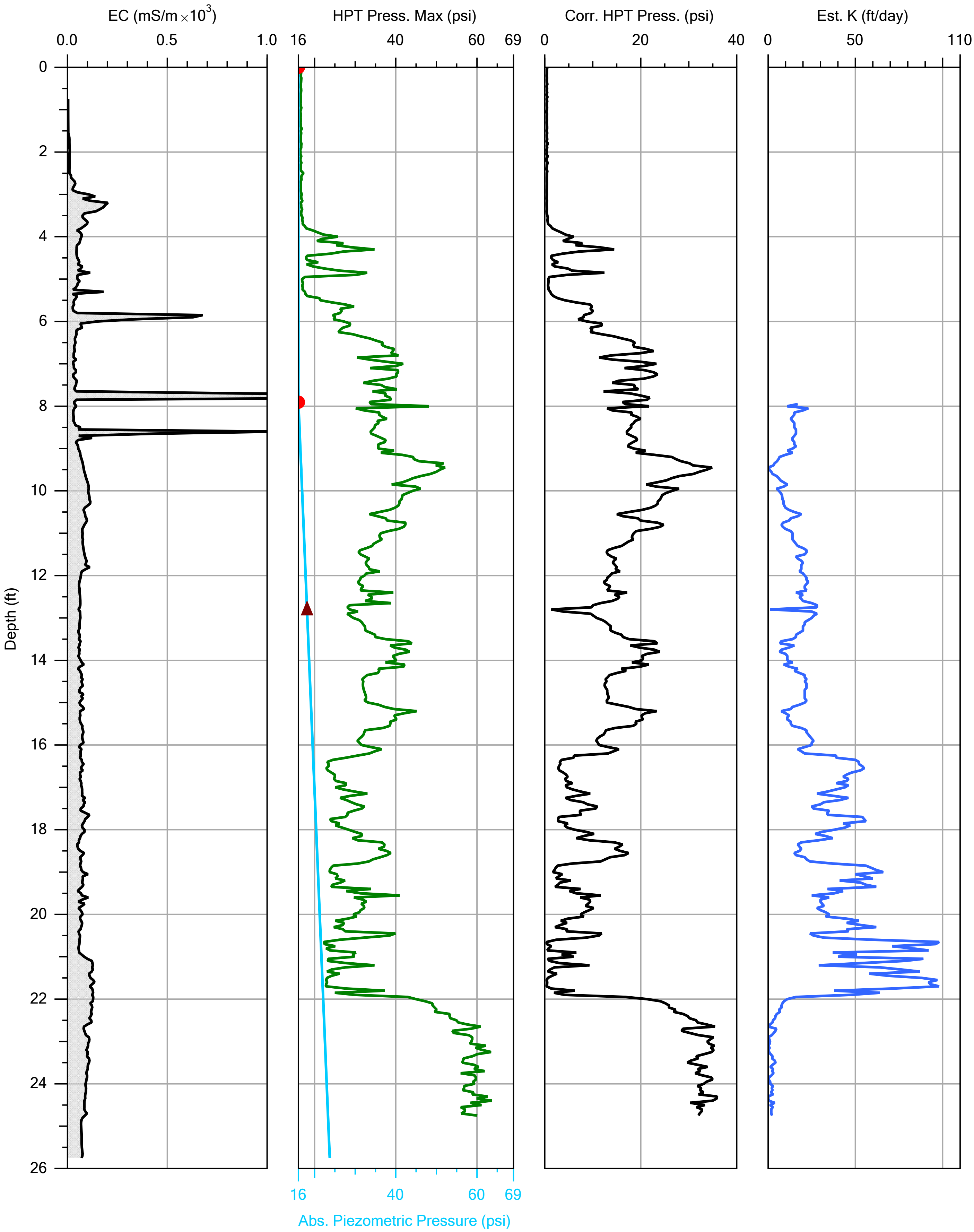


CASCADE
DRILLING | TECHNICAL SERVICES

| | | |
|---|---|---|
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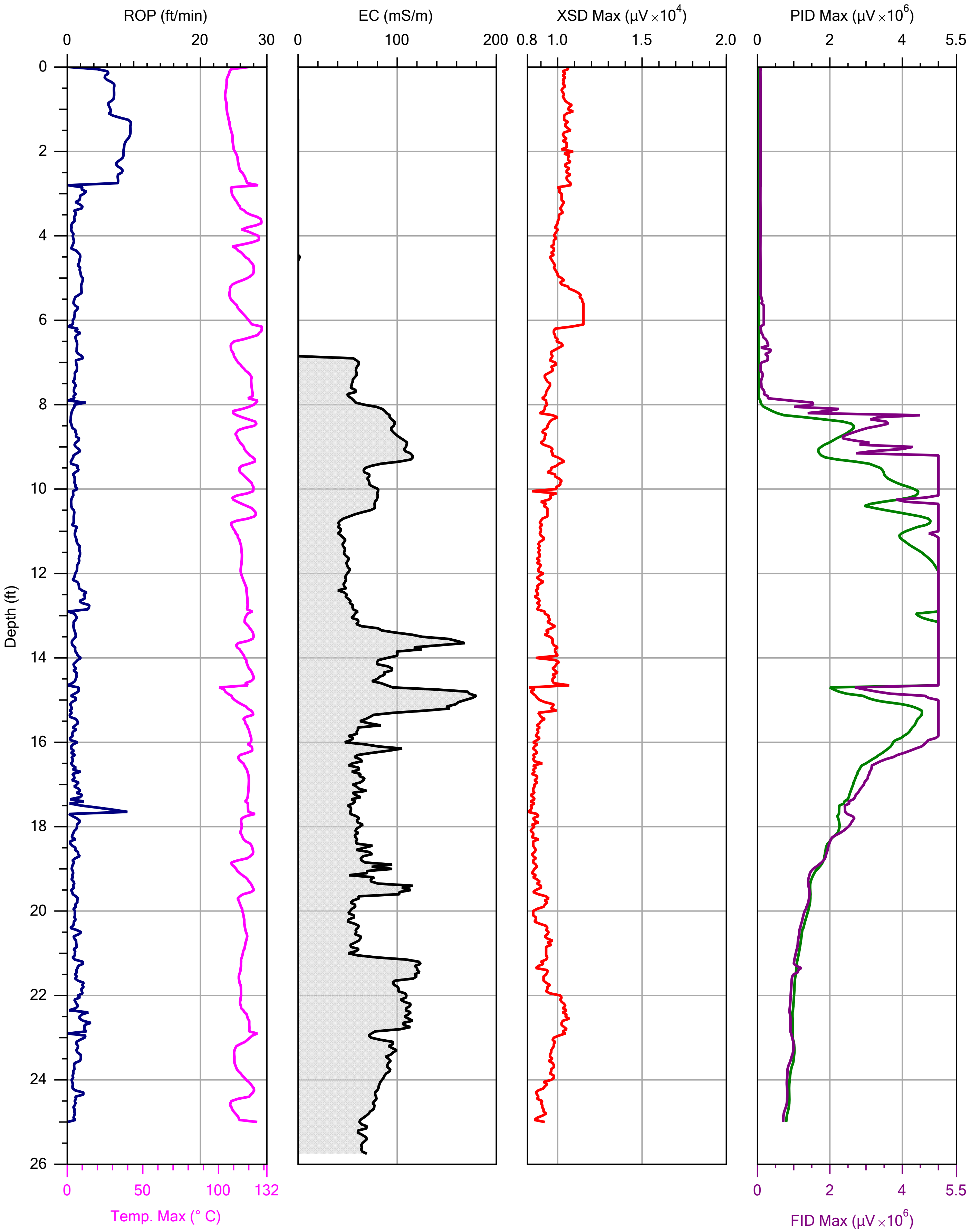


CASCADE
DRILLING | TECHNICAL SERVICES

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|---|---|---|
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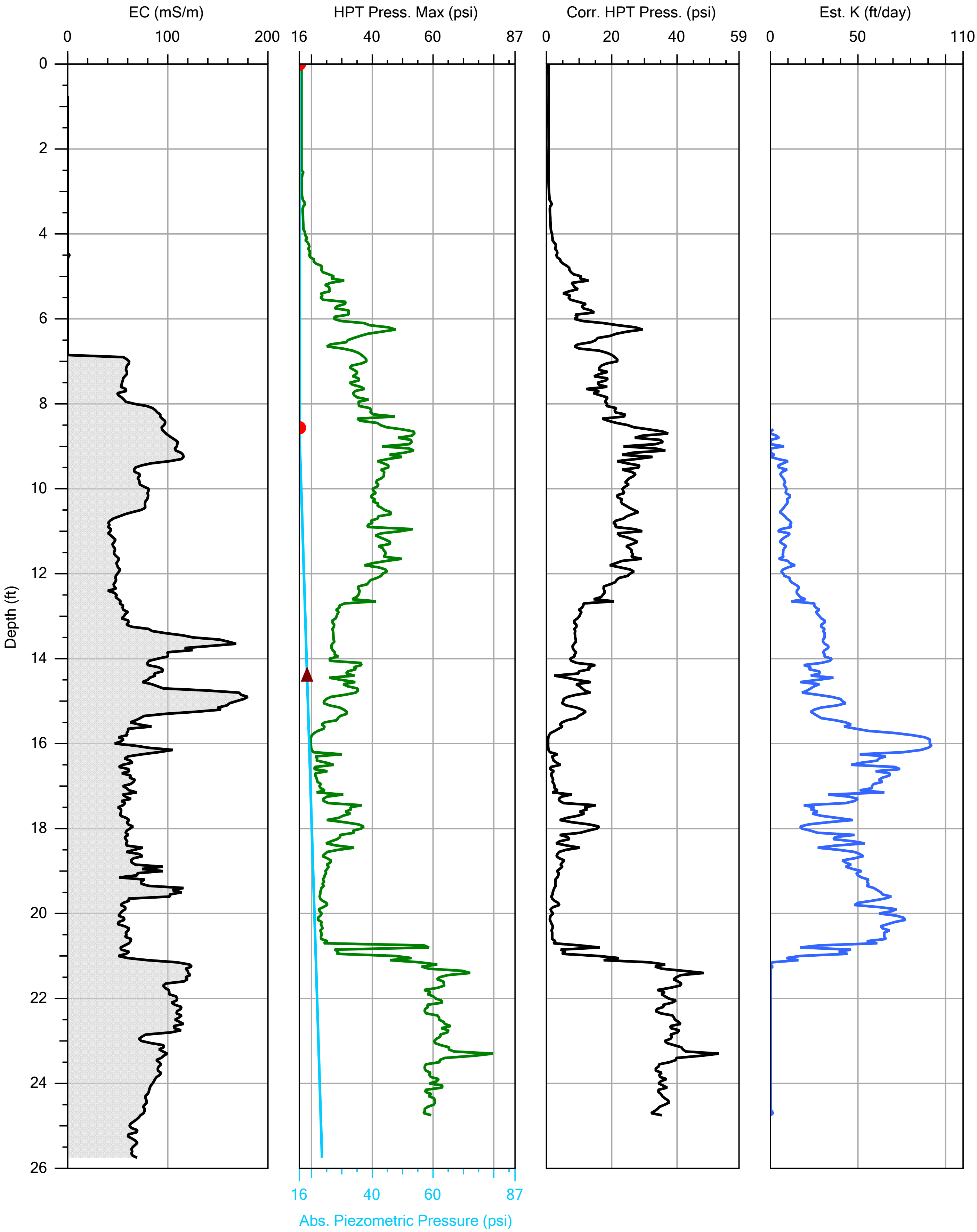


CASCADE DRILLING | TECHNICAL SERVICES

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|---|---|---|
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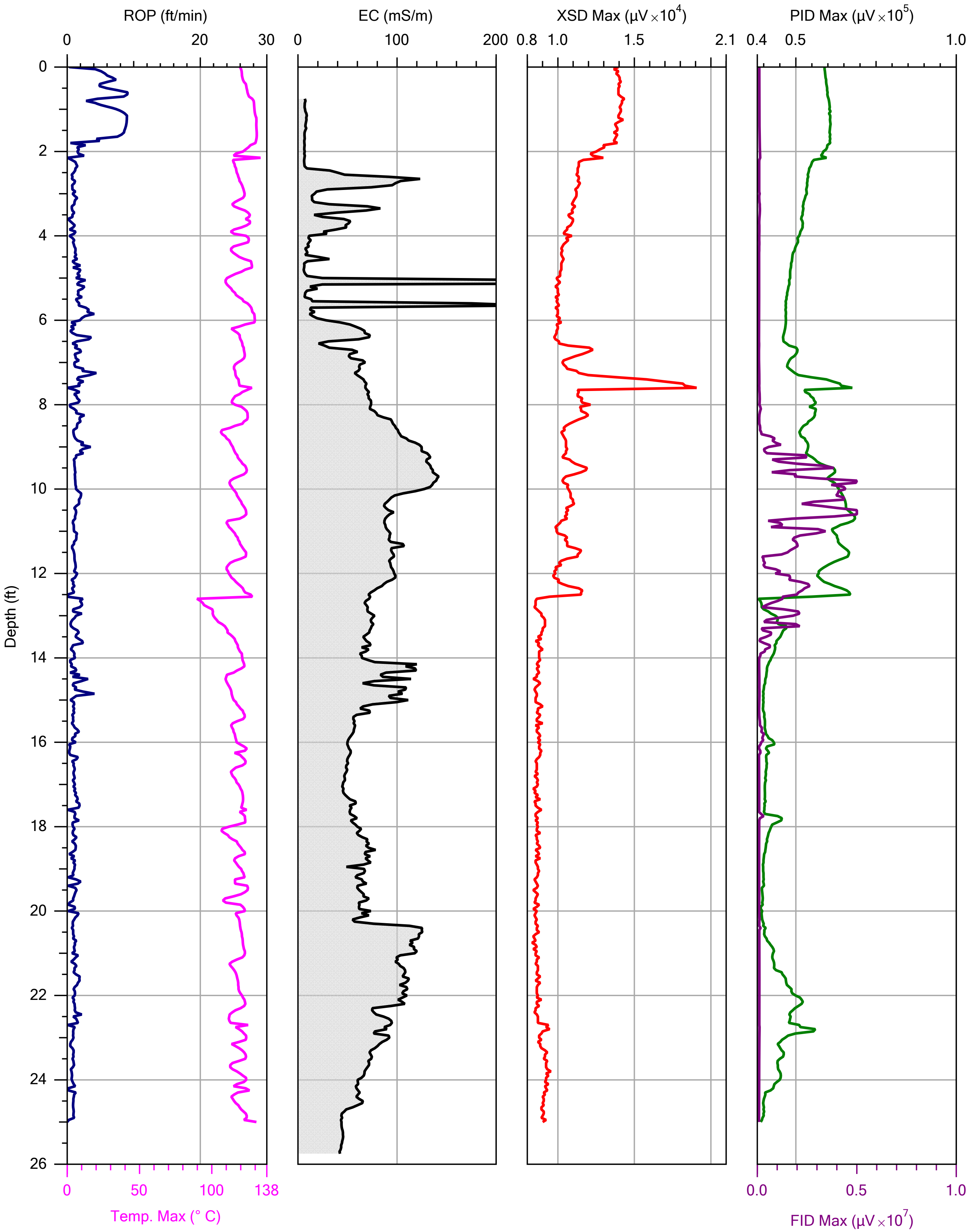


CASCADE DRILLING | TECHNICAL SERVICES

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|---|---|---|
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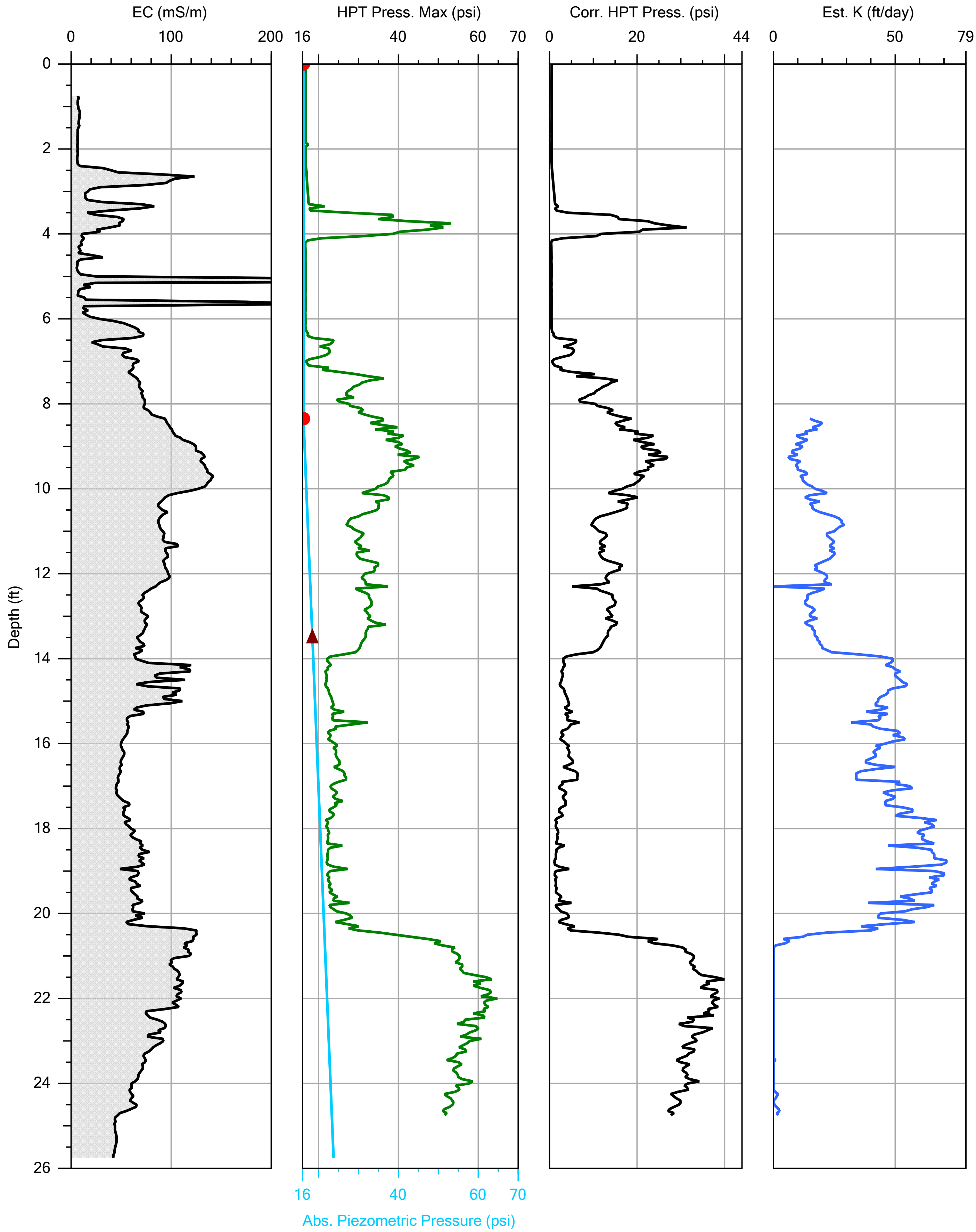


CASCADE
DRILLING | TECHNICAL SERVICES

| Company: Cascade Tech Services | Operator: Z. Fordley | File: MIHPT-12.MHP / Date: 03/05/20 |
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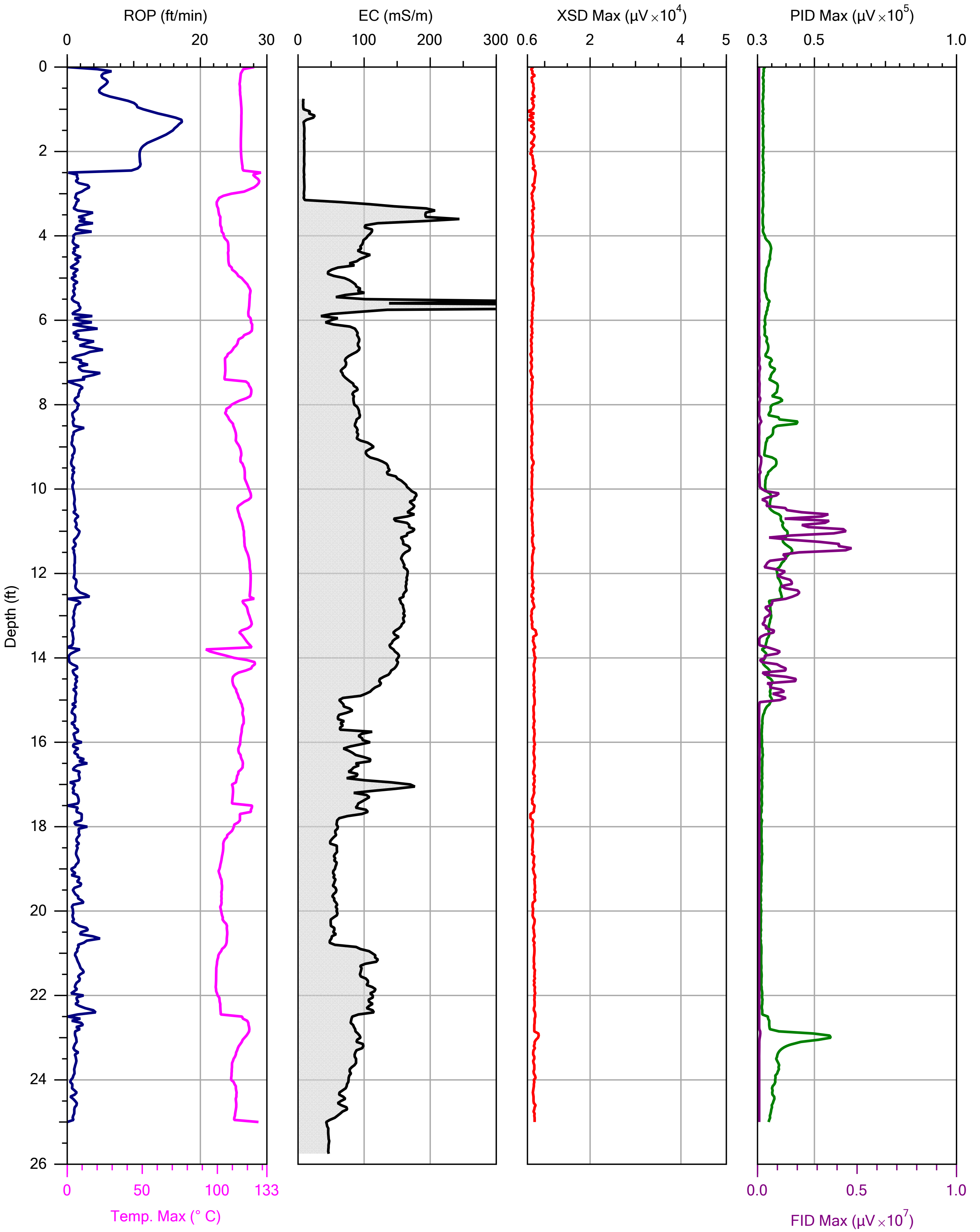


CASCADE DRILLING | TECHNICAL SERVICES

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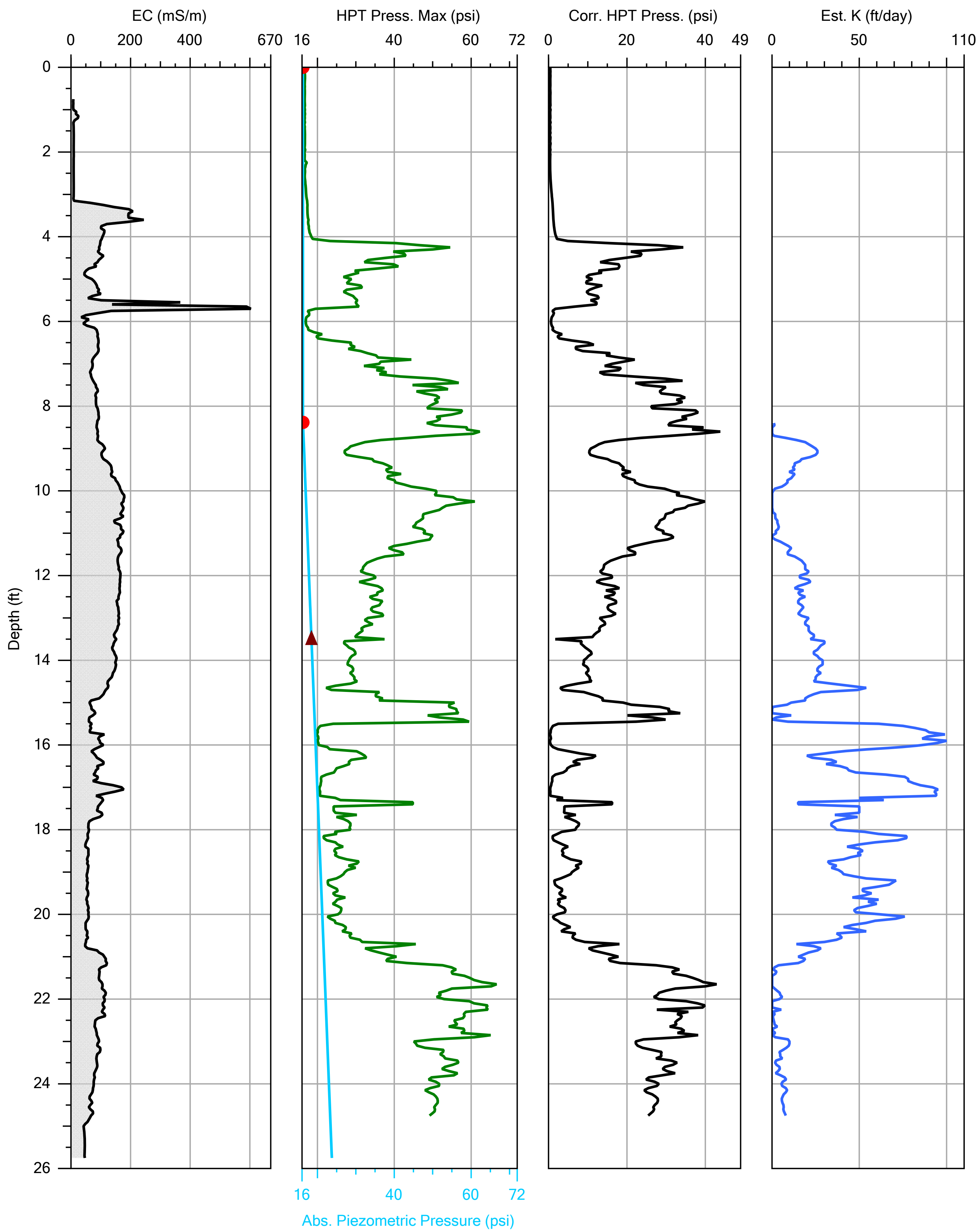


CASCADE
DRILLING | TECHNICAL SERVICES

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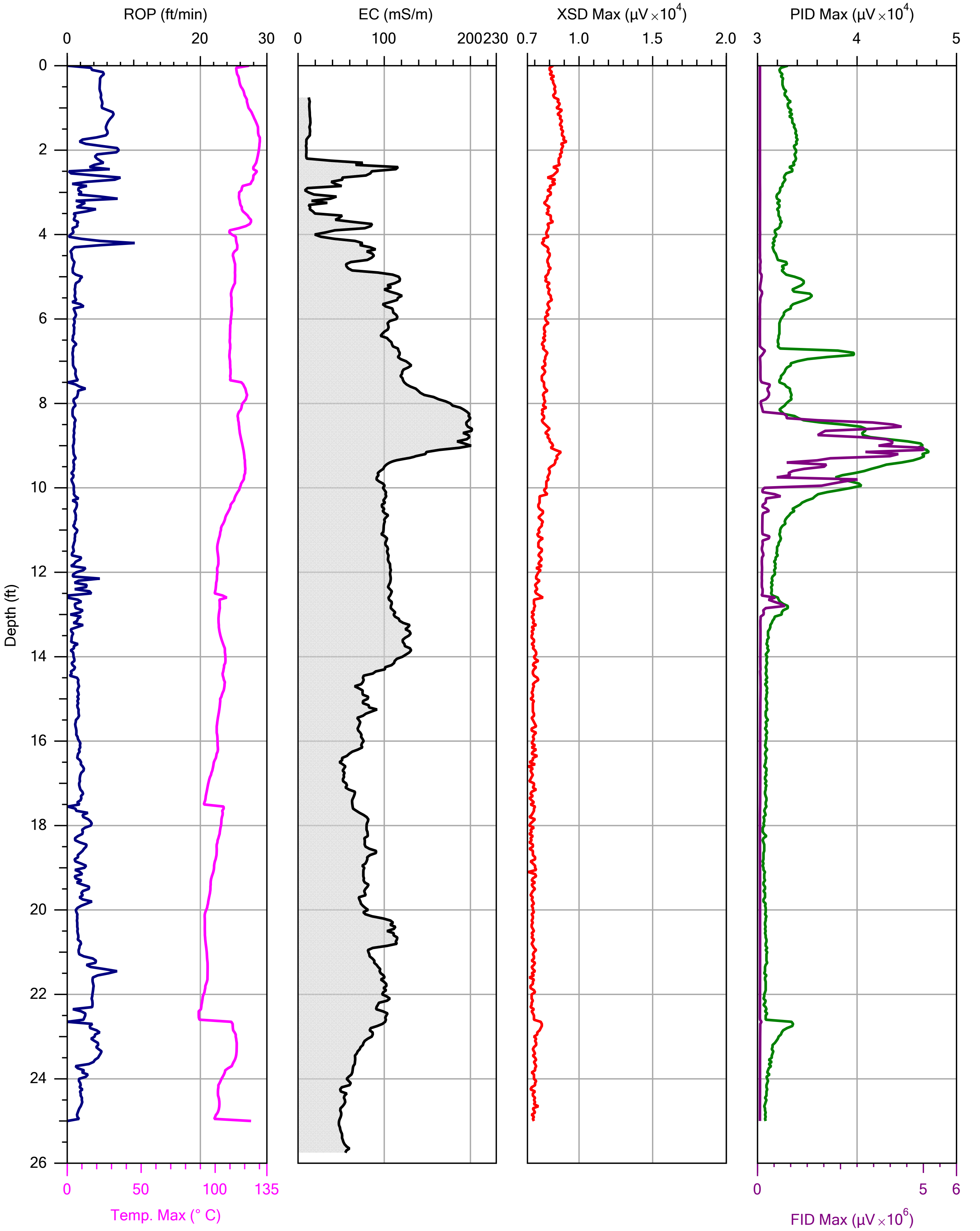


CASCADE
DRILLING | TECHNICAL SERVICES

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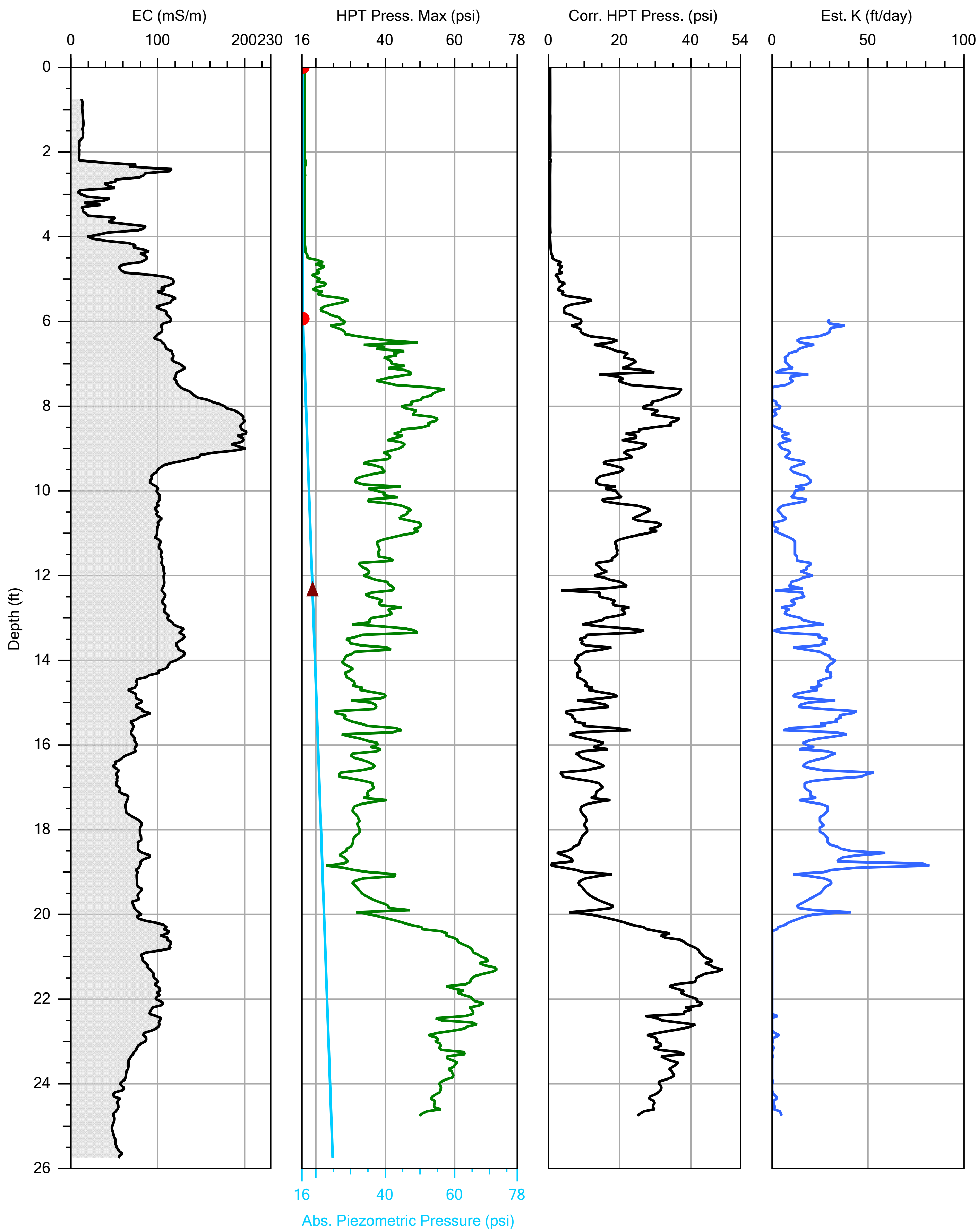
| Project ID: | Client: CHA | Location: SYRACUSE |




CASCADE
DRILLING | TECHNICAL SERVICES

| | | |
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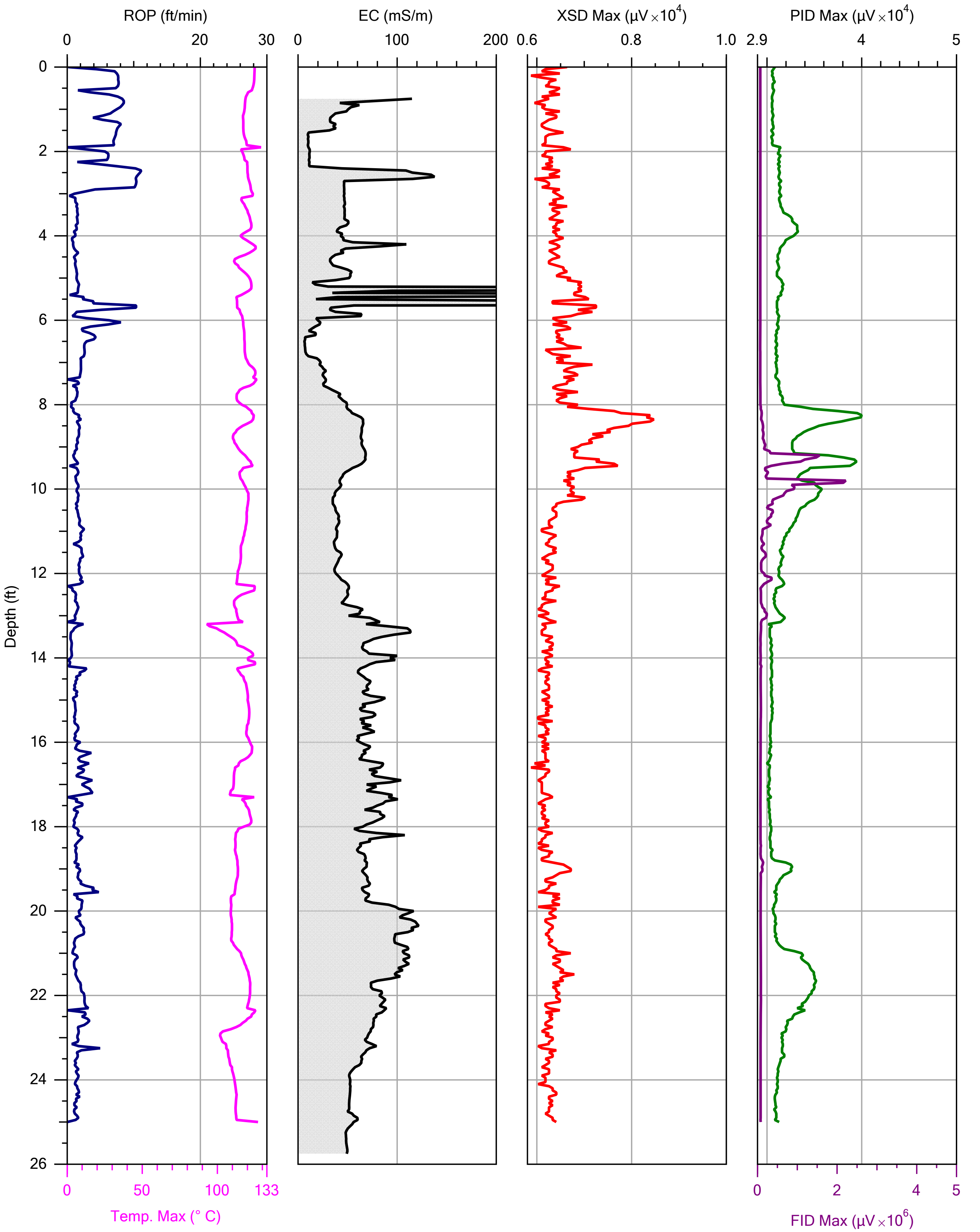
| Project ID: | Client: CHA | Location: SYRACUSE |




CASCADE
DRILLING | TECHNICAL SERVICES

| | | |
|---|---|---|
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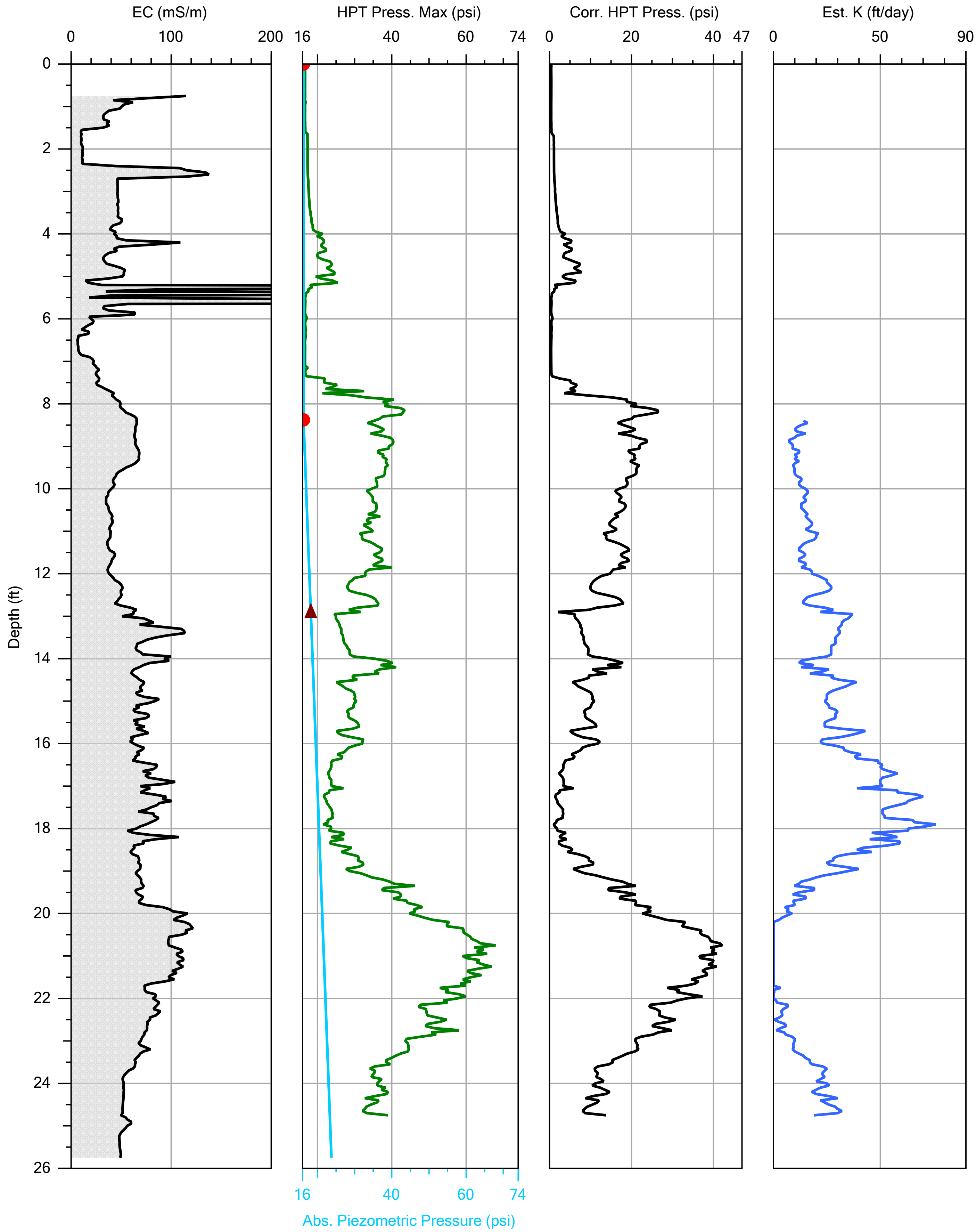
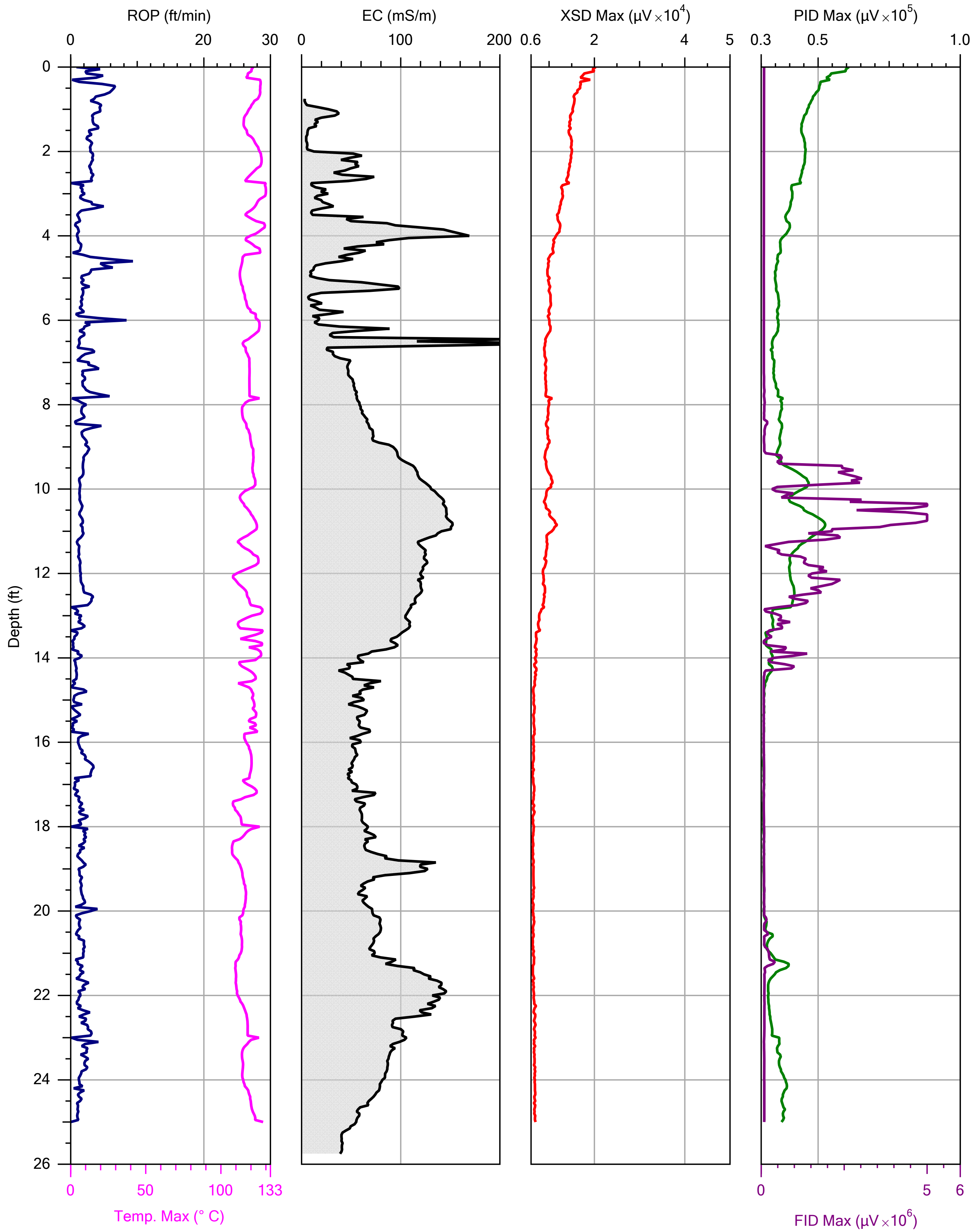


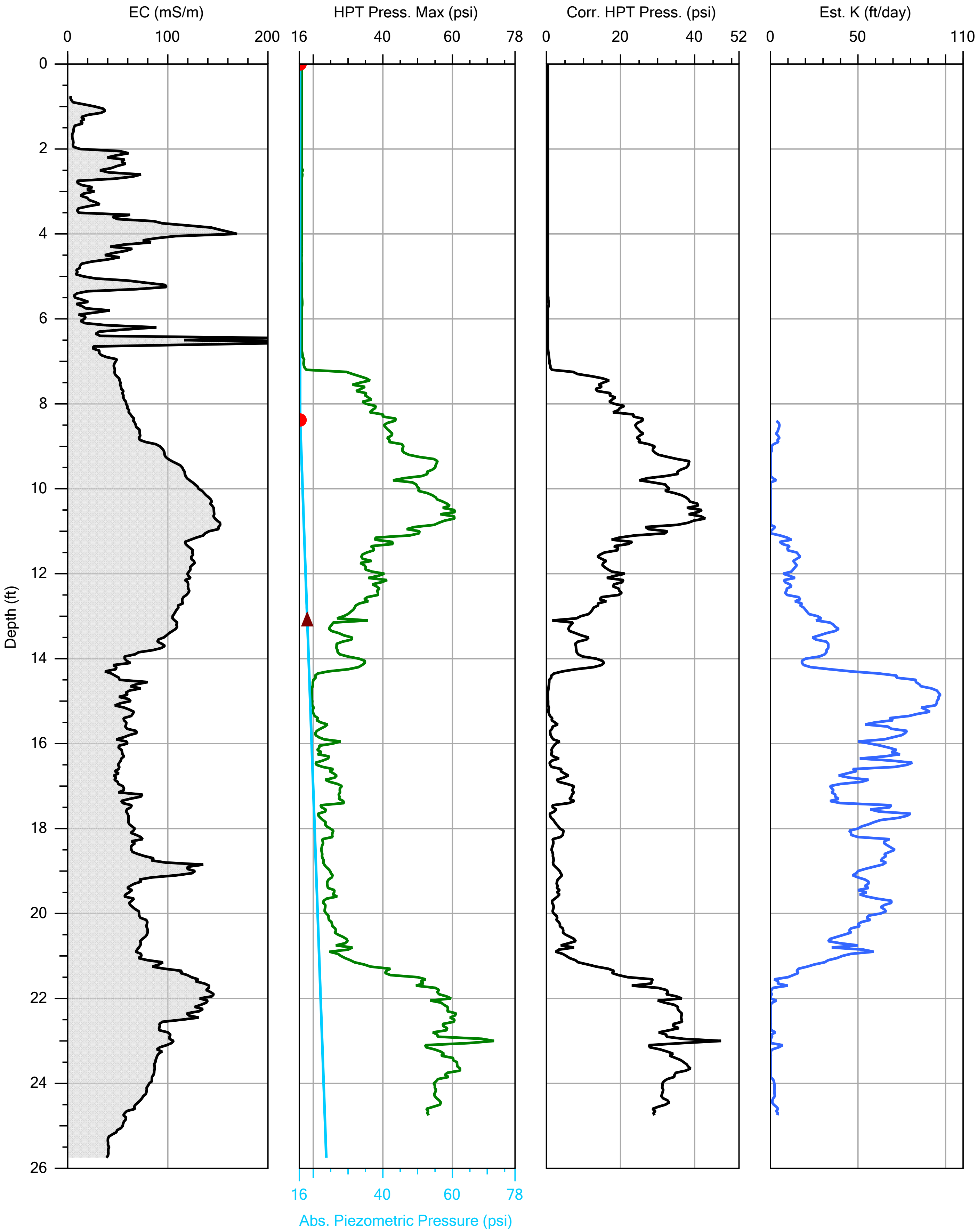

CASCADE
DRILLING | TECHNICAL SERVICES

| | | |
|---|---|---|
| | | File: MIHPT-15.MHP |
| Company: Cascade Tech Services | Operator: Z. Fordley | Date: 03/05/20 |
| Project ID: | Client: CHA | Location: SYRACUSE |




CASCADE
DRILLING | TECHNICAL SERVICES

| | | |
|---|---|---|
| | | File: MIHPT-16.MHP |
| Company: Cascade Tech Services | Operator: Z. Fordley | Date: 03/05/20 |
| Project ID: | Client: CHA | Location: SYRACUSE |




CASCADE
DRILLING | TECHNICAL SERVICES

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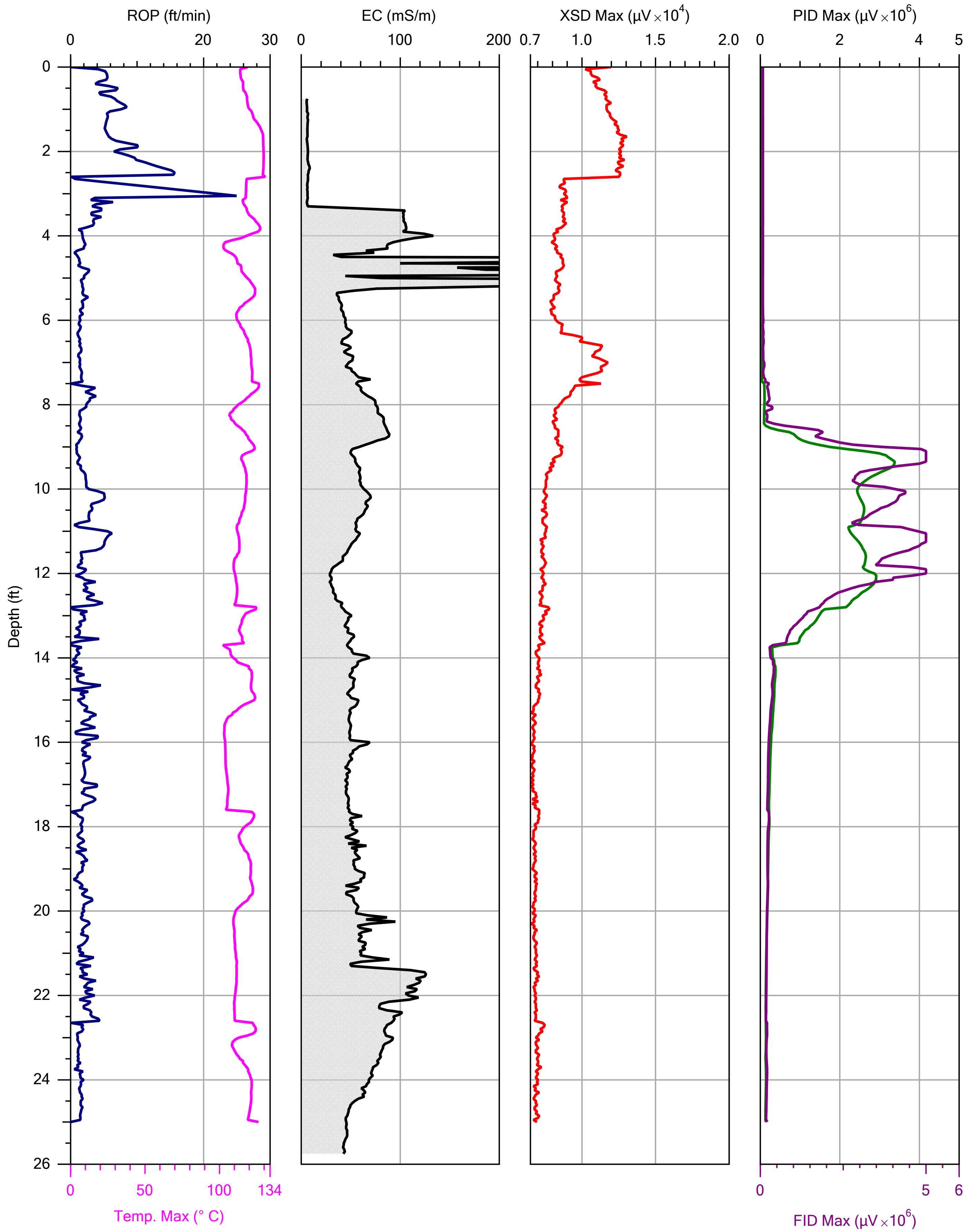
| Company: Cascade Tech Services | Operator: Z. Fordley | Date: 03/05/20 |
| Project ID: | Client: CHA | Location: SYRACUSE |




CASCADE
DRILLING | TECHNICAL SERVICES

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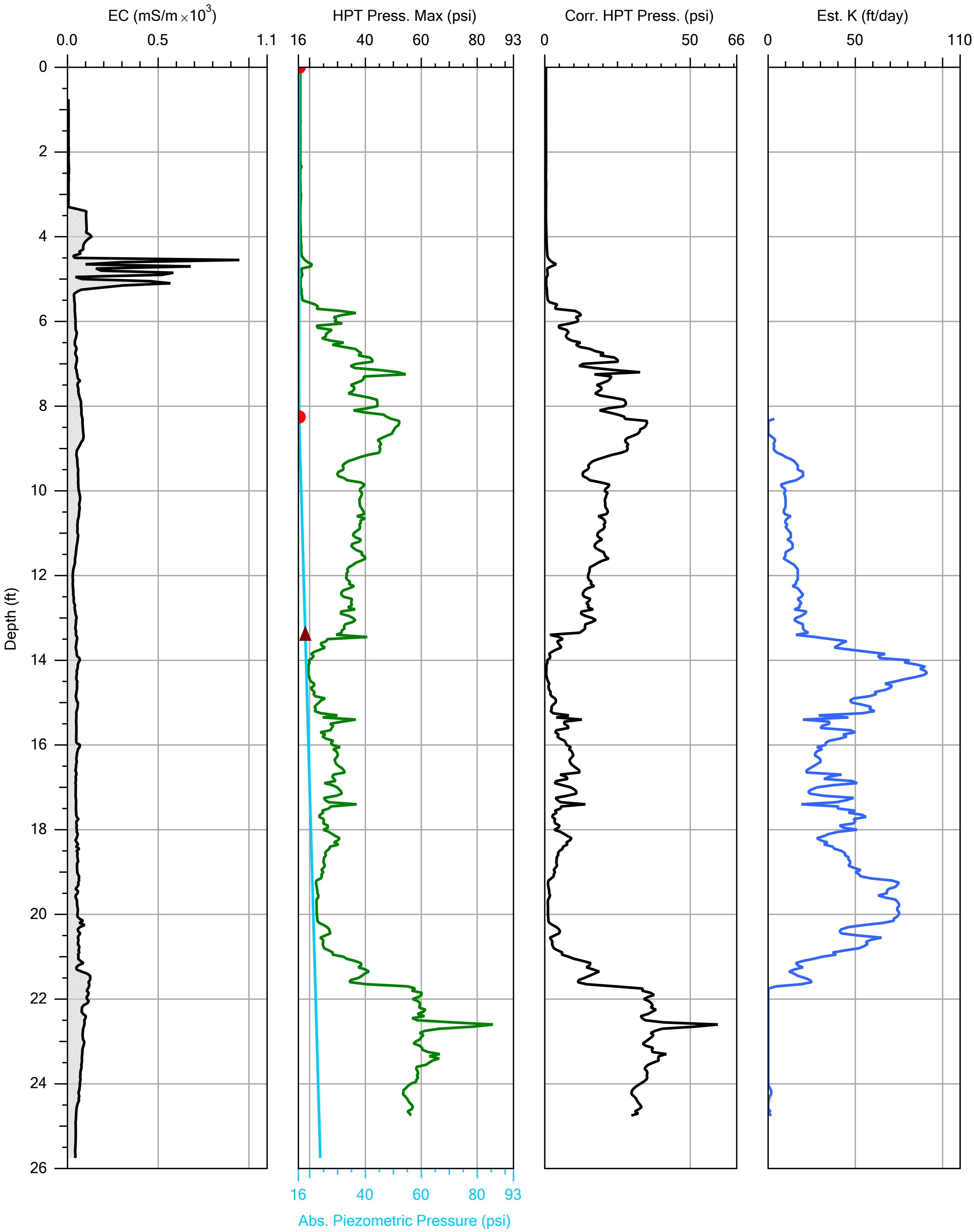
|---|---|---|
| | | File: MIHPT-17.MHP |
| Company: Cascade Tech Services | Operator: Z. Fordley | Date: 03/05/20 |
| Project ID: | Client: CHA | Location: SYRACUSE |




CASCADE DRILLING | TECHNICAL SERVICES

| Company: Cascade Tech Services | Operator: Z. Fordley | File: MIHPT-17.MHP<br>Date: 03/05/20 |
|---|---|---|
| Project ID: | Client: CHA | Location: SYRACUSE |

# APPENDIX B

## ZVI Treatability

**Table 1**
**ZVI Treatability Test Results Summary**
Former Coyne Textile Facility
Syracuse, New York

| Analyte | Control | Control Dupe | Average | Ferox Flow 2% | Ferox Flow 2% Dupe | Average | Percent Reduction | Ferox Flow 4% | Ferox Flow 4% Dupe | Average | Percent Reduction | Ferox Target 2% | Ferox Target 2% Dupe | Average | Percent Reduction |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **VOCs** | (mg/Kg) | | | (mg/Kg) | | | % | (mg/Kg) | | | % | (mg/Kg) | | | % |
| cis-1,2-DCE | 1,600 | 2,000 | 1,800 | 1,600 | 1,500 | 1,550 | 14% | 1,100 | 2,400 | 1,750 | 2.8% | 1,500 | 1,600 | 1,550 | 13.9% |
| PCE | 5,700 | 6,200 | 5,950 | 5,800 | 5,300 | 5,550 | 6.7% | 4,600 | 1,100 | 2,850 | 52.1% | 4,400 | 5,200 | 4,800 | 19.3% |
| **Total Detected VOCs** | **7,300** | **8,200** | **7,750** | **7,400** | **6,800** | **7,100** | **8.4%** | **5,700** | **3,500** | **4,600** | **40.6%** | **5,900** | **6,800** | **6,350** | **18.1%** |

Notes:
VOCs = volatile organic compounds
mg/kg = milligrams per kilogram

# APPENDIX C

## Pilot Test Groundwater Disposal Manifest

# NON-HAZARDOUS WASTE MANIFEST

Please print or type (Form designed for use on elite (12 pitch) typewriter)

| NON-HAZARDOUS WASTE MANIFEST | 1. Generator's US EPA ID No. N/A | Manifest Document No. 20-0044 | 2. Page 1 of 1 |
|---|---|---|---|
| 3. Generator's Name and Mailing Address | Ranalli/Taylor St. LLC<br>7645 Henry Clay Blvd<br>PO Box 678<br>Liverpool NY 13088 | 140 Cortland Ave<br>Syracuse NY | |
| 4. Generator's Phone ( ) | | | |
| 5. Transporter 1 Company Name: Paragon Environmental Construction, Inc. | 6. US EPA ID Number: NYR 000119289 | A. State Transporter's ID: 7A-516 | B. Transporter 1 Phone: (315) 699-0840 |
| 7. Transporter 2 Company Name | 8. US EPA ID Number | C. State Transporter's ID | D. Transporter 2 Phone |
| 9. Designated Facility Name and Site Address: Onondaga County Dept Water Protection, 650 Hiawatha Blvd, Syracuse NY | 10. US EPA ID Number | E. State Facility's ID | F. Facility's Phone: (315) 435-2260 |

| 11. WASTE DESCRIPTION | Containers No. | Containers Type | 13. Total Quantity | 14. Unit Wt./Vol. |
|---|---|---|---|---|
| a. Non-Regulated Liquid | 1 | TT | 1900 | G |
| b. | | | | |
| c. | | | | |
| d. | | | | |

G. Additional Descriptions for Materials Listed Above

A) Groundwater

H. Handling Codes for Wastes Listed Above

A) T

15. Special Handling Instructions and Additional Information

Emergency Contact: Paragon Environmental Construction, Inc. @ 315-699-0840

16. GENERATOR'S CERTIFICATION: I hereby certify that the contents of this shipment are fully and accurately described and are in all respects in proper condition for transport. The materials described on this manifest are not subject to federal hazardous waste regulations.

| Printed/Typed Name | Signature | Date Month | Day | Year |
|---|---|---|---|---|
| Gary Cawley | G Cawley | 5 | 7 | 20 |

17. Transporter 1 Acknowledgement of Receipt of Materials

| Printed/Typed Name | Signature | Date Month | Day | Year |
|---|---|---|---|---|
| Bruce Reynolds | Bruce Reynolds | 5 | 7 | 20 |

18. Transporter 2 Acknowledgement of Receipt of Materials

| Printed/Typed Name | Signature | Date Month | Day | Year |
|---|---|---|---|---|
| | | | | |

19. Discrepancy Indication Space

20. Facility Owner or Operator: Certification of receipt of the waste materials covered by this manifest, except as noted in item 19.

Onondaga County Water Environment Protection

| Printed/Typed Name | Signature | Date Month | Day | Year |
|---|---|---|---|---|
| Tim O'Dell | T O'Dell | 5 | 7 | 20 |

GENERATOR · TRANSPORTER · FACILITY · NON-HAZARDOUS WASTE

# APPENDIX D

## Design Drawings

# RANALLI/TAYLOR ST. LLC
# BID PACKAGE 3 BROWNFIELD REMEDIATION
# 140 CORTLAND AVE
# CITY OF SYRACUSE, NEW YORK
# NYSDEC BCP NO. C734144

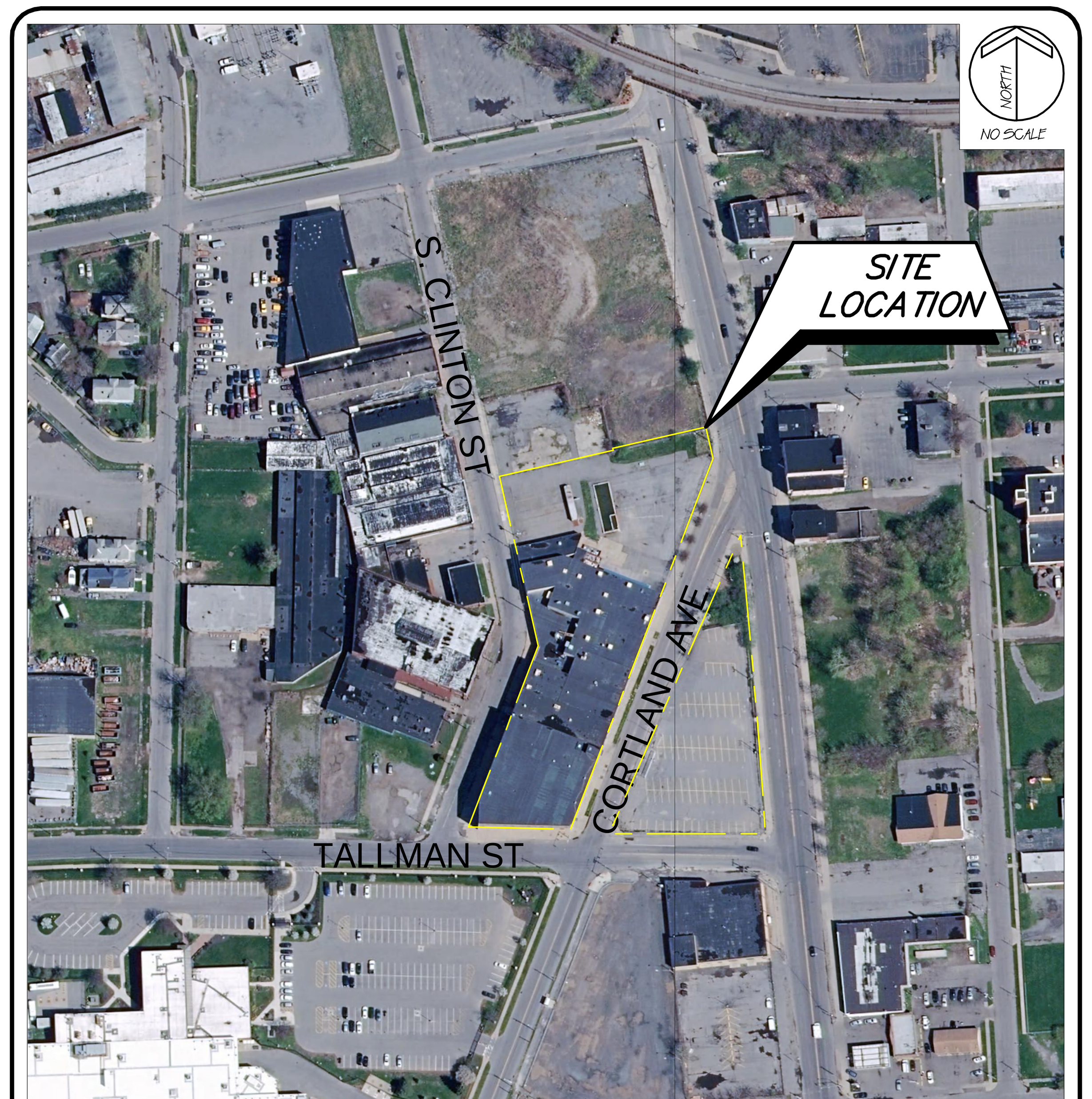
prepared for:

GEC CONSULTING, LLC
ON BEHALF OF
JMA TECH PROPERTIES, LLC
PO BOX 678
LIVERPOOL, NY 13088

prepared by:

One Park Place, 300 South State Street, Suite 600
Syracuse, NY 13202
315.471.3920 . www.chacompanies.com

CHA Project # 059294




## DRAWING INDEX

| Sheet Number | Sheet Title |
|---|---|
| T-001 | TITLE SHEET AND DRAWING INDEX |
| G-001 | GENERAL NOTES, LEGEND, & ABBREVIATIONS |
| EV-001 | EXISTING CONDITIONS AND SITE PREPARATION PLAN |
| EV-101 | TREATMENT ZONE OVERVIEW |
| EV-102 | TREAMENT ZONE 1 PLAN |
| EV-103 | TREATMENT ZONE 2 PLAN |
| EV-104 | TREATMENT ZONE 3 PLAN |
| EV-201 | PROCESS FLOW DIAGRAM |
| EV-202 | PROCESS LEGEND |
| EV-203 | PROCESS, INSTRUMENTATION AND CONTROL DIAGRAM |
| EV-601 | GENERAL DETAILS |

## JULY 2020

Dig Safely. New York
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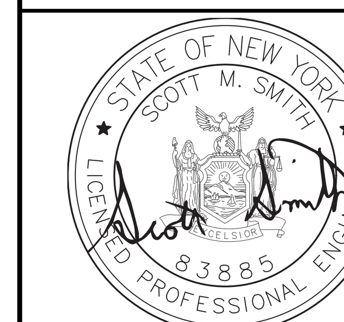
before you dig



300 South State Street - Suite 600
Syracuse, NY 13202
315.471.3920 · www.chacompanies.com

GEC CONSULTING, LLC
on behalf of
JMA TECH PROPERTIES, LLC




IT IS A VIOLATION OF LAW FOR ANY PERSON, UNLESS THEY ARE ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER, ARCHITECT, LANDSCAPE ARCHITECT OR LAND SURVEYOR TO ALTER AN ITEM IN ANY WAY. IF AN ITEM BEARING THE STAMP OF A LICENSED PROFESSIONAL IS ALTERED, THE ALTERING ENGINEER, ARCHITECT, LANDSCAPE ARCHITECT OR LAND SURVEYOR SHALL STAMP THE DOCUMENT AND INCLUDE THE NOTATION "ALTERED BY" FOLLOWED BY THEIR SIGNATURE, THE DATE OF SUCH ALTERATION, AND A SPECIFIC DESCRIPTION OF THE ALTERATION.

RANALLI/TAYLOR
ST. LLC
REMEDIAL DESIGN
140 CORTLAND AVE
SYRACUSE, NEW YORK
NYSDEC BCP NO. C734144

| No. | Submittal / Revision | App'd. | By | Date |
|---|---|---|---|---|
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| A | 100% SUBMISSION | SMS | TRG | 07/10/2020 |

TITLE SHEET AND
DRAWING INDEX

| Designed By: | Drawn By: | Checked By: |
|---|---|---|
| SJM | TRG | SMS |
| Issue Date: | Project No: | Scale: |
| 07/10/2020 | 059294.001 | AS SHOWN |

Drawing No.:

T-001

File: V:\PROJECTS\ANY\K5\059294.001\CADD_ACAD\059294_T-001.DWG
Saved: 7/8/2020 10:15:15 AM Plotted: 7/8/2020 10:16:41 AM Current User: Gray, Timmolyn LastSavedBy: 3511

## GENERAL NOTES:

1. THE PLANS SHOW SUBSURFACE STRUCTURES, ABOVE GROUND STRUCTURES AND/OR UTILITIES FROM FIELD LOCATION AND RECORD MAPPING, EXACT LOCATION OF WHICH MAY VARY FROM THE LOCATIONS INDICATED. IN PARTICULAR, THE CONTRACTOR IS WARNED THAT THE EXACT OR EVEN APPROXIMATE LOCATION OF SUCH PIPELINES, SUBSURFACE STRUCTURES AND/OR UTILITIES IN THE AREA MAY BE DIFFERENT FROM THAT SHOWN OR MAY NOT BE SHOWN, AND IT SHALL BE THE CONTRACTORS RESPONSIBILITY TO PROCEED WITH GREAT CARE IN EXECUTING ANY WORK. CONTRACTOR SHALL COMPLY WITH THE STATE OF NEW YORK DEPARTMENT OF PUBLIC SERVICE, 16NYCRR PART 753, EFFECTIVE FEBRUARY 5, 1997. CALL BEFORE YOU DIG© 1-800-962-7962.
2. THE ENGINEER SHALL BE NOTIFIED IN WRITING OF ANY CONDITIONS THAT VARY FROM THOSE SHOWN ON THE PLANS. THE CONTRACTOR'S WORK SHALL NOT VARY FROM THE PLANS WITHOUT THE EXPRESSED APPROVAL OF THE ENGINEER.
3. THE CONTRACTOR IS INSTRUCTED TO COOPERATE WITH ANY AND ALL OTHER CONTRACTORS PERFORMING WORK ON THIS JOB SITE DURING THE PERFORMANCE OF THIS CONTRACT.
4. ALL WORK SHALL BE DONE IN STRICT COMPLIANCE WITH ALL APPLICABLE NATIONAL, STATE, AND LOCAL CODES, STANDARDS, ORDINANCES, RULES, AND REGULATIONS.
5. ALL PROPOSED WORK MAY BE SUBJECT TO MINOR MODIFICATIONS IN THE FIELD BY THE ENGINEER TO MEET EXISTING CONDITIONS.
6. THE OWNER, NYSDEC, AND ENGINEER RESERVE THE RIGHT TO EXAMINE ANY WORK DONE ON THIS PROJECT AT ANY TIME TO DETERMINE THE CONFORMANCE WITH THE REQUIREMENTS OF THE CONTRACT DOCUMENTS OF THIS PROJECT, AS INTENDED AND INTERPRETED BY THE OWNER, NYSDEC AND ENGINEER.
7. THE CONTRACTOR SHALL PROTECT EXISTING PROPERTY LINE MONUMENTATION. ANY MONUMENTATION DISTURBED OR DESTROYED, AS JUDGED BY THE ENGINEER OR OWNER, SHALL BE REPLACED AT THE CONTRACTOR'S EXPENSE UNDER THE SUPERVISION OF A NEW YORK STATE LICENSED LAND SURVEYOR.
8. PRIOR TO BIDDING ON THE PROJECT, THE CONTRACTOR SHALL VISIT THE SITE TO VERIFY EXISTING CONDITIONS.
9. ALL PHYSICAL FEATURES, INDIVIDUAL TREES, LANDSCAPING OR UTILITY LOCATIONS COULD NOT BE POSSIBLY SHOWN ON THE CONTRACT DRAWINGS. EACH BIDDER IS ENCOURAGED TO PERSONALLY INSPECT ALL AREAS OF PROPOSED WORK, IN ORDER TO ENSURE THAT BIDDER IS FAMILIAR WITH THE PHYSICAL LAYOUT OF THE AREA AND THE REQUIREMENTS OF THE WORK.
10. THE CONTRACTOR SHALL:
    - A. VERIFY ALL CONDITIONS IN THE FIELD PRIOR TO COMMENCEMENT OF WORK AND NOTIFY THE ENGINEER OF ANY DISCREPANCIES.
    - B. EXAMINE THE SITE AND INCLUDE IN HIS WORK THE EFFECT OF ALL EXISTING CONDITIONS ON THE WORK.
    - C. PROVIDE ALL MATERIALS AND PERFORM ALL WORK IN ACCORDANCE WITH RECOGNIZED GOOD STANDARD PRACTICE.
    - D. HOLD THE OWNER HARMLESS AGAINST ANY AND ALL CLAIMS ARISING FROM WORK DONE BY THE CONTRACTOR ON THE SITE.
    - E. DEFINE HAUL ROUTE AND LOADING CONDITIONS FOR TRANSPORT OF MATERIAL IN AND AROUND THE SITE AND OFFSITE.
    - F. ALL TRENCH EXCAVATION AND ANY REQUIRED SHEETING AND SHORING SHALL BE DONE IN ACCORDANCE WITH THE LATEST REVISIONS OF NEW YORK STATE INDUSTRIAL CODE RULE 23 AND OSHA REGULATIONS FOR CONSTRUCTION. SHEET PILING SHALL BE DESIGNED AND SEALED BY A NEW YORK STATE PROFESSIONAL ENGINEER. REFER TO SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.
11. THE CONTRACTOR SHALL BE RESPONSIBLE FOR SECURING ALL OPEN EXCAVATIONS WITH APPROPRIATE BARRICADES AND WARNING SIGNAGE. ADDITIONALLY, THE CONTRACTOR SHALL SECURE ALL WORK ZONES (E.G. EXCLUSION ZONES) WITH TEMPORARY FENCING AND WARNING SIGNAGE.
12. MAINTAIN FLOW FOR ALL EXISTING UTILITIES REMAINING IN SERVICE.
13. CONTRACTOR SHALL TAKE CARE TO PREVENT DAMAGE TO EXISTING UTILITIES AND PUBLIC SIDEWALKS. DAMAGED UTILITIES OR SIDEWALKS SHALL BE IMMEDIATELY REPAIRED BY CONTRACTOR AT THE CONTRACTOR'S EXPENSE.
14. ALL ROADWAYS ACCESSING AND ON THE SITE SHALL BE KEPT CLEAN OF MUD AND DEBRIS AT ALL TIMES. CLEAN AND SWEEP ALL EXISTING AND NEW PAVEMENTS AND/OR LANES AS PART OF THIS PROJECT ROUTINELY TO REMOVE TRACKED MATERIAL AS A RESULT OF THIS PROJECT.
15. UPON COMPLETION OF THE WORK, ALL DISTURBED AREAS SHALL BE RESTORED TO A CONDITION EQUAL TO OR BETTER THAN THAT WHICH EXISTED PRIOR TO CONSTRUCTION WITH THE EXCEPTION OF RESTORING THE EXISTING CONCRETE SLAB.
16. CONTRACTOR TO PROVIDE SCHEDULE OF WORK FOR APPROVAL. NO WORK WILL BE PERMITTED UNLESS APPROVED BY THE OWNER OR OWNER'S REPRESENTATIVE.
17. ALL ACTIVITY WITHIN THE SITE SHOULD BE LIMITED TO THE CONSTRUCTION AREAS SHOWN ON THE PLANS WHENEVER POSSIBLE. USE DESIGNATED STAGING AREAS AS DIRECTED BY THE OWNER.
18. ALL CONTAMINATED OR POTENTIALLY CONTAMINATED MATERIAL (E.G. SOIL AND GROUNDWATER) MUST REMAIN ON THE BROWNFIELD CLEANUP PROGRAM PROPERTY UNTIL WHICH TIME IT IS DISPOSED OF OFF-SITE AT A REGULATED FACILITY. STAGING OF SOIL OFF THE BROWNFIELD BOUNDARY IS STRICTLY PROHIBITED.
19. ALL CONSTRUCTION STAKE OUT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.
20. WASTE MANAGEMENT:
    - A. CONTRACTOR GENERATED MSW: SOLID WASTE GENERATED FROM CONTRACTOR'S OPERATIONS SHALL BE DISPOSED OF OFF-SITE AT A PROPERLY PERMITTED FACILITY AT THE CONTRACTOR'S EXPENSE.
    - B. EXCESS FILL AND CONTAMINATED SOIL DISPOSAL DOCUMENTATION: THE CONTRACTOR SHALL PROVIDE COPIES OF DISPOSAL FACILITY PERMITS, APPROVED WASTE PROFILES, CURRENT PART 364 PERMITS FOR WASTE HAULERS, BILL OF LADINGS/MANIFESTS TO DOCUMENT DISPOSAL OF THE MATERIAL, AND WEIGHT TICKETS DOCUMENTING TONNAGE DISPOSED FOR ALL FILL MATERIALS DISPOSED OF OFF-SITE, EXCEPT FOR CONTRACTOR GENERATED MSW.
    - C. ALL FILL MATERIALS, DEBRIS, AND SOILS SHALL BE SEGREGATED AND MANAGED IN ACCORDANCE WITH 6 NYCRR PART 360.12 & 360.13 AS WELL AS THE TECHNICAL SPECIFICATIONS.
22. ALL CONTRACTOR PERSONNEL PERFORMING INTRUSIVE ACTIVITIES ARE REQUIRED TO BE PROPERLY TRAINED PURSUANT TO THE HAZARDOUS WASTE OPERATIONS AND EMERGENCY RESPONSE STANDARD (HAZWOPER); AND 40 CFR 1910.120.
23. THE CONTRACTOR WILL BE RESPONSIBLE FOR PROVIDING LIMITED TEMPORARY UTILITIES DURING THE COURSE OF THE PROJECT, INCLUDING TWO CHAIRS AND A TABLE WITHIN THE EXISTING BUILDING FOR THE ENGINEER'S USE AT A LOCATION DETERMINED ACCEPTABLE BY THE CONSTRUCTION MANAGER. THE CONTRACTOR SHOULD ALSO PROVIDE A FIRE EXTINGUISHER, FIRST AID KIT, PORTABLE EYE WASH, SPILL CLEANUP KITS, AND A WIRELESS INTERNET/DATA SERVICE FOR USE BY THE ENGINEER WITH A MINIMUM OF 12 GIGABYTES PER MONTH OF DATA CAPABILITY.

## SURVEY NOTES:

1. BASE MAPPING PREPARED FROM A DECEMBER 13, 2019 FIELD SURVEY BY IANUZI & ROMANS LAND SURVEYING, P.C.
2. NORTH ORIENTATION IS NORTH BASED ON GPS. DATUM IS NEW YORK STATE PLANE COORDINATE NAD83, EAST ZONE.
3. ELEVATIONS ARE BASED ON CITY OF SYRACUSE DATUM.
4. SUBJECT TO ALL RIGHTS, EASEMENTS, COVENANTS OR RESTRICTIONS OF RECORD.
5. LOCATION OF UNDERGROUND UTILITIES TAKEN BY FIELD MEASUREMENT WHERE PRACTICAL, OTHERWISE TAKEN FROM VARIOUS OTHER SOURCES AND ARE APPROXIMATE ONLY.
6. PROPERTY LINES ARE APPROXIMATE AS INTERPOLATED FROM EXISTING MAPPING AND ARE SHOWN FOR REFERENCE ONLY.

## CONTRACTOR RESPONSIBILITIES NOTES:

1. CONTRACTOR RESPONSIBLE FOR THE INSTALLATION, MAINTENANCE, AND DECOMMISSIONING OF THE COMPONENTS REQUIRED TO EXECUTE THE REMEDIAL TECHNOLOGIES SHOWN ON THE DRAWINGS AND IN THE SPECIFICATIONS WITHIN THE THREE TREATMENT ZONES, INCLUDING BUT NOT NECESSARILY LIMITED TO THE FOLLOWING ITEMS:
    - A. THE PROPER DECOMMISSIONING, CLEANING, AND REMOVAL OF THE 10,000-GALLON #6 FUEL OIL TANK AND ASSOCIATED CONTAMINATED SOIL.
    - B. IN-SITU SOIL MIXING WITH THE INJECTION OF ZERO-VALENT IRON.
    - C. GROUNDWATER RECIRCULATION WITH SODIUM PERMANGANATE TREATMENT.
2. CONTRACTOR RESPONSIBLE FOR THE INSTALLATION AND COMMISSIONING OF ALL COMPONENTS OF THE TREATMENT ZONE 3 GROUNDWATER RECIRCULATION SYSTEM.
3. CONTRACTOR SHALL BE RESPONSIBLE FOR OPERATING AND MAINTAINING THE RECIRCULATION TREATMENT SYSTEM THROUGHOUT THE TREATMENT DURATION. THIS SHALL INCLUDE OPERATION OF THE COMPRESSED AIR SYSTEM, OPERATION OF ALL PUMPS AND ADJUSTMENTS TO PRESSURES/FLOWS TO MAINTAIN TARGETED FLOW RATES (4 GPM PER WELL FOR EXTRACTION AND 5 GPM PER WELL FOR INJECTION), BAG FILTER CHANGE OUTS, CARBON CHANGE OUTS, SWITCHING OF VALVES TO MANAGE THE BATCHING OPERATION AND ACTIVE PORTIONS OF THE WELLFIELD, SWITCHOVER OF PERMANGANATE TOTES, ETC.
4. CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING ALL EQUIPMENT IN OPERABLE ORDER, INCLUDING ROUTINE SERVICE THROUGHOUT THE OPERATION PERIOD OF UP TO TWO MONTHS.
5. CONTRACTOR SHALL REPAIR/REPLACE ANY EQUIPMENT THAT STOPS FUNCTIONING AS DESIGNED DURING THE OPERATIONAL PERIOD OF UP TO TWO MONTHS.
6. CONTRACTOR SHALL BE RESPONSIBLE FOR OPERATING SYSTEM, MAKING ROUTINE ADJUSTMENTS TO SYSTEM FLOWS/PRESSURES, AND RECORDING ALL SYSTEM DATA NEEDED TO EVALUATE SYSTEM PERFORMANCE.
7. CONTRACTOR SHALL BE RESPONSIBLE FOR ROUTINE GRANULAR ACTIVATED CARBON (GAC) CHANGE OUTS WHEN REQUESTED BY THE ENGINEER, AND REQUIRED FOR PROPER SYSTEM MAINTENANCE.
8. CONTRACTOR SHALL BE RESPONSIBLE FOR DECOMMISSIONING OF THE GROUNDWATER RECIRCULATION SYSTEM AFTER THE TREATMENT OF TWO FULL PORE VOLUMES (673,246 GALLONS), OR ROUGHLY 88 BATCHES. DECOMMISSIONING SHALL INCLUDE:
    - A. REMOVAL OF THE ABOVEGROUND PROCESS EQUIPMENT (E.G. BAG FILTERS, CARBON VESSELS, PUMPS, ETC.)
    - B. GROUT, CUT AND REMOVE, ALL INJECTION AND EXTRACTION WELLS IN ACCORDANCE WITH THE SPECIFICATIONS AND NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION (NYSDEC) POLICY CP-43.
    - C. RESTORE GRADE TO ALL SURFACES IMPACTED AS PART OF REMEDIAL ACTIVITIES AS SHOWN ON THE DRAWINGS

## LEGEND

| DESCRIPTION | EXISTING |
|---|---|
| FENCE | |
| 5' OR 10' CONTOUR LINE | 250 |
| 1' OR 2' CONTOUR LINE | 202 |
| SPOT ELEVATION | 120.5 OR x120.5 |
| DITCH OR SWALE | |
| PROPERTY LINE | |
| EDGE OF PAVEMENT | |
| EDGE OF WOODS | |
| BUILDING | |
| STORM SEWER | (SIZE TYPE) |
| CHEMICAL SEWER | (SIZE TYPE) |
| FORCE MAIN | (SIZE TYPE) |
| WATER LINE | (SIZE TYPE) W |
| GAS LINE | (SIZE TYPE) G |
| OVERHEAD ELECTRIC | OVERHEAD WIRES |
| CATCH BASIN | |
| STORM MANHOLE | |
| HYDRANT | |
| LIGHT POLE, LAMP POST | |
| POWER POLE / UTILITY POLE | |

## LEGEND (CONTINUED)

| DESCRIPTION | EXISTING | PROPOSED |
|---|---|---|
| MARKER | | |
| IRON ROD, PIN, OR PIPE | | |
| BORING / WELL | B-1 | |
| DETAIL CALLOUT | X / X-X DETAIL IDENTIFICATION NO. SHEET NO. WHERE DETAIL IS SHOWN | |
| DETAIL IDENTIFICATION NO. | X DETAIL TITLE SCALE | |

NOTE: SOME FEATURES IN THE LEGEND MAY NOT HAVE BEEN USED

## TABLE OF ABBREVIATIONS

| | | | |
|---|---|---|---|
| APPROX | APPROXIMATE | LAT | LATITUDE |
| ALUM | ALUMINUM | LB | POUND |
| ASPH | ASPHALT | LF | LINEAR FOOT OR LINEAR FEET |
| BARB | BARBED | LONG | LONGITUDE |
| BL | BASELINE | MAX | MAXIMUM |
| BLDG | BUILDING | MH | MANHOLE |
| BM | BENCHMARK | MIN | MINIMUM |
| BOT | BOTTOM | MISC | MISCELLANEOUS |
| BOL | BOLLARD | MW | MONITORING WELL |
| CB | CATCH BASIN | NO | NUMBER |
| CF | CUBIC FOOT OR CUBIC FEET | NTS | NOT TO SCALE |
| CIP | CAST IRON PIPE | OSHA | OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION |
| CL | CLASS OR CENTERLINE | | |
| CMP | CORRUGATED METAL PIPE | PL | PROPERTY LINE |
| CONC | CONCRETE | PP | POWER POLE, POWER PANEL |
| CS | CARBON STEEL OR CHEMICAL SEWER | PPM | PARTS PER MILLION |
| CSP | CORRUGATED STEEL PIPE | RCP | REINFORCED CONCRETE PIPE |
| CTR | CENTER | RD | ROOF DRAIN |
| CV | CHECK VALVE | SCH | SCHEDULE |
| CY | CUBIC YARD | SF | SQUARE FOOT OR SQUARE FEET |
| D | DRAIN | SPECS | SPECIFICATIONS |
| DECON | DECONTAMINATION | SS | STAINLESS STEEL |
| DIA | DIAMETER | SY | SQUARE YARD |
| DIP | DUCTILE IRON PIPE | TEMP | TEMPORARY |
| DWG | DRAWING | TF | TOP OF FRAME |
| EA | EACH | TYP | TYPICAL |
| ELEV | ELEVATION | UTIL | UTILITY |
| EOP | EDGE OF PAVEMENT | VERT | VERTICAL |
| FT | FOOT OR FEET | W/ | WITH |
| GAL | GALLONS | | |
| GPS | GLOBAL POSITIONING SYSTEM | | |
| HORIZ | HORIZONTAL | | |
| HT | HEIGHT | | |
| IN | INCH(ES) | | |
| INV | INVERT | | |

NOTE: SOME ABBREVIATIONS MAY NOT HAVE BEEN USED



CHA
300 South State Street - Suite 600
Syracuse, NY 13202
315.471.3920 · www.chacompanies.com

GEC CONSULTING, LLC on behalf of JMA TECH PROPERTIES, LLC

STATE OF NEW YORK · SCOTT M. SMITH · LICENSED PROFESSIONAL ENGINEER · 83885 · EXCELSIOR



RANALLI/TAYLOR ST. LLC
REMEDIAL DESIGN
140 CORTLAND AVE
SYRACUSE, NEW YORK
NYSDEC BCP NO. C734144

| No. | Submittal / Revision | App'd. | By | Date |
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| | | | | |
| A | 100% SUBMISSION | SMS | TRG | 07/10/2020 |

GENERAL NOTES, LEGEND, & ABBREVIATIONS

| Designed By: | Drawn By: | Checked By: |
|---|---|---|
| SJM | TRG | SMS |
| Issue Date: 07/10/2020 | Project No: 059294.001 | Scale: AS SHOWN |

Drawing No.: G-001

File: V:\PROJECTS\ANY\K5\059294.001\CADD_ACAD\059294_G-001.DWG
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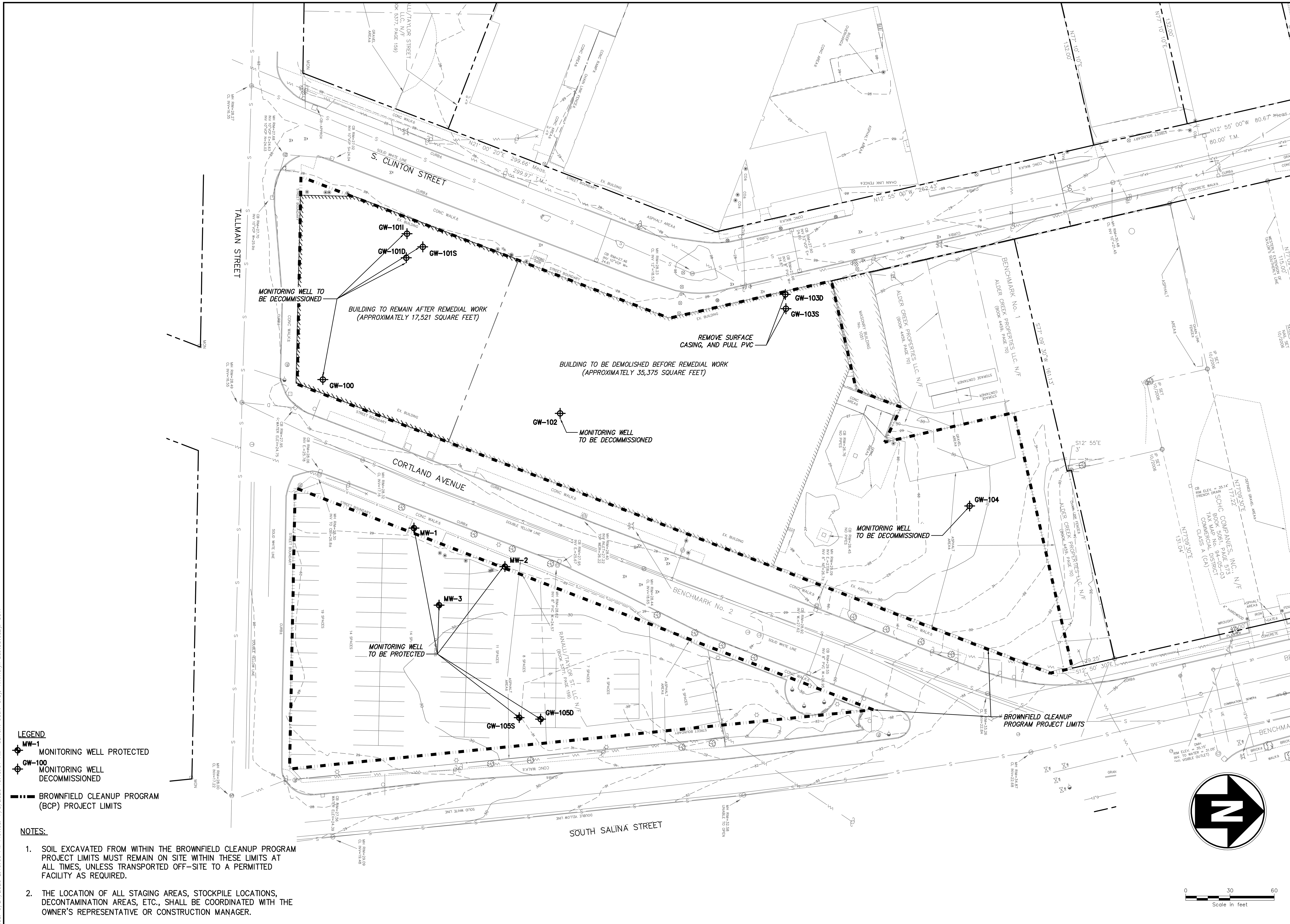


**LEGEND**

MW-1 — MONITORING WELL PROTECTED

GW-100 — MONITORING WELL DECOMMISSIONED

BROWNFIELD CLEANUP PROGRAM (BCP) PROJECT LIMITS

**NOTES:**

1. SOIL EXCAVATED FROM WITHIN THE BROWNFIELD CLEANUP PROGRAM PROJECT LIMITS MUST REMAIN ON SITE WITHIN THESE LIMITS AT ALL TIMES, UNLESS TRANSPORTED OFF-SITE TO A PERMITTED FACILITY AS REQUIRED.

2. THE LOCATION OF ALL STAGING AREAS, STOCKPILE LOCATIONS, DECONTAMINATION AREAS, ETC., SHALL BE COORDINATED WITH THE OWNER'S REPRESENTATIVE OR CONSTRUCTION MANAGER.





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GEC CONSULTING, LLC on behalf of JMA TECH PROPERTIES, LLC

STATE OF NEW YORK — SCOTT M. SMITH — 083885 — LICENSED PROFESSIONAL ENGINEER



RANALLI/TAYLOR ST. LLC
REMEDIAL DESIGN
140 CORTLAND AVE
SYRACUSE, NEW YORK
NYSDEC BCP NO. C734144

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# EXISTING CONDITIONS AND SITE PREPARATION PLAN

| Designed By: | Drawn By: | Checked By: |
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| SJM | TRG | SMS |
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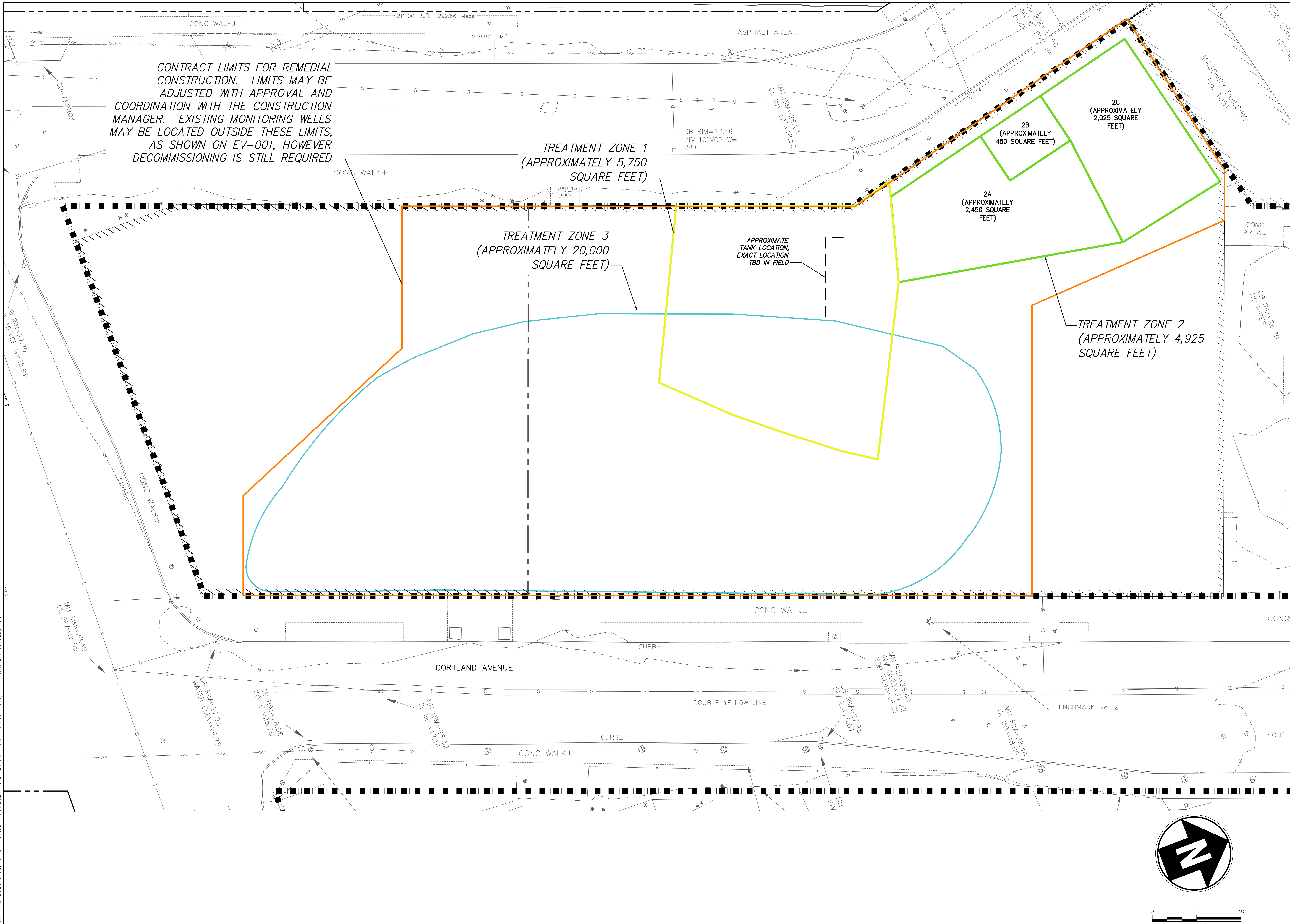
| 07/10/2020 | 059294.001 | AS SHOWN |

Drawing No.:

EV-001



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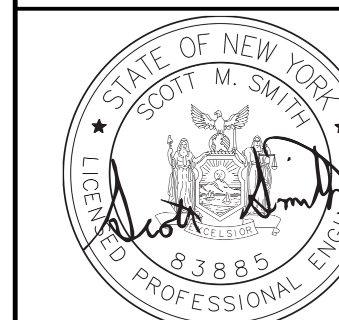


IT IS A VIOLATION OF LAW FOR ANY PERSON, UNLESS THEY ARE ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER, ARCHITECT, LANDSCAPE ARCHITECT OR LAND SURVEYOR TO ALTER AN ITEM IN ANY WAY. IF AN ITEM BEARING THE STAMP OF A LICENSED PROFESSIONAL IS ALTERED, THE ALTERING ENGINEER, ARCHITECT, LANDSCAPE ARCHITECT OR LAND SURVEYOR SHALL STAMP THE DOCUMENT AND INCLUDE THE NOTATION "ALTERED BY" FOLLOWED BY THEIR SIGNATURE, THE DATE OF SUCH ALTERATION, AND A SPECIFIC DESCRIPTION OF THE ALTERATION.

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ST. LLC
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# TREATMENT ZONE OVERVIEW

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|---|---|---|
| SJM | TRG | SMS |
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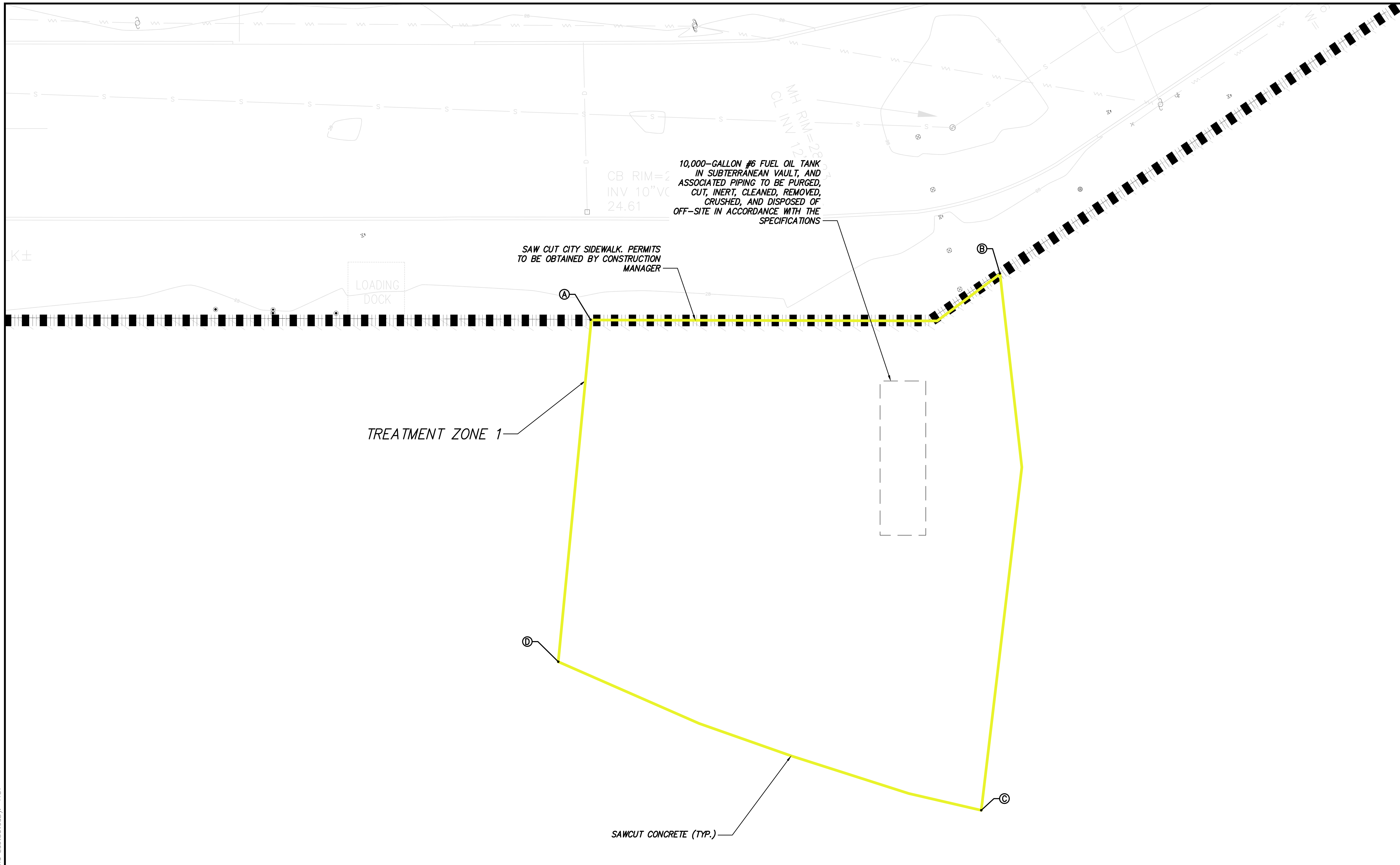


| TREATMENT ZONE 1 POINT TABLE | | |
|---|---|---|
| POINT NO. | NORTHING | EASTING |
| A | 1106864.65 | 935790.21 |
| B | 1106934.43 | 935808.32 |
| C | 1106897.71 | 935894.88 |
| D | 1106837.92 | 935844.08 |

NOTES

1. CONTRACTOR RESPONSIBLE FOR TEMPORARY SHORING SYSTEMS TO AVOID UNDERMINING SIDEWALKS, UTILITIES, AND OTHER PUBLIC INFRASTRUCTURE, AS NEEDED. THE CONTRACTOR SHALL SLOPE OR BENCH NORTH, EAST, AND SOUTH SIDE WALLS OF EXCAVATION TO AVOID SLOUGHING OF SOIL AND MINIMIZE THE POTENTIAL FOR UNDERMINING THE REMAINING CONCRETE. IF ADDITIONAL EXCAVATION IS REQUIRED BEYOND THE LIMITS SHOWN BASED UPON FIELD SCREENING OF THE SOILS FOR CONTAMINATION, ADDITIONAL CONCRETE SAW CUTTING AND REMOVAL SHALL BE COMPLETED AS DIRECTED BY THE ENGINEER.

2. EXCAVATE OVERBURDEN MATERIAL AND DISPOSE OFF-SITE AT PERMITTED FACILITY.

3. EMPTY, CLEAN, AND REMOVE TANK IN ACCORDANCE WITH TECHNICAL SPECIFICATIONS.

4. EXCAVATE CONTAMINATED MATERIAL FOR OFF-SITE DISPOSAL AS DIRECTED BY FIELD ENGINEER, TO AN APPROXIMATE DEPTH OF 9-FEET BELOW GROUND SURFACE (APPROXIMATE GROUNDWATER TABLE ELEVATION).

5. IF A SHEEN IS OBSERVED ON THE GROUNDWATER, ABSORBENT PADS SHOULD BE PLACED ON THE SURFACE, AND REMOVED PRIOR TO BACKFILLING.

6. ENGINEER WILL FIELD SCREEN SOILS FOR EVIDENCE OF CONTAMINATION. SHOULD THE SCREENING INDICATE THAT CONTAMINATION EXTENDS DEEPER OR THAT THERE IS A SIGNIFICANT "SMEAR ZONE" BENEATH THE TANK, ADDITIONAL EXCAVATION SHALL BE COMPLETED TO REMOVE THE SMEAR ZONE AS DIRECTED BY THE ENGINEER.

   A. IF REMOVAL OF A SMEAR ZONE BENEATH THE WATER TABLE IS REQUIRED, THE REMEDIAL CONTRACTOR SHALL EXCAVATE A SUMP IN ONE CORNER OF THE EXCAVATION AND ADD STONE AND PIPING/SCREEN TO FACILITATE TEMPORARY DEWATERING OF THE EXCAVATION. ALL WATER SHALL BE COLLECTED IN AN APPROPRIATE TEMPORARY STORAGE TANK, SAMPLED FOR WASTE CHARACTERIZATION PURPOSES, AND DISPOSED OF OFF-SITE AT A PROPERLY PERMITTED FACILITY.
   B. THE BOTTOM OF THE EXCAVATION SHALL BE EXCAVATED BY A GRADING BUCKET OR BUCKET WITH A FLAT STEEL PLATE WELDED OVER THE BUCKET TEETH TO PROVIDE A FLAT BOTTOM AND AVOID DISTURBANCE TO SOILS TO REMAIN IN PLACE. BACKFILLING ACTIVITIES SHALL NOT COMMENCE UNTIL CONFIRMATION/ DOCUMENTATION SOILS RESULTS HAVE BEEN REVIEWED BY THE ENGINEER AND THE SUBGRADE HAS BEEN REVIEWED/INSPECTED BY THE CONSTRUCTION MANAGER.

7. BACKFILL EXCAVATION WITH STRUCTURAL FILL SUBBASE MATERIAL COMPACTED IN 12-INCH LIFTS. PRIOR TO BACKFILLING ACTIVITIES, THE EXCAVATION SHALL BE LINED ON ALL SIDES WITH A 6-OUNCE NON-WOVEN GEOTEXTILE DEMARCATION BARRIER. THE EXCAVATION SHALL THEN BE BACKFILLED WITH STRUCTURAL FILL IN ACCORDANCE WITH THE SPECIFICATIONS.

8. ALL FOUNDATIONS, PIPING, VAULTS, ETC., ENCOUNTERED DURING THE SOIL MIXING ACTIVITIES SHOULD BE REMOVED AND DISPOSED OF OFF-SITE.

9. ALL CONCRETE IS TO BE SCRAPED CLEAN AND SHIPPED OFF-SITE TO A C&D LANDFILL.

0 10 20
Scale in feet



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# TREAMENT ZONE 1 PLAN

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| 07/10/2020 | 059294.001 | AS SHOWN |

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**EV-102**

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NOTES

1. IN-SITU SOIL MIXING SHALL INCLUDE INJECTION OF ZERO-VALENT IRON FROM 9 FEET BELOW THE GROUND SURFACE (BGS) TO THE TARGET DEPTH SPECIFIED AND SOIL MIXING WITH PORTLAND CEMENT FROM 2 TO 9 FEET BGS.

2. EXCAVATED, SURPLUS SOIL TO BE TRANSPORTED OFF-SITE IN ACCORDANCE WITH THE SPECIFICATIONS.

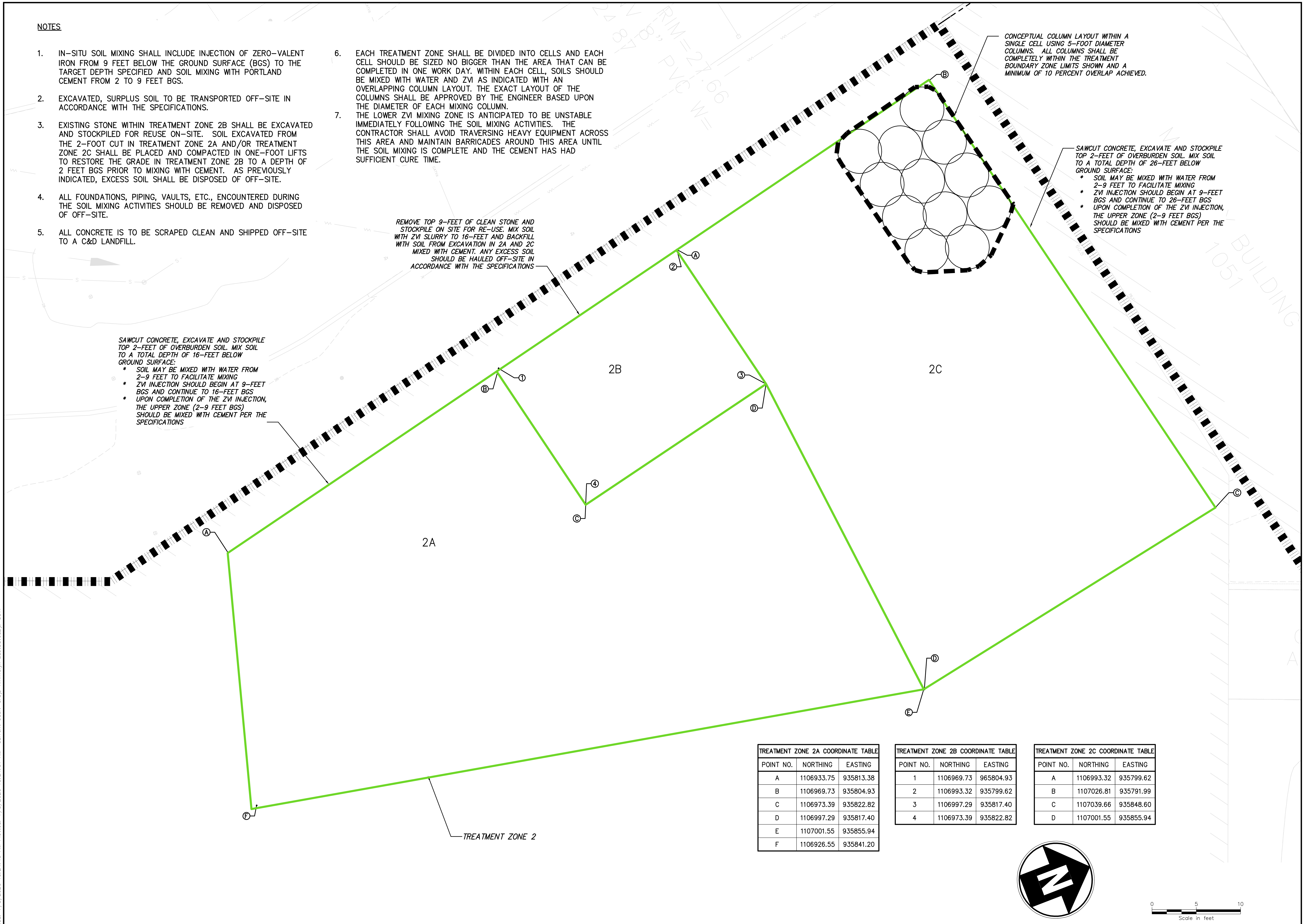
3. EXISTING STONE WITHIN TREATMENT ZONE 2B SHALL BE EXCAVATED AND STOCKPILED FOR REUSE ON-SITE. SOIL EXCAVATED FROM THE 2-FOOT CUT IN TREATMENT ZONE 2A AND/OR TREATMENT ZONE 2C SHALL BE PLACED AND COMPACTED IN ONE-FOOT LIFTS TO RESTORE THE GRADE IN TREATMENT ZONE 2B TO A DEPTH OF 2 FEET BGS PRIOR TO MIXING WITH CEMENT. AS PREVIOUSLY INDICATED, EXCESS SOIL SHALL BE DISPOSED OF OFF-SITE.

4. ALL FOUNDATIONS, PIPING, VAULTS, ETC., ENCOUNTERED DURING THE SOIL MIXING ACTIVITIES SHOULD BE REMOVED AND DISPOSED OF OFF-SITE.

5. ALL CONCRETE IS TO BE SCRAPED CLEAN AND SHIPPED OFF-SITE TO A C&D LANDFILL.

6. EACH TREATMENT ZONE SHALL BE DIVIDED INTO CELLS AND EACH CELL SHOULD BE SIZED NO BIGGER THAN THE AREA THAT CAN BE COMPLETED IN ONE WORK DAY. WITHIN EACH CELL, SOILS SHOULD BE MIXED WITH WATER AND ZVI AS INDICATED WITH AN OVERLAPPING COLUMN LAYOUT. THE EXACT LAYOUT OF THE COLUMNS SHALL BE APPROVED BY THE ENGINEER BASED UPON THE DIAMETER OF EACH MIXING COLUMN.

7. THE LOWER ZVI MIXING ZONE IS ANTICIPATED TO BE UNSTABLE IMMEDIATELY FOLLOWING THE SOIL MIXING ACTIVITIES. THE CONTRACTOR SHALL AVOID TRAVERSING HEAVY EQUIPMENT ACROSS THIS AREA AND MAINTAIN BARRICADES AROUND THIS AREA UNTIL THE SOIL MIXING IS COMPLETE AND THE CEMENT HAS HAD SUFFICIENT CURE TIME.




| TREATMENT ZONE 2A COORDINATE TABLE | | |
|---|---|---|
| POINT NO. | NORTHING | EASTING |
| A | 1106933.75 | 935813.38 |
| B | 1106969.73 | 935804.93 |
| C | 1106973.39 | 935822.82 |
| D | 1106997.29 | 935817.40 |
| E | 1107001.55 | 935855.94 |
| F | 1106926.55 | 935841.20 |

| TREATMENT ZONE 2B COORDINATE TABLE | | |
|---|---|---|
| POINT NO. | NORTHING | EASTING |
| 1 | 1106969.73 | 965804.93 |
| 2 | 1106993.32 | 935799.62 |
| 3 | 1106997.29 | 935817.40 |
| 4 | 1106973.39 | 935822.82 |

| TREATMENT ZONE 2C COORDINATE TABLE | | |
|---|---|---|
| POINT NO. | NORTHING | EASTING |
| A | 1106993.32 | 935799.62 |
| B | 1107026.81 | 935791.99 |
| C | 1107039.66 | 935848.60 |
| D | 1107001.55 | 935855.94 |



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TREATMENT ZONE 2 PLAN

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Drawing No.:

EV-103

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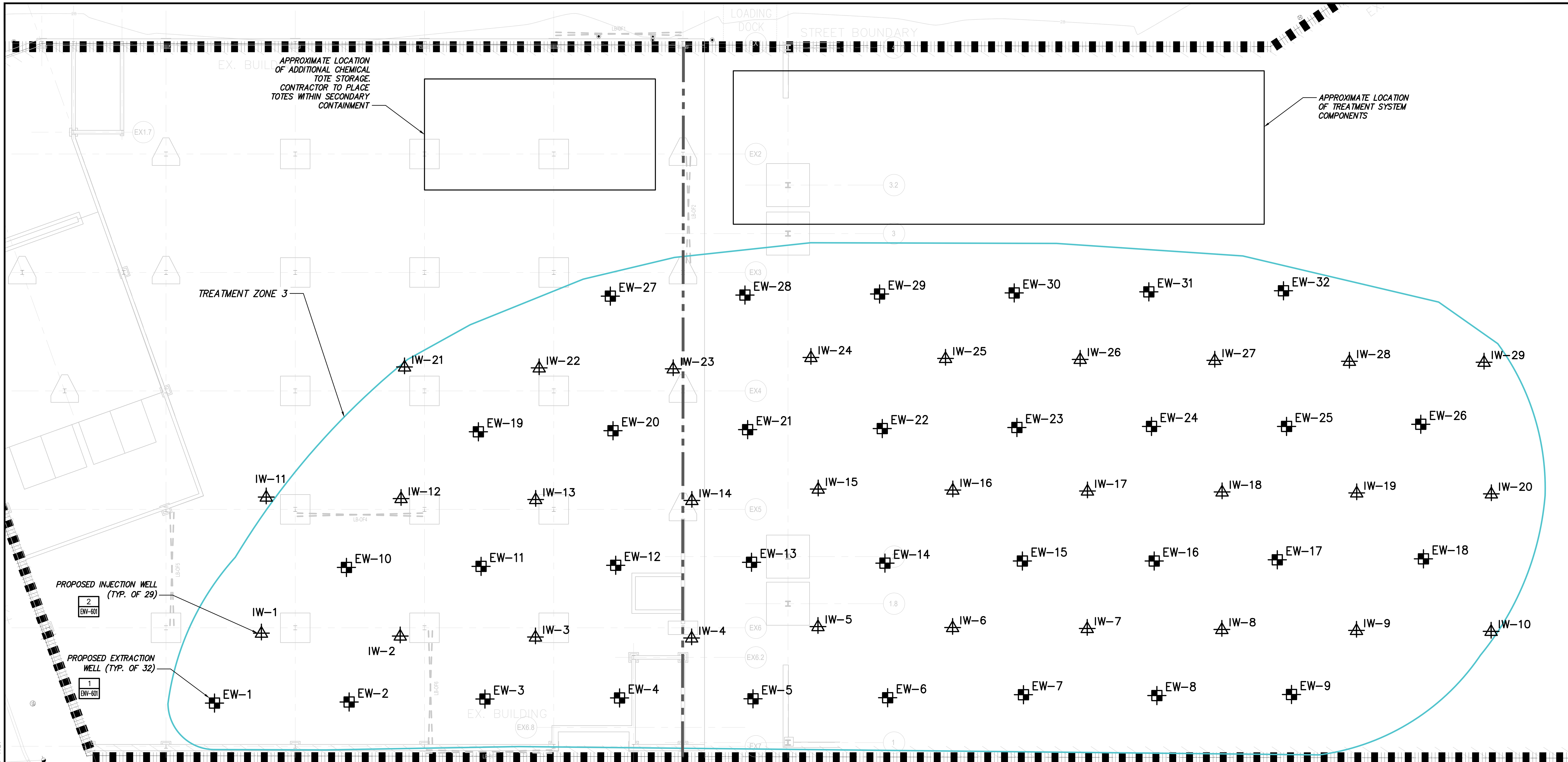


NOTES

1. EXACT LOCATIONS OF EXTRACTION/INJECTION WELLS MAY BE MOVED TO AVOID DAMAGE TO THE EXISTING FOUNDATION.
2. CONTRACTOR WILL BE RESPONSIBLE FOR CORING THROUGH THE EXISTING CONCRETE SLAB TO INSTALL WELLS AND IS RESPONSIBLE FOR OFF-SITE DISPOSAL.
3. WELLS WITHIN THE FOOTPRINT OF TREATMENT ZONE 1 SHALL NOT BE INSTALLED UNTIL AFTER THE EXCAVATION HAS BEEN BACKFILLED.
4. WELLS INSTALLED WITHIN THE PORTION OF THE BUILDING THAT WILL REMAIN (I.E. OFFICE AREA CIRCA 1980'S BUILDING) SHALL BE ADJUSTED IN THE FIELD TO AVOID DRILLING THROUGH THE EXISTING FOUNDATION FOOTERS.
5. THE EXACT LOCATION OF THE GROUNDWATER TREATMENT SYSTEM AND CHEMICAL TOTE STORAGE SHALL BE VERIFIED WITH THE CONSTRUCTION MANAGER PRIOR TO CONSTRUCTION. NOTE: ALL RIGID PIPING, PUMPS, CHEMICAL TOTES, AND TREATMENT SYSTEM COMPONENTS OTHER THAN THE FLEXIBLE HOSES MUST BE PLACED WITHIN SECONDARY CONTAINMENT.
6. THE HOSING RUNNING TO INDIVIDUAL WELL HEADS SHALL BE KEPT NEAT TO THE EXTENT PRACTICAL WITHIN THE WELL FIELD. THE CONTRACTOR SHALL PROVIDE A MINIMUM OF 4-FOOT WIDE BY 4-INCH HIGH RAMPS OVER THE GROUPING OF HOSES AT THE NORTH AND SOUTH ENDS OF THE SECONDARY CONTAINMENT AREA TO FACILITATE BETTER FOOT TRAFFIC AROUND THE TREATMENT EQUIPMENT. RAMPS ON EACH SIDE SHALL BE INSTALLED AT A 1:12 SLOPE.
7. ALL WELLHEAD ID NUMBERS SHALL BE MARKED ON THE PVC RISERS.
8. ALL TUBES SHALL BE LABELED AT THE MANIFOLD SYSTEM WITH THE WELLHEAD ID NUMBER THAT THEY ARE CONNECTED TO.

TREAMENT ZONE 3 COORDINATE TABLE

| POINT NO. | NORTHING | EASTING |
|---|---|---|
| EW-8 | 1106857.09 | 935916.03 |
| EW-1 | 1106692.62 | 935854.89 |
| EW-2 | 1106716.46 | 935863.83 |
| EW-3 | 1106739.77 | 935872.18 |
| EW-4 | 1106763.62 | 935881.12 |
| EW-5 | 1106786.98 | 935890.27 |
| EW-6 | 1106810.11 | 935898.92 |
| EW-7 | 1106833.85 | 935907.44 |
| EW-9 | 1106880.77 | 935925.41 |
| EW-10 | 1106725.02 | 935839.78 |
| EW-11 | 1106748.27 | 935849.50 |

TREAMENT ZONE 3 COORDINATE TABLE

| POINT NO. | NORTHING | EASTING |
|---|---|---|
| EW-12 | 1106772.21 | 935858.03 |
| EW-13 | 1106795.69 | 935865.94 |
| EW-14 | 1106818.77 | 935874.97 |
| EW-15 | 1106842.40 | 935884.62 |
| EW-16 | 1106864.98 | 935892.78 |
| EW-17 | 1106886.84 | 935900.94 |
| EW-18 | 1106912.68 | 935910.67 |
| EW-19 | 1106756.86 | 935825.57 |
| EW-20 | 1106780.44 | 935833.91 |
| EW-21 | 1106803.51 | 935843.56 |
| EW-22 | 1106826.92 | 935852.33 |

TREAMENT ZONE 3 COORDINATE TABLE

| POINT NO. | NORTHING | EASTING |
|---|---|---|
| EW-23 | 1106850.50 | 935860.67 |
| EW-24 | 1106873.47 | 935869.27 |
| EW-25 | 1106897.32 | 935878.42 |
| EW-26 | 1106920.73 | 935886.98 |
| EW-27 | 1106788.76 | 935810.83 |
| EW-28 | 1106811.73 | 935819.44 |
| EW-29 | 1106835.58 | 935828.38 |
| EW-30 | 1106859.43 | 935837.32 |
| EW-31 | 1106882.23 | 935846.36 |
| EW-32 | 1106904.94 | 935854.36 |
| IW-1 | 1106705.99 | 935846.37 |

TREAMENT ZONE 3 COORDINATE TABLE

| POINT NO. | NORTHING | EASTING |
|---|---|---|
| IW-2 | 1106729.80 | 935855.56 |
| IW-3 | 1106752.98 | 935865.25 |
| IW-4 | 1106780.72 | 935875.50 |
| IW-5 | 1106802.69 | 935881.79 |
| IW-6 | 1106825.92 | 935890.80 |
| IW-7 | 1106848.65 | 935899.95 |
| IW-8 | 1106872.71 | 935909.01 |
| IW-9 | 1106895.65 | 935919.00 |
| IW-10 | 1106918.83 | 935927.45 |
| IW-11 | 1106716.11 | 935822.92 |
| IW-12 | 1106738.96 | 935831.91 |

TREAMENT ZONE 3 COORDINATE TABLE

| POINT NO. | NORTHING | EASTING |
|---|---|---|
| IW-13 | 1106762.58 | 935841.24 |
| IW-14 | 1106789.35 | 935851.55 |
| IW-15 | 1106812.16 | 935858.20 |
| IW-16 | 1106835.00 | 935867.16 |
| IW-17 | 1106858.33 | 935876.84 |
| IW-18 | 1106881.87 | 935885.70 |
| IW-19 | 1106904.66 | 935894.47 |
| IW-20 | 1106928.49 | 935903.35 |
| IW-21 | 1106748.49 | 935809.46 |
| IW-22 | 1106771.77 | 935818.59 |
| IW-23 | 1106794.16 | 935827.37 |

TREAMENT ZONE 3 COORDINATE TABLE

| POINT NO. | NORTHING | EASTING |
|---|---|---|
| IW-24 | 1106819.25 | 935834.36 |
| IW-25 | 1106842.41 | 935843.82 |
| IW-26 | 1106865.99 | 935853.03 |
| IW-27 | 1106889.33 | 935862.05 |
| IW-28 | 1106912.37 | 935871.78 |
| IW-29 | 1106935.95 | 935880.13 |

LEGEND

EW-1 EXTRACTION WELL LOCATION

IW-1 INJECTION WELL LOCATION

0 10 20
Scale in feet



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TREATMENT ZONE 3 PLAN

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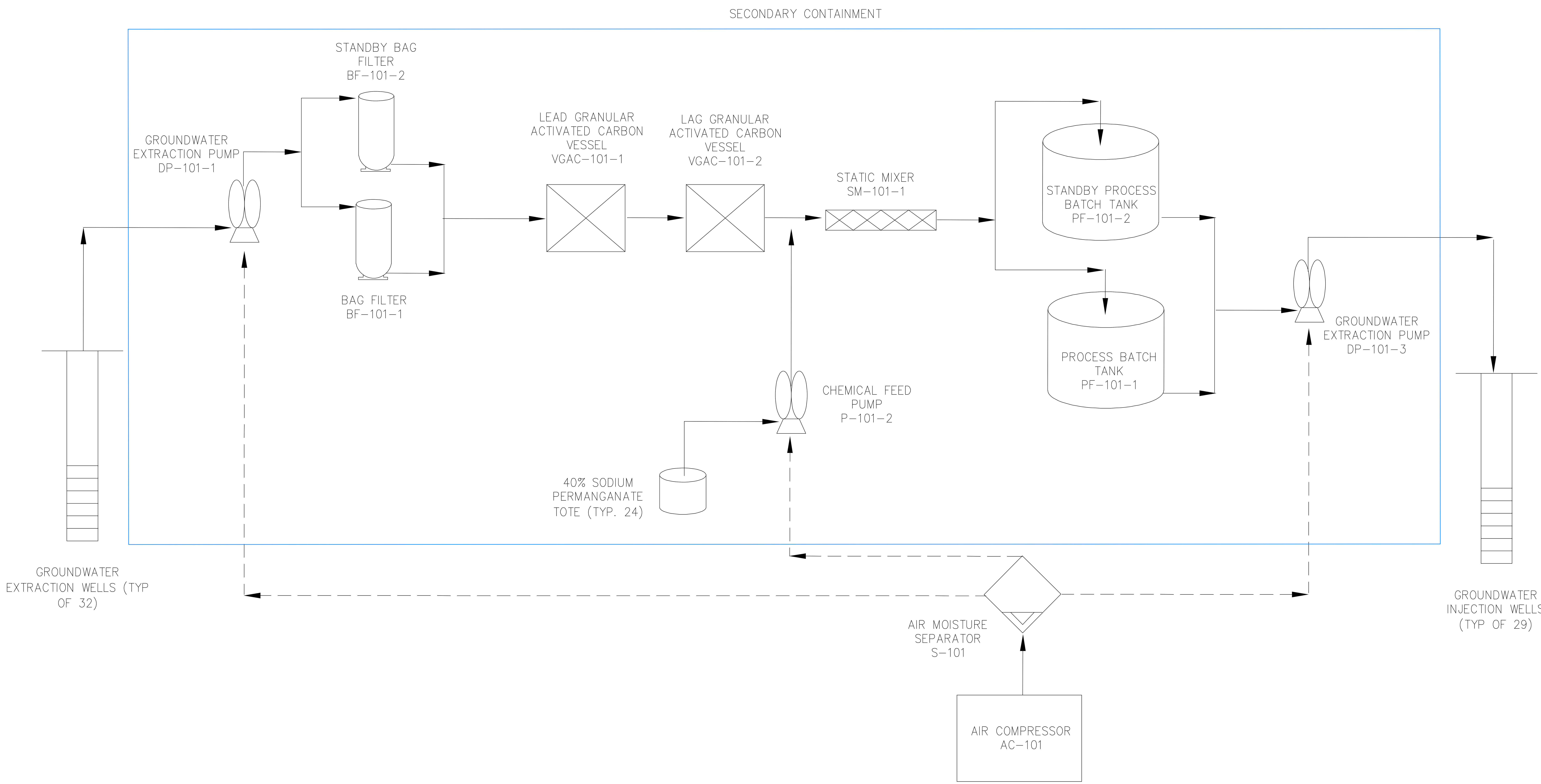




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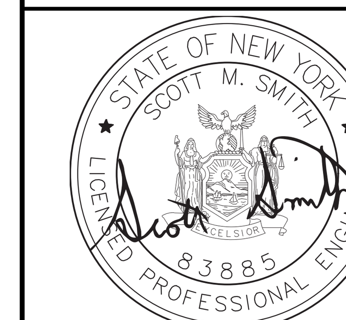




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# PROCESS FLOW DIAGRAM

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EV-201

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## GENERAL EQUIPMENT

- POLYETHYLENE STORAGE TANK
- STATIC MIXER
- GRANULAR ACTIVATED CARBON UNIT
- BAG FILTER HOUSING
- PUMP, DOUBLE DIAPHRAGM
- AIR–MOISTURE SEPARATOR
- FM FLOW METER
- PRESSURE REGULATOR WITH GAUGE
- NEEDLE VALVE
- SIGHT GLASS
- BATCH TANK VENT

## GENERAL PIPING

- DIRECTION OF FLOW
- CONCENTRIC REDUCER OR INCREASER
- CAM QUICK DISCONNECT
- UNION
- FLEXIBLE CONNECTION
- AIR LINE

## EQUIPMENT NUMBER IDENTIFICATION

T – 101 A

- DUPLICATE OR SPARE
- SEQUENCE NUMBER
- EQUIPMENT LETTER (SEE BELOW)

| | |
|---|---|
| AC | AIR COMPRESSOR |
| BF | BAG FILTER |
| BV | BALL VALVE |
| DP | DIAPHRAGM PUMP |
| GA | GATE VALVE |
| GAC | GRANULAR ACTIVATED CARBON |
| P | STAINLESS STEEL PRESSURE GAUGE (<75 psi) |
| PF | PROCESS FLOW |
| S | AIR MOISTURE SEPARATOR |
| SM | STATIC MIXER |
| SP | SAMPLE PORT |
| V | STAINLESS STEEL VACUUM GAUGE |

## MISCELLANEOUS

- SP — SAMPLE PORT/BLEEDING VALVE
- SECONDARY CONTAINMENT

## GENERAL INSTRUMENTS

### INSTRUMENTATION DEVICES AND FUNCTION SYMBOL

INSTRUMENT FOR SINGLE MEASURED VARIABLE AND ANY NUMBER OF FUNCTIONS. INSTRUMENT IS FIELD MOUNTED.

## VALVE BODIES

| OPEN | | CLOSED |
|---|---|---|
| | GATE (GA) | |
| | BALL (BA) | |
| | CHECK (CV) | |
| PR | PRESSURE RELIEF VALVE | |



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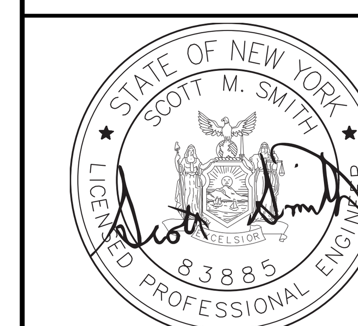




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# PROCESS LEGEND

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| SJM | TRG | SMS |
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| 07/10/2020 | 059294.001 | AS SHOWN |

Drawing No.:

# EV-202

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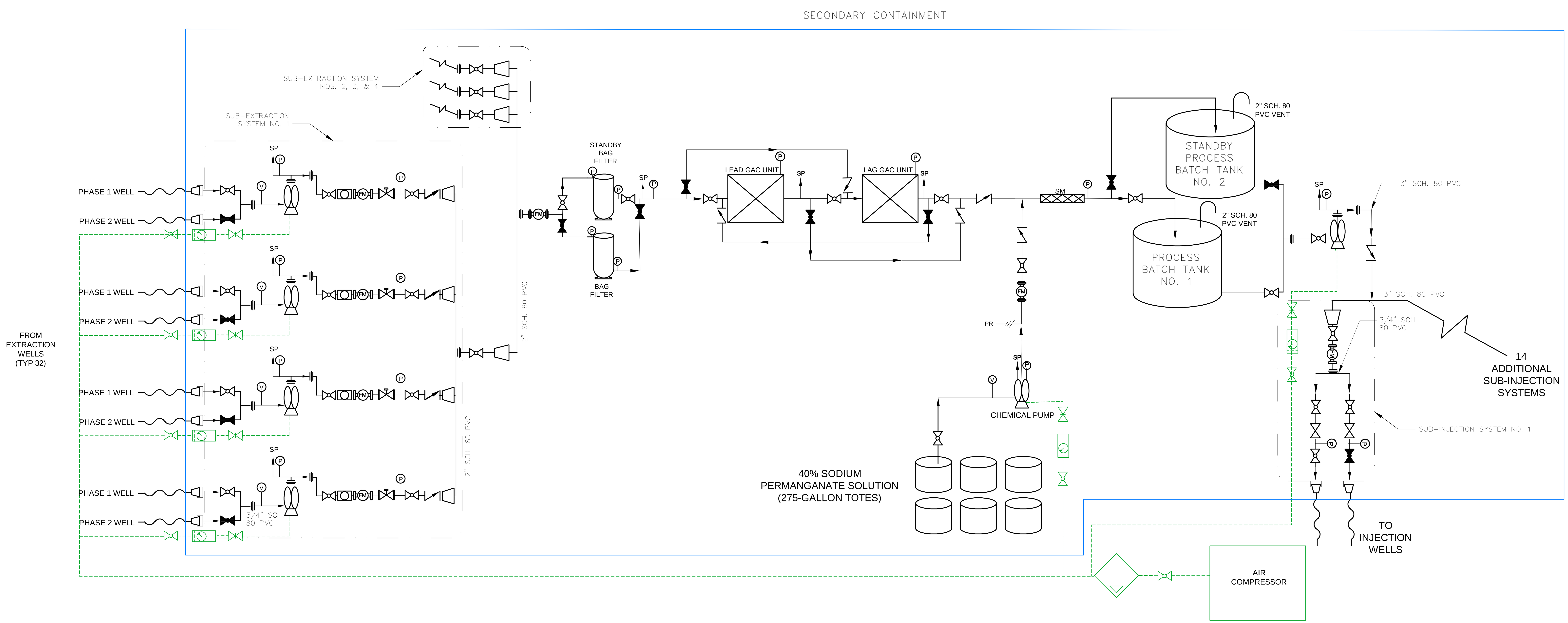


SYSTEM OPERATION NOTES

1. THE SYSTEM IS DESIGNED TO OPERATE USING A SEQUENCING BATCH REACTOR TREATMENT PROCESS TO REMEDIATE TWO PORE VOLUMES OF GROUNDWATER USING A PHASED APPROACH.
   A. ONE BATCH WILL CONSIST OF THE FOLLOWING:
      i. GROUNDWATER WILL BE EXTRACTED FROM 16 OUT OF 32 WELLS AT AN AVERAGE RATE OF 4GPM FOR A COMBINED FLOW OF 64 GPM
      ii. EXTRACTED WATER FLOWS THROUGH A BAG FILTER AND TWO CARBON UNITS BEFORE A 40% SODIUM PERMANGANATE SOLUTION IS INJECTED, MIXED, AND THE MIX IS DISCHARGED INTO ONE 8,400-GALLON POLYETHYLENE TANK.
      iii. IT IS ESTIMATED THAT ONE BATCH WILL OCCUR OVER TWO HOURS AND GENERATES 7,680 GALLONS OF EXTRACTED GROUNDWATER MIXED WITH 70.5 GALLONS OF 40% SODIUM PERMANGANATE.
      iv. EACH BATCH WILL SIT IN THE HOLDING TANK FOR 10 MINUTES PRIOR TO RE-INJECTION INTO THE GROUNDWATER FOR A TOTAL BATCH AMOUNT OF 7,750.5 GALLONS. THE SYSTEM WILL BE SHUT DOWN AN DECOMMISSIONED UPON COMPLETION OF A TOTAL OF 88 BATCHES.
   B. THE TREATMENT PROCESS WILL BE COMPLETED IN A TOTAL OF FOUR PHASES CONSISTING OF 22 BATCHES EACH. EACH PHASE WILL TREAT ONE PORE VOLUME IN HALF OF THE WELLFIELD, WHICH INCLUDES A TOTAL OF 168,311.5 GALLONS OF EXTRACTED WATER MIXED WITH 1,551 GALLONS OF SODIUM PERMANGANATE EACH. IN SUMMARY:
      i. THE FIRST PHASE WILL INCLUDE TREATMENT OF ONE PORE VOLUME FROM THE FIRST SET OF 16 EXTRACTION WELLS
      ii. THE SECOND PHASE WILL INCLUDE TREATMENT OF ONE PORE VOLUME FROM THE SECOND SET OF 16 EXTRACTION WELLS
      iii. THE THIRD PHASE WILL INCLUDE TREATMENT OF A SECOND PORE VOLUME FROM THE FIRST SET OF 16 EXTRACTION WELLS
      iv. THE FOURTH PHASE WILL INCLUDE TREATMENT OF A SECOND PORE VOLUME FROM THE SECOND SET OF 16 EXTRACTION WELLS
      v. SINCE THERE ARE ONLY 29 INJECTIONS WELLS, THREE OF THE INJECTION WELLS WILL BE USED FOR INJECTION IN BOTH HALVES OF THE WELLFIELD
2. THE TARGETED 40% SODIUM PERMANGANATE DOSE IS 5 G/L PER BATCH.
3. GROUNDWATER WILL BE INJECTED AT A RATE OF 5 GPM PER WELL FOR A TOTAL FLOW OF 80 GPM TO PREVENT DOWNTIME BETWEEN BATCHES.

GENERAL NOTES

1. PUMPS, FLOW METERS, BAG FILTERS, CARBON UNITS, AND POLYETHYLENE TANKS MAKE AND MODEL ARE DEFINED IN THE SPECIFICATIONS.
2. BAG FILTERS ARE DESIGNED TO OPERATE IN PARALLEL.
3. GAC UNITS ARE DESIGNED TO OPERATE IN A SERIES LEAD/LAG SEQUENCE.
4. AIR COMPRESSOR SIZE SHALL MEET THE REQUIREMENTS FOR OPERATION OF 16 GROUNDWATER EXTRACTION PUMPS, ONE CHEMICAL FEEL PUMP, AND ONE INJECTION PUMP.
5. ALL FLOW METERS, PUMPS, AND FILTER HOUSING MUST BE CHEMICALLY COMPATIBLE WITH SODIUM PERMANGANATE (E.G. NON-METALLIC PUMPS, STAINLESS STEEL BAG FILTER HOUSING, ETC.).



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GEC CONSULTING, LLC
on behalf of
JMA TECH PROPERTIES, LLC

STATE OF NEW YORK · SCOTT M. SMITH · LICENSED PROFESSIONAL ENGINEER · 83885



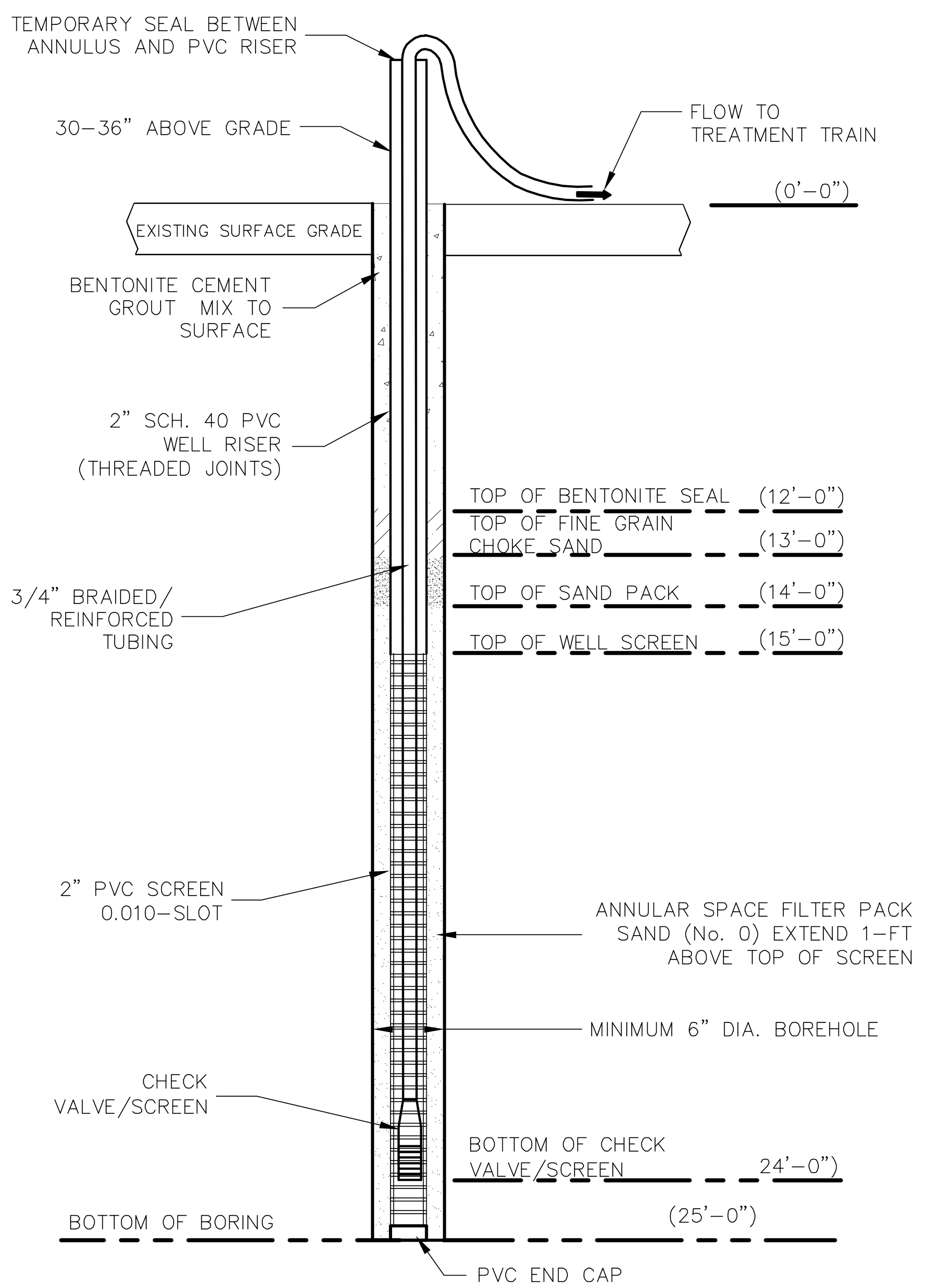
RANALLI/TAYLOR ST. LLC
REMEDIAL DESIGN
140 CORTLAND AVE
SYRACUSE, NEW YORK
NYSDEC BCP NO. C734144

| No. | Submittal / Revision | App'd. | By | Date |
|---|---|---|---|---|
| A | 100% SUBMISSION | SMS | TRG | 07/10/2020 |

PROCESS, INSTRUMENTATION AND CONTROL DIAGRAM

| Designed By: | Drawn By: | Checked By: |
|---|---|---|
| SJM | TRG | SMS |
| Issue Date: | Project No: | Scale: |
| 07/10/2020 | 059294.001 | AS SHOWN |

Drawing No.:
EV-203

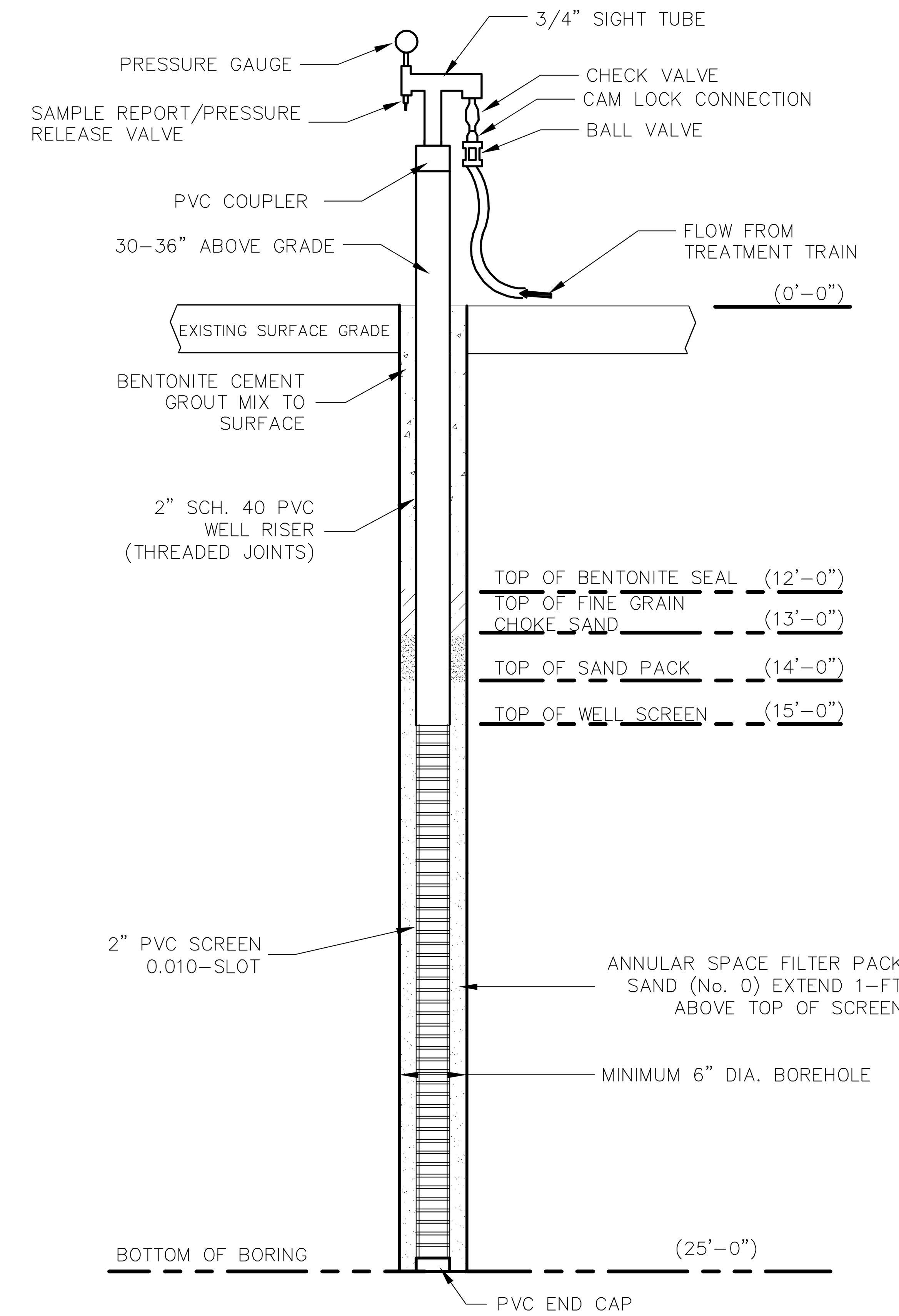



10' L X 2" PVC WELL SCREEN, 0.010–SLOT 14' L X 2" RISER

**1 TYPICAL EXTRACTION WELL DETAIL**
NOT TO SCALE

NOTES:

1. ALL JOINTS TO BE THREADED. DO NOT USE PVC GLUE TO CONNECT PVC PIPE.
2. PVC TO BE SCHEDULE 40.
3. BOTTOM OF HOSING AND CHECK VALVE/SCREEN FOR EXTRACTION TO BE SET 1' ABOVE BOTTOM OF SCREEN




10' L X 2" PVC WELL SCREEN, 0.010–SLOT 14' L X 2" RISER

**2 TYPICAL INJECTION WELL DETAIL**
NOT TO SCALE

NOTES:

1. ALL JOINTS TO BE THREADED. DO NOT USE PVC GLUE TO CONNECT PVC PIPE BELOW SURFACE.
2. PVC TO BE SCHEDULE 40.



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| No. | Submittal / Revision | App'd. | By | Date |
|---|---|---|---|---|
| A | 100% SUBMISSION | SMS | TRG | 07/10/2020 |

GENERAL DETAILS

| Designed By: | Drawn By: | Checked By: |
|---|---|---|
| SJM | TRG | SMS |
| Issue Date: | Project No: | Scale: |
| 07/10/2020 | 059294.001 | AS SHOWN |

Drawing No.:
EV-601

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# APPENDIX E

## Technical Specifications

SECTION 024113.40 - MONITORING WELL ABANDONMENT

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the abandonment of thirty-two extraction wells (32) twenty-nine (29) injection wells, and seven (7) permanent groundwater monitoring wells as shown on the Contract Drawings. All wells will be decommissioned after the completion of the remedy with the exception of GW-103S and GW-103D which will be decommissioned prior to soil mixing.

1.2 QUALITY ASSURANCE

A. Reference Standards:
   1. The latest edition of the following standards, as referenced shall be applicable.
      a. New York State Department of Environmental Conservation's (NYSDEC's) Policy "CP-43: Groundwater Monitoring Well Decommissioning Policy."

1.3 WELL LOCATIONS

A. The locations of all extraction, injection, and permanent monitoring well points have been identified on the Contract Drawings.

1.4 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Delivery and Storage:
   1. Store products and materials at locations where unnecessary handling is avoided and where they will not interfere with the Owner's operations, construction operations or public travel.
   2. Cover all grouting materials to protect the materials from hydration prior to use.

1.5 QUALITY ASSURANCE

A. Registration:
   1. All work shall be completed by a well drilling Contractor registered in the State of New York, who shall comply with all applicable rules, regulations, and guidelines published by the State of New York regarding performance of the work.

B. Utilities for Construction:
   1. Unless otherwise provided for, the Contractor shall furnish his own source of electricity, fuel, and potable water required to perform the work, and shall bear the costs of these services.

C. Protection of Property:
   1. The Contractor shall properly protect all surface and subsurface structures and surrounding areas from damage which may result from the methods employed in performing the work. The Contractor shall be responsible for any damages to such structures resulting from his operations. Damaged property shall be repaired or replaced to a condition which is equal to that which existed prior to damage. The Engineer and the Client shall have the right to approve these restoration measures.
   2. The Contractor shall clear all underground utilities within the proposed work areas by calling Dig Safely New York, municipal authorities, and public utilities of record prior to commencing all work. Refer to Section "Underground Utility Locator Service" for additional utility locating requirements.

D. Protection of Environment:

1. The Contractor shall contain all solid and liquid materials during the abandonment of the wells.

E. Health and Safety:

1. Prior to mobilization to the site, the drilling Contractor will be responsible for providing a copy of a project specific Health and Safety Plan (HASP) to the Owner's Representative in accordance with Section "Health and Safety Plan".
2. The Contractor shall comply with all applicable laws and regulations governing the furnishing and use of safeguards, safety devices, and protection of equipment. The Contractor shall take any necessary precautions to protect the life and health of employees and the public in performance of the work.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

A. Bentonite-Cement Grout:

1. Bentonite-cement grout shall consist of Type I Portland cement (refer to ASTM Standard C150), finely ground sodium-bentonite type clay, and potable water. The mixture shall consist of one 94-pound bag of Type 1 Portland cement, 3.9 pounds of bentonite clay powder, and 7.8 gallons of potable water.

B. Bentonite Seal:

1. A one-foot thick bentonite seal consisting of 1/4-inch diameter sodium-bentonite chips hydrated with potable water shall be placed at the top of the bentonite-cement grout column. The seal shall be no less than three (3) inches below the existing site grade.

## PART 3 - EXECUTION

### 3.1 WELL ABANDONMENT

A. General Requirements:

1. The Contractor shall be responsible for providing temporary power service and potable water, as needed, to complete the well abandonment work as well as decontamination activities.
2. All abandoned wells must be fully sealed in a manner appropriate for site specific geologic conditions to prevent contaminant migration through the borehole.
3. The Contractor shall maintain a complete and accurate record of the well abandonment operation. For each well abandoned, the Contractor shall complete a Well Decommissioning Record (Figure 3 of NYSDEC's Groundwater Monitoring Well Decommissioning Policy) The information to be recorded shall include the well ID, the depth of the well and riser diameter, the name of the driller and drilling company, the date of the decommissioning, type of plugging material used, the volume of materials used, the interval grouted, and the method of placing the plugging material into each well. All records shall be submitted to the Engineer within five (5) business days after the well abandonment is complete.
4. All work shall be completed under the direction of the Engineer on-site representative.

B. Plugging Procedures for Shallow Overburden Wells with Uncompromised Well Seals:

1. Cut the pavement around the well to be abandoned if removal of pavement will be required for future removal of the protective steel well casing. The minimum cut should be 18-inches square. No cutting of the existing concrete slab is required for the abandonment of the injection and extraction wells.
2. Place a minimum of 6-mil polyethylene around the boring location to minimize materials contacting the existing pavement surface.
3. Puncture the bottom cap of each well.
4. A bentonite-cement grout mixture shall be placed in the well by pumping the mixture down a tremie pipe of a least one-inch inside diameter (half inch diameter permissible for 1-inch diameter wells only) which has been placed to the bottom of the well to avoid segregation or dilution of the sealing materials. The slurry shall be applied in one continuous operation until the well is filled to within at least eighteen (18) inches of the ground surface elevation. The tremie pipe shall be submerged in the grout during grout placement. Equipment used for pumping the grout shall be of the diaphragm, piston, gear, or helical type. The Contractor shall be responsible for determining the amount of grout required to plug each well.
5. Continue to add grout to the hole as the well is extracted. Place grout to within eighteen (18) inches of the adjacent ground surface.
6. The Contractor shall allow the grout mixture to settle a minimum of two hours prior to placing the bentonite seal. Additional grout, if necessary, should be added to the well borehole to raise the grout level to within eighteen (18)inches of the ground surface elevation.
7. A one-foot thick (eighteen inches within the footprint of the existing concrete slab) bentonite seal consisting of 1/4-inch diameter sodium-bentonite chips hydrated with potable water shall be placed at the top of the bentonite-cement grout to provide a secondary seal.
8. The concrete surface seal and protective steel casings around the permanent monitoring wells shall be removed only after the initial grouting of the well is completed. Remove the previously cut pavement from around the protective steel casing as necessary to facilitate the removal (not applicable for the Treatment Zone 3 injection and extraction wells).

C. Decontamination:

1. All down-hole equipment will be thoroughly decontaminated on-site prior to abandoning each existing monitoring well with a high-pressure steam cleaner and again prior to demobilization.
2. Decontamination of down-hole equipment is only required prior to demobilization for the abandonment of the Treatment Zone 3 injection and extraction wells

D. Site Restoration:

1. The Contractor shall restore the site to a condition that reasonably approaches the original condition of the property prior to the start of work. Boreholes in pavement may be patched with 6-inches concrete at the surface or asphalt cold patch.
2. Upon completion of the work, the Contractor shall remove from the premises, all materials, debris, tools, and machinery used to complete the work. Plugging materials, grease, or other materials, which have accumulated on the work site premises shall be removed. The Contractor shall dispose of all excess materials, the well protective casings, and PVC well pipe off-site in accordance with all local, State, and Federal regulations. Any excess soil associated with the well abandonments shall be placed into a roll-off container for future waste characterization and disposal in accordance with Section "Excavation & Management of Contaminated Soil."

END OF SECTION

SECTION 026113 - EXCAVATION AND MANAGEMENT OF CONTAMINATED SOIL

PART 1 – GENERAL

1.1 SUMMARY

A. This specification provides the requirements for the excavation and management of suspected contaminated soils. For this project, contaminated soils shall be considered:
   1. Soils with dark staining or heavy sheens.
   2. Soils exhibiting strong petroleum or other chemical odors.
   3. Soils with an organic vapor concentration in excess of 10 ppm above background as measured at the site with a handheld photoionization detector (PID).

B. This section includes the excavation, staging, characterization, transportation, off-site disposal, and documentation submittals required for managing contaminated soils as well as establishment of pertinent site controls.

C. Excavation and direct loading of contaminated soils for off-site disposal is recommended. However, if soil stockpiles are considered necessary, temporary soil containment pads shall be constructed in accordance with Paragraph 3.6.

D. Conduct all tasks associated with these items in accordance with all Federal, State, County, and local regulations.

E. This specification requires the Contractor to develop, implement, maintain and enforce a written site-specific health and safety plan (HASP) as well as a material handling and excavation plan prior to commencing any on-site work and update the plans as necessary throughout the duration of the work.

PART 2 – PRODUCTS

2.1 MATERIALS

A. At a minimum, the following items shall be furnished by the Contractor upon encountering suspect contaminated material:
   1. 20-mil minimum polyethylene sheeting for decontamination pad and/or temporary soil containment pads.
   2. 10-mil polyethylene sheeting for covering of contaminated soil in any stockpiles and protecting the ground surface from spillage during the loading of trucks.
   3. Waterproof tarpaulins for covering of trucks/roll-offs (automatically closed covers for large hauling dump trucks, but no mesh cover permissible).
   4. 6-oz. Non-woven geotextile for delineation of excavation area.
   5. Oil-absorbent pads, booms or similar.
   6. Potable water and non-phosphate detergents for decontamination purposes.
   7. Temporary fencing and/or barricades to secure open excavations and ensure compliance with OSHA 29 CFR 1910.

PART 3 – EXECUTION

3.1 ADVANCE PREPARATION

A. Contractor's Site-Specific Health and Safety Plan (HASP):
   1. Within 7 days after the date of Notice to Proceed, submit a site-specific HASP in accordance with Section "Health and Safety Program".

B. Material Handling and Excavation Plan: Within 7 days after the date of the Notice to Proceed, Contractor shall prepare and submit a Material Handling Plan to the Engineer for Review. The plan must be accepted by the Engineer prior to the commencement of work within the defined remedial excavation area. Procedures must include:
   1. A site plan identifying all proposed staging/stockpiling areas, unless direct loading.
   2. Methods for maintenance and protection of stockpiled soil prior to removal for disposal.
   3. Soil screening characterization procedures, if necessary.
   4. Waste profiling and coordination with disposal facilities.
   5. Proposed transportation methods, hauling routes, tracking requirements, and permitting requirements. Note: Any soil moved off-site or transported through an active lane of traffic must be in New York State Department of Environmental Conservation (NYSDEC) 6 NYCRR Part 364 permitted vehicles.

3.2 EXCAVATION

A. Site Preparation:
   1. All site controls shall be installed, including stormwater pollution prevention controls, prior to the commencement of ground intrusive activities.
   2. Upon first encountering suspect contaminated soil, temporary soil containment pads, decontamination areas, etc. should be installed at the site prior to continuing the excavation of such materials.
   3. Secure the excavation area with temporary construction fencing and/or barricades. Place appropriate warning signs around the perimeter of the work area.

B. Excavation within concrete paved areas shall be neatly saw-cut prior to the removal of the concrete.

C. Excavation Areas: Proposed excavation area associated with the removal of the existing underground storage tank (Treatment Zone 1) is shown on the Drawings. Excavation areas for soil within the soil mixing zone (Treatment Zone 2) is also shown on the Contract Drawings.

D. All materials should be disposed of at a properly permitted facility in accordance with 6 NYCRR Part 360 regulations.

3.3 SOIL SCREENING & DELINEATION OF CONTAMINATED SOIL

A. During any excavation activities the Engineer will perform screening consisting of visual and odor observation of soils.
   1. Non-Contaminated Soil: Soil/sediment with no visual or odor evidence of contamination shall be considered non-contaminated and can be stockpiled and used as backfill for the excavation, unless otherwise specified.
   2. Contaminated soil: Soils/ sediments exhibiting visual (e.g. staining) or olfactory (strong odors) signs of contamination, shall be direct loaded into trucks or placed on a temporary soil containment pad prior to disposal. The Engineer will screen the soils with a handheld

photoionization detector (PID) in an effort to delineate the contaminated soil, and will make the final determination of a fully delineated area.

a. All overburden soil excavated prior to reaching suspect contaminated material will be direct loaded or stockpiled for off-site disposal regardless of organic vapor concentration.

b. Soils with an organic vapor concentration of 10 parts per million (ppm) or more above background will be excavated for off-site disposal and excavation within the area will continue.

c. Upon reaching the contaminated layer (i.e. smear zone), soils with an organic vapor concentration in less than10 ppm above background will be sampled for laboratory analysis by the Contractor for confirmatory purposes to determine if the area has been fully delineated.

3. If evidence of gross contamination is encountered, the excavation shall be advanced until all suspect material has been removed in accordance with the screening techniques above or until further excavation is no longer feasible (e.g. potential undermining of a utility or building foundation).

B. The Contractor will collect soil for screening purposes with an excavator bucket of similar so that the Engineer can screen the selected soils from outside the excavation.

3.4 WASTE CHARACTERIZATION TESTING & PROFILING

A. The frequency of analytical testing will be based upon the volume of contaminated soil and requirements by the selected disposal facility. The Contractor shall be responsible for collecting representative samples of suspect contaminated soils and submitting the samples to a New York State Department of Health (NYSDOH) certified laboratory for analysis and waste characterization purposes as required by the selected disposal facility or for compliance with local, State and Federal regulations.

B. The Contractor shall be responsible for coordinating the schedule for the waste characterization analyses directly with the selected laboratory. The Contractor shall be responsible for any additional costs for expediting receipt of the results.

C. Waste characterization samples will be shipped to a certified laboratory for analysis under proper chain-of-custody protocol and analyzed for the following minimum parameters:

1. Toxicity Characteristic Leaching Procedure (TCLP) Volatile Organic Compounds (VOCs);
2. TCLP Semivolatile Organic Compounds (SVOCs);
3. TCLP Resource Conservation and Recovery Act (RCRA) 8 Metals;
4. Total Polychlorinated Biphenyls (PCBs);
5. Total Pesticides/Herbicides;
6. Reactivity/pH/flashpoint;
7. Paint filter test; and;
8. Additional parameters required by the selected disposal facility.

D. Waste profiles shall be prepared by the Contractor, signed by the Owner and accepted in writing by the disposal facility prior to shipment.

## 3.5 MATERIAL HANDLING

A. Work Practices: Effort shall be made to avoid tracking contaminated media into uncontaminated portions of the site or off-site. To minimize the potential cross-contamination on-site via tracking and reduce the extent of decontamination required, the following work practices shall be implemented:

1. Effort will be made to advance the excavation face toward the excavator such that the tracks/tires on the machine do not contact impacted media.
2. Effort will be made to minimize the amount of equipment and machinery that contacts the contaminated soils/sediment.
3. The operator will fill only three quarters of the bucket and/or shake the bucket prior to turning the machine to minimize spillage and material falling off as the machine turns/swings.
4. 10-mil polyethylene sheeting shall be placed between the excavation and trucks or stockpiles such that spillage does not contact uncontaminated areas of the site.
5. Similar work practices should be implemented when completing excavations with equipment other than an excavator.

B. If dewatering of the excavation is deemed necessary to facilitate the removal of contaminated media or groundwater with a significant sheen is encountered, suspected contaminated water shall be collected and managed in accordance with Paragraph 3.9.

C. If significant odors are encountered in workers' breathing zone or are emanating off-site during excavation activities, one or more of the following procedures shall be implemented:

1. The rate of progress of the excavation activity will be reduced.
2. Contaminated soil/sediment stockpiles will be covered as material is placed in them.
3. The amount of open excavation will be reduced and/or polyethylene sheeting will be placed over the excavation faces.
4. In the event that the above methods are not sufficient in reducing odors emanating from the work area, spray foam products (e.g., RusFoam® by Rusmar Foam Technologies™) or similar products will be applied to the excavation faces and stockpiles following approval by the Engineer to further control odors.

D. A grading bucket or a bucket with a steel plate welded over the bucket teeth shall be utilized to create a flat bottom in the excavation. No gouges in or other disturbance to the subgrade is permissible prior to backfilling activities.

E. Upon completion of the excavation within Treatment Zone 1, place 6-ounce non-woven geotextile over unexcavated areas (i.e. sidewalls and bottom) to serve as a demarcation barrier between the site soil and the clean backfill, as further described in Section "Geotextiles."

## 3.6 MATERIAL STOCKPILING

A. The Contractor shall make reasonable effort to direct load all soil upon collection of waste characterization samples and landfill approval. It is the responsibility of the Contractor to collect waste characterization samples, coordinate with the waste disposal facility, and facilitate loading out of all contaminated soils requiring off-site disposal. If direct loading of contaminated soil into trucks for off-site disposal is not possible due to pending analytical results or disposal facility approvals, locate stockpiles where excavation equipment can place soil directly onto the stockpile.

B. Areas available for stockpiling soil will be limited due to other on-going construction at the site. Should stockpiling of contaminated soils on site be required during the course of work, it shall not be done without the prior approval of the Engineer. If stockpiling activities are approved, the following procedures and requirements shall be followed.

1. Where stockpiling is required, the location of all temporary soil containment pads shall be approved by the Engineer and shall not hinder the continuation of other construction or facility activities.
2. Prepare the subgrade, which shall consist of a stable subgrade where all visible sharp objects have been removed. The temporary soil containment areas shall be sufficiently sized to contain all stockpiled material and accessible to excavation equipment and trucks for eventual loading.
3. A low point or sump shall be constructed on the temporary soil containment pad to collect any water generated from dewatering of the materials placed on the pad and the pad shall be graded towards the low point.
4. Any liquid that accumulates on the temporary soil containment pad shall be containerized, characterized and managed per Paragraph 3.9.
5. A minimum of 20-mil polyethylene sheeting with at least two-foot of overlap at all seams shall be placed on the subgrade. The top sheet shall be lapped over the bottom sheet in a shingle type pattern.
6. A minimum of a one-foot high soil berm, hay bales, wood timbers, or similar shall be placed around the perimeter of the containment area to ensure that no saturated soils and/or water migrate off the containment pad. Secure the edges of the sheets to keep the polyethylene sheeting in place.
7. Erosion and sediment controls shall be erected around the perimeter of stockpiles, including silt fence or Silt Soxx, at a minimum. Stormwater runoff shall be directed around all stockpiles and excavation.
8. Construct stockpiles in a height not exceeding 15-feet and with side slopes no steeper than 2H:1V unless otherwise accepted by the Engineer.
9. Stockpiles shall be kept covered at all times with appropriately anchored 10-mil polyethylene sheeting (minimum) or waterproof tarpaulins. Stockpiles will be routinely inspected and ripped or damaged stockpile covers will be promptly replaced.
10. Maintain all stockpiles and embankments until material is disposed of off-site. Inspect stockpiles frequently to ensure that materials are not released into the surrounding environment.
11. Dispose of contaminated soils within ten (10) days of being stockpiled unless otherwise approved by the Engineer.

## 3.7 DISPOSAL

A. The Contractor is responsible for coordination of the proper disposal of contaminated soil. Waste profiles will be signed by the Owner following receipt and review of waste characterization samples, unless authorization is received in writing for the Contractor to sign on the behalf of the Owner.

B. Submit waste disposal facility permit and approved waste profile to the Engineerprior to shipping contaminated soils off-site. Valid Part 364 permits shall be included with this submittal for the selected waste hauler(s).

C. The Contractor is responsible for obtaining all permits associated with the off-site transportation and disposal of contaminated materials. Provide vehicles, equipment, labor, signs, labeled placards, manifests, necessary for accomplishment of the work, including materials necessary for cleanup up of spills that may occur.

D. Where possible, all trucks shall be loaded adjacent to the excavation and stockpile area. Care shall be taken to minimize the potential for spillage of contaminated materials on the sides of trucks as they are loaded and to keep haul truck tires from contacting contaminated media. Polyethylene sheeting must be placed between the material being loaded and the truck that it is being loaded into at all times.

E. Saturated soils shall be dewatered prior to loading and shipment. No spillage of fluids is permitted from the haul trucks and all loads must be covered with waterproof tarpaulins (automatically closed covers for large hauling dump trucks). Do not transport material if it contains free liquid or is sufficiently wet to be potentially flowable during transport. If necessary, waterproof liners may be installed in the truck beds. Loads that are rejected by the disposal facility due to high moisture content will be the sole responsibility of the Contractor. Should dewatering of the soils be deemed necessary, the Contractor is required to submit the means and methods of dewatering to the Engineer for approval prior to dewatering.

F. If soil or water escapes onto uncontaminated portions of the site or public roadways, immediately clean the area and restore it to the original condition and notify the Engineer.

G. The Owner will sign all bill of ladings/manifests accompanying shipments as the waste generator, unless the Contractor is authorized in writing to sign waste documentation on the Owner's behalf.

H. The licensed/permitted hauler shall transport the waste material to the disposal facility with no unauthorized stops in between, except as required by regulatory authority. Transport vehicles must arrive at the receiving facility the same day as loaded.

I. Submit one copy of the document of the disposal facility's acceptance of the material, including weight ticket slips to the Engineer within 15 days of acceptance at the disposal facility. Ensure that the bill of lading or waste manifest include the following information:
   1. Transport subcontractor name, address, EPA ID number, and telephone number.
   2. Type and quantity of waste removed.
   3. Weight ticket with corresponding bill of lading/manifest tracking number.
   4. Disposal facility name, address, permit number, and telephone number.
   5. Copy of the approved waste profile.
   6. Date material was removed from the project site.

J. Immediately submit written notification to the Engineer if problems arise, regarding the facility chosen to accept the waste for off-site disposal, that would require the return of waste, or if the chosen facility has violated any environmental regulations that may result in regulatory enforcement action. Propose an alternate disposal facility and provide all required documentation previously indicated.

K. The Contractor and their hauler are responsible for all bill of lading/manifest discrepancies. Immediately report discrepancies to the Engineer and resolve to the satisfaction of the Owner.

L. Payment for soil disposal will be made based on weight (tonnage), per the above-referenced weight tickets and upon receipt of fully executed waste manifests/bill of ladings.

3.8 DECONTAMINATION

A. Clean equipment that contacts contaminated media shall be decontaminated at the end of each working day or before removing the equipment from the project site. At a minimum, all heavy equipment contacting contaminated media shall be cleaned using a high-pressure steam cleaner. All equipment decontamination activities shall be performed on a temporary decontamination pad, which shall include the following, at a minimum:

1. The decontamination pad shall be constructed in an area accessible to heavy equipment and trucks and should be located in proximity to the excavation area.
2. Prepare the subgrade, which shall consist of a stable subgrade where all visible sharp objects have been removed. The area shall be sufficiently large to facilitate the decontamination of heavy equipment and trucks.
3. A low point or sump shall be constructed to collect any wash water that accumulates on the pad. The grade of the decontamination pad shall be pitched towards the low point.
4. A minimum of 20-mil polyethylene sheeting, with at least two-foot of overlap at all seams shall be placed on the subgrade. The top sheet shall be lapped over the bottom sheet in a shingle type pattern.
5. A minimum of a one-foot high soil berm, wood timbers or similar shall be placed around the perimeter of the containment area to ensure that no saturated soils and/or water migrate/flow off of the containment pad. Secure edges to keep sheeting in place. Ramps shall be constructed as necessary to facilitate access onto and off of the decontamination pad.
6. Splash guards shall be installed around the perimeter of the decontamination pad to direct overspray to the pad.
7. A portable decontamination pad may be used in lieu of a field constructed decontamination pad; however, overspray protection is still required.

3.9 CONSTRUCTION WASTEWATER MANAGEMENT

A. Whenever possible the Contractor may pump water from one area of the excavation to another so long as this does not cause undermining of existing on-site structures or cause significant erosion of surrounding site soil.

B. If pumping water from one excavation to another is not feasible, the Contractor is responsible for the proper characterization and disposal of all water collected from dewatering of stockpiled materials, water pumped from excavations to facilitate soil removal, and wash water associated with decontamination activities. All wastewater shall be managed in accordance with applicable federal, state and local regulations.

C. The Contractor is responsible for diverting stormwater runoff around the excavation areas.

D. Any wastewater collected from the excavation area, runoff/run-on control operations within the project area, and the decontamination of personnel and equipment shall be collected and managed in one of the following ways:

1. Water will be collected in a temporary storage container (e.g., drums, polyethylene tank or frac tanks depending on the volume of water requiring treatment) and sediment will be allowed to settle out.
2. All stored water will be placed in approved containers and labeled in accordance with United States Department of Transportation (USDOT) requirements.
3. Following initial settling, the Contractor is responsible for collecting appropriate characterization samples and profiling the wastewater.

4. Disposal of water pumped from the excavation and/or collected during decontamination: Following initial settling, the water will be pretreated as necessary to be accepted by the selected disposal facility. The contractor shall remove, transport, and dispose of the wastewater at a properly permitted off-site treatment facility.
5. Discharge of contaminated or potentially contaminated fluids on-site is prohibited.

E. Free product: If light non-aqueous phase liquid (LNAPL) is encountered, the contractor shall use one or more of the following methods to control and remove the free product:
1. Absorbent booms, pads, etc.
2. Floating skimmer systems.
3. Removal with a vacuum truck.

Note: The use of dispersants is prohibited at this site.

F. The Contractor shall provide the following minimum documentation to the Engineer for any fluids disposed of off-site:
1. Name, address, phone number, and contact person for disposal facility accepting the waste stream.
2. A copy of the permit for the disposal facility.
3. A copy of the written authorization from the disposal facility agreeing to accept the waste.
4. A copy of the approved waste profile and analytical reports (where applicable).
5. Name, address, phone number, contact person and copy of permit for waste transporters.
6. Type and quantity of each material removed.
7. Bill of ladings/manifests for each shipment, including volumes shipped and signatures of generator, transporter, and receiving facility.
8. Date material was removed from the site.

## 3.10 QUALITY ASSURANCE

A. Post-Excavation Confirmation/Documentation Soil Sampling: In the event that collection of post-excavation soil samples from the excavation bottom and/or sidewalls is deemed necessary by the Engineer or the NYSDEC, the Contractor shall be responsible for assisting in the collection in accordance with NYSDEC's DER-10: Technical Guidance for Site Investigation and Remediation (Section 5.4) and Sections "Tank Cleaning & Decommissioning" and "Environmental Excavation, Backfill and Compaction."

B. Excavation areas shall not be backfilled until analytical sample results are reviewed by the Engineer (up to 48 hours following sample collection) and determined to meet the applicable NYSDEC SCOs, and the Geotechnical Engineer has approved of the subgrade. Contractor will be responsible for securing open excavations for the protection of public safety.

## 3.11 DEMARCATION BARRIER

A. Prior to commencing backfilling operations, the bottom and sides of the excavation shall be wrapped with a demarcation barrier in accordance with Section "Geotextiles."

## 3.12 BACKFILLING

A. The excavation shall be backfilled in accordance with Section “Environmental Excavation, Backfilling and Compaction.”

B. All impervious areas surrounding the excavation shall be broom cleaned upon completion of the backfilling activities.

END OF SECTION

SECTION 026540 - TANK CLEANING & DECOMMISSIONING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes furnishing all labor, materials and equipment necessary to decommission the existing aboveground storage tank (AST) located in a subterranean vault as identified for removal on the Drawings. The tank was reported as a 10,000-gallon tank that contained No. 6 fuel oil. A suspected fill port has been observed within Treatment Zone 1; however, the exact location of the tank and/or associated vault has not been determined and the Contractor shall complete exploratory excavation to identify the exact location and orientation of the tank. Work shall also include installation of site controls, coordinating utility clearance, removal of tank contents (fill, residual fuel and fill materials), removal of flammable vapors, cleaning the interior of the tanks and disposing of wash water/cleaning fluids/sludge from the storage tanks, excavation, removal and disposal of the tank system including all ancillary equipment and the vault, assistance with the collection of confirmation soil and groundwater samples, and closure reporting.

B. Section includes all labor, materials and equipment necessary for the disposal of the tank vault, ancillary equipment and piping as identified for removal on the Drawings.

1.2 REFERENCE STANDARDS

A. Work shall conform to all applicable federal, state and local laws, ordinances and regulations and codes and standards including:
1. National Fire Protection Association (NFPA) Codes.
2. Occupational Safety and Health Administration (OSHA).
3. Owner’s Insurance Underwriters Criteria.
4. Code of Federal Regulations (CFR), 40 CFR 280.
5. Underwriter’s Laboratories (UL) Criteria.
6. American Petroleum Institute (API).
7. City of Syracuse Mechanical Code.
8. New York State Department of Environmental Conservation (NYSDEC).

B. Where minimum requirements of Codes are exceeded by the Drawings and Specifications, the requirements of the Drawings and Specifications shall govern. Where in conflict, Local Code requirements shall take precedence. Where any requirements of the Drawings and Specifications are not in conformance with Code requirements, notify the Engineer before the work is initiated. The decision of Engineer in interpreting the Drawings and Specifications and Code requirements related thereto shall be considered final.

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

D. American Petroleum Institute (API) Standards:
1. Recommended Practice 1604 (2001), Closure of Underground Petroleum Storage Tanks.
2. Recommended Practice 2003 (2015), Protection Against Ignitions Arising Out of Static, Lightning and Stray Currents.
3. Standard 2015 (2018), Requirements for Safe Entry and Cleaning Petroleum Storage Tanks.
4. Recommended Practice 2217A (2017), Safe Work in Inert Confined Spaces in the Petroleum and Petrochemical Industries.
5. Recommended Practice 2219 (2016), Safe Operation of Vacuum Trucks Handling Flammable and Combustible Liquids in Petroleum Service.

E. National Fire Protection Association (NFPA):
   1. NFPA 30, Flammable and Combustible Liquids Code.
   2. NFPA 241 – Safeguarding Construction, Alteration and Demolition Operations.
   3. NFPA 326 (2020), Standard for Safeguarding of Tanks and Containers for Entry, Cleaning, or Repair.
   4. NFPA 350 (2019), Guide for Safe Confined Space Entry and Work.

F. Code of Federal Regulations:
   1. 29 CFR 1910, Occupational Safety and Health Standards.
   2. 29 CFR 1926, Safety and Health Regulations for Construction.
   3. 40 CFR 280, Technical Standards and Corrective Action Requirements for Owners and Operators of Underground Storage Tanks.

G. Applicable State Agency Regulations:
   1. New York State Department of Environmental Conservation (NYSDEC):
      a. 6 NYCRR Part 613, Petroleum Bulk Storage.
      b. January 20, 1987 (Modified July 19, 1988 and December 3, 2003) Memorandum, Permanent Closure of Petroleum Storage Tanks.
      c. NYSDEC’s CP-51: Soil Cleanup Guidance.

1.3 QUALITY ASSURANCE

A. Contractors, subcontractors and their employees responsible for tank vapor removal and cleaning shall be trained and experienced with all applicable safety rules and regulations, the use of equipment and procedures for testing and removing all vapor from tanks, the cleaning and disposal of wash water for the tank systems and types of products likely to be encountered, and the applicable sections of the codes and referenced standards listed in these specifications. Work shall be performed in accordance with API 1604 and NFPA 327.

B. Prior to commencing field work, the Contract shall prepare a site-specific Health and Safety Plan (HASP) which addresses all planned field activities associated with the work. The HASP shall be prepared in accordance with all applicable OSHA regulations, API Publication 2015, and shall be submitted to the Engineer prior to the start of work. Refer to Section “Health and Safety Program” for specific HASP requirements.

C. Use adequate numbers of skilled workmen and operators who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with specified requirements and the methods needed for proper performance of the work of this Section.

D. Use equipment adequate in size, capacity, and numbers to accomplish the work in a timely manner.

E. Provide access for and cooperate with any testing company authorized by the Engineer.

1.4 DEFINITIONS

A. Definitions shall be as defined in NFPA 326.

SUBMITTALS

A. Site-Specific HASP: See Section “Health and Safety Program”.

B. Spill and Discharge Control Plan: Develop a written spill and discharge control plan prior to commencing any on-site work and continue to implement, maintain, and enforce the plan until final demobilization from the site. The spill and discharge control plan shall be provided to the Engineer a minimum of 7 days prior to mobilization.

C. Copies of the final/approved Syracuse Fire Department Fire Prevention Bureau Application of Tank Removal and the City of Syracuse Permit Application for Above/Underground Tank/Fuel Dispenser/Pumps associated with the tank removal. The Contractor is responsible for submitting the required documentation and obtaining approval from the City as well as all permit fees.

D. The following waste disposal documentation:
   1. Copies of any other required for the removal of the AST, including waste hauler permits.
   2. Analytical results for wash water characterization samples and draft waste profile.
   3. Approved waste profile and facility approvals.
   4. Waste documentation (including weight tickets, bill of ladings, manifests, etc.)
   5. Tank disposal paperwork.

1.5 JOB CONDITIONS

A. During underground storage tank cleaning, workers may be exposed to liquids, vapors or wastes. Special precautions shall be observed by all individuals engaged in the procedures outlined in this specification.

PART 2 - PRODUCTS

2.1 Furnish 20 mil minimum polyethylene sheeting for temporary staging and covering the removed tank.

2.2 Backfill material: Select Granular Material as specified in Section “Environmental Excavation, Backfilling and Compaction”.

PART 3 - EXECUTION

3.1 GENERAL PRECAUTIONS

A. Work on tanks that have held liquids shall be performed under the supervision of persons who understand the fire and explosion potential involved. Workers shall be sufficiently skilled to safely carry out the operations necessary. The characteristics of the contents of the tank shall be determined prior to beginning work.

B. Before cleaning work is started on tanks that may be under pressure, the pressure shall be reduced to atmospheric. The tank contents shall be vented to a safe location.

C. Any equipment that may provide a source of ignition shall not be permitted within the vicinity of a tank being cleaned until the area has been tested and found to be vapor free. All instruments shall be thoroughly checked, maintained and calibrated in accordance with the manufacturer’s instructions (e.g. calibration typically with isobutylene for photoionization detectors and pentane or hexane in air for combustible gas indicators). Persons responsible for monitoring and testing shall be completely familiar with the use of the instruments and the interpretation of the instrument’s readings. Readings in the vapor space shall be taken at the bottom, middle and upper portions the tank due to potential stratification.

3.2 PREPARATION

Prior to commencing with the tank removal and associated excavation activities, the Contractor shall call Dig Safely New York at 811 for location of publicly owned utilities.

A. Obtain applicable permits and schedule work with Owner and applicable agencies. Provide copies of any permits to the Engineer.

B. Install controls to divert surface runoff from entering the tank, vault and associated excavation.

C. Protection of work area:
   1. Provide and properly locate adequate barriers and warning signs for work areas which will require closure during performance of the work. Signage shall include warning signs such as “Danger - No Smoking” and “Danger – Excavation Area” at a minimum. The use of highly visible cones, lights and barricades shall be utilized as appropriate.
   2. Contractor shall barricade the work area with a minimum of 4-foot high temporary orange construction fencing with warning signage. Concrete barricades or similar shall be installed where it is necessary to provide protection for vehicular traffic. Barricades, warning signs, and lights shall comply with standards and code requirements for erecting structurally adequate barricades.
   3. Provide adequate protection to all property line monumentation, utilities, building areas, pavement areas, landscaping, etc. not include in the work or not directly involved in the performance of the work. Repair or replace damaged property to the satisfaction of the Engineer.

D. Coordinate with the Construction Manager to arrange shutdown of any utilities before excavating in the areas where they are located. Repair or replaced damaged utilities to the satisfaction of the Engineer at no additional cost to the Owner.

E. Excavation Support and Protection: Shoring and bracing necessary to protect existing buildings, streets, walkways, utilities, and other improvements, as well as the excavation and workers, against loss of ground or caving embankments. It shall be the Contractor's responsibility to provide protection adequate for this purpose. Details of this sheeting must conform with the requirements of Title 29 Code of Federal Regulations, Part 1926, Safety and Health Regulations for Construction (OSHA). Design, furnish, install, monitor, and maintain excavation support and protection system capable of supporting excavation sidewalls, resisting soil and hydrostatic pressure, and superimposed and construction loads.

3.3 CLEANING PROCEDURES

A. General: Cleaning operations shall be conducted in the open if practical.
   1. Take appropriate steps to protect personnel from harmful exposure to toxic or corrosive vapors or gases.
   2. A portion of the tank may have been previously filled when the tank was originally taken out of service. The Contractor shall not assume that there is no remaining headspace within the tank if evidence of filling is observed during the decommissioning activities.
   3. Flammable or combustible vapors may be present in the work area and hazardous vapor concentrations shall be monitored regularly using a combustible gas indicator (CGI) throughout the decommissioning process. The concentrations of vapor in the tank and excavation areas may reach the flammable/explosive range before venting is completed and a safe atmosphere is reached. Therefore, precautions must be taken to:
      a. Eliminate sources of ignition in the work area (e.g. smoking, use of non-explosion-proof electrical Class I, Division I, Class D or otherwise approved equipment in a potentially explosive atmosphere and internal combustion equipment). Non-sparking tools and explosion-proof tools (e.g. flashlights) shall be utilized as appropriate.
      b. Prevent the discharge of static electricity during the venting of flammable vapors.
      c. Prevent the accumulation of vapors at the ground level.
   4. Disconnect or remove sources of ignition from the vicinity of the tank before venting or cleaning operations are started. Turn off all switches, pull breakers, and utilize a voltmeter or similar device to confirm that power is no longer live for all electrical equipment

associated with the fueling system and other nearby equipment. All electrical equipment in the vicinity shall be in accordance with NFPA 70, National Electrical Code. Any modifications to the electrical system shall be completed by a licensed electrician.

B. Removal of Flammable Vapors:

1. While the tank scheduled for decommissioning was reported to have contained No. 6 fuel oil, the Contractor shall still assume that any headspace within the tank contains flammable vapors.
2. Remove flammable vapors by one of the methods described in these specifications, or as required by local codes. These methods provide a means for temporary removal of potentially flammable or combustible vapors in the tank atmosphere. However, it is important to recognize that the tank may continue to be a source of flammable vapors even after following the vapor removal procedures described. For this reason, caution must always be exercised when handling or working around tanks that have stored flammable or combustible liquids. Before initiating work in the tank area or on the tank, a CGI shall be used to assess flammable vapor concentrations in the tank and work area.
3. Displacement with Air: Vapor removal/purging may be accomplished by purging with air, and a safe atmosphere may be sustained by continuing the ventilation. When openings of sufficient size are available, air movers that do not provide an ignition source may be attached so that air is drawn through one opening and discharged through another opening. When openings cannot accommodate an air mover, the container may be purged by introducing air so that it will circulate through the tank or container and be discharged to the outside. In air purging, the concentration of vapor in air in the tank may go through the flammable range before a safe atmosphere is obtained; therefore, every precaution shall be taken to ensure that all ignition sources have been removed from the vicinity. An effective ground shall be maintained between the air mover and the tank being cleared.
4. Displacement with Inert Gas: To minimize the hazards of passing through the flammable range, the tank can be first purged with an inert gas, and then ventilated with air.
5. Vapors shall be vented at least 12 feet above the ground surface and at least 10 feet away from adjacent structures.

C. Inerting of Vapor Space: Inerting is a means of safeguarding a tank by reducing the oxygen content to the point where combustion cannot take place. Individuals in direct charge of the work must be thoroughly familiar with the limitations and characteristics of the inert gas being used. Briefly, the procedure for inerting is as follows:

1. Close all openings in the tank except for the fill connection and vent.
2. Cracks or other damaged sections shall be plugged.
3. Flammable and combustible vapors may be purged with an inert gas such as carbon dioxide ($CO_2$) or nitrogen ($N_2$). The inert gas shall be introduced through a single tank opening at a point near the bottom of the tank at the end of the tank opposite the vent. When inert gases are used, they shall be introduced under low pressure to avoid the generation of static electricity. When using $CO_2$ or $N_2$, pressures in the tank shall not exceed 5 pounds per square inch gauge.

   CAUTION: The process of introducing compressed gases into the tank may create a potential ignition hazard as the result of the development of static electrical charges. The discharging device must therefore be grounded. $CO_2$ extinguishers shall not be used for inerting flammable atmospheres.

4. The vapors in the tank may be displaced by adding solid carbon dioxide (dry ice) to the tank in the amount of at least 1.5 pounds per 100 gallons of tank capacity. The dry ice shall be crushed and distributed evenly over the greatest possible area in the tank to promote rapid evaporation. As the dry ice vaporizes, flammable vapors will flow out of the tank and may surround the area. Therefore, where practical, plug all tank openings except the vent after introducing the solid $CO_2$ and continue to observe all normal safety precautions regarding flammable or combustible vapors. Make sure that all of the dry ice

has evaporated before proceeding.

CAUTION: Skin contact with dry ice may produce severe burns.

5. Flammable vapors may be exhausted from the tank by one of the methods of tank ventilation listed in API 1604, with Engineer's approval.

6. In the case of a tank inerted with nitrogen, the oxygen content may be measured directly by an oxygen indicator. When carbon dioxide is used, the oxygen percentage can be calculated from the percentage of carbon dioxide in the tank measured by means of a carbon dioxide indicator.

CAUTION: $CO_2$ and $N_2$ are asphyxiants which displace oxygen. If entering the tank becomes necessary, caution should be taken to ensure that the proper controls are in place to prevent asphyxiation.

7. If the tank is a double-wall tank, the interstitial space must also be inerted from any potential flammable vapors.

D. Testing Procedures:

1. Testing for Oxygen Content: When purging a tank with an inert gas, a CGI may not indicate the actual flammability of the sample correctly. The concentration of oxygen shall be determined by an appropriate oxygen indicator.
2. Testing for Flammability: The test for flammability is the most important phase of the cleaning procedures and determines whether or not the cleaning has been effective. These tests may be made with a CGI. Readings from most CGI's give the percentage of lower flammable limit of the vapors present in an atmosphere. The readings may be misleading where the atmosphere contains less than five percent by volume of oxygen as in an inert container, although in general the readings in oxygen-lean atmospheres will be on the high or safe side. It is essential that the operator using the indicator be well-trained in the use of the instrument and that the operator perform the checks recommended by the manufacturer to ensure that the instrument is in good operating condition. The vapor content of the gas leaving the tank shall be tested periodically while ventilation or air purging is in progress. If an air mover is used to exhaust air from a tank, the discharge from the air mover will be diluted with air used in the jet, but the results of the test at this point will still be indicative of the change of vapor concentration within the vessel. When the desired low concentration is reached, the condition of the tank or container itself may be checked by taking samples at appropriate points.

E. Removal of liquid and sludge:

1. Remove liquids and vapors from the product lines, traps, fill pipes, vapor recovery lines (and vents if necessary, under a non-complying tank condition), etc. by purging and draining the lines toward the tank. To minimize the hazards of passing through the flammable range, the lines can be first purged with an inert gas, and then ventilated with air if necessary. Flushing with a proper cleaning liquid and purging of the product lines will be required prior to removal and disposal scheduled for decommissioning. If product lines are scheduled to be reused for a new/replacement tank system, the product lines shall be capped and protected from damage during and prior to removal of the AST.
   a. Pressurized piping: Remove or fully open the functional element check valve at the pump.
   b. Suction piping: There may be a check valve located at or within the tank in addition to the one at the pump that may need to be removed to drain all product into the tank.
2. Empty and drain the tank of all contents including any fill materials that may have been historically placed inside when the tank was previously removed from service. The Contractor shall recover any remaining fuel in the tank for recycling or proper disposal.

Remove liquids and residues from the tank by using explosion-proof or air-driven pumps. Pump motors and suction hoses must be grounded to the tank or otherwise grounded to prevent electrostatic ignition hazards. It may be necessary to use a hand pump to remove the last few inches of liquid from the bottom of the tank. If a vacuum truck is used for removal of liquids or residues, the area of operation for the vacuum truck must be vapor-free. The truck shall be located upwind from the tank and outside the path of probable vapor travel. The vacuum pump exhaust gases shall be discharged through a hose of adequate size and length downwind of the truck and tank area. See API publication 2219 for vacuum truck operating and safety practices.

3. After inerting, the tank shall be accessed for mechanical scrubbing and/or high-pressure wash and removal of sludge from the tank bottom as well as accumulation on the side walls of the tank. This can be accomplished by cutting a hole in the tank to provide a means of entry. Contractor shall adhere to OSHA regulations for confined space entry and API publication 2015 and recommended Practice 1604. If the tank is in poor condition and the Contractor removes the tank prior to cleaning, refer to Section 3.5 for requirements for excavating the tank.
4. After the interior of the tank is cleaned, conduct a visual inspection of the tank interior to verify all visible product, sludge and wash waster has been removed. Document the location and size of any holes observed in the tank surface. Use appropriate confined space entry protocols if entry into the tank is necessary to perform this operation.

## 3.4 DECONTAMINATION AND WASH WATER/SLUDGE MANAGEMENT

A. Decontaminate or properly dispose of personnel protective equipment and clothing worn in contaminated areas at the end of each workday, at a minimum. Decontaminate personnel, materials and equipment before exiting the work zone, and prior to being removed from the site.

B. Contractor is responsible for the proper recycling/disposal of all fill material, product, sludge and wash water in accordance with applicable federal, state and local regulations.

C. The Contractor shall collect representative samples of decontamination fluids/wash fluids as well as any sludge and submit the samples to a New York State Department of Health (NYSDOH) certified laboratory for analysis and waste characterization purposes. All samples shall be managed in accordance with appropriate chain-of-custody protocols.

D. The frequency of analytical testing will be based upon the volume of wash waters generated and requirements by the selected disposal facility. The Contractor shall be responsible for the collection and submittal of the number and types of soil samples necessary for waste characterization in accordance with the requirements of the selected disposal facility and for compliance with Local, State and Federal Regulations.

E. Waste characterization samples will be shipped to a certified laboratory for analysis under proper chain-of-custody protocol and analyzed for the following minimum parameters:

1. Total Volatile Organic Compounds (VOCs) Note: do <u>NOT</u> composite VOC samples.
2. Total Semivolatile Organic Compounds (SVOCs)
3. Total RCRA 8 Metals
4. Total PCBs
5. Reactivity/pH/flashpoint
6. Additional parameters required by the selected disposal facility. Sludges that are to be handled as solids will also likely be required to be sampled utilizing the toxicity characteristic leaching procedure (TCLP).

F. The Contractor shall be responsible for coordinating the schedule for the waste characterization analyses directly with the selected laboratory. The Contractor shall be responsible for any additional costs for expediting receipt of the results.

G. Waste profiles shall be prepared by the Contractor based upon the waste characterization data and accepted in writing by the disposal facility prior to shipment for off-site disposal.

H. Submit waste disposal facility permit and approved waste profile to the Engineer no less than 24 hours prior to shipping contaminated wash water and sludge off-site. Valid waste hauler permits shall be included with this submittal for the selected waste hauler(s).

I. The Contractor is responsible for obtaining all permits associated with the off-site transportation and disposal of contaminated materials, including a valid NYSDEC Part 364 permit. Provide vehicles, equipment, labor, signs, labels, placards, manifests, necessary for accomplishment of the work, including materials necessary for cleanup up of spills that may occur.

J. The Owner shall sign all bill of ladings/manifests accompanying shipments as the waste generator, unless the Contractor is authorized in writing to sign waste documentation on the Owner's behalf.

K. The licensed/permitted hauler shall transport the waste material to the disposal facility with no unauthorized stops in between, except as required by regulatory authority. Transport vehicles must arrive at the disposal/receiving facility the same day as loaded.

L. Submit weight ticket slips and associated manifest/bill of ladings to the Engineer within fifteen (15) days of acceptance at the disposal facility. Ensure that the bill of lading or waste manifest include the following information:
1. Transport subcontractor name, address, EPA ID number, and telephone number.
2. Type and quantity of waste removed.
3. Weight ticket with corresponding bill of lading/manifest tracking number.
   Disposal facility name, address, permit number, and telephone number.
4. Copy of the approved waste profile.
5. Date material was removed from the project site.

M. Immediately submit written notification to the Engineer if problems arise, regarding the facility chosen to accept the waste for off-site disposal, that would require the return of waste, or if the chosen facility has violated any environmental regulations that may result in regulatory enforcement action. Propose an alternate disposal facility and provide all required documentation previously indicated.

N. The Contractor and their hauler are responsible for all bill of lading/manifest discrepancies. Immediately report discrepancies to the Engineer and resolve to the satisfaction of the Engineer.

## 3.5 EXCAVATION AND TANK REMOVAL

A. Neatly saw cut all concrete cover systems over the tank to minimize damage to materials not being demolished or removed as part of the work.

B. Excavate to the top of the tank and/or vault.

C. Remove all tank-top equipment including the top of the vault, fill pipe, drop tube, automatic tank gauge equipment and riser, leak detection equipment, submersible turbine or other tank top pumps, vapor recovery equipment, conduits, etc., except for the vent line that must remain connected until the tank is purged/inerted of flammable vapors. The Contractor is responsible for protecting any equipment identified on the Drawings or Specifications for reuse.

D. All tank openings but the vent shall be plugged as openings in the top are created by removing existing equipment to force the vapors through the vent during the purging process. Once the tank is purged/inerted of flammable vapors, all holes shall be plugged.

E. Tanks Scheduled for Removal:

1. Place a minimum of 20-mil polyethylene sheeting on a flat area near the tank excavation, but far enough from the pit that weight of the tank will not jeopardize the stability of the excavation side walls. Store blocking nearby in preparation of the AST removal.
2. Plug any remaining holes in the tank. One plug shall have a 1/8-inch diameter hole to serve as a vent, which will allow for the expansion and contraction of the remaining non-flammable air/vapor mixture in the tank.
3. Continue excavating around the sides of the tank. Should evidence of contaminated soil and/or groundwater be encountered, refer to Section “Excavation and Management of Contaminated Soil” for requirements.
4. Secure the tank with appropriate slings, chains, or other equipment specifically design for lifting heavy loads.
5. Use equipment large enough and structurally sound enough to lift the tank out of the excavation pit.
6. Place the tank on the polyethylene sheeting and securing it with blocking to prevent the tank from shifting or rolling.
7. Remove any large clods of soil from the exterior of the tank inspect the exterior of the tank for any pin holes or areas of discoloration that would be indicative of release as part of the tank condition documentation process.
8. Upon preparing the tank for shipment off-site for recycling or disposal, the tank shall have a large hole cut into the shell or be crushed prior to leaving the site to render it unusable. Tanks shall not be reused to store a regulated substance unless the tank is recertified by the original manufacturer for the intended use.
9. Tanks not removed from the site the same day they are cleaned and removed from the excavation shall be temporarily covered with polyethylene sheet to prevent potential contact with precipitation. A small hole shall be cut in the sheeting where the 1/8-inch diameter vent hole has been installed.
10. Dispose of or recycle the tank off-site. Provide a copy of the bill of lading or manifest documenting the final off-site disposal/recycling location of the tank.

F. The remaining sections of the tank vault shall be removed following removal of the tank.

G. Additional contaminated soil shall be excavated for off-site disposal in accordance with Section “Excavation and Management of Contaminated Soil.”

## 3.6 BACKFILLING & SITE RESTORATION

A. All excavation areas associated with the removal of the tank and ancillary equipment shall be backfilled with approved materials in accordance with the Contract Documents, including backfill materials.

B. Imported backfill material shall meet the requirements of Select Granular Material as specified in Section “Environmental Excavation, Backfilling, and Compaction”.

## 3.7 CLEANUP & REPAIR

A. Upon completion of work, removal all tools, equipment and demolished materials form the site.

B. Remove temporary controls/protections and leave all impervious areas adjacent to the excavation area broom clean.

C. Repair demolition performed in excess of that required by the Drawings at no additional cost to the Owner.

D. Return elements of construction and surfaces to the condition existing prior to the start of operations. Repair adjacent construction or surface soil damaged by Contractor's demolition work.

3.8 REGISTRATION OF TANK(S)

A. Within 30 days after the permanent closure of the tank, the Owner will submit a Petroleum Bulk Storage (PBS) registration application to the NYSDEC in accordance with 6 NYCRR Part 613-1.9(f), indicating that the UST(s) have been permanently closed and removed. The tank was previously identified as closed in-place.

END OF SECTION

SECTION 310519.13 – GEOTEXTILES

PART 1 – GENERAL

1.1 SUMMARY

A. This Section includes the installation of separation/demarcation barrier fabric as shown on the Drawings and as specified herein.

1.2 QUALITY ASSURANCE

A. The latest edition of the following standards, as referenced herein, shall be applicable.
   1. American Society for Testing and Materials (ASTM).

1.3 SUBMITTALS

A. Product Data:
   1. Submit Manufacturer's material specifications, product literature and installation instructions.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Delivery:
   1. Deliver sufficient materials to the site to prevent interruption of the work.
   2. All materials shall be inspected by Contractor upon delivery. Contractor shall notify Engineer of any damage. Products received at the site torn, with holes, deteriorated, or otherwise damaged will not be approved and shall be returned and replaced at no expense to the Owner.

B. Storage:
   1. All material shall be stored in strict accordance with the manufacturer's recommendations and as approved by the Engineer.
   2. Do not store products directly on ground. Ship and store geotextile with suitable wrapping for protection against moisture and ultraviolet exposure. Store geotextile in way that protects it from elements, if stored outdoors, elevate, and protect geotextile with waterproof cover.

C. Handling:
   1. All material shall be handled in strict accordance with the manufacturer's recommendations and as approved by the Engineer.

PART 2 – PRODUCTS

2.1 NONWOVEN GEOTEXTILE

A. Demarcation Barrier/Filtration Fabric: To be used in excavations between clean, imported and existing site soil as a demarcation barrier along the sides and bottom of the excavation in Treatment Zone 1. Additionally, the geotextile shall be placed over the soil mixing area in Treatment Zone 2 prior to demobilization and before additional fill is placed over the area.

B. Pervious sheet of polyester, polypropylene, or polyethylene fabricated into stable network of fibers that retain their relative position with respect to each other. Nonwoven geotextile shall be composed of continuous or discontinuous (staple) fibers held together through needle-punching, spun-bonding, thermal-bonding, or resin-bonding.

C. Geotextile Edges; selvaged or otherwise finished to prevent outer material from pulling away from geotextile.

D. Unseamed Sheet Width: Minimum 12 feet.

E. Physical Properties: Mirafi® 160NO Orange Delineation nonwoven geotextile as manufactured by TenCate Geosynthetics or equal. Conform to the minimum requirements noted below:

| PROPERTY | DESIGN VALUE | TEST METHOD |
|---|---|---|
| Tensile Strength | 160 pounds | ASTM D4632 |
| Elongation | 75 percent | ASTM D4632 |
| Trapezoidal Tear | 80 pounds | ASTM D4533 |
| CBR Puncture Strength | 450 pounds | ASTM D6241 |
| A.O.S. | 70 (US Sieve) | ASTM D4751 |
| Permittivity | 1.4 $sec^{-1}$ | ASTM D4491 |

PART 3 – EXECUTION

3.1 GENERAL

A. The Contractor shall be responsible for the installation and seaming of geotextile fabric in accordance with the specifications and the manufacturer's recommendations, as approved by the Engineer.

3.2 SUBGRADE PREPARATION

A. Surfaces to be covered with geotextile fabric shall be smooth and free of rocks, sticks, roots, sharp objects, and all debris that may damage the fabric. The surface to be covered shall be firm and unyielding, with no sudden changes or breaks in grade. There shall be no standing water or excessive moisture on the surface when the fabric is placed.

B. The compacted subgrade shall be maintained in a smooth, uniform, and compacted condition during installation of the fabric.

3.3 GEOTEXTILE INSTALLATION

A. The fabric shall be cleaned of all debris or other materials that may negatively affect the fabric's performance.

B. Mechanical equipment shall not be permitted to operate directly on the fabric unless authorized to do so by the manufacturer and approved by the Engineer.

C. Geotextile Placement:
1. Fabric shall be placed as recommended by the manufacturer and approved by the Engineer on surfaces which have been prepared to conform with these Specifications and found acceptable for fabric installation.
2. The fabric shall be placed as smooth and wrinkle-free as possible.

3. All areas of fabric damaged during installation as determined by the Engineer shall be repaired or replaced by the Contractor as specified at no additional cost to the Owner. Should the fabric be damaged during any step of the installation, the damaged section shall be repaired by covering it with a piece of fabric which extends at least 12 inches in all directions beyond the damaged area. The fabric shall be secured by sewing or bonding as approved by the Engineer.
4. At time of installation, fabric will be rejected if it has defects, ribs, holes, flaws, deterioration, or damage incurred during manufacture, transportation, handling, or storage. Damaged materials shall be removed and replaced at no additional cost to the Owner.
5. Fabric shall be placed with long dimension down slope in areas with a grades in excess of 2 percent or more.
6. Fabric shall be protected at all times during construction from contamination by surface run-off and any fabric so contaminated shall be removed and replaced with uncontaminated fabric.

D. Seams and Overlaps of Geotextile:
1. All overlaps shall be a minimum of 12 inches (450 mm).

## 3.4 COVER MATERIALS OVER GEOTEXTILES

A. Granular materials shall be placed on geotextiles as shown on the Drawings. During back-dumping and spreading, a minimum depth of 6 inches of granular material shall be maintained at all times between the fabric and wheels of trucks or spreading equipment. All equipment used in spreading or traveling on the cover layer for any reason shall exert low ground pressures and shall be approved by the manufacturer and Engineer. Dozer blades, etc., shall not make direct contact with the fabric; however, if tears occur in the fabric during the spreading operation, the granular material shall be cleared from the fabric and the damaged area repaired as previously described.

B. The granular material shall be spread in the direction of fabric overlap. Large fabric wrinkles which may develop during the spreading operations shall be folded and flattened in the direction of the spreading. Occasionally, large folds may reduce the fabric overlap width. Special care shall be given to maintain proper overlap and fabric continuity.

C. All equipment spreading cover material or traveling on the cover layer shall avoid making sharp turns, quick stops, or quick starts.

D. Fabric shall be covered as soon as possible after placement to minimize exposure to sunlight. Fabric shall not be exposed for more than 5 days.

## 3.5 DISPOSAL OF SCRAP MATERIALS

A. On completion of installation, the Contractor shall legally dispose of all trash and scrap material off-site or in a location approved by the Owner and Engineer, remove equipment used in connection with the work herein, and shall leave the premises in a neat acceptable manner.

END OF SECTION

# SECTION 312305 – ENVIRONMENTAL EXCAVATION, BACKFILLING, AND COMPACTION

## PART 1 – GENERAL

### 1.1 SUMMARY

A. The Contractor shall provide all labor, materials, equipment, and services necessary for, and incidental to, the excavation, backfilling, compaction, protection and dewatering, as shown on the Drawings and as specified herein, including, but not limited to the following:
   1. Excavation of an aboveground storage tank (AST) located within a subterranean vault and associated contaminated soil within Treatment Zone 1, and placement and compaction of structural fill in the excavation in preparation for future site redevelopment.
   2. Excavation of the 0 to 2-foot interval of contaminated soil within Treatment Zones 2A and 2C.
   3. Excavation of the stone in the 0 to 9-foot interval within Treatment Zone 2B.
   4. Installation of all sheeting, shoring, and bracing required to execute the work.
   5. Disposal of all excavated material off site unless otherwise specified.
   6. Testing and test reports including but not limited to; gradation, density, in-place compaction, and analytical testing in compliance with the New York State Department of Environmental Conservation (NYSDEC) Division of Environmental Remediation Policy 10 (DER-10) Table 5.4(e)10.

B. The Contractor shall accept the site in the condition in which it exists at the time of the award of the Contract.

### 1.2 QUALITY ASSURANCE

A. Reference Standards:
   1. The latest edition of the following standards, as referenced herein, shall be applicable.
      a. Standard Specifications, Construction and Materials, New York State Department of Transportation, Office of Engineering.
      b. "Standard Specifications for Highway Materials and Methods of Sampling and Testing, American Association of State Highway and Transportation Officials (AASHTO)."
      c. NYSDEC DER-10 Technical Guidance for Site Investigation and Remediation.
      d. Occupational Safety and Health Administration (OSHA) 29 CFR 1910.

B. The Contractor shall provide and pay for all preconstruction costs in connection with an approved independent testing facility to determine conformance of soils and aggregate with the specifications.

C. The Engineer shall determine the suitability of materials that are to be used in the work and should any materials encountered be unsatisfactory for the purpose intended, they shall be removed from the site at the Contractor’s expense.

### 1.3 SUBMITTALS

A. General: The Testing Laboratory shall submit all written reports to the Contractor and Engineer according to the Conditions of the Contract and Division 1 Specification Sections.

B. Test Reports: Prior to delivery or use of any fill material, the Testing Laboratory shall submit the following reports of each material to the Contractor and Engineer:
   1. Description of material.
   2. Gradation analysis.

3. Modified proctor laboratory compaction tests ASTM D1557.
4. Laboratory analytical data for all backfill material except that which contains less than 10% by weight material which would pass through a size 80 sieve and consists of:
    a. Gravel, rock or stone, consisting of virgin material from a permitted mine or quarry.

C. Field Reports: In-place soil density tests, calibrated from the modified proctor laboratory compaction test.

1.4 PROJECT REQUIREMENTS

A. Site Information: Data in subsurface investigation reports was used for the basis of the design and may be available to the Contractor, but for information only. Conditions are not intended as representations or warranties of accuracy or continuity between soil borings. The Owner will not be responsible for interpretations or conclusions drawn from this data by Contractor.
   1. Additional test borings and other exploratory operations may be performed by Contractor at the Contractor's option. No change in the Contract Sum will be authorized for such additional exploration.

B. Notify the Engineer of any unexpected subsurface condition.

C. Protect excavations by shoring, bracing, sheet piling, underpinning, or by other methods as required to ensure the stability of the excavation. The north, east and west sides of the Treatment Zone 1 excavation may be benched or sloped in accordance with OSHA regulations; however, the western end of Treatment Zone 1 must be shored to limit the impact to off-site infrastructure.

D. Underpin or otherwise support structures adjacent to the excavation which may be damaged by the excavation. This includes service lines.

E. Protection of Existing Utilities:
   1. Locate existing underground utilities in areas of work. If utilities are to remain in place, provide adequate means of support and protection during earthwork operations. Comply with OSHA requirements.
   2. Coordinate interruption and/or termination of utilities with the utility companies and the Owner.
   3. Provide a minimum of 48 hours' notice to the Owner and receive written notice to proceed before interrupting any utility.
   4. Repair any damaged utilities as acceptable to the Engineer, at no additional cost to the Owner.

F. Use of Explosives: Use of explosives is not permitted.

G. Protection of Persons and Property:
   1. Barricade open excavations occurring as part of this work and post with the appropriate zones as identified in OSHA 29 CFR 1910 (i.e. exclusion zone, contamination reduction zone, support zone).
   2. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.
   3. Provide planking at all walks, pavements, and curbs to be crossed by equipment.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Structural Fill and Selected Fill: sound, durable, sand, gravel, stone, or blends of these materials, free from organic, frozen or other deleterious materials[, conforming to the requirements of NYSDOT Section 203-2.02C and meeting the following gradation requirements:

| SIEVE | PERCENT PASSING |
|---|---|
| 4" | 100 |
| No. 40 | 0 - 70 |
| No. 200 | 0 - 15 |

1. Fines passing No. 200 shall be non-plastic.
2. Particle size analysis shall show NO gap grading.

B. Crushed stone: free from organic material, elongated particles or other deleterious materials, conforming to the requirements of NYSDOT Section 703-2 and meeting the following gradation requirements NYSDOT, Size 2:

| SIEVE | PERCENT PASSING |
|---|---|
| 1-1/2" | 100 |
| 1" | 90 - 100 |
| 1/2" | 0 - 15 |

PART 3 – EXECUTION

3.1 PRECONSTRUCTION MATERIAL QUALIFICATION TESTING

A. A 100-pound minimum representative sample shall be obtained from each potential borrow source. If different material gradations are known to exist in the pit, samples shall be obtained for each material. Each sample shall be mixed thoroughly and reduced to test specimen size, in accordance with AASHTO T87. The tests shall be performed in the order shown. Failure to pass any test is grounds for disqualification and shall lead to cessation of the test program for that material.

1. Particle Size Analysis:
    a. Method: AASHTO D422.
    b. Number of Tests: One (1) per potential source.
    c. Acceptance Criteria: Gradation within specified limits.
2. Maximum Density Determination:
    a. Method: ASTM D1557/AASHTO T180, Modified Proctor.
    b. Number of Tests: One (1) per potential source.
3. Re-establish gradation and maximum density of fill material if source is changed during construction.

B. NYSDEC DER-10 Imported Material Testing.

1. Materials to be imported to the site for use as backfill shall meet the requirements of Appendix 5 (Allowable constituent Levels for Imported Fill or Soil) in the NYSDEC’s guidance document DER-10/Technical Guidance for Site Investigation and Remediation. Any fill material that is imported from off-site shall meet the Unrestricted Use soil cleanup standards specified in 6 NYCRR Part 375-6.8(a).

2. Before soils are brought onto the site, the remedial Contractor shall provide the Engineer with the name, location, brief history and certified analytical test results for soil originating at the proposed site or facility for review and approval. No imported soils will be allowed onto the site before they are approved by the Engineer. The fill must be free of organic matter, wood, trash, etc. which cannot be properly compacted. Materials containing less than 10 percent passing a No. 200 sieve (fines), such as washed gravels and riprap, shall not require analytical testing if the material originates from a permitted quarry, and a letter from the facility owner is submitted indicating that the facility processes virgin material only and is not known to have ever supported commercial or industrial use.

3. Sampling frequency of imported soil or sand will consist of the following:

| SOIL QUANTITY (CUBIC YARDS) | GRAB SAMPLE | COMPOSITE SAMPLE |
|---|---|---|
| 0-50 | 1 | 1 |
| 50-100 | 2 | 1 |
| 100-200 | 3 | 1 |
| 200-300 | 4 | 1 |
| 300-400 | 4 | 2 |
| 400-500 | 5 | 2 |
| 500-800 | 6 | 2 |
| 800-1,000 | 7 | 2 |
| > 1,000 | 2 additional grab samples every 1,000 cubic yards | 1 additional composite sample every 1,000 cubic yards |

a. Each grab sample shall be analyzed for Target Compound List (TCL) volatile organic compounds (VOCs) and each composite sample shall be analyzed for TCL Semivolatile organic compounds (SVOCs), TCL pesticides, TCL herbicides, polychlorinated biphenyls (PCBs) and target analyte list (TAL) metals.

C. The use of on-site material for use as backfill is prohibited, except in Treatment Zone 2B as directed.

D. The Contractor shall furnish all earth materials to the testing laboratory for analysis and report as directed by the Engineer or as outlined in the specifications.

3.2 PREPARATION

A. Establish all appropriate control zones as defined in OSHA 29 CFR 1910.

B. Cut and remove existing concrete slab.

C. Locate and remove UST in accordance with Section “Tank Cleaning & Decommissioning.”

D. Establish location and extent of existing utilities before commencement of excavation.

E. Establish all necessary excavation supports.

## 3.3 EXCAVATION

A. Excavate subsoil in accordance with the Drawings for Treatment Zones 1 and 2, Section "Excavation and Management of Contaminated Soil" and at the direction of the Engineer. Subgrade (bottom of the excavation) shall consist of a smooth surface (i.e. no gouges from excavator bucket teeth) prior to inspection by the Geotechnical Engineer.

B. Additional Excavation:
   1. If unsuitable bearing materials such as concrete blocks, vaults, or stone foundations are encountered at required subgrade elevations, advance excavations deeper and replace excavated material with structural fill or other material as directed by the Engineer.

C. Excavation Limits: The exact limits of the Treatment Zone 1 excavation will be based upon the field screening activities performed by the Engineer in accordance with Section "Excavation and Management of Contaminated Soil."

D. Soil Sample Collection: The Treatment Zone 1 remediation requires the collection of sidewall and bottom of the excavation samples. The Contractor shall use an excavator to collect representative soil samples from areas selected by the Engineer. The Engineer will be responsible for filling sampling containers and submittal of the samples to the laboratory for analysis. The Engineer will request all samples to be analyzed on a 24-hour turnaround timeframe; however, the Contractor shall wait up to 48-hours for the Engineer to determine if additional excavation is necessary or if backfill operations can be commenced.

E. Stability of Excavations: Bench or slope sides of excavations to comply with OSHA requirements and local codes. Shore and brace where sloping is not possible because of space restrictions or stability of material excavated. Maintain sides and slopes of excavations in safe condition and in accordance with OSHA requirements until completion of backfilling. Bracing will not be permitted against pipes or structures in trenches.

F. Shoring and Bracing: Provide materials for shoring and bracing, such as sheet piling, uprights, stringers, and cross braces in good serviceable condition. Maintain shoring and bracing in excavations regardless of time period excavations will be open. Carry down shoring and bracing as excavation progresses. Bracing will not be permitted against pipes or structures in trenches.

## 3.4 REVIEW OF SUBGRADE

A. Notify Geotechnical Engineer when excavations have reached required subgrade at least 24 hours in advance of requiring inspection of the subgrade for suitability for backfilling.

B. When Geotechnical Engineer determines that unforeseen unsatisfactory soil is present, continue excavation and replace with compacted structural fill or other approved material as directed.
   1. Unforeseen additional excavation and replacement material will be paid according to the Contract provisions for changes in work.

C. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by the Geotechnical Engineer.

## 3.5 DRAINAGE AND DEWATERING

A. If required, perform dewatering operations may be completed by pumping water from one excavation to another within the excavation footprint on site. The bottom of the excavation shall be maintained free of standing water for inspection by the Geotechnical Engineer.

B. Prevent surface water from flowing into excavation and from flooding project area, as well as surrounding areas. The Contractor shall cover the bottom of the excavation (subgrade) with polyethylene sheeting or tarps when precipitation is expected.

C. Do not allow water to accumulate in excavations. Divert water to prevent contact with potentially contaminated soil and/or soil changes detrimental to the stability of subgrades.

D. Provide and maintain the pumps, sumps, suction and discharge lines, and other dewatering components necessary to convey water away from excavations.

E. Provide and maintain temporary drainage ditches and other diversions outside excavation limits to convey rainwater and water removed from excavations by dewatering, to collection or run-off areas. Do not use trench excavations as temporary drainage ditches.

F. Water that is pumped outside of excavations must be pumped into frac tanks (or other temporary holding tanks), sampled, and disposed of off-site at a regulated facility.

## 3.6 STRUCTURAL FILL, BACKFILL, AND COMPACTION

A. Place fill materials in the types and thicknesses as detailed on the Drawings. Where no thickness is specified on the drawings, the Contractor shall backfill the excavation to the match the removed sections of the existing concrete slab. All backfill shall be Structural Fill unless otherwise directed by the Engineer or shown on the Drawings.

B. After approval of the subgrade by the Geotechnical Engineer, a non-woven geotextile demarcation barrier shall be placed along the bottom and sidewalls of the excavation in accordance with Section “Geotextiles.”

C. Place backfill and fill materials in layers not more than 12 inches in loose depth. Lift height shall be governed by the ability of the compaction equipment to obtain the required compaction with 12 inches as a maximum lift height. Before compaction, moisten or aerate each layer as necessary to achieve the optimum moisture content and facilitate compaction to the required density. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost, ice, ponded water, or extraneous debris.

D. Moisture Control:

1. Where fill or backfill must be moisture conditioned before compaction, uniformly apply water to the surface and to each layer of fill or backfill. Prevent ponding or other free water on surface subsequent to, or during, compaction operations.
2. Remove and replace, or scarify and air dry, soil that is too wet to permit compaction to specified density. Soil that has been removed because it is too wet to permit compaction may be stockpiled or spread and allowed to dry. Assist drying by discing, harrowing, or pulverizing until moisture content is reduced to a value which will permit compaction to the percentage of maximum density specified.

E. All fill shall be thoroughly and satisfactorily compacted to <u>95 percent</u> of the maximum density of material used.

F. If the surface of any layer becomes contaminated by mud or unsuitable materials, the contaminated soil shall be removed.

G. Fill placement shall be suspended when wet weather prevents proper operation of compaction equipment.

H. Adjacent to structures, fill shall be placed in a manner which will prevent damage to the structures and will allow the structures to assume the loads from the fill gradually and uniformly. The height of the fill adjacent to structure shall be increased at approximately the same rate on all sides of the structure.

I. No backfilling or compaction shall take place against any cast-in- place concrete footings or slabs prior to 7 days initial concrete set, or against any cast-in-place concrete walls prior to achieving the desired design strength, f'c.

J. Heavy equipment and compactors shall not be operated within 4 feet of any newly constructed structure.

K. Excavated material meeting the requirements of Structural Fill shall be spread and allowed to dry until obtaining the required moisture content prior to re-use.

3.7 FIELD QUALITY CONTROL

A. Notify the Engineer at least one (1) working day in advance of all phases of filling and backfilling operations.

B. Compaction testing shall be performed to ascertain the compacted density of the fill and backfill materials in accordance with the following methods:
   1. In-place relative density:
      a. Method:
         1) AASHTO T238, Nuclear Method.

C. Foundation Subbase: Perform one (1) field density test in each compacted fill lift for the following:
   1. Each 1,000 square feet of future slabs on grade but in no case fewer than three (3) tests per lift.

D. The Engineer may direct additional tests to establish gradation, maximum density, and in-place density as required by working conditions at the Contractor's expense.

E. Acceptance Criteria: The sole criterion for acceptability of in-place fill shall be in situ dry density. Minimum dry density for all fill or backfill shall be 95 percent of the maximum dry density. If a test fails to qualify, the fill shall be further compacted and re-tested. Subsequent test failures shall be followed by removal and replacement of the material.

3.8 EROSION CONTROL

A. Provide erosion control methods in accordance with requirements of authorities having jurisdiction.

3.9 CLEAN UP

A. Provide and maintain protections or newly filled areas against damage. Upon completion or when directed, correct all damaged and deficient work by building up low spots and remove temporary protections, fencing, shoring and bracing.

B. Remove all surplus excavated material not required for filling and backfilling and legally dispose of same away from premises.

C. Leave the premises and work in clean, satisfactory condition, ready to receive subsequent operations.

END OF SECTION

SECTION 313216.15 – ZVI SOIL MIXING & IN-SITU SOIL STABILIZATION

PART 1 – GENERAL

1.1 SUMMARY

A. The Contractor shall provide all labor, materials, equipment and services necessary for, and incidental to, in-situ soil mixing with zero-valent iron (ZVI) and Portland cement as well as related work as indicated on the Drawings and hereinafter specified.

B. In the event of conflict between these specification requirements and laws, rules or regulations of Federal, State or local agencies, the more restrictive laws, rules or regulations shall apply.

C. Contractor shall comply with all project specific environmental and facility restrictions and requirements.

D. The Contractor shall be responsible for providing a slurry that will produce an overall mixture of 4 percent Ferox Flow ZVI Powder within the soil mass at the targeted treatment interval (9 to 16 feet below the ground surface in Treatment Zones 2A and 2B and 9 to 26 feet below the ground surface in Treatment Zone 2C).

E. Following the completion of the ZVI soil mixing the Contractor will be responsible for blending the remaining overburden soil (approximately 2 to 9 feet below the ground surface) with Portland cement to achieve the minimum bearing capacity specified herein.

1.2 DEFINITIONS

A. ASTM: American Standards of Testing Materials.

B. Ferox Flow Zero Valent Iron: A compound which facilitates contaminant destruction by dehalogenation of chlorinated compounds by chemical reduction.

C. Grout: A stable colloidal mixture of potable water and Type I-II Portland cement.

D. Shallow Soil Mixing (SSM): A soil blending technique used to treat soils in-situ to a maximum depth of 26 feet below the ground surface. This is accomplished with a series of overlapping soil columns formed using a single shaft larger diameter auger head with a minimum of two cutting edges and mixing blades. A slurry of ZVI and potable water is pumped through the hollow drill shaft and injected into the soil as the auger head is advanced into the soil. The soil and ZVI slurry are blended with the soil utilizing the cutting edges and mixing blades with a shearing motion. Once the design depth is reached, the auger head is raised to an elevation of 9 feet below the ground surface and re-advanced to the design depth.

E. In-situ Soil Stabilization: A treatment technique applied to soil to improve the strength, durability, and permeability of the soil mass within the targeted mixing zone.

F. Work Area: The area as shown on the Contract Drawings as Treatment Zone 2.

1.3 REFERENCE STANDARDS

A. Reference Standards:
   1. The latest edition of the following standards, as referenced herein, shall be applicable, but not limited to:
      a. ASTM C39 – Unconfined Compressive Strength (UCS).
      b. ASTM C 150 Portland Cement.

1.4 QUALIFICATIONS OF CONTRACTOR

A. The Contractor shall submit to the Owner's Representative documented evidence of their ability to complete this project by having previously successfully completed four jobs utilizing shallow soil mixing. Of these four jobs, at least two shall be associated with environmental work.

B. The project foreman/superintendent must have documented minimum qualifications of successful shallow soil mixing experience on two different projects. This person shall be proficient in shallow soil mixing to perform and supervise construction and quality control.

1.5 PROTECTION OF WATER RESOURCES

A. All water resources (ground and surface waters), including all drains, shall be protected from leaching and/or run-off of petroleum, chemical pollutants, solid wastes, sediment and construction site debris. Groundwater is located approximately 9 feet below ground surface.

B. The Contractor shall maintain on site, sufficient quantities of absorbent materials, booms, drum over packs, shovels and other response supplies for use in case of spills. In the event of any actual or suspected spill of any chemical, petroleum product, or waste, the Contractor shall immediately notify the Owner and immediately take all measures necessary to control the spread of the spilled material, and to clean it up. Dispersants shall not be utilized unless approved in writing by the Owner and the New York State Department of Environmental Conservation (NYSDEC) prior to use.

C. Disposal of any waste materials on the construction site is prohibited.

D. Water resulting from, or contaminated by, construction operations shall not be directly discharged into any bodies of water or drainage systems.

E. The Contractor shall comply with all applicable Federal, State and Local regulations and laws. In the event of a discharge to streams, rivers, lakes or canals, the Contractor shall immediately notify the Engineer.

1.6 SUBMITTALS

A. Qualifications:
   1. The Contractor shall submit documented evidence of their ability to complete this project by having previously successfully completed jobs utilizing shallow soil mixing as specified in Paragraph 1.3. This evidence shall include:
      a. Project Descriptions – Include similar in-situ soil mixing project information including area dimensions as well as a description of the type of reagents used, soil conditions, performance objectives and outcomes (e.g., compressive strength, hydraulic conductivity, contaminant mass reduction, etc.), and any difficulties encountered during construction. Project descriptions shall be submitted with the bid.

2. Site Foreman/Superintendent – The project foreman/superintendent must have documented minimum qualifications of successful shallow soil mixing experience on 2 different projects. Provide sufficient evidence that the site foreman/superintendent has both the knowledge and experience necessary to manage and control site operations including the rate of auger advancement, proper mixture of the ZVI slurry, rate of slurry injection, proper drilling and mixing patterns, interconnectivity of soil mixing shafts, and routine quality assurance/quality control testing. The site foreman's credentials shall be submitted a minimum of one (1) week prior to site mobilization.

B. Work Plan: Develop a detailed In-Situ Soil Mixing and Soil Stabilization Work Plan. This plan shall address, at a minimum, all major equipment by type and capacity to be utilized during the project; a detailed description of the methods and/or procedures to be utilized during soil mixing activities, including, but not limited to:

a. Construction methods and sequencing.
b. On-site blending (including both ZVI/water slurry and Portland cement).
c. ZVI slurry/soil mixing and monitoring.
d. Portland cement/water grout mixing and monitoring.
e. Rate of auger advancement.
f. Overlap percentage of columns.
g. Minimum quantity of ZVI slurry and Portland cement per column.
h. Quality control plan for verifying ZVI ratio in soil and compressive strength of upper soils blended with Portland cement.
i. Off-site disposal of all waste/excess materials, including any required processing prior to transport.
j. Temporary containment pad details for slurry mixing.
k. Erosion, water pollution and water runoff control measures.
l. The time period between advancement of adjacent columns (which shall not exceed 72 hours).

The work plan shall also include a schedule that identifies major work components in sufficient detail containing both start and end dates. The Contractor shall submit the work plan to the Engineer a minimum of seven (7) days prior to mobilization to the site. If conditions change during construction, the Contractor shall revise the plan(s) as necessary and resubmit to the Owner for review and approval.

C. Safety Data Sheets (SDSs) shall be provided for any proposed cleanup materials the Contractor will mobilize to the site.

D. Submit a copy of the approved hydrant permit from the City of Syracuse Department of Water, if necessary.

## PART 2 – PRODUCTS

### 2.1 MATERIALS

A. Furnish all materials required by the Contractor's approved Work Plan in sufficient quantity to conduct required activities.

B. Portland Cement:

1. Cement utilized in the manufacture of the grout shall conform to ASTM Designation C-150 “Requirements for Portland Type I-II Cement”. During transit, the cement shall be protected from moisture and contamination. Storage of cement on site via silo(s) or other appropriate bulk storage containers is acceptable. Storage of cement in bags is not acceptable. Reclaimed cement or cement containing deleterious matter or lumps shall not be utilized.
2. The material added to the soil shall be a water-based grout that shall consist of water and cement. The grout shall be premixed in batch or continuous mix plants which combine materials in predetermined proportions.

C. Zero Valent Iron:

1. Supplier: Hepure Technologies, Inc. located in Flemington, New Jersey, or equal.
2. Product Name: Ferox Flow zero valent iron powder.
3. Iron Content: 95 percent, minimum.
4. Particle Size: 100 to 150 microns (µm)/Mesh Size: -100/+325.

D. Potable Water: If an existing, sufficiently sized water service is not at available at the site at the time of construction, the Contractor shall be responsible for procuring an approved hydrant permit from the City of Syracuse Department of Water to facilitate a hydrant for the source of potable water.

## 2.2 EQUIPMENT

A. Furnish all necessary plant and related mixing equipment required by the Contractor to implement the Work Plan in a working order to conduct activities. The Contractor shall provide equipment of the type and capacity to complete work in an efficient manner. Equipment shall be maintained in operable conditions at all times.

B. The Contractor shall provide a mixing plant containing all necessary equipment for the preparation of the ZVI slurry as well as the cement-water grout. The Contractor is responsible for providing all pumps, valves, volumetric feeders, flow controllers and/or meters, hoses and all other equipment to adequately supply grout for the duration of the project.

C. ZVI slurry and cement/cement grout not utilized within the project shall be legally disposed of off-site at the Contractor’s expense.

D. A maximum holding time of three (3) hours shall be enforced for the cement grout. Grout not utilized within the specified timeframe shall be legally disposed of off-site at the Contractor’s expense.

E. The Contractor shall calibrate the mixing components at the beginning of the project and weekly thereafter.

F. The Contractor shall supply a vertical, single-shaft auger system or rotary mixing tool capable of achieving a maximum depth of twenty (26) feet below ground surface. The auger or mixing tool shall contain a bottom discharge capability for the ZVI/water slurry and be capable of blending in-situ soils into a homogeneous mixture. The discharge shall transition to the cement-based grout for the upper, unsaturated soils.

## PART 3 – EXECUTION

### 3.1 PROTECTION OF EXISTING INFRASTRUCTURE

A. The Contractor shall protect existing infrastructure, including, but not limited to, City of Syracuse sidewalks and streets, and aboveground and belowground public and private utilities within and adjacent to the soil mixing area.

### 3.2 PRE-EXCAVATION OF SOIL

A. Excavation and Management of the top two (2) feet in Treatment Zones 2A and 2C shall be conducted in accordance with this section and Section 026113 "Excavation and Management of Contaminated Soil". Refer to drawings for specifics relative to Treatment Zone B.

### 3.3 IN-SITU SOIL MIXING

A. The Contractor is responsible for ensuring that all work is performed to the standards established herein and subject to review and inspection by the Owner and the Owner's Representative. The work shall be performed in accordance with the sequencing established in the Contractor's Work Plan.

B. The in-situ soil mixing mass shall be constructed to the elevations, lines and grades shown on the drawings and in accordance with these specifications unless otherwise directed in writing by the Owner's Representative.

C. The soil mixing area shown on the Design Drawings shall be marked out prior to initiation of construction. The entirety of the soil mixing area shall be treated as shown on the Drawings. The Contractor shall use a template or other approved means to gage the distance between shafts. Each shaft/column location shall be set according to surveyed reference points.

D. Maintaining vertical control shall be accomplished by observing the angle of the Kelly bar as it is advanced into the ground relative to a known benchmark or datum established at the site or other means approved in writing by the Owner's Representative. Each shaft/column shall be installed plumb.

E. The rate of both mixing and shaft/tool penetration shall be constant and adjusted by the Contractor based upon the degree of drilling difficulty. The Contractor shall ensure proper mixing and achieve the projected production rates.

F. The ZVI slurry and cement grout injection rates per vertical foot of column shall be adjusted to the requirements of the mix design.

G. The ZVI slurry injection rate shall be controlled and monitored by the Contractor and shall be 100 percent while the auger is moving downward from a depth of nine (9) feet below the ground surface to the target depth shown on the Contractor Drawings. Once the design depth (16 feet below the ground surface in Treatment Zones 2A and 2B and 26 feet below the ground surface in Treatment Zone 2C) is reached, the auger head is raised to an elevation of 9 feet below the ground surface and re-advanced to the design depth to improve distribution of ZVI.

H. After the ZVI injection is complete, the cement grout shall be mixed in the interval from 2 to 9 feet below the ground surface.

I. The Contractor shall monitor, calculate and control the minimum application rate to each shaft to achieve the design mixtures.

   1. The ZVI slurry mixture shall be premixed in batch or continuous mix plants which combine materials in predetermined proportions. The soil mix shall achieve the minimum design of four (4) percent ZVI with the existing soils by dry weight throughout the entire treatment zone.
   2. The cement grout-soil mix shall achieve a minimum unconfined compressive strength of 50 pounds per square inch (psi) at 7 days and 150 psi at 28 days.

J. Shafts shall be completed within 72 hours of adjacent shafts to prevent cracking.

K. The Contractor shall make measurements of each shaft depth at the completion of mixing. The Contractor shall maintain an as-built profile of the mixing area on-site at all times.

L. The Contractor shall obtain samples of the mixed cement grout and soil each day, one set per shift and days when cement grout is injected at the site. These samples shall be collected with a specialized sampling tool at the middle of the cement-grout shaft (5.5 feet below the ground surface). Sufficient sample shall be collected at this depth to make three molds. The mixed soil shall be placed in suitable molds, rodded to remove air pockets, then placed in a plastic bag containing sufficient moisture to keep the mixture damp.

M. Cement grout/soil samples shall be submitted/transported to an independent geotechnical laboratory for testing once samples have achieved a sufficient strength. At the end of seven (7) days, curing one sample from each shift’s daily production shall be tested for Unconfined Compressive Strength via ASTM C-39. At the end of twenty-eight (28) days a second sample shall be selected for testing for Unconfined Compressive Strength via ASTM C-39. The Contractor shall provide all test results to the Owner’s Representative within 24 hours of receipt of information.

N. The Owner reserves the right to perform additional tests via the Owner’s Representative or other means, on the soil mixing area. The Owner’s testing will in no way relieve the Contractor of their responsibility to perform testing as specified in the above sections and to meet this specification.

END OF SECTION

SECTION 332305 – GROUNDWATER RECIRUCLATION SYSTEM TREATMENT COMPONENTS

PART 1 - GENERAL

1.1 SUMMARY

A. This specification establishes the minimum requirements for the complete installation of temporary piping and equipment for the remedial construction activities associated with Treatment Zone 3. Work shall include installation and plumbing of 32 extraction and 29 injection wells, bag filters, granular activated carbon vessels, treatment tanks, and associated pumps.

B. Section includes all labor, materials and equipment necessary for the equipment and rigid piping as identified on the Drawings, including but not limited to:
1. Groundwater extraction, process flow, and chemical feed pumps.
2. Flow Meter.
3. Granular Activated Carbon.
4. Bag filter housing and bags.
5. Treatment tanks.

C. Contractor shall be responsible for the safe and proper handling and mixing of injection chemicals once they have been delivered to the work area by others. Contractor shall furnish all labor equipment and materials and perform all injection work in accordance with this specification and the Contract Documents.

D. The Contractor shall assume that all work will be conducted in Level D or Level C personal protective equipment (PPE) when handling/mixing sodium permanganate. Therefore, the Contractor will not be additionally compensated for upgrade to Level C (if required) for the performance of the Work.

1.2 REFERENCE STANDARDS

A. Work shall conform to all applicable federal, state and local laws, ordinances and regulations and codes and standards including:
1. National Fire Protection Association (NFPA) Codes.
2. Occupational Safety and Health Administration (OSHA).
3. Owner’s Insurance Underwriters Criteria.
4. Code of Federal Regulations (CFR), 40 CFR 280.
5. Underwriter’s Laboratories (UL) Criteria.
6. New York State Department of Environmental Conservation (NYSDEC).

B. Where minimum requirements of Codes are exceeded by the Drawings and Specifications, the requirements of the Drawings and Specifications shall govern. Where in conflict, Local Code requirements shall take precedence. Where any requirements of the Drawings and Specifications are not in conformance with Code requirements, notify the Owner or Owner’s Representative before the work is initiated. The decision of Owner or Owner’s Representative in interpreting the Drawings and Specifications and Code requirements related thereto shall be considered final.

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

D. National Fire Protection Association (NFPA):
1. NFPA 30, Flammable and Combustible Liquids Code.
2. NFPA 241 – Safeguarding Construction, Alteration and Demolition Operations.
3. NFPA 326 (2020), Standard for Safeguarding of Tanks and Containers for Entry, Cleaning, or Repair.

4. NFPA 350 (2019), Guide for Safe Confined Space Entry and Work.

E. Code of Federal Regulations:
1. 29 CFR 1910, Occupational Safety and Health Standards.
2. 29 CFR 1926, Safety and Health Regulations for Construction.

F. Applicable State Agency Regulations:
1. New York State Department of Environmental Conservation (NYSDEC):
a. Water discharge permit.

## 1.3 QUALITY ASSURANCE

A. Prior to commencing field work, the Contract shall prepare a site-specific Health and Safety Plan (HASP) which addresses all planned field activities associated with the work. The HASP shall be prepared in accordance with all applicable OSHA regulations, API Publication 2015, and shall be submitted to the Owner or Owner's Representative prior to the start of work. Refer to Section "Excavation and Management of Contaminated Soil" for specific HASP requirements.

B. Use adequate numbers of skilled workmen and operators who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with specified requirements and the methods needed for proper performance of the work of this Section.

C. Use equipment adequate in size, capacity, and numbers to accomplish the work in a timely manner.

D. Provide access for and cooperate with any testing company authorized by the Engineer.

## 1.4 SUBMITTALS

A. Before any components are fabricated, and/or integrated into assemblies or shipped to the job site, furnish to the Engineer for their review copies of submittal documents. Submittals shall include full details, shop drawings, catalog cuts, and such other descriptive matter and documentation as may be required to fully describe the equipment and to demonstrate its conformity to these specifications. Specifically, the Contractor shall submit the following shop drawings for approval:
1. Pumps:
a. Product data including certified performance curves.
b. Product certificates signed by pump manufacturers certifying accuracies under specified operating conditions and compliance with specified requirements.
2. Flow Meter:
a. Product conformance with display requirements.
b. Product compatibility with chemical to be used as part of the remedial treatment technology.
3. Granular Activated Carbon System Vessels:
a. Vessel specifications and drawings, including design pressure, dimensions, and capacity.
b. System flow diagram showing all valves, components, instrumentation, and utilities.
c. Pressure drop information across the system.
d. Specification of the GAC to be utilized in the system.
4. Bag Filter Housing and Appurtenances:
a. Bag filter vessel specifications and drawings, including design pressure, dimensions, and capacity.
b. System flow diagram showing all valves, components, instrumentation, and utilities.
c. Pressure drop information across the system.

5. Piping:
   a. Illustrations, specifications, and engineering data including the following: dimensions, materials, size, class, weight for pipes, fittings and appurtenances.
   b. Manufacturer's instructions and recommendations for installation of pipe, joints, fittings, and appurtenances.
   c. Detailed layout drawings for all piping under this Section relating to the stationing of equipment.
6. Treatment Tanks
   a. Illustrations and/or specifications including the following: dimensions, materials and size.
7. 40 Sodium Permanganate Solution:
   a. Supplier's name, container type, container size, and shippers name. Contractor is responsible for all required local, state, and federal notifications and/or permitting for the procurement, transportation and delivery of the chemicals to the Site.
   b. Provide data sheets indicating the volume of 40 percent sodium permanganate per tote as well as the mass of sodium permanganate per tote at a minimum.

1.5 QUALITY ASSURANCE

A. Equipment and material furnished under this specification will be in good, working condition when delivered to the site. Equipment will be labeled with manufacturer's name, model, and serial number. The Contractor shall be responsible for and shall provide for the design, supply, delivery, installation, calibration, and adjustment configuration during system operation.

B. The manufacturer shall, in addition to the Contractor, assume the responsibility for proper function of the bag filter and GAC systems.

PART 2 - PRODUCTS

2.1 EQUIPMENT

A. General:
   1. Compatibility: All materials shall be compatible with a 40% sodium permanganate solution to prevent corrosion and failure of equipment.
   2. Weather Protection: The Contractor is required to provide enclosures or other form of protection for any system components that are susceptible to damage from exposure to precipitation or other weather-related damage.

B. Additional Health and Safety Equipment:
   1. Contractor shall provide adequate amount of appropriate fire extinguishers located in the work areas. Fire extinguishers must be located and readily available in all exclusion zones and work zones as well as within the immediate vicinity of the recirculation equipment.
   2. Contractor must have adequate absorbent materials, neutralizing liquids, and containment equipment located in vicinity of the treatment system to enable rapid cleanup of a spill. Contractor shall maintain spill kits containing a sufficient quantity of absorbency and barrier materials and neutralizing chemicals to adequately contain, neutralize and recover spills. These kits may include but are not limited to absorbent pads and socks, loose absorbent, spill containment barriers, plastic sheeting, plastic bags, neutralizing liquids, pressure spray tanks, shovels, recovery pumps and holding tanks.
   3. Contractor shall maintain a portable eye wash in the vicinity of the sodium permanganate solution inject system.

C. Secondary Containment:
1. All treatment system components and chemical storage shall be located within a secondary containment system. Only the injection/extraction wells and the hosing running from the treatment system to the individual wells is permitted to be located outside of secondary containment.
2. The Contractor shall be responsible for sizing the containment system(s) to have sufficient area to house all treatment system components.
3. Type of Containment: Portable spill berm system with chemically compatible membrane system. Ready Spill Berms™, or equal.
4. Wall Height: 12-inches minimum. The containment shall be sized to provide a volume equal to 150 percent of the volume of the largest storage vessel within the containment area.
5. Bottom Mat: Include chemical resistant ground and tracking mats.

D. Pumps:
1. Extraction Well Pumps/Chemical Injection Pump: Sandpiper® S1F non-metallic pumps fitted with chemically compatible seals, or equal. At least one spare/standby pump shall be maintained at the site at all times.
2. Injection Pump: Sandpiper® S20 non-metallic pump fitted with chemically compatible seals, or equal.
3. Each pump will be equipped with a regulator to control the air pressure delivered to the pump and a needle valve to control the air flow rate to the pump to allow field adjustment to the pump discharge rate.
4. The Contractor shall provide a portable/towable, diesel-powered air compressor with sufficient airflow to power all pumps included in the groundwater recirculation system.

E. Flow Meter:
1. The flow meters shall be Signet 2551 Magmeter by GF Piping Systems© or approved equal.

F. Granular Activated Carbon Vessels:
1. The GAC system vessels shall be Model PROTECT TW-72 by Calgon Carbon Corporation or approved equal.
   a. Required system flow: 64 gpm.
   b. GAC amount: 2,000 lbs.
   c. Principal organic constituent targeted for carbon: Benzene, 24 µg/L.

G. Bag Filter Vessels and Appurtenances:
1. The Carbon vessels shall be Model Eaton Flowline II, 316SS or approved equal.
   a. 2-inch inlet outlet NPT.
   b. 150 pounds.
   c. Part Number: SBL102S6NSOBSP0.
   d. Description: FBF2-0102-AB10-020N-NI-B-PCS.
2. Filter Bags shall meet the criteria provided below.
   a. 7-inch by 30-inch long.
   b. 25 micron (µm).
   c. Polypropylene and wholly welded.

H. Piping & Appurtenances:
1. Piping from the extraction wells to the treatment system and from the treatment system to the injection wells shall be ¾-inch inside diameter braided/reinforced flexible tubing.
2. Piping within the treatment train shall be rigid Schedule 80 PVC at a variety of sizes, as shown on the Drawings. At a minimum, required piping diameters will include:
   a. ¾-inch.
   b. 2-inch.

c. 3-inch.

I. Treatment Tanks:

1. Treatment tanks shall be a minimum of 8,400-gallon vertical polyethylene reaction tanks in a natural white or translucent color (i.e. no dark colors).
2. Treatment tanks shall be equipped with a minimum of a 2-inch diameter vent. Vents shall be equipped with a rain cap or similar to prevent the intrusion of precipitation into the tanks.

## 2.2 CHEMICAL SOLUTION

A. Sodium Permanganate Solution:

1. A dosage rate of 5 g/L or approximately 70.5-gallons of Sodium Permanganate will be required for each batch to be treated. A minimum of twenty-four (24), 275-gallon totes of solution shall be provided for this project. Each 275-gallon tote shall contain the following:
   - a. 3,000 pounds of 40 percent sodium permanganate solution.
   - b. 263 gallons of 40 percent sodium permanganate solution.
   - c. 1,207 pounds of sodium permanganate (minimum).
   - d. 4.59 pounds of sodium permanganate per gallon of 40 percent sodium permanganate solution.
2. Chemical shall be obtained from Carus Corporation in LaSalle, Illinois (pre-approved) or equal.
3. Contractor shall ensure that adequate volume of chemicals and materials are on-Site and do not cause a delay to the project schedule. Contractor shall be responsible for any additional costs incurred due to delays caused by chemical deliveries or shortages of available chemicals and materials on-Site.

# PART 3 - EXECUTION

## 3.1 EXAMINATION

A. Verify that all dimensions shown on the Drawings and shop drawings match field conditions.

B. The Contractor shall inspect all material or equipment as it is received to verify that it is in good condition and functions properly, as designed. It shall be the Contractor’s responsibility to repair or replace damaged items.

## 3.2 INSTALLATION

A. Equipment installation shall be in complete conformance with manufacturer’s instructions.

B. Once all equipment is connected, the Contractor must perform a potable water leak test of all tanks, pumps, piping hose, etc. in the presence of the Engineer prior to mixing any chemicals in the batching and delivery equipment. This test should be run from the front end to the end of the flex hose that will be connected to the injection and extraction points. All leaks must be eliminated before commencing any chemical injection activities.

## 3.3 MAINTENANCE

A. The Contractor shall maintain all groundwater recirculation equipment in working condition and in accordance with all manufacturer recommendations. All service, including fueling of diesel-powered equipment, shall be completed prior to the start of each workday or at the end of each workday.

B. Maintenance during the workday and during batching operations shall be avoided to the extent practical.

C. Contractor shall regularly inspect hoses, pipes, valves, and tanks to ensure equipment is free of leaks. Any equipment that is leaking or in need of repair will be immediately removed from service by the Contractor and repaired prior to resuming service.

D. Secondary containment maintenance:
   1. Precipitation: Any precipitation that accumulates on the pad shall be visually inspected for evidence of contamination (e.g. sheen, discoloration). If no evidence of a release is identified, the accumulated water shall be pumped out of the containment system a minimum of every morning prior to starting work.
   2. Groundwater and chemical discharges: Small leaks shall be cleaned up with absorbent pads and disposed of properly off-site. Significant system leaks (e.g. greater than 1 gpm) shall result in the immediate shutdown of the system.

3.4 SEQUENCING

A. Contractor must provide a minimum of two on-site field staff at all times throughout the day to perform the recirculation activities described herein. The Contractor shall provide on-site personnel to operate the system for a minimum of 30 business days for ten hours per day to account for any operational issues (e.g. equipment failures) or actual extraction rates being less than the targeted total extraction rate of 64 gallons per minute (4 gallons per minute per extraction well with 16 extraction wells operating simultaneously).

B. It is estimated that injections will take at least 22 business days (88 total batches with four batches being completed per day at an estimated batching time of approximately two hours per batch). If the Contractor believes site conditions will require additional days beyond 30 days, they must provide a formal request to the Engineer for approval to extend the project duration. If the Engineer deems the lack of productivity is due to the Contractor's inability or inefficiency to inject the chemicals the Contractor will not be compensated for the extra days to complete the injections.

C. Dosing rate:
   1. 40 percent sodium permanganate solution shall be added into the reaction tank simultaneously with the extracted groundwater to create a batch. Each batch shall include:
      a. 7,680 gallons of groundwater.
      b. 70.5 gallons of 40 percent sodium permanganate solution.

D. 16 extraction wells (half of the well field) and 16 injection wells will be operated at one time. Since only 29 injection wells will be installed in the wellfield, it will be necessary to utilize three of the injection wells when treating both halves of the wellfield. The system will be operated in the following sequence for a minimum of 88 batches:
   1. The first set of 16 extraction wells and 16 of the injection wells will be operated simultaneously to treat the first pore volume in the first half of the wellfield (22 batches).
   2. The second set of 16 extraction wells and 16 of the injection wells will be operated simultaneously to treat the first pore volume in the second half of the wellfield (22 batches).
   3. The first set of 16 extraction wells and 16 of the injection wells will be operated simultaneously to treat the second pore volume in the first half of the wellfield (22 batches).
   4. The second set of 16 extraction wells and 16 of the injection wells will be operated simultaneously to treat the second pore volume in the second half of the wellfield (22 batches).

3.5 DATA COLLECITON

A. At a minimum, Contractor shall record the following parameters during injection activities and provide a summary of all such data at the conclusion of the injection activities:
   1. Time and date of injections (start and finish).
   2. IDs of active injection and extraction points.
   3. Flow rates (individual wells and total system) at least twice per day.
   4. Pressure (individual injection points and total system) at least twice per day.
   5. Flow totals (individual wells and total system) at end of each workday.
   6. Process tank levels.
   7. ID of reagent batch being injected.

B. The Contractor shall assist in the collection the following process monitoring parameters at monitoring points/sampling ports (at least one on the extraction side and one on the injection side of the treatment system) twice daily:
   1. Water quality parameters:
      a. Oxidation reduction potential (ORP).
      b. pH.
      c. Dissolved oxygen (DO) concentration.
      d. Temperature.
      e. Specific conductivity.
      f. Sodium persulfate concentrations.
   2. The groundwater quality equipment will be provided by the Engineer.
   3. The frequency of these readings may be adjusted based on observations in the field.

C. Water levels should be measured from at least two points within the well field prior to the startup of the system each day and once immediately upon system shutdown.

3.6 DEMOBILIZATION

A. Contractor shall remove all equipment, materials and debris for the Site upon final demobilization.

B. Contractor shall remove solid waste and spill prevention controls from the Site upon completion. Contractor shall be responsible for off-site disposal of solid waste at a properly permitted facility.

END OF SECTION

SECTION 332400 –MONITORING WELLS

## PART 1 – GENERAL

### 1.1 SUMMARY

A. This Section includes the installation of monitoring wells, in completed soil test borings as shown on the Drawings and as specified herein.

B. This Section also includes the installation of injection and extraction wells associated with Treatment Zone 3.

### 1.2 LOCATION

A. All wells shall be installed at the location specified by the Engineer.

### 1.3 DEPTH

A. Total depth of the monitoring well installation will be dependent upon field conditions. Length and depth of the screen will be determined in the field by the Engineer.

B. Depths of the injection and extraction wells shall be as shown on the Drawings.

## PART 2 – MATERIALS

### 2.1 EQUIPMENT

A. All wells are to consist of 2-inch diameter Schedule 40 PVC riser pipe and screen sections. The screen shall contain 0.010-foot diameter slots with a total length of 10 feet. Riser pipe section lengths will be dictated by the subsurface conditions encountered in each borehole or as shown on the Drawings. All screen and riser pipe sections are to be connected with flush-mounted threaded couplings and in no instance will glue or joint compound be allowed in the subsurface. All wells will have a sufficient riser pipe section such that the riser pipe extends 30 to 36 inches above the ground surface.

B. A tremie pipe and cement pump will be provided to ensure proper grouting when required. Additionally, clean No. 00 Jersey Sand will be used as well packing in each borehole. A minimum 3-1/2-foot length of protective steel casing will be installed over the monitoring wells and grouted inside and outside with a cement slurry. Each protective casing is to contain a locking cover and lock that can be opened with a master key. The PVC cap placed on the PVC stickup is to be vented with a 1/8-inch diameter drill hole placed concentrically on the cap end.

C. No concrete surface seals or protective steel casings are required for the installation of the injection and extraction wells in Treatment Zone 3. However, temporary caps shall be installed on the top of each well until they are connected to the groundwater recirculation system. The remaining annulus on the extraction wells between the suction tubing and the well riser should be sealed with tape or similar.

PART 3 – EXECUTION

3.1 INSTALLATION PROCEDURE

A. Ten feet of 2-inch Schedule 40 PVC, 0.010-foot slotted screen will be emplaced into the borehole at a depth such that the clutter of the slotted screen section is at the same elevation as the anticipated center of the production well screen for the monitoring wells, except for the inject and extraction wells that will be screened from 15 to 25 feet below the ground surface as shown on the Drawings. Appropriate amounts of No. 00 Jersey Sand, if needed, will be added into the borehole to adjust the screen to the proper interval as dictated by the Engineer. Two-inch Schedule 40 PVC riser pipe will be added to the remaining upper portion of the borehole. Monitoring wells will be installed flushed with the surrounding concrete slab. A surface stickup of approximately 30 to 36 inches of PVC riser will be left above the ground's surface for the injection and extraction wells.

B. No. 00 Jersey Sand will be added to the annulus while the hollow stem auger casing is being removed. At a level approximately at least 12-inches above the screen, the sand will cease to be added to the hole.

C. A 2-foot layer of bentonite pellets will then be installed into the annulus on top of sand. This seal will be hydrated with potable water.

D. A bentonite-cement grout will then be emplaced into the well bore with a tremie pipe concurrently with the removal of the four 1/4-inch hollow stem auger. The grouting will cease when the grout reaches a level approximately 18-inches from the ground surface for monitoring wells. The grout shall be extended to the top of the existing concrete slab for the injection and extraction wells.

E. An air-entrained concrete seal will then be inserted in the annulus along with a flush-mount protective steel casing with locking cap for the monitoring wells. A screw-on PVC cap will be emplaced on top of the monitoring well.

3.2 MONITORING WELL DEVELOPMENT PROCEDURE

A. Once the construction of the wells has been completed, each well must be properly developed. Well development may be accomplished by surging and pumping, either mechanical or with an airline. The best method to be utilized will be governed by the physical characteristics of the aquifer and the depth of the well. The wells shall be developed until the turbidity levels are below 50 Nephelometric turbidity units (NTUs) or less, or for a maximum of two hours.

END OF SECTION

# APPENDIX F

## Standard Operating Procedures

Author: Chris Burns
Reviewer: Seth Fowler
Sandy Warner

# FIELD LOGBOOK AND PHOTOGRAPHS

A. PURPOSE/SCOPE:

To produce an accurate and reliable record of all field activities, including field observations, sample collection activities, etc.

All pertinent field survey and sampling information shall be recorded in a logbook or on field logs during each day of the field effort.

In addition to keeping logs, photographs will be taken to provide a physical record to augment the field worker's written observations. They can be valuable to the field team during future inspections, informal meetings, and hearings. Photographs should be taken with a camera-lens system having a perspective similar to that afforded by the naked eye. A photograph must be documented if it is to be a valid representation of an existing situation.

B. EQUIPMENT/MATERIALS:

- Bound Field Book (with waterproof paper) or Field Logs
- Chain-of-Custody, Other Appropriate Forms
- Indelible Ink Pens
- Digital Camera with 50 mm lens or similar.

C. PROCEDURE:

1. At a minimum, entries in a logbook shall include:
   a. Date and time of starting work
   b. Names of all personnel at site
   c. Summary of key conversations with contractors, agency representatives, etc.
   d. Purpose of proposed work effort
   e. Sampling equipment to be used
   f. Field calibration of equipment or documentation of calibration of rented equipment
   g. Description of work area
   h. Location of work area, including map reference. Document sample locations with references to fixed landmarks (e.g., 10 feet from southwest corner of building).
   i. Details of work effort, particularly any deviation from the field operations plan or standard operating procedures
   j. Field observations and field measurements (e.g., pH)
   k. Field laboratory analytical results
   l. Personnel and equipment decontamination procedures
   m. Daily health and safety entries, including levels of protection
   n. Type and number of samples

**FIELD LOGBOOK AND PHOTOGRAPHS**

o. Sampling method, particularly deviations from the standard operating procedures

p. Sample location and number

q. Sample handling, packaging, labeling, and shipping information (including destination)

r. Time of leaving site.

For each photograph taken, several items shall be recorded in the field logbooks:

a. Date and time – Camera set to record on photo

b. Name of photographer

c. General direction faced and description of the subject

d. Sequential number of the photograph

e. Always attempt to include an object in the photograph that helps show scale

f. Always try to shoot at approximately 50mm focal length (what human eye sees).

2. Each day's entries will be initialed and dated at the end by the author, and a line will be drawn through the remainder of the page.

D. QA/QC REQUIREMENTS:

All entries in the logbook shall be made in indelible ink. All corrections shall consist of single line-out deletions that are initialed.

The field task leader shall be responsible for ensuring that sufficient detail is recorded in the logbooks, and shall review the site logbooks daily.

E. SPECIAL CONDITIONS:

Photographs should be downloaded from the camera to the project folder and notes regarding the photographs should accompany the photos. Photographs should be no larger than 2 MB each unless they are being utilized for presentation purposes. CHA has software available to decrease file sizes if necessary.

As noted above, if a bound logbook is not used, then a field observation form must be used and information above should be captured on the form.

F. REFERENCES:

None

G. APPENDICES/FORMS:

Not Applicable

**END OF SOP**

Final Check by C. Burns 10/2/15

Author: Sarah Benson
Reviewer(s): Keith Cowan
Sandy Warner

# SAMPLE NAMING AND NUMBERING

## A. PURPOSE/SCOPE:

The success of large environmental programs is greatly affected by the efficiency of data management and analysis. When performing environmental sampling, one of the most critical steps is appropriately naming or numbering samples so that they are uniquely identified and can be distinguished from all other samples by all future users.

Some of the potential benefits that can be obtained by adopting a naming convention include the following:

a. To ensure that every sample collected at a site has a unique identifier

b. To enhance clarity in cases of potential ambiguity

c. To help avoid "naming collisions" that might occur when the data is imported into our Equis or other databases; and

d. To provide meaningful data to be used in project handovers.

Note that many of our sampling programs are performed at sites with previously established sample locations and in these cases, we would not change sample names. Additionally, this process shall be applied at larger, more complex sites, and/or sites that are required to follow a site- specific QAAP. Simpler naming conventions may be implemented for small, simple sites.

## B. EQUIPMENT/MATERIALS:

- Field Logbook
- Field Sample Login Sheet
- Site Map/ Work Plan
- Sampling Forms
- Chain-of-Custody
- Sample Containers with Labels

## C. PROCEDURE:

1. Each sample shall be uniquely defined by a multi-field name. In general, three fields are required: [Project # or Name] – [Media Type] – [Location Name/Sequential Number].
2. If using a site name, abbreviate to 2-3 letters. (e.g., Congress St site would be “CS”).
3. Use the following abbreviations for media types:

| | |
|---|---|
| Subsurface Soil | SOIL |
| Surface Soil | SURF |
| Sediment | SED |
| Groundwater | GW |
| Surface Water | SW |
| Waste Water | WW |
| Soil Vapor | SV |
| Storm Water | STORM |

Author: Sarah Benson
Reviewer(s): Keith Cowan
Sandy Warner

**SAMPLE NAMING AND NUMBERING**

4. All samples collected at a site shall be numbered sequentially for each media type, regardless of the field event or project phase. The use of hyphens to separate segments of a sample name is beneficial for sample name readability. It is also beneficial to use enough leading zeros to accommodate the Sequential Number (or sys_loc_code) portion of the sample name, which will assist in sorting sample IDs in the data management program or database (see EQUIS discussion below).
5. Do not include information such as time, sample depths, etc. in the name. This information should be recorded as defined in Section F (below).
6. In no cases shall the multi-field name be longer than 30 characters, including dashes. Ensure that each name is clearly written on both the sample label as well as the Chain of Custody.
7. Do not use special characters (e.g. #, ‘, “, @, !) when naming samples. Including such characters in the Serial Number (sys_loc_codes) or Sample Number (sys_sample_codes) can be incompatible with the database.
8. For QA/QC blank samples use the following abbreviations in place of the media type:

   Trip Blank............................................TB
   Equipment Rinse (Field Blank) .............FB
   Duplicate..............................................DUP
   Matrix Spike ........................................MS
   Matrix Spike Duplicate..........................SD

   For Duplicate and MS/MSD samples we need to make sure we include the parent sample name. Add the DUP, MS or MSD indicator after the Sequential Number.

   For Blind Duplicate samples, use the CHA indicator in place of the Sequential Number. The location should be recorded in the field logs for our evaluation purposes. For example, a blind duplicate sample number for soil collected at the 005 location would be “CS-SOIL-CHA-1.”

   You would record in the field log that the blind soil duplicate CHA-1 has SOIL-12345-005 as its parent sample.

9. <u>Option to Include the Sample Collection Date</u> - As an option, the date may be included in the sample name. NYS Electronic Data Deliverable guidance suggests using dates in the YYYYDDMM format. Placing the year first provides for ease of sorting data in the database:

   However, adding the date adds 9 characters to the sample name thus increasing the complexity of sample numbering. The date is captured on the Chain-of-Custody and in field records.

D. <u>QA/QC REQUIREMENTS:</u>

All data must be documented on field data sheets or within site logbooks.

Field personnel should verify that all sample data and supporting information in log books is correct prior to leaving the site.

# SAMPLE NAMING AND NUMBERING

E. SPECIAL CONDITIONS:

NYSDEC EQUIS Considerations:

NYSDEC uses EQuIS for data management and generally requires data to be submitted in EQuIS format. EQuIS has three different sample name related fields, a sample_name, a sys_sample_code and a location_name. Location_name will almost always be simplified to something like SW-1, GW-2 etc. and is usually the last field of the sample name.

In terms of the other two, sample_name is what we record in the field. That is limited to 30 characters of text.

The laboratory generates the sys_sample_code by taking the sample_name field and adding another qualifier, such as the sample delivery group or work order number. EQuIS requires that the sys_sample_code field be unique within a database. This is limited to 40 characters of text so it typically will be the sample name plus up to 10 characters.

It is recommended to keep the CHA sample name as short as possible to work with the EQuIS format. The basic sample names identified above are 14 to 17 characters long. If the optional date format is used, sample names will be 23 to 26 characters which is near the limit for what EQuIS can accommodate (and you may have issues physically fitting the sample names legibly into the COC form).

F. REFERENCES:

NYSDEC, DER-10, Technical Guidance for Site Investigation and Remediation, May 2010, http://www.dec.ny.gov/docs/remediation_hudson_pdf/der10.pdf

NYSDEC, Electronic Data Delivery Manual, January 2013, http://www.dec.ny.gov/docs/remediation_hudson_pdf/eddmanual.pdf

New Jersey Department of Environmental Protection, August 2005, Field Sampling Procedures Manual, Chap. 6, http://www.nj.gov/dep/srp/guidance/fspm/

G. APPENDICES/FORMS:

Not Applicable

**END OF SOP**

Final Check by C. Burns 12/2/15

Author: Sarah Newell, Mark Corey
Reviewer: Keith Cowan, Sandy Warner

# COMPLETING A CHAIN-OF-CUSTODY RECORD

## A. PURPOSE/SCOPE:

This protocol provides a standard operating procedure (SOP) for initiating and maintaining a Chain of Custody (COC) document. A COC is a legal document designed to track persons who are responsible for the preparation of the sample container, sample collection, sample delivery, sample storage, and sample analysis. A COC is an appropriate format to record important data associated with each individual sample. In general, a sample requiring a COC will follow a path as follows:

Sample Collector → Sample Courier/Operator → Sample Custodian

Verification of who has possessed the samples and data and where the samples have been is completed when staff follow chain-of-custody procedures.

## B. EQUIPMENT/MATERIALS:

- Chain of Custody form
- Ball-point, permanent pens
- Gallon-Sized Ziploc Bag (to keep COC dry)
- Field Logbook
- Custody seals
- Padlock(s) (optional)

## C. PROCEDURE:

1. Once a sample has been determined to require a COC, the Sample Collector must initiate the COC. The Sample Collector must fill in the fields provided on the COC. The words "Chain of Custody" must be located in a conspicuous location at the top of the document.
2. The form is generally a three-page carbon copy document, including a white, yellow and pink sheet. While CHA generally uses COCs provided by the applicable laboratory, it is important to ensure that the COC from each lab contains places for all necessary information.
3. The COC at that time should include the fourteen-digit CHA project number and phase, the project name and location.
4. The Client Information Section must be completed. In most cases the "client" will be CHA Consulting, Inc.
5. The first field of information is the Sample Identification or Sample Identification Number. This identification/number must match the identification/number located on the sample container.
6. An information line for the date, time, phone number, printed name of Sample Collector, signature of Sample Collector, organization name (no acronyms), organization's full mailing address, and sample description must also be included.
7. Sampling personnel should enter the sample number(s) (which should correspond with a unique number on a sample container [SOP #103] if applicable, and parameters to be analyzed. The "Sample ID" must be included and must match the number on the sample.

Author: Sarah Newell, Mark Corey
Reviewer: Keith Cowan, Sandy Warner

# COMPLETING A CHAIN-OF-CUSTODY RECORD

8. Subsequent fields must be provided to allow for documentation of information about any subsequent Sample Couriers/Operators or Sample Custodians. These fields must contain the date, time, phone number, printed name of person taking custody of sample, signature of person taking custody of sample and organization name (no acronyms).
9. Field Information - The COC must contain places to enter the following field information: sample number, sampling date, and type of sample. Other field information may be recorded as specified in the field sampling plan or proposal for the project. It is imperative that there be only one sample with a particular sample number per project/study so as to prevent duplicates in Excel files and EQuIS databases.
10. Laboratory Information - Once the sample is delivered to the lab, the laboratory personnel will sign and date the "received by" line located at the bottom of the COC. Other laboratory information may be recorded as specified in the project/study work plan/proposal.
11. Signatures - The COC must contain places for all people who handle the sample to sign his/her name. This is a record of persons who had custody of the sample during all steps of the process from container preparation, sample collection, sample storage and transport, and sample analysis. There should be signature lines to relinquish custody of the sample and to receive custody of the sample.

## D. QA/QC REQUIREMENTS:

The Field Team Leader or senior person on the sampling team will review the completed COC form to verify that all fields are properly completed. For purposes of this SOP, signing the form under Collected/Delivered by is considered evidence that the COC form has been checked for accuracy and completeness.

## E. SPECIAL CONDITIONS:

Whenever samples are split with a source or government agency, a separate chain of custody form should be completed for the samples and the relinquisher (sampler) and recipient should sign. If a representative is unavailable or refuses to sign for the samples, this can be noted in the “remarks” area of the form. When appropriate, as in the case where the representative is unavailable, the custody record should contain a statement that the samples were delivered to the designated location at the designated time. A copy of the chain of custody form for split samples must be kept with the project file.

Samples may require short term storage in field locations prior to delivery to the laboratory for analyses. The storage may be in vehicles or lodging locations. The samples must be secured to limit access to them. A locked vehicle is considered controlled access. However, simply a locked lodging room is not secure due to potential custodial access. If an unattended lodging room is used for sample storage, the samples must be further secured. This may entail a padlock on the ice chest, samples in an ice chest secured in an inner bag with a custody seal on it, and/or ice chest taped shut with custody seal on the outside of it.

## F. REFERENCES:

Sampling Guidelines and Protocols, NYSDEC, http://www.dec.ny.gov/regulations/2636.html
Chain of Custody Protocol is in Appendix 5X.2.

## COMPLETING A CHAIN-OF-CUSTODY RECORD

Chain of Custody Procedures for Samples and Data, EPA 50 minute Self Instructional Course:
http://www.epa.gov/apti/coc/

SOP for Chain of Custody, EPA Region 1:
http://www.epa.gov/region6/qa/qadevtools/mod5_sops/misc_docs/r1_chain-of-custody.pdf

G. APPENDICES/FORMS:

CHA COC Form

**END OF SOP**
Final Check by C. Burns 10/7/15

Author: Matt Renko
Reviewer: Seth Fowler

# SMALL EQUIPMENT DECONTAMINATION

## A. PURPOSE/SCOPE:

Proper decontamination of small equipment prevents cross-contamination of samples, introduction of contaminants to clean sites, and the mixture of incompatible substances. Equipment decontamination also assures the health and safety of all equipment users. Procedures for decontamination procedures vary depending on the matrix sampled, level of contamination, type of contaminants, and the target analytes of the sampling event. The procedure outlined in this SOP is a general procedure for field/ warehouse decontamination of equipment associated with water, soil and other surficial sampling activities.

Decontamination should be performed before sampling work commences and after each sampling event. Decontaminated equipment should be protected from contact with surroundings during storage and transport, and should be handled as little as possible before its use and always with disposable gloves. Note that all waste generated by decontamination procedures including liquids, solids, rags, gloves, etc., will be collected and disposed of properly according to the procedures outlined in SOP #507.

## B. EQUIPMENT/MATERIALS:

- Alconox®
- Tap water
- Distilled and deionized water
- 10% Nitric acid rinse
- Acetone (or other pesticide grade organic solvent)
- 1-Gallon pressure spray bottles
- Long-handled brushes
- 5-Gallon plastic buckets

## C. PROCEDURE:

Note that if it is logistically impractical/ impossible to complete all steps listed below at the field site, Steps 1-4 should be performed prior to transport of equipment to a facility where all steps can be completed if required. All field decontamination should take place over a container and liquids should be properly disposed of.

1. Disassemble equipment as necessary.
2. Remove gross contamination from equipment by scraping, brushing and rinsing with tap water
3. Wash with Alconox® or other laboratory grade detergent to remove all visible particulate matter and residual oils and grease.
4. Rinse with tap water to remove detergent.
5. Rinse with distilled and deionized water.
6. Field personnel will use a new pair of outer gloves before handling sample equipment after it is cleaned.
7. If equipment will not be used immediately, wrap in aluminum foil (unless sampling for metals analysis) or seal in plastic bags (unless sampling for organics analysis) and store.
8. Record the date and method of decontamination on foil/bag and equipment log.

# SMALL EQUIPMENT DECONTAMINATION

## D. QA/QC REQUIREMENTS:

When necessary, field equipment rinsate blanks will be collected by pouring analyte-free water over decontaminated equipment and submitting them to the lab with the other blanks and samples. These blanks are used to assess the quality of equipment decontamination.

## E. SPECIAL CONDITIONS:

Reusable PPE such as respirators, chemical-resistant overboots and gloves shall also undergo the equipment decontamination sequence. See SOP #505 for related information on Personnel decontamination.

If acetone is a known or expected contaminant another solvent may be substituted. Note that methanol cannot be used for decontamination when sampling gasoline or its by-products.

Additional decontamination procedures may be required for particular contaminants or when samples are to be analyzed at very low concentrations. Identify methods as needed but see for example Wilde, 2004.

## F. REFERENCES:

New Jersey Department of Environmental Protection, August 2005. *Field Sampling Procedures Manual*.

USEPA, 1994. Sampling Equipment Decontamination. Environmental Response Team SOP #2006, Revision #0.0. Edison, NJ. http://www.ert.org.

USEPA, 1996. *Environmental Investigations Standard Operating Procedures and Quality Assurance Manual*. Region 4, Science and Ecosystem Support Division. Athens, GA. http://www.epa.gov/region04/sesd/eisopqam/eisopqam.html

Wilde, F.D., ed., 2004. *Cleaning of Equipment for water sampling (ver. 2.0)*: U.S. Geological Survey Techniques of Water-Resources Investigations, book 9, chap. A3, April, accessed January 5, 2009 at http://pubs.water.usgs.gov/twri9A3/

## G. APPENDICES/FORMS:

Not Applicable

**END OF SOP**

Final Check by C. Burns 10/27/15

Author: Matt Renko
Reviewer: John Favreau

# LARGE EQUIPMENT DECONTAMINATION

A. PURPOSE/SCOPE:

Decontamination of large equipment (drilling rigs, backhoe excavators, bulldozers, etc.) is necessary to prevent cross-contamination between sampling points and to prevent the removal of contaminants from a hazardous waste site.

B. EQUIPMENT/MATERIALS:

- Steam cleaner
- Generator
- Decontamination pad or supplies to construct a temporary pad
- Centrifugal pump
- Discharge hose
- 55-Gallon drums
- Alconox®
- Hexane
- Potable water source

C. PROCEDURE:

1. Drilling rigs and excavation equipment and materials should arrive on-site in a clean condition, free of oil, grease, and debris. Inspect rigs for any fluid leaks.
2. Unless otherwise approved, all decontamination of large equipment will take place on a decontamination pad designed to collect all rinsate generated during cleaning. Temporary pads should be lined with a water-impermeable material with no seams, and if possible, constructed on a level, paved surface. Pads should be constructed so as to facilitate the collection of wastewater, with a sump in one corner or side, or with one corner generally lower than others. Where appropriate, side shields should be placed around the decon pad to prevent overspray.
3. Steam clean the drill rig/ excavator, tools, drill bits, buckets, etc. prior to the start of work. Smaller equipment and tools should be elevated on saw horses to avoid any splashing. After steam cleaning, the equipment should be inspected for residues such as machine oil. If residues are observed, the equipment should be steam cleaned until such residues are removed. Steam cleaning procedures can be supplemented with manual scrubbing with Alconox® where necessary to remove contamination.
4. In the event that equipment is contaminated with heavy oils or products that cannot be removed by the standard decontamination procedures outlined above, the following modifications will be made. First, wipe all excess oil/tar from the equipment with a paper towel or clean rag. Second, with a paper towel or clean rag that has been soaked in hexane, wipe any residual contamination off the equipment. When equipment is relatively free of gross oil or tar contamination, proceed with the usual decontamination procedure.
5. At the completion of the project, or when required, all rinsate generated from decontamination activities shall be pumped from the decontamination pad to 55-gallon drums for disposal.

**LARGE EQUIPMENT DECONTAMINATION**

D. QA/QC REQUIREMENTS:

Equipment field blanks may be required depending on job specifics.

E. SPECIAL CONDITIONS:

Not Applicable

F. REFERENCES:

New Jersey Department of Environmental Protection, 2005. *Field Sampling Procedures Manual. August*.

USEPA, 1996. *Environmental Investigations Standard Operating Procedures and Quality Assurance Manual*. Region 4, Science and Ecosystem Support Division. Athens, GA. http://www.epa.gov/region04/sesd/eisopqam/eisopqam.html

G. APPENDICES/FORMS:

Not Applicable

**END OF SOP**
Final Check by C. Burns 10/22/15

Author: Matt Renko
Reviewer: John Favreau

# DECONTAMINATION OF PERSONNEL

## A. PURPOSE/SCOPE:

The objective of decontamination is to prevent the transmission of contaminants to personnel and equipment and to prevent the spread of contaminants off-site. Decontamination is performed as a quality assurance measure and as a safety precaution during sampling. The following SOP outlines general decontamination procedures that apply to personal protection Level C. Projects that necessitate higher levels of protection (Levels B or A) require site-specific decontamination plans as part of the project's Health and Safety Plan.

The decontamination area must be set up before any entry into contaminated areas or the Exclusion Zone. All personnel must undergo decontamination prior to leaving the site. Sites with relatively low contamination levels and no Exclusion Zone activities (Level D PPE) still may require decontamination. At Level D activity sites, decontamination should be provided for the following: washing of boots, or the removal and disposal of boot covers (booties); removal and disposal of disposable coveralls; removal and disposal of outer and inner gloves; and the washing of hands, arms and face prior to leaving the site, or taking any breaks for eating, drinking, etc.

## B. EQUIPMENT/MATERIALS:

- Decontamination pad
- Brushes
- Polyethylene
- Tap water
- Detergent
- Appropriate decontamination solutions
- 55-Gallon drum
- Shallow wash buckets

## C. PROCEDURE:

1. Maximum and minimum decontamination procedures for Level C protection are described in detail in Tables 1 and 2 on the following pages, and the procedure sequence is shown on associated flow-charts.
2. Arrange disposal of all waste generated during decontamination procedures according to guidelines in SOP #507. Check that all reusable PPE has been adequately decontaminated for future use.

## D. QA/QC REQUIREMENTS:

Not Applicable

## E. SPECIAL CONDITIONS:

Note that decontamination procedures will vary between sites depending on contaminants present.

**DECONTAMINATION OF PERSONNEL**

F. REFERENCES:

New Jersey Department of Environmental Protection *Field Sampling Procedures Manual*, August, 2005.

NIOSH, OSHA, USCG, EPA, *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities*, DHHS (NIOSH) Publication No. 85-115, October, 1985.

G. APPENDICES/FORMS:

Associated Flow Charts - The following Tables are included:

- Table 1. Maximum Measures for Level C Decontamination and Procedure Sequence
- Table 2. Minimum Measures for Level C Decontamination and Procedure Sequence

**END OF SOP**
Final Check by C. Burns 10/22/15

**DECONTAMINATION OF PERSONNEL**

**Table 1. Maximum Measures for Level C Decontamination**

| | | | | |
|---|---|---|---|---|
| Station | 1: | Segregated Equipment Drop | 1. | Deposit equipment used on site (tools, sampling devices and containers, monitoring instruments, radios, clipboards, etc.) on plastic drop cloths or in different containers with plastic liners. Segregation at the drop reduces the probability of cross contamination. During hot weather operations, a cool down station may be set up within this area. |
| Station | 2: | Boot Cover and Glove Wash | 2. | Scrub outer boot covers and gloves with decon solution or detergent and water. |
| Station | 3: | Boot Cover and Glove Rinse | 3. | Rinse off decon solution from station 2 using copious amounts of water. |
| Station | 4: | Tape Removal | 4. | Remove tape around boots and gloves and deposit in container with plastic liner. |
| Station | 5: | Boot Cover Removal | 5. | Remove boot covers and deposit in containers with plastic liner. |
| Station | 6: | Outer Glove Removal | 6. | Remove outer gloves and deposit in container with plastic liner. |
| Station | 7: | Suit and Boot Wash | 7. | Wash splash suit, gloves, and safety boots. Scrub with long-handle scrub brush and decon solution. |
| Station | 8: | Suit and Boot, and Glove Rinse | 8. | Rinse off decon solution using water. Repeat as many times as necessary. |
| Station | 9: | Canister or Mask Change | 9. | If worker leaves exclusion zone to change canister (or mask), this is the last step in the decontamination procedure. Worker's canister is exchanged, new outer gloves and boot covers donned, and joints taped worker returns to duty. |
| Station | 10: | Safety Boot Removal | 10. | Remove safety boots and deposit in container with plastic liner. |
| Station | 11: | Splash Suit Removal | 11. | With assistance of helper, remove splash suit. Deposit in container with plastic liner. |
| Station | 12: | Inner Glove Rinse | 12. | Wash inner gloves with decon solution. |
| Station | 13: | Inner Glove Wash | 13. | Rinse inner gloves with water. |
| Station | 14: | Face Piece Removal | 14. | Remove face piece. Deposit in container with plastic liner. Avoid touching face with fingers. |

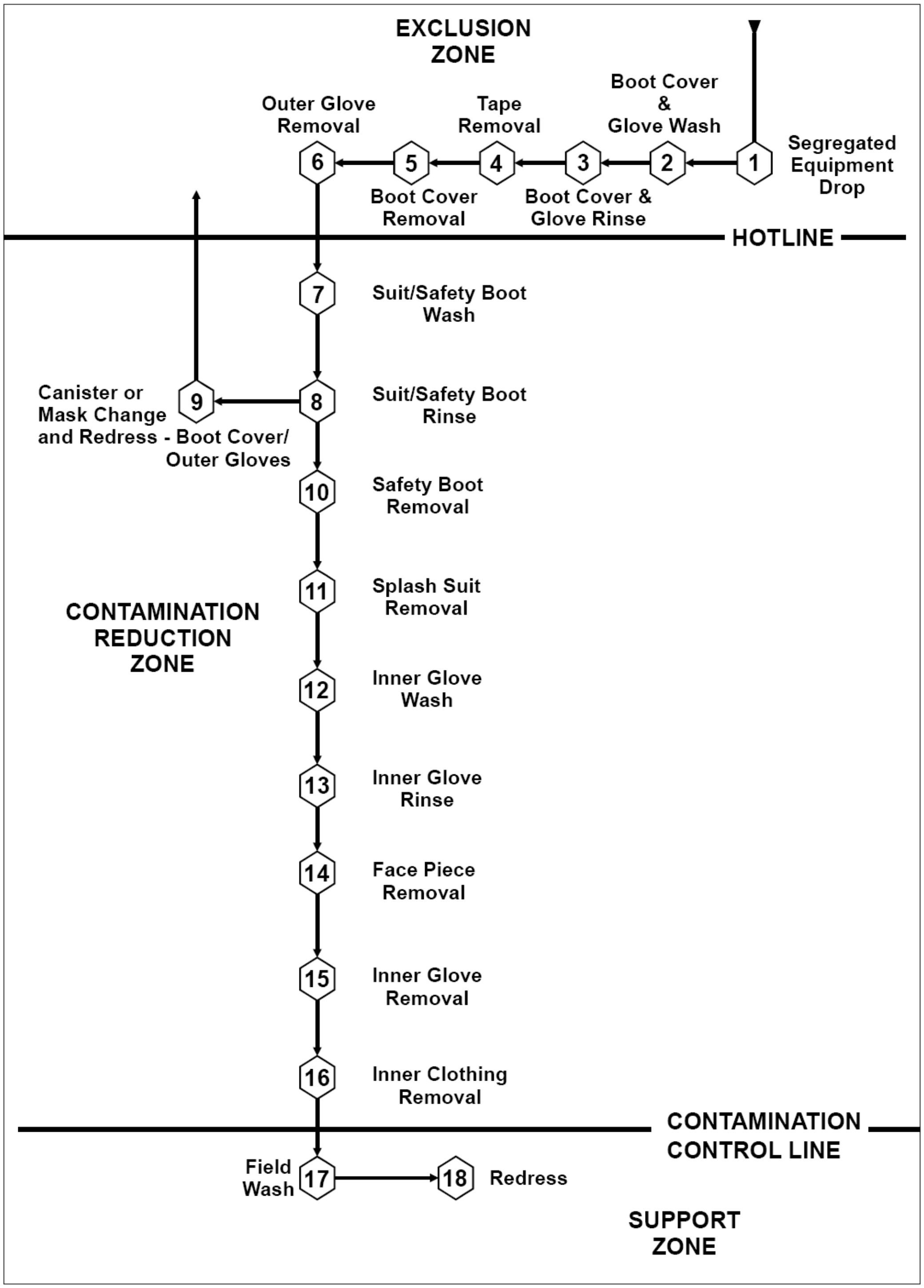
**DECONTAMINATION OF PERSONNEL**

**Table 1. Maximum Measures for Level C Decontamination continued**

| | | | | |
|---|---|---|---|---|
| Station | 15: | Inner Glove Removal | 15. | Remove inner glove and deposit in lined container. |
| Station | 16: | Inner Clothing Removal | 16. | Remove clothing soaked with perspiration and place in lined container. Do not wear inner clothing off-site since there is a possibility that small amounts of contaminants might have been transferred in removing the fully-encapsulating suit. |
| Station | 17: | Field Wash | 17. | Shower if highly toxic, skin-corrosive or skin-absorbable materials are known or suspected to be present. Wash hands and face if shower is not available. |
| Station | 18: | Redress | 18. | Put on clean clothes. |

## DECONTAMINATION OF PERSONNEL

### Maximum Measures for Level C Decontamination



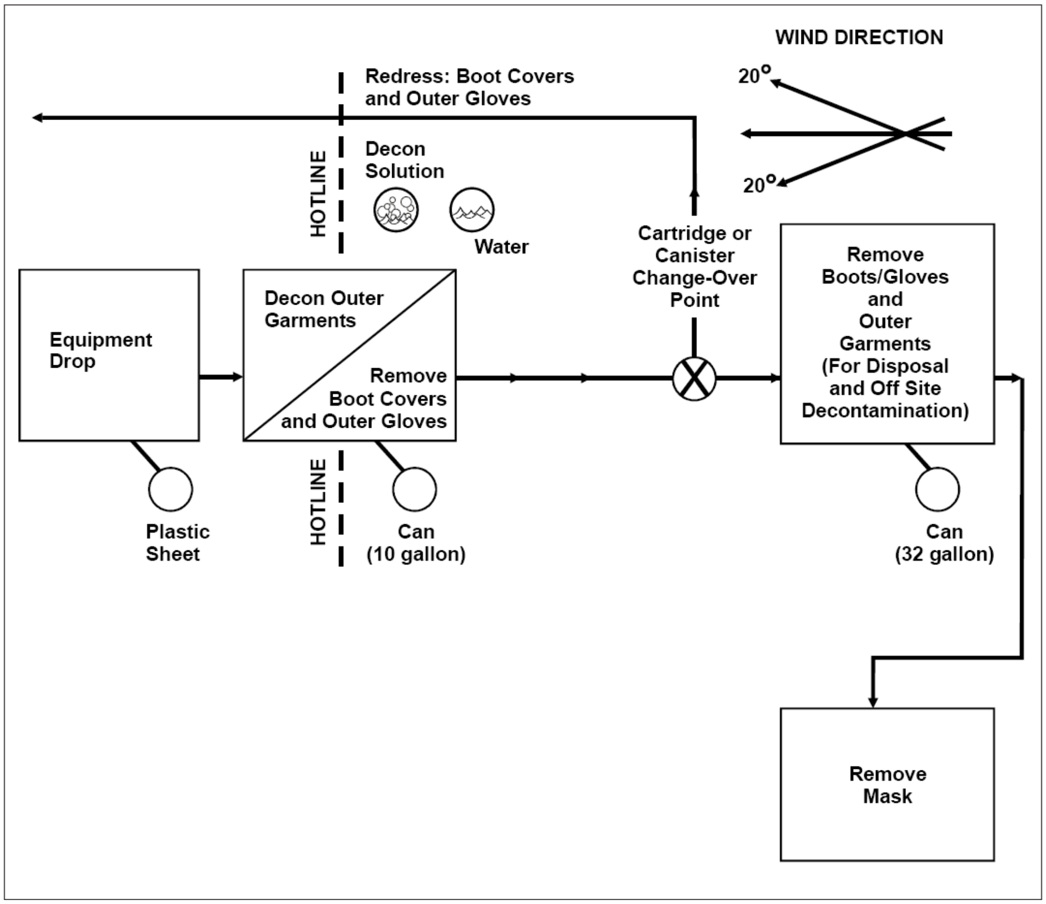
**DECONTAMINATION OF PERSONNEL**

**Table 2. Minimum Measures for Level C Decontamination**

| | | | | |
|---|---|---|---|---|
| Station | 1: | Equipment Drop | 1. | Deposit equipment used on-site (tools, sampling devices and containers, monitoring instruments, radios, clipboards, etc.) on plastic drop cloths. Segregation at the drop reduces the probability of cross contamination. During hot weather operations, a cool down station may be set up within this area. |
| Station | 2: | Outer Garment, Boots, and Gloves Wash and Rinse | 2. | Scrub outer boots, outer gloves and splash suit with decon solution or detergent water. Rinse off using copious amounts of water. |
| Station | 3: | Outer Boot and Glove Removal | 3. | Remove outer boots and gloves. Deposit in container with plastic liner. |
| Station | 4: | Canister or Mask Change | 4. | If worker leaves exclusive zone to change canister (or mask), this is the last step in the decontamination procedure. Worker's canister is exchanged, new outer gloves and boot covers donned, joints taped, and worker returns to duty. |
| Station | 5: | Boot, Gloves and Outer Garment Removal | 5. | Boots, chemical-resistant splash suit, inner gloves removed and deposited in separate containers lined with plastic. |
| Station | 6: | Face Piece Removal | 6. | Facepiece is removed. Avoid touching face with fingers. Facepiece deposited on plastic sheet. |
| Station | 7: | Field Wash | 7. | Hands and face are thoroughly washed. Shower as soon as possible. |

**DECONTAMINATION OF PERSONNEL**

## Minimum Measures for Level C Decontamination



**Author: Meghan Platt, P.E.**
**Reviewer: Scott Smith, P.E.**

# RESIDUALS MANAGEMENT

## A. PURPOSE/SCOPE:

The following standard operating procedure (SOP) presents a description of the methods generally employed for the management of residual waste. Field personnel are responsible for ensuring that state-specific standards/guidelines/regulations are followed, where applicable. In addition, field personnel are responsible for coordination efforts associated with the waste disposal facility, if known.

Improper handling and storage of residual waste can result in leaks and spills and pose a serious threat to the quality of the environment. Timely characterization and disposal of residual wastes shall be conducted in order to not exceed onsite quantity and/or storage regulations.

## B. EQUIPMENT/MATERIALS:

Off-Site transportation and disposal of residual waste will be performed by a licensed waste hauler under the direction of CHA. The company will supply the necessary equipment and materials needed to remove the residual waste from the Site and transport it to an approved waste disposal facility.

The field geologist/engineer will obtain the necessary sample bottles with the associated preservatives, if required, from the analytical laboratory. See SOP #603, Sample Containers, Volumes, Preservations and Holding Times, for additional information on these topics. In addition, if a flame ionization detector (FID), photoionization detector (PID) and/or gas meter will be used to screen waste containers soils for the presence of volatile organic compounds (VOCs).

All other equipment required during transportation/disposal activities is the responsibility of the Contractor (waste hauler).

## C. PROCEDURE:

1. During remedial activities all residual waste, including, but not limited to, soil cuttings, decontamination wash/rinse water, purge water and personal protective equipment (PPE) shall be containerized in United States Department of Transportation (USDOT) approved 55-gallon drums or similar waste containers, unless the Work Plan indicates otherwise. Each drum shall contain similar materials/matrices (e.g., soil, water, PPE).
2. Label each waste container using a permanent marker and weather proof label with the following:
   a. Description of the container contents
   b. Site name and address
   c. Name of Site contact and associated phone number

   Waste container labels shall be legible and easily understood by those unfamiliar with the Site.
3. Upon completion of remedial activities, the field geologist/engineer will conduct waste characterization of the residual waste prior to off-Site transportation and disposal. Depending upon the type of waste present, various waste disposal facilities may have different testing requirements. CHA will complete the required analytical testing. Upon receipt of analytical data and coordination with the disposal facility, the field geologist/engineer will supervise the removal of the waste from the Site.

**RESIDUALS MANAGEMENT**

4. Waste containers shall be transported and stored in a secure location on-Site. All waste containers shall be located in one location, if possible.
5. If waste containers are stored for a period of time prior to collecting waste characterization samples, all waste containers shall be inspected for signs of the potential presence of explosive/flammable gases and/or toxic vapors. These signs include pressurization (bulging/dimples); crystals formed around the drum opening; leaks, holes, stains; labels, marking; composition and type (steel/poly and open/bung); condition, age, rust; and sampling accessibility. Drums showing evidence of pressurization and crystals shall be further assessed to determine proper drum opening techniques.
6. All metal waste containers not in direct contact with the earth shall be grounded.
7. Open the waste container with spark resistant tools (e.g., brass, beryllium).
8. Screen the waste containers for explosive gases and/or toxic vapor with appropriate air monitoring instruments as necessary.
9. Obtain the necessary sample bottles with the associated preservatives, if required, from the analytical laboratory. See SOP #603, Sample Containers, Volumes, Preservations and Holding Times, for information regarding field preservation of sample containers, if necessary.
10. Each matrix (e.g., soil, water) shall be sampled for waste characterization purposes. The field geologist/engineer shall determine the quantity of similar waste characterization samples to be collected from the waste containers in conjunction with the project manager and/or waste disposal facility. Containers with similar wastes (e.g., soil, water) generated from one area of the site may require only one composite sample from each of the waste containers. This determination shall also be made in conjunction with the project manager and/or waste disposal facility.
11. Use a decontaminated spade or shovel to collect representative solid waste samples from each waste container or use a beaker, bailer or similar mechanism to collect representative liquid waste samples from each waste container.
12. Immediately place sample in the pre-preserved sample containers and close the waste container(s).
13. Chill all samples to 4ºC from sample collection until laboratory analysis.
14. Package and ship samples per SOP #607.

D. QA/QC REQUIREMENTS:

This section includes QA/QC requirements associated with tank closure activities. The following general requirements apply to this SOP:

1. All data must be documented on field data sheets or within site logbooks.
2. All instrumentation must be operated in accordance with operating instructions as supplied by the manufacturer, unless otherwise specified in the work plan.
3. Equipment checkout and calibration activities must occur prior to sampling/operation, and must be documented.

**RESIDUALS MANAGEMENT**

E. SPECIAL CONDITIONS:

In no case, will CHA be considered the generator of the waste. The site owner shall always take responsibility for waste disposal. Additionally, CHA may only act as agent for the owner relative to signing manifests with specific permission from CHA's in-house counsel. In most every case, the owner should sign waste manifests.

F. REFERENCES:

United States Environmental Protection Agency, Science and Ecosystem Support Division, Waste Sampling Standard Operating Procedure: http://www.epa.gov/region4/sesd/fbqstp/Waste-Sampling.pdf

G. APPENDICES/FORMS:

Not Applicable

**END OF SOP**

Final Check by C. Burns 10/26/15

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# SAMPLE CONTAINERS, VOLUMES, PRESERVATIONS AND HOLDING TIMES

## A. PURPOSE/SCOPE:

The following standard operating procedure (SOP) presents general guidelines for sample containers, volumes, preservations and holding times associated with air, water and soil/sediment samples. Field personnel are responsible for ensuring that state-specific standards/guidelines/regulations are followed, where applicable.

Improper preserving, storing and handling of air, water and soil/sediment samples are critical if the integrity of the samples are to be maintained. Samples collected in the field may undergo biological, chemical or physical changes following removal from their environment. In order to minimize those changes, many samples must have preservatives in the form of strong acids or bases added prior to delivery to the laboratory. If samples are to be collected as part of a government program, the governing agency typically must be notified 30 days prior to sample collection.

## B. EQUIPMENT/MATERIALS:

Pre-cleaned sample containers along with associated preservations within the sample containers will be provided to CHA from the analytical laboratory. The field geologist/engineer will provide the necessary personal protective equipment to place samples collected within the appropriate sample containers per SOPs 300 through 417. However, if field preservation is required the following equipment and materials shall be obtained:

- Hydrochloric (HCl) Acid Reagent A.S.C. 38%
- Nitric (HNO3) Acid Reagent A.S.C. 71%
- Sodium Hydroxide (NaOH) 97%
- 10 mL glass pipettes
- Narrow range (0-3 and 12-14) pH paper
- Nitrile gloves

## C. PROCEDURE:

1. Review Table 1 which details typical parameters of interest at environmental sites and the associated methods, preservation, container type, holding time and required sample volume.
2. Obtain pre-cleaned and pre-preserved sample containers from the laboratory. If pre-preserved sample containers were provided skip to Step 7; if not proceed to Step 3.
3. Put on a clean pair of nitrile gloves.
4. In a clean, non-dusty environment, remove the cap of the sample container.
5. Using a clean, 10 mL glass pipette draw the required amount of acid or base and insert into the sample container.
6. Volatile Organic Compounds – 2 mL of HCl acid (water samples).
7. Total and Dissolved Metals (including mercury) – 5 mL Nitric acid (water samples).
8. Cyanide – 15-20 Sodium Hydroxide pellets (water samples).

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9. Chemical Oxygen Demand, Oil and Grease, Organic Carbon, Phenolics, Total Dissolved Phosphorous, Hydrolyzable Phosphorus, Ammonia, Nitrate and Nitrite – 5 mL Sulfuric acid (water samples).
10. Immediately replace and tighten the sample container cap.
11. Collect sample using equipment and procedures outlined in other SOPs as appropriate. The volume of the sample collected shall be sufficient to conduct the analysis required, as well as associated quality assurance/quality control samples (QA/QC). QA/QC samples shall be collected in accordance with SOP 605.
12. Place samples immediately in the pre-preserved sample containers.
13. Chill all samples to 4ºC from sample collection until laboratory analysis.
14. Package and ship samples per SOP #607.

D. QA/QC REQUIREMENTS:

This section includes QA/QC requirements associated with sample containers, volumes, preservations, and holding times. The following general requirements apply to this SOP:

1. All data must be documented on field data sheets or within site logbooks.
2. All instrumentation must be operated in accordance with operating instructions as supplied by the manufacturer, unless otherwise specified in the work plan.
3. Equipment checkout and calibration activities must occur prior to sampling/operation, and must be documented.
4. QA/QC samples shall be collected in accordance with SOP 605.

The following procedure shall be conducted to provide a QA/QC check of water (aqueous) samples to ensure the samples were preserved to the proper pH prior to shipping for laboratory analysis.

Volatile Organic Compounds:

1. Collect one additional VOA vial at every third aqueous sampling location.
2. Fill the extra vial with the sample.
3. Using the extra VOA vial, remove the cap and using a clean, 10 mL glass pipette extract approximately 1 mL of water.
4. Place two drops of the water on a 1-inch strip of 0-3 range pH paper.
5. Compare pH strip's color while wet with that of the color key included on the pH paper container.
6. If pH is not less than 2, add additional HCL to the remaining 3 VOA vials prior to collecting the sample.
7. Discard the vial used to check the pH.

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Total and Dissolved Metals, Mercury, Ammonia, Nitrate plus Nitrite, Total Dissolved Phosphorus, COD, Oil & Grease, Organic Carbon, Phenolics

1. Collect sample and tightly reseal the cap.
2. Agitate the sample by gently shaking the sample bottle to mix the acid and water.
3. Remove the cap and using a clean, 10 mL glass pipette extract approximately 1 mL of sample.
4. Place approximately two drops of sample on a 1 inch strip of 0-3 range pH paper.
5. Compare pH strip's color while wet with that of the color key included on the pH paper container.
6. If pH is not less than 2, add appropriate additional Sulfuric Acid to the sample using a clean pipette.
7. Recheck sample using steps 2 through 6 until sample pH is less than 2.

Cyanide

1. Collect sample and tightly reseal the cap.
2. Agitate the sample by gently shaking the sample bottle until the NaOH pellets are dissolved.
3. Remove the cap and using a clean 10 mL glass pipette extract approximately 1 mL of sample.
4. Place approximately two drops of sample on a 1-inch strip of 12-14 range pH paper.
5. Compare pH strip's color while wet with that of the color key included on the pH paper container.
6. If pH is not greater than 12, add additional NaOH to the sample using standard procedures.
7. Recheck sample using steps 2 through 6 until sample pH is greater than 12.

E. SPECIAL CONDITIONS:

Not Applicable

F. REFERENCES:

Alpha Analytical Aqueous and Soil/Solid Reference Guides.

G. APPENDICES/FORMS:

Table 1 Laboratory Analysis: Summarizing parameters, methods, preservations, container type, holding times and minimum sample volumes are included as an attachment to this SOP.

**END OF SOP**
Final Check by C. Burns 10/27/15

Table 1

| Laboratory Analysis | EPA Method | Standard Method and/or SW846 Method | Preservation | Container | Holding Time | Minimum Volume |
|---|---|---|---|---|---|---|
| WATER | | | | | | |
| Acid Soluble & Insoluble Sulfide | ----- | 9030B | Cool to 4 deg C No Headspace | P or G | 7 Days | 8 oz. |
| Acidity as CaCO3 | 305.1 | 2310B | Cool to 4 deg C | P or G | 14 Days | 100 mL |
| Alkalinity | ----- | 2320B | Cool to 4 deg C | P or G | 14 Days | 100 mL |
| Alkalinity as CaCO3 | 310.1 | 2320B | Cool to 4 deg C | P or G | 14 Days | 100 mL |
| Ammonia | 350.2/.3 | 4500-NH3 B,E | Cool to 4 deg C, H2SO4 to pH<2 | P or G | 28 Days | 400 mL |
| Aromatic Hydrocarbons | 602 | 8021B | 1:1 HCl to pH <2, Cool to 4 deg C 0.008% Na2S2O3 if residual chlorine present | G, Vial screw cap with center hole Teflon- faced silicone septum | 14 Days | 40 mL |
| Biochemical Oxygen Demand | 405.1 | 5210B | Cool to 4 deg C | P or G | 48 Hrs. | 500 mL |
| Bromide | 300 | ----- | None | P or G | 28 Days | 250 mL |
| Calcium | ----- | 3120B | HNO3 to pH<2 | P or G | 6 Months | 100 mL |
| Calcium- Hardness | 200.7 | 3111B | HNO3 to pH<2 | P or G | 6 Months | 100 mL |
| Carbamates | 531.1 | ----- | Cool to 4 deg C, 0.08% Na2S2O3 if residual chlorine present | G, screw cap Teflon faced silicone septum | 14 Days | 100 mL mL |
| Carbonaceous BOD | ----- | 5210B | Cool to 4 deg C | P or G | 48 Hrs. | 1000 mL |
| Chloride | 300 | 4500-CL D<br>4110 | Cool to 4 deg C | P or G | 28 Days | 100 mL |
| Chloride, Residual Disinfectant | ----- | 4500Cl-G | Cool to 4 deg C | P or G | Analyze Immediately | 200 mL |
| COD | 410.4 | 5220D | H2S04 to pH<2, Cool to 4 deg C | P | 28 days | 250 mL |
| Color | ----- | 2120B | Cool to 4 deg C | P or G | 24 Hrs | 100 mL |
| Conductivity | ----- | 2510B | Cool to 4 deg C | P or G | 28 Days | 100 mL |
| Cyanide | 335.4 | 4500-CN C&E | Cool to 4 deg C NaOH pH>12 | P or G | 14 Days | 250 mL |
| Cyanide | 335.2 | 9010B, 9012A, 9014 | Cool to 4 deg C, NaOH to pH>12 0.6 g ascorbic acid if residual chlorine present | P or G | Sulfide absent, 14 days; sulfide present 24 Hrs | 250 mL |
| Cyanide, Amenable | 335.1 | | | | | |
| Dioxin | ----- | 8280A | Cool to 4 deg C 0.008% Na2S2O3 if residual chlorine present | G, Amber Teflon-lined screw cap | 7 days until extraction 40 days after extraction | 1000 mL |
| DRO | ----- | 8015B | Cool to 4 deg C 0.008% Na2S2O3 if residual chlorine present | G, Amber Teflon-lined screw cap | 7 days until extraction 40 days after extraction | 1000 mL |
| Escherichia Coli | ----- | 9222B | 0.008% Na2S203 if residual chlorine present<br>0.3 mL/125 mL<br>15% EDTA if ><br>0.01 mg/L heavy metals | Sterile<br>P or G | 30 Hrs. for Drinking Water<br>6 Hrs. for Waste Water | 125 mL |
| Extractable Org. Compounds | | | Cool to 4 deg C, Store in dark | G, Amber Teflon-lined screw cap | *7 days | 4000 mL |

Table 1

| Laboratory Analysis | EPA Method | Standard Method and/or SW846 Method | Preservation | Container | Holding Time | Minimum Volume |
|---|---|---|---|---|---|---|
| Fecal Coliform | ----- | 9222B or D | 0.008% $Na_2S_2O_3$ if residual chlorine present<br>0.3 mL/125 mL<br>15% EDTA if ><br>0.01 mg/L heavy metals | Sterile<br>P or G | 30 Hrs. for Drinking Water<br>6 Hrs. for Waste Water | 125 mL |
| Fecal Streptococci | ----- | 9230C | Cool to 4 deg C<br>0.008% $Na_2S_2O_3$ if residual chlorine present | Sterile<br>P or G | 30 Hrs. for Drinking Water<br>6 Hrs. for Waste Water | 125 mL |
| Fluoride | 300 | 4500 F-B,C S | Cool to 4 deg C | P or G | 28 Days | 300 mL |
| Foaming Agents (MBAS) | ----- | 5540C | Cool to 4 deg C | P or G | 48 Hrs | 250 mL |
| Gases | ----- | 3810 | Cool to 4 deg C<br>0.008% $Na_2S_2O_3$ if residual chlorine present<br>1:1 $HCl$ to pH <2 | G, Vial screw cap with center hole Teflon- faced silicone septum | 7 days without $HCl$<br>14 days with $HCl$ | 40 mL |
| GRO | ----- | 8015B | 1:1 $HCl$ to pH <2, Cool to 4 deg C<br>0.008% $Na_2S_2O_3$ if residual chlorine present | G, Vial screw cap with center hole Teflon- faced silicone septum | 7 days w/o $HCl$<br>14 days w/$HCl$ | 40 mL |
| Hardness | | | $HNO_3$ to pH<2 | P | 6 months | 1000 mL |
| Heterotrophic Plate Count | ----- | 9215B | Cool to 4 deg C<br>0.008% $Na_2S_2O_3$ if residual chlorine present | Sterile<br>P or G | 30 Hrs. for Drinking Water<br>6 Hrs. for Waste Water | 125 mL |
| Hexavalent Chromium | 7196A | 3500Cr-D | Cool to 4 deg C | P | 24 hours | 500 mL |
| HPLC (Explosive) | ------ | 8330 | Cool to 4 deg C | G, Amber Teflon-lined screw cap | 7 days until extraction 40 days after extraction | 1000mL |
| HPLC (Explosive) | ------ | 8310 | Cool to 4 deg C | G, Amber Teflon-lined screw cap | | 1000mL |
| Mercury | ----- | 7470A | Cool to 4 deg C | P or G | 28 Days | 8 oz. |
| Metals | 200.7 | ----- | $HNO_3$ to pH<2 | P | 6 Months | 100 mL |
| Nitrate | 300 | ----- | Cool to 4 deg C | P or G | 48 Hrs. | 100 mL |
| Nitrate (Chlorinated) | 353.2 | 4500-NO3 F | Cool to 4 deg C | P or G | 48 Hrs | 250 mL |
| Nitrate (Non- chlorinated) | 353.2 | 4500-NO3 F | $H_2SO_4$ to pH<2, Cool to 4 deg C | P or G | 14 Days | 250 mL |
| Nitrite | 300, 353.2, 354.1 | 4500-NO3 D | Cool to 4 deg C | P or G | 48 Hrs | 100 mL |
| Odor | ----- | 2150B | Cool to 4 deg C | G only | 24 Hrs | 200 mL |
| Oil and Grease | | 1664 | $HCl$ to pH<2, Cool to 4 deg C | G, Amber Teflon-lined screw cap | 28 days | 1000 mL |
| Organic Nitrogen | 351.1 | ----- | Cool to 4 deg C, $H_2SO_4$ to pH<2 | G | 28 Days | 500 mL |

Table 1

| Laboratory Analysis | EPA Method | Standard Method and/or SW846 Method | Preservation | Container | Holding Time | Minimum Volume |
|---|---|---|---|---|---|---|
| Organochlorine Pesticides/PCB | 608 | 8081A,8082 | Cool to 4 deg C 0.008% Na2S2O3 if residual chlorine present If aldrin is to be determined bind to pH 5-9. | G, Amber Teflon-lined screw cap | 7 days until extraction 40 days after extraction | 1000 mL |
| Ortho Phosphate | 300 | 4500 P-E | Cool to 4 deg C | P or G | 48 Hrs | 50 mL |
| Orthophosphate | 365.2 | ----- | Filter immediately, Cool to 4 deg C | P or G | 48 Hrs. | 50 mL |
| pH, Hydrogen ion | ----- | 4500-H-B | Cool to 4 deg C | P or G | Analyze Immediately | 25 mL |
| Phenols | 420.1 | 9065, 510ABC | Cool to 4 deg C, H2SO4 to pH<2 | G | 28 Days | 500 mL |
| Pseudomanas Aeruginosa | ----- | 9213E | Cool to 4 deg C 0.008% Na2S2O3 if residual chlorine present | Sterile P or G | 30 Hrs. for Drinking Water 6 Hrs. for Waste Water | 125 mL |
| Purgeable Halocarbons | 601 | 8021B | Cool to 4 deg C 0.008% Na2S2O3 if residual chlorine present | G, Vial screw cap with center hole Teflon- faced silicone septum | 14 Days | 40 mL |
| Radiological | ----- | ----- | HNO3 to pH<2 | P or G | 6 Months | 100 mL |
| Residue- Settleable (SS) | 160.5 | ----- | Cool to 4 deg C | P or G | 48 Hrs. | 1000 mL |
| Residue-filtered (TDS) | 160.1 | ----- | Cool to 4 deg C | P or G | 7 Days | 100 mL |
| Residue-non- filtered (TSS) | 160.2 | ----- | Cool to 4 deg C | P or G | 7 Days | 100 mL |
| Residue-Total Volatile Solids | 160.4 | 2540 E | Cool to 4 deg C | P or G | 7 Days | 100 mL |
| Salinity | ----- | 2520 C | Cool to 4 deg C | G | 28 Days | 100 mL |
| Semivolatile Organic Compounds (Unregulated) | 525.2 | ----- | If residual chlorine is present, add 40-50 mg Sodium Thiosulfate. If not chlorinated, add 6N HCl to pH<2 Cool to 4 deg C | G, Amber Teflon-lined screw cap | 7 Days for extraction, 30 after extraction | 1000 mL |
| Semivolatile Organics | 625 | 8270C | Cool to 4 deg C 0.008% Na2S2O3 if residual chlorine present | G, Amber Teflon-lined screw cap | 7 days for extraction 40 days after extraction | 1000 mL |
| Silica | 200.7 | ----- | Cool to 4 deg C | P only | 7 Days | 50 mL |
| Specific Conductance | 120.1 | ----- | Cool to 4 deg C | P or G | 28 Days | 100 mL |
| Sulfate | 300 | 4500-SO4 | Cool to 4 deg C | P or G | 28 Days | 50 mL |
| Sulfate | 375.4 | ----- | Cool to 4 deg C | P or G | 28 Days | 50 mL |
| Sulfide | 376.2 | 9030 B, 4500S2-AD | Cool to 4 deg C, add zinc plus NaOH to pH>9 | P or G | 7 Days | 50 mL |
| Sulfite (SO3) | 377.1 | ----- | None Required | G, Bottle and Top | Analyze immediately | 50 mL |
| Surfactants (MBAS) | 425.1 | ----- | Cool to 4 deg C | P or G | 48 Hrs. | 250 mL |

Table 1

| Laboratory Analysis | EPA Method | Standard Method and/or SW846 Method | Preservation | Container | Holding Time | Minimum Volume |
|---|---|---|---|---|---|---|
| TDS | | | Cool to 4 deg C | P | 7 days | 500 mL |
| Temperature | ----- | 2550B | None | P or G | Analyze Immediately | 1000 mL |
| Temperature | 170.1 | ----- | None Required | G, Bottle and Top | Analyze immediately | 1000 mL |
| Total Kjeldahl Nitrogen | 353.3/.1 | 4500Norg-C | H2S04 to pH<2 , Cool to 4 deg C | P | 28 days | 250 mL |
| Total Coliform | ----- | 9221D | 0.008% Na2S203 if residual chlorine present<br>0.3 mL/125 mL<br>15% EDTA if ><br>0.01 mg/L heavy metals | Sterile<br>P or G | 30 Hrs. for Drinking Water<br>6 Hrs. for Waste Water | 125 mL |
| Total Dissolved Solids | 160.1 | 2540C | Cool to 4 deg C | P or G | 7 Days | 100 mL |
| Total Hardness | 130.2 ,<br>200.7 | ----- | HNO3 to pH<2<br>H2SO4 to pH<2 | P or G | 6 Months | 100 mL |
| Total Kjeldahl Nitrogen | 351.3 | ----- | H2SO4 to pH<2 | P or G | 28 Days | 500 mL |
| Total Metals | 200.7<br>200.8 | 6010B, 6020, 7000A | HNO3 to pH<2 | P | 6 months<br>(Hg 28 days) | 500 mL |
| Total Organic Carbon (TOC) | 415.1 | 9060, 5310C | H2SO4 to pH<2, Cool to 4 deg C | G, Amber Teflon-lined screw cap | 28 days | 80 mL |
| Total Organic Halides | | 5320B | 1N H2SO4 to pH<2 | P or G | 28 Days | 50 mL |
| Total Phosphorus | 365.2 | ----- | Cool to 4 deg C, H2SO4 to pH<2 | G | 28 Days | 50 mL |
| Total Recoverable Oil & Grease | 413.1,1664A | ----- | Cool to 4 deg C, HCL or H2SO4 to pH<2 | G | Petroleum Based 3 Days; Non-Petroleum Based 24 hours | 1000 mL |
| Total-Residue (TS) | 160.3 | 2540B | Cool to 4 deg C | P or G | 7 Days | 100 mL |
| Turbidity | 180.1 | 2130B | Cool to 4 deg C | P or G | 48 Hrs | 100 mL |
| Volatile Organics | 624 | 8260B | 1:1 HCl to pH <2, Cool to 4 deg C<br>0.008% Na2S2O3 if residual chlorine present | G, Vial screw cap with center hole Teflon-faced silicone septum | 7 days w/o HCl<br>14 days w/HCl | 40 mL |
| Volatiles (Regulated) | 524.2 | ----- | Cool to 4 deg C HCl to pH<2 | G, Vial screw cap with center hole Teflon-faced silicone septum | 14 Days | 60-120 mL |
| SOIL | | | | | | |
| Acid Soluble & Insoluble Sulfide | ----- | 9030B | Cool to 4 deg C, no headspace | P or G | 7 Days | 8 oz. |
| Amenable Cyanide | ----- | 9213 | Cool to 4 deg C | P or G | 14 Days | 4 oz. |
| Bromide | ----- | 9211 | Cool to 4 deg C | P or G | 28 Days | 8 oz. |
| Cation - Exchange Capacity | ----- | 9080, 9081 | None | P | ----- | 8 oz. |
| Chloride | ----- | 9212, 9056, 9253 | None | P or G | 28 Days | 8 oz. |
| Chlorinated Herbicides | ----- | 8151A | Cool to 4 deg C | G, wide mouth, teflon liner | 14 Days | 8 oz. |
| Corrosivity pH Waste>20% water | ----- | 9040B | Cool to 4 deg C | P | Analyze Immediately | 4 oz. |

Table 1

| Laboratory Analysis | EPA Method | Standard Method and/or SW846 Method | Preservation | Container | Holding Time | Minimum Volume |
|---|---|---|---|---|---|---|
| Corrosivity Toward Steel | ----- | 1110 | Cool to 4 deg C | P | 14 Days | 4 oz. |
| Cyanide | | 9010B, 4500CN | Cool to 4 deg C | G, Amber | 14 Days | 4 oz |
| Dioxin | ----- | 8280A | Cool to 4 deg C | G | 14 Days | 8 oz. |
| DRO | ----- | 8015B | Cool to 4 deg C | G, Amber | 14 Days | 4 oz. |
| Extractable Organic Compounds | | | Cool to 4 deg C, Store in dark | G | 14 days | 8 oz |
| Extractable Sulfide | ----- | 9031 | Cool to 4 deg C, fill top of sample with 2N Zinc Acetate until moistened | P or G | 7 Days | 8 oz. |
| Fluoride | ----- | 9214 | None | P | 28 Days | 8 oz. |
| Gases | ----- | 3810 | Cool to 4 deg C | G, Amber | 14 Days | 8 oz. |
| Grain Size | | | N/A | G | N/A | 8 oz |
| GRO | ----- | 8015B | Cool to 4 deg C, check state regulations for proper preservative. NJ (methanol), PA (encore samplers) NY (cool to 4 deg C). | G, Amber VOA vial | 14 Days | 15 Grams |
| HPLC (PAH) | ------ | 8310 | Cool to 4 deg C | G, Amber Teflon-lined screw cap | 14 days until extraction 40 days after extraction | 4 oz. |
| Ignitability | ----- | 1010 | None | P or G | None | 8 oz. |
| Ignitability of Solids | | 1030 | None | P or G | None | 8 oz. |
| Mercury | 245.1 | 7471A | Cool to 4 deg C | G, Amber | 28 Days | 4 oz. |
| Metals | ----- | 6010B, 6020, 7000A | Cool to 4 deg C | G, Amber | 6 Months | 8 oz. |
| Moisture Content | | | Store in airtight jar 3-30 deg C | G | N/A | 8 oz |
| Nitrate | ----- | 9210 | Cool to 4 deg C | P or G | 48 Hrs | 8 oz. |
| Oil & Grease (Sludge, Sludge- Hem) | ----- | 9071B | Cool to 4 deg C | G | 28 Days | 8 oz. |
| Organochlorine | ----- | 8081A | Cool to 4 deg C | P or G | 14 Days | 8 oz. |
| Paint Filter Liquids Test | ----- | 9095A | Cool to 4 deg C | P or G | ----- | 8 oz. |
| PCBs | ----- | 8082 | Cool to 4 deg C | G, Amber Teflon-lined screw cap | 14 Days | 4 oz. |
| pH | ----- | 9045C | Cool to 4 deg C | G, Amber | Analyze Immediately | 4 oz. |
| pH, Soil and Waste | ----- | 9045A | Cool to 4 deg C | G | Analyze Immediately | 8 oz. |
| Phenol | ----- | 9065, 9066, 9067 | Cool to 4 deg C | G, Amber | 28 Days | 4 oz. |
| Radiological | ----- | ----- | Cool to 4 deg C | G | 6 Months | 8 oz. |
| Reactivity Cyanide | ----- | SW-846 7.3.3.2 | Cool to 4 deg C | P | 14 Days | 8 oz. |
| Reactivity Sulfide | ----- | SW-846 7.3.4.2 | Cool to 4 deg C | P | 14 Days | 8 oz. |
| Semivolatile Organics | ----- | 8270C | Cool to 4 deg C | G, Amber | 14 Days | 8 oz. |

**Table 1**

| Laboratory Analysis | EPA Method | Standard Method and/or SW846 Method | Preservation | Container | Holding Time | Minimum Volume |
|---|---|---|---|---|---|---|
| Sulfate | ----- | 9035, 9036, 9038 | Cool to 4 deg C | P or G | 28 Days | 8 oz. |
| Sulfides | ----- | 9215 | Cool to 4 deg C | P or G | 7 Days | 8 oz. |
| TCLP Metals | ----- | 1311, 6010B, 6020, 7000A, 7470A | Cool to 4 deg C | G, Amber | 180 Days (Hg 28 days) | 8 oz |
| TCLP Herbicides | ----- | 1311 | Cool to 4 deg C | G, Amber | 14 Days | 8 oz. |
| TCLP Pesticides | ----- | 1311 | Cool to 4 deg C | G, Amber | 14 Days | 8 oz. |
| TCLP Semivolatile Organics | ----- | 1311, 8270C, 8081A, 8151A | Cool to 4 deg C | G, Amber Teflon Lined | 14 Days | 8 oz. |
| TCLP Volatile Organics | ----- | 1311, 8260B | Cool to 4 deg C | G, Amber VOA Vial Teflon Lined | 14 Days | 8 oz. |
| Temperature | ----- | 2550 | ----- | P | Analyze Immediately | 4 oz. |
| TOC | | Lloyd Kahn Method | Cool to 4 deg C | G, Amber | 14 days | 4 oz. |
| Total Coliform | ----- | 9131 | Cool to 4 deg C | Sterile, P or G | 6 Hrs | 4 oz. |
| Total Coliform | ----- | 9132 | Cool to 4 deg C | Sterile, P or G | 6 Hrs | 4 oz. |
| Total Cyanide | ----- | 9013 | Cool to 4 deg C | P or G | 14 Days | 8 oz. |
| Volatile Organic Compounds | ----- | 8260B | Cool to 4 deg C Check individual state regulations for proper preservative. NJ (methanol), PA (encore samplers), NY (cool to 4 deg C) | G, wide mouth, teflon liner | 14 Days | 4 oz. |
| Volatile Organic Compounds | ----- | 8021 | | G, wide mouth, teflon liner | 14 Days | 4 oz. |
| CLP Sampling and Holding Time Information | | | | | | |
| Cyanide (aqueous) | ILM04.1 | | NaOH to pH>12, Cool to 4 deg C | P | 12 Days VTSR | 1000ml |
| Cyanide** | ILM04.1 | | Cool to 4 deg C | G | | 8 oz |
| Mercury (aqueous) | ILM04.1 | | HNO3 to pH<2, Cool to 4 deg C | P | 26 Days VTSR | 1000ml |
| Mercury (solid/soils) | ILM04.1 | | Cool to 4 deg C | G | | 8 oz |
| Metals (aqueous) | ILM04.1 | | HNO3 to pH<2, Cool to 4 deg C | P | 180 Days VTSR | 1000ml |
| Metals (solid/soils) | ILM04.1 | | Cool to 4 deg C | G | | 8 oz |
| PCBs (aqueous) | OLM04.2 | | Na2S203, Cool to 4 deg C | G | See Note 7 | 1000ml |
| PCBs (solid/soils) | OLM04.2 | | Cool to 4 deg C | G | See Note 6 | 8 oz |
| Pesticides (aqueous) | OLM04.2 | | Na2S203, Cool to 4 deg C | G | See Note 7 | 1000ml |
| Pesticides (solid/soils) | OLM04.2 | | Cool to 4 deg C | G | See Note 6 | 8 oz |
| Semivolatile Organic Compounds (aqueous) | OMLO4.2 | | Cool to 4 deg C | G | See Note 8 | 1000ml |
| Semivolatile Organic Compounds (solid/soils) | OLM04.2 | | Cool to 4 deg C | G | See Note 6 | 8 oz |
| Volatile Organic Compounds (aqueous) | OLM04.2 | | HCL pH < 2, Cool to 4 deg C | G | W/preservative: 10 days VTSR; W/O: 7 days VTSR | 40ml |
| Volatile Organic Compounds (solid/soils) | OLM04.2 | | Cool to 4 deg C | G | 10 Days VTSR | 4 oz |

**Table 1**

| Laboratory Analysis | EPA Method | Standard Method and/or SW846 Method | Preservation | Container | Holding Time | Minimum Volume |
|---|---|---|---|---|---|---|

**Notes:**

1. P - Plastic.
2. G - Glass.
3. Minimum volume is the minimum volume required by the laboratory to conduct the analysis. The laboratory will likely require additional sample volume.
4. * Extraction within seven (7) days of collection; analysis within 40 days of extraction.
5. **When chlorine is present ascorbic acid is used to remove the interference (0.6 g ascorbic acid).
6. VTSR - Validated time of sample receipt.
7. Ten (10) days from VTSR for extraction and 40 days following extraction.
8. Five (5) days from VTSR for extration 14 days after extraction.
9. Five (5) days from VTSR for extraction 40 days after extraction.
10. Holding times are from the time of sample collection unless otherwise noted.

# QUALITY ASSURANCE/QUALITY CONTROL SAMPLES

## A. PURPOSE/SCOPE:

This standard operating procedure explains the purpose and correct usage of Quality Assurance/Quality Control (QA/QC) samples. QA/QC samples are intended to validate the results of sample analysis by providing the means to determine the influence of outside factors on the sample and analysis. There are several types of QA/QC samples in use to ensure the best practices are being followed by both the laboratory preforming the analysis and the sampling team in the field. This is a general procedure for the use of QA/QC samples. Also refer to any guidelines provided by the laboratory.

## B. EQUIPMENT/MATERIALS:

QA/QC samples require the following materials:

- Sample containers:
  They should be the same containers in number and type of preservative as the containers for the samples for which QA/QC samples are being taken.
- Analyte-free water
- Any laboratory supplied QA/QC materials.

## C. PROCEDURE:

The following are types of QA/QC samples.

1. Duplicate Sample

A duplicate sample is a sample that is collected concurrently with the routine samples. It consists of an additional set of sample containers to be analyzed for the same parameters as the routine samples. It is taken at a sample point of the samplers choosing and at the same time as the routine sample for that sample point is taken. It is labeled and included on the Chain of Custody (COC) Form (see SOP 105) with a name unknown to the laboratory.

**Example:**

- Sample Point ID is **MW-1**
- Duplicate Sample ID is **CHA-1**

The duplicate sample is submitted as a 'blind' sample to the laboratory. The purpose of a duplicate sample is to allow the sampler to determine the precision of laboratory analysis. The results of the duplicate sample are compared with the results of the concurrent routine sample by the sampler. These results should be within the margin of error for the test being performed.

One duplicate sample should be taken for every twenty (20) routine samples. For example if 16 samples points were sampled, there would be 1 duplicate sample taken at one of the sample points for a total of 17 sample sets submitted to the lab.

2. Field Blank

The Field Blank sample is a type of QA/QC sample used to account for possible external contamination of the routine samples, usually by exposure to the air from being on site. It consists of an additional set of sample containers to be analyzed for the same parameters as the routine samples. It is common to only conduct a Field Blank for volatile organic compound (VOC) parameters even when sampling

**QUALITY ASSURANCE/QUALITY CONTROL SAMPLES**

to additional parameters. This is because VOCs are more likely to be present in the atmosphere at the site then a parameter like metals. However a Field Blank can be conducted for any parameter.

The containers are prepared prior to sampling by filling the containers with analyte-free water. The containers are then transported with the routine sample containers to the site. Once at the site the containers are placed in a location representative of the site conditions and their caps are removed. At the end of the sampling event the caps are then replaced. The sample is labeled and included on the COC as **Field Blank** or **FB**.

If any results are positive for the Field Blank it can be assumed that the routine samples have also been exposed to a similar amount of contaminant and that contaminant is probably present in the atmosphere at the site.

One Field Blank should be taken as required for each day of sampling at the site. They are only used for the collection of aqueous samples.

3. Equipment Blank

An Equipment Blank is a QA/QC sample designed to measure the effectiveness of the decontamination of field equipment. It consists of an additional set of sample containers being analyzed for the same parameters as the routine samples.

An Equipment Blank is collected by pouring analyte-free water directly over/on/into the decontaminated sampling equipment coming into contact with the samples being collected. The water is then collected in the sample containers. Once the containers are filled they are capped and sent to the lab with the other routine samples. The sample is labeled and included on the COC as **Equipment Blank** or **EQ Blank**.

A positive result for the analysis of the Equipment Blank could signal inadequate decontamination of the equipment which may result in cross-contaminated samples and thus suspect results.

One Equipment Blank should be taken for every twenty (20) routine samples collected. The Equipment Blank is not necessary when using dedicated sampling equipment or sampling equipment that is disposed of between each sample point.

4. Matrix Spike/Matrix Spike Duplicate Sample

The Matrix Spike/Matrix Spike Duplicate (MS/MSD) Sample is a quality control system used by the laboratory to check the accuracy of their instruments. It consists of a set of two (2) samples taken at a sample point concurrently with the routine sample for a total of three (3) sets of containers for that sample point. Therefore, the MS/MSD samples should be collected from sample points with sufficient sample volume (e.g., monitoring wells that have low recharge are not good candidates). They are labeled and included on the COC as ‘Sample ID’ MS and ‘Sample ID MSD’.

**Example:**

- Sample Point ID is **MW-1**
- Matrix Spike would be **MW-1 MS**
- Matrix Spike Duplicate would be **MW-1 MSD**

## QUALITY ASSURANCE/QUALITY CONTROL SAMPLES

The MS/MSD samples are submitted to the laboratory with the routine samples. Once at the laboratory they will have a known amount of an analyte added, known as the spike. The sample will then be run as a routine sample. Once the results are received they are compared to the results of the routine sample (MW-1 results are compared to MW-1 MS results). There should be a difference in the amount of analyte detected between the samples that should be within the margin of error of the amount of analyte spike that was added to the MS sample. This process is repeated for the MSD sample. This process is an internal review of results for the laboratory to determine the accuracy of their instruments.

One MS/MSD set should be taken for every twenty (20) samples (including Duplicate Samples and Field or Equipment Blank Samples). For example if 12 samples are taken, there should also be a set of MS/MSD samples taken for a total of 14 sample sets submitted to the lab. If 20 samples will be taken, only one set of MS/MSD samples needs to be submitted (total number of samples being 22).

*The following QA/QC samples are used for only specific analyses or functions.*

5. <u>Trip Blank</u>

A Trip Blank is a form of QA/QC that is utilized to account for possible exposure to an external source of VOCs during storage and transport of the sample containers and samples to and from the laboratory. It consists of a VOC sample container prepared by the laboratory and filled with analyte-free water. Trip Blanks are only required when aqueous samples are being collected for VOC analysis, all other parameters do not need one.

The Trip Blank is placed in the cooler with the sample containers when they are sent form the lab to the client. The Trip Blanks will remain in the cooler with the sample containers at all times. When the samples are collected they are placed in the cooler and put on ice with the Trip Blanks for shipment to the lab. At no time should the Trip Blanks be opened or removed from the coolers containing VOC samples. The Trip Blank should be labeled and included on the COC as **Trip Blank** or **TB**.

Each cooler that contains samples for VOC analysis must have a Trip Blank. It is good practice to combine all VOC containers from a site into one cooler to minimize the number of Trip Blanks required. For example if there are five coolers of samples, place all the VOC containers into one cooler and the remaining containers in the other four coolers. Thus only the VOC cooler requires a Trip Blank, which saves on the cost of analysis.

A positive result on the Trip Blank for a VOC could indicate the samples had been exposed during transportation which can have an effect on the results of the routine samples.

Different laboratories have different practices concerning their Trip Blanks. For example some laboratories will include just one VOA vial as their trip blank while others will utilize multiple vials for theirs. The extra vials are often included only as a backup in the event one of the Trip Blank vials is broken during transport, and will not be analyzed unless necessary.

D. <u>QA/QC REQUIREMENTS:</u>

Not Applicable

**QUALITY ASSURANCE/QUALITY CONTROL SAMPLES**

E. SPECIAL CONDITIONS:

**Temperature Blanks** are a type of QA/QC that fall outside of the umbrella of QA/QC Samples.

A Temperature Blank is a container provided by the lab and is used to obtain the temperature of the cooler upon receipt at the lab, usually with an infrared thermometer. It is generally a ~125 mL plastic bottle filled with tap water.

- The Temperature Blank should be left in the cooler during sampling. When the cooler is being prepared for shipment, place the Temperature Blank in the center of the cooler next to the sample containers. There is no need to open the container; it is filled with tap water and therefore harmless unless otherwise noted on the container.
- It should be noted that not all laboratories require a Temperature Blank. There is no cost associated with the Temperature Blanks in the coolers.

F. REFERENCES:

United States Environmental Protection Agency (July 2007), *Samplers Guide, Contract Laboratory Program Guidance for Field Samplers*, Section 3.4, retrieved April 6, 2009, from http://www.epa.gov/superfund/programs/clp/download/sampler/clp_sampler_guidance.pdf

United States Environmental Protection Agency (May 2002), *Ground-Water Sampling Guidelines for Superfund and RCRA Project Managers*, Page 34, retrieved December 15, 2010, from http://www.epa.gov/tio/tsp/download/gw_sampling_guide.pdf

G. APPENDICES/FORMS:

Not Applicable

**END OF SOP**

Final Check by C. Burns 10/27/15

**Author: Scott Smith**
**Reviewer: Chris Burns**

# REMEDIAL CONSTRUCTION OVERSIGHT AND DOCUMENTATION

## A. PURPOSE/SCOPE:

This SOP is intended to provide guidance and define the responsibility of CHA personnel engaged in construction observation. The objective of construction observation is to document construction activities for compliance with the contract requirements. Since the duty of CHA personnel on-site will vary based on our contractual obligations to our client, size and complexity of the project, project specification requirements and types of activities being observed, performance of the contractor, etc., it is important that the observer be familiar with:

- CHA's contract with the client
- The contract/agreement between the contractor and client
- Project manual/specifications and drawings
- Project plans and/or work plans
- Site-specific HASP.

***Note:*** *Construction "observation" or "oversight" refers to the action or process of observing something or someone in order to gain information without the higher level of completeness and rigor implied by the term "inspect". The term "inspect" implies a rigorous and complete review of construction relative to what is shown in the contract documents. The industry generally interprets the term "inspector" to imply that this employee has some authority over the contractor to control conformance with plans and specifications. With the exception of work performed under CHATS, CHA typically has no contractual relationship with the contractor performing the work or authority over the contractor, and thus, it is important to refer to our construction phase oversight as "observation" rather than "inspection."*

## B. EQUIPMENT/MATERIALS:

Required Equipment:

- Personal protective equipment (PPE) – Level D at a minimum
- Clothing appropriate for weather anticipated
- Field book
- Indelible pens & markers (e.g. Sharpies)
- Clipboard (preferably one that encloses paperwork)
- Field/Construction Observation Reports
- Digital camera
- 25-foot steel measuring tape (preferably in 100ths)

Optional Equipment (based upon project-specific needs):

- Additional PPE (Level C, personal flotation devices, etc.) – Refer to site-specific HASP
- 100', 200', or 300' measuring tapes or measuring wheel
- 6' folding wood ruler (preferably in 100ths)
- Hand held GPS
- Photoionization detector, combustible gas meter, particulate meter, etc.
- Latex/nitrile gloves
- Sampling equipment and containers

**REMEDIAL CONSTRUCTION OVERSIGHT AND DOCUMENTATION**

- Wooden survey stakes and 3-lb. sledge hammer
- Survey tape/flagging/wire stakes
- Survey tape
- Digital audio recorder
- Computer with remote network access (for long duration projects).

C. GENERAL PROCEDURES/JOB DUTIES:

**Electronic File Storage:** Wherever practical, the below referenced documentation should be stored electronically and routinely uploaded to the project folders on CHA's server. Binders may be used to store paper documentation when appropriate, but CHA personnel should make a reasonable effort to minimize the amount of paper generated for the project and the amount of files stored at the site due to the potential for damage or loss of such documents.

The CHA construction observer will perform the following tasks:

1. Attend a preconstruction meeting whenever possible. If possible, a field visit to the project site should also be made.
2. Establish and maintain lines of communication between all parties. Establish a chain of command with the CHA PM, the client, the contractor, regulators, etc.
3. File all correspondence in the project folder, including e-mails. Letters received in hard copy only should be scanned in PDF format and stored in the project file as well. All correspondence should be stored with the date first followed by a description of the content to facilitate future searches (e.g. 2015-01-01_CHA to Contractor Re Recent Analytical Results). Conversation Logs and Meeting minutes shall be stored in a similar manner.
4. Monitor that construction work conforms to the provisions of the contract documents and/or project plans (i.e. HASP, QAPP, CAMP, SWPPP, etc.).
5. Prepare daily observation reports and take digital photographs documenting major site activities and observations made. For small, simple projects, complete a **Field Observation Report**. For larger, more complex projects where multiple activities are being observed, a more detailed **Construction Observation Report** should be completed. At a minimum, observation reports will include:

   - Date and weather conditions
   - Name of important visitors
   - Work/activity in progress and location
   - Contractor's means and methods for completing activities
   - Size of contractor's work force and equipment in use
   - Number of hours worked per day for contractor and subcontractor (arrival & departure times)
   - The substance of important conversations with the contractor concerning conduct, progress, changes, test results, interpretations of specifications and all other important details
   - Reporting of any variances made in the field to sampling plans, SOPs or other applicable contract documents
   - Documentation of calibration/maintenance of field instrumentation, field screening observations, samples collected, etc.

## REMEDIAL CONSTRUCTION OVERSIGHT AND DOCUMENTATION

6. Maintain digital photographic documentation of all work completed. Sufficient photographs should be taken to depict the location of the activity, the material(s) being placed/installed, the equipment being utilized by the contractor, the means and methods implemented by the contractor, and any issues that may arise.
7. Observe all materials incorporated in the work for compliance with the contract documents and inform the Engineer and contractor of any conflicts.
8. Attend regularly scheduled progress meetings, as appropriate. Prepare meeting minutes and submit to engineer/PM for review. Upon completing any modifications, distribute meeting minutes to the project team.
9. Review project schedules to prepare for upcoming work and anticipate changes or potential conflicts.
10. Computations will be made of quantities of work performed, and materials used on the project by actual field measurements and survey data provided by the Contractor in accordance with the specifications.
11. Track, collect and review all required shop drawings and submittals. Forward to design engineers for review when necessary. Advise the Engineer and Contractor of the commencement of any work requiring a Shop Drawing or sample if the submittal has not been approved by the Engineer.
12. Oversee testing and observation requirements called for in the contract documents. Document that testing required by the contract documents is performed and that commercially manufactured products used on the project are accompanied by numerical test results or a certification from the manufacturer that the material meets applicable standards. QA/QC testing will be provided through the contractor as part of the technical specifications. The contractor will be required to prepare and submit all documentation of both failed and passed QA/QC tests.
13. Review test reports and certifications for conformance with the contract documents. Each test report for material in place should, as a minimum, contain the following:
    - Test performed and dated
    - Applicable standard or project specifications
    - Test location
    - Test result
    - Action taken on failing tests.
14. Maintain a file of all test reports and certifications as provided by the contractor.
15. Inform the contractor in writing, of deficiencies in order that the corrections can be made and retested prior to covering any substandard work with additional material. Document that corrective work and retesting is performed.
16. Coordinate with the contractor the preparation of record or as-built drawings and remind the contractor periodically to collect important record data as the work progresses, particularly for work that will be covered by subsequent tasks.

**REMEDIAL CONSTRUCTION OVERSIGHT AND DOCUMENTATION**

D. QA/QC REQUIREMENTS:

It is important to read all contract documents and project plans and maintain an understanding of which QA/QC testing will be the responsibility of the contractor versus CHA throughout the duration of the project. QA/QC testing performed by CHA employees (e.g. end point sampling, air monitoring, etc.) shall be completed in accordance with CHA's SOPs. QA/QC testing requirements listed in the project specifications are typically required to be performed by the Contractor and it is often the responsibility of the contractor to retain an independent third party testing agency to meet these testing requirements.

It should be noted that prequalification testing refers to testing results that must be provided to the Engineer for acceptance prior to commencing with a task utilizing the specified material. Conformance testing or field QA/QC testing typically refers to post-installation or placement testing that is completed on-site after the specified material is installed.

E. SPECIAL CONDITIONS:

The field observer must be in frequent communication with the CHA Project Manager or task manager regarding the progress of the project. Circumstances can change quickly on projects and proactive communication can help reduce the potential for larger problems or issues to arise. Depending on the situation, it may become important to record additional information. Examples may include:

1. Detail breakdown of type and number of personnel on-site for each contractor/subcontractor and hours worked by each.
2. Detailed breakdown of heavy equipment on-site and hours each piece of equipment is actually used each day.
3. Material deliveries and quantities.
4. Delays and/or downtime (length of time, people affected, equipment not used, etc.).
5. Detailed weather information (e.g. periodic wind speed and direction throughout day).
6. Length of time spent in upgraded levels of PPE and number of personnel working in exclusion zones.
7. Air monitoring results, dust control issues, air monitoring plan exceedances, etc.
8. Details for erosion and sediment control issues (e.g. tracking onto roadways).
9. Detailed lists of all site visitors (sign in/sign out sheets).

F. REFERENCES:

CHA Total Technical Quality Control Manual, Field Observations Section: http://chanet.cha-llp.com/manual/ttqc/section7/index.cfm

G. APPENDICES/FORMS:

Field Observation Report – for simple, short duration projects.

Construction Observation Report – for complex, longer duration projects.

**END OF SOP**
**Final Check by C. Burns 11/19/2015**

# APPENDIX G

## Health and Safety Plan

# Health and Safety Plan

## Former Coyne Textile Facility
## 140 Cortland Avenue
## Syracuse, New York

## NYSDEC BCP Site No. C734144

*CHA Project Number: 059294.001*

***Prepared for:***
***JMA Wireless d/b/a GEC Consulting***
*168 Brampton Road*
*Syracuse, New York 13205*

***Prepared by:***

CHA

*300 South State Street, Suite 600*
*Syracuse, New York 13202*
*Phone: (315) 471-3920*

***June 2020***

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## LIST OF APPENDICES

# LIST OF ACRONYMS & ABBREVIATIONS

| | |
|---|---|
| 6NYCRR | Title 6 New York Codes, Rules and Regulations |
| APR | Air Purifying Respirator |
| C | Ceiling Value |
| Ca | Potentially Cancerous |
| CAMP | Community Air Monitoring Plan |
| CFR | Code of Federal Regulations |
| CHA | CHA Consulting, Inc. |
| CO | Carbon Monoxide |
| CPR | Cardiopulmonary Resuscitation |
| CRZ | Contaminant Reduction Zone |
| Cis-1,2-DCE | cis-1,2-dichloroethene |
| EZ | Exclusion Zone |
| FLT | Field Team Leader |
| H2S | Hydrogen Sulfide |
| HASP | Health and Safety Plan |
| HAZWOPER | Hazardous Waste Operations and Emergency Response |
| HSC | Health and Safety Coordinator |
| IDLH | Immediately Dangerous to Life and Health |
| IRM | Interim Remedial Measure |
| JSA | Job Safety Assessment |
| LEL | Lower Explosive Limit |
| NIOSH | National Institute for Occupational Health and Safety |
| NYSDEC | New York State Department of Environmental Conservation |
| O2 | Oxygen |
| OSHA | Occupational Safety and Health Administration |
| PCE | Tetrachloroethene |
| PEL | Permissible Exposure Limit |
| PID | Photoionization Detector |
| PM | Project Manager |
| PPE | Personal Protection Equipment |
| RD Report | Remedial Design Report |
| REL | Recommended Exposure Limit |
| RI | Remedial Investigation |
| SOP | Standard Operating Procedures |
| SSO | Site Safety Officer |
| ST/STEL | Short Term Exposure Limit |
| SZ | Support Zone |
| TCE | Trichloroethene |
| TWA | Time Weighted Average |
| UST | Underground Storage Tank |
| ZVI | Zero-valent Iron |

| | |
|---|---|
| $ft^2$ | Square Foot |
| ppm | Part per Million |
| mg/Kg | Milligram per Kilogram |
| mg/L | Milligram per Liter |
| $mg/m^3$ | Milligram per Cubic Meter |
| µg/Kg | Microgram per Kilogram |
| µg/L | Microgram per Liter |

# 1.0 INTRODUCTION

The following Health and Safety Plan (HASP) has been created for the protection of CHA Consulting, Inc. (CHA) staff conducting remedial activities at the Former Coyne Textile Facility (Site), located at 140 Cortland Avenue in the City of Syracuse, New York. Remedial activities will be performed in accordance with the Remedial Design Report (RD Report), which this HASP is appended to as Appendix G. This project's various assignments require CHA employees to perform tasks where personal safety could be endangered due to chemical, physical, and/or biological hazards. While conducting field work, CHA employees may be exposed to hazards including but not limited to:

- Chemical exposure due to the presence of subsurface contamination during intrusive activities such as the installation of extraction/injection wells, underground storage tank (UST) removal and soil excavation
- Chemical exposure during the implementation of soil mixing with zero valent iron (ZVI) and Portland cement
- Chemical exposure during the application of sodium permanganate during groundwater recirculation
- Slip/Trips/Falls
- Cold Stress/Heat Stress
- Excessive noise for certain operations
- Heavy equipment operation
- Environmental and Biological hazards (e.g. insects, plants, ultra-violet exposure, etc.)

The requirements and guidelines in this HASP are based on a review of available information and an evaluation of potential on-Site hazards, including: Environmental Site Assessments conducted by GZA GeoEnvironmental, a Remedial Investigation (RI) conducted by CHA in 2018, and experience from the Source Area interim remedial measures (IRM) conducted by CHA in June 2019. This HASP will be discussed with Site personnel and will be available on-Site for review while work is underway. CHA personnel will report to the Project Manager (PM) and consult with the Health and Safety Coordinator (HSC) in matters of health and safety. The Site Safety Officer (SSO) and Field Team Leader (FTL) is the same person for this project and is responsible for compliance with this HASP, stopping work when necessary, and for implementation of this HASP for daily site activities.

Non-intrusive activities within CHA's Scope of work are those that do NOT have the potential to jeopardize the health and safety of Site workers, the public, or the environment with respect to Site contaminants in the soil or groundwater.

Intrusive activities within CHA's Scope of Work are those that have the potential to cause health and safety concerns to Site workers, the public, or the environment in regards to Site contaminants. These activities and any non-intrusive activities conducted in an Exclusion Zone require training per 29 CFR 1910.120 on a NYSDEC Brownfield hazardous waste site.

# 2.0 KEY PERSONNEL

## 2.1 OFF-SITE PERSONNEL

**<u>Title:</u> CHA Corporate Director of Health & Safety**
*<u>Description:</u>* Responsible for the CHA's corporate health and safety program and developing procedures, policies, and coordinating training programs. Additionally, provides senior level guidance on development of HASPs and interpretation of regulations.
***<u>Contact:</u>***
Ronald Rogers
(518) 453-3917 (Office)
(518) 810-8926 (Cell)

**<u>Title:</u> Project Manager**
*<u>Description:</u>* Reports to upper level management, provides sufficient authority and resources to satisfy health and safety requirements, and assumes total control over site activities. The Project Manager is ultimately responsible for ensuring field implementation of this HASP.
***<u>Contact:</u>***
Samantha Miller
(315) 257-7154 (Office)
(915) 329-9898 (Cell)

## 2.2 ON-SITE PERSONNEL

**<u>Title:</u> Site Safety Officer**
*<u>Description:</u>* Advises the field team on all aspects of health and safety issues, recommends stopping work if any operation threatens worker or public health and safety.
***<u>Contact:</u>***
Karyn Ehmann
(315) 257-7250 (Office)
(585) 721-2402 (Cell)

**<u>Title:</u> Field Team Leader/Work Party**

*<u>Description:</u>* Responsible for coordinating project requirements in the field. The Field Team Leader oversees daily activities of the project and is, therefore, responsible for implementing health and safety requirements and following safety procedures in the field. The Field Team Leader will contact the local emergency response organizations to notify concerned affiliates of the hazards associated with this project.

***<u>Contact:</u>***

Karyn Ehmann

(315) 257-7250 (Office)

(585) 721-2402 (Cell)

## 2.3 ON-SITE OPTIONAL PERSONNEL

**<u>Title:</u> Health and Safety Coordinator**

*<u>Description:</u>* Responsible for making recommendations regarding the work area to the SSO. Inspections may be periodically conducted to monitor worker health and safety and will address such issues as appropriate personal protection equipment (PPE), required air monitoring, decontamination procedures, and worker safety.

***<u>Contact:</u>***

Ronald Rogers
(518) 453-3917 (Office)
(518) 810-8926 (Cell)

**<u>Title:</u> Project Engineer**

*<u>Description:</u>* Guides the Project Team in design implementation.

***<u>Contact:</u>***

Scott Smith, P.E.
(315) 257-7227 (Office)
(315) 427-1033 (Cell)

**<u>Title:</u> Scientific Advisor**

*<u>Description:</u>* Guides the Project Team in scientific matters.

***<u>Contact:</u>***

Christopher Burns, Ph.D., P.G.
(804) 412-8841 (Office)
(804) 822-0406 (Cell)

### 2.4 AS-NEEDED PERSONNEL

**<u>Title:</u> Fire Department**
*<u>Description:</u>* Responds to fires and performs rescues.
***<u>Contact:</u>***
911

**<u>Title:</u> New York State DEC Spill Hotline**
*<u>Description:</u>* Responds to all petroleum and other hazardous releases into the environment, anywhere in New York State.

**<u>Contact:</u>**
(800) 457-7362

**<u>Title:</u> EPA National Response Center**
*<u>Description:</u>* Responds to all oil, chemical, radiological, biological and etiological discharges into the environment, anywhere in the United States and its territories.
**<u>Contact:</u>**
(800) 424-8802

## 3.0 SITE ENTRY

### 3.1 OBJECTIVES

This HASP has been created for the implementation of the Remedial Design. Figures included in the RD Report are referenced within this document. For example, the treatment zones referenced in the following site activities can be found on Figure 7 of the RD Report.

The CHA non-intrusive objectives of the Site entry are to:

1. Oversee the implementation of the remedial design as described in the RD Report
2. Document contractor activities
3. Documentation of soil transported off-site to permitted receiving facilities
4. Documentation of imported materials
5. Documentation of soil mixing activities
6. Implement the Community Air Monitoring Plan (CAMP)
7. Assist in the operation of the groundwater recirculation system as defined by Treatment Zone 3

The intrusive Site activities may include the following:

1. Observation of the removal of the concrete floor within Treatment Zone 1 and Treatment Zone 2

2. Observation of the removal of the UST and excavation of contaminated soil within Treatment Zone 1
3. Screen soils and vapors (visual, olfactory, and photoionic) for level of contamination in accordance with the New York State Department of Environmental Conservation (NYSDEC) Title 6 New York Codes, Rules and Regulations (6NYCRR) Part 360 Soil Cleanup Guidance Objectives
4. Collection of confirmation samples
5. Observation of the excavation of 2 feet of Site soils beneath the concrete slab in Treatment Zone 2
6. Observation of the application of ZVI within Treatment Zone 2 at the appropriate treatment depths
7. Observation of the installation of injection and extraction wells within Treatment Zone 3
8. Observation of the decommissioning of the injection and extraction wells once the groundwater treatment has concluded

This HASP has been developed for the protection of CHA employees on the Site. Subcontractors will be responsible for developing a HASP to protect their employees. Modifications to this HASP and its PPE requirements <u>must</u> occur if Site activities indicate higher levels of exposure than previously encountered or anticipated.

## 3.2 SAFETY MEETINGS

The SSO shall conduct a safety meeting prior to entry to the Site or the initiation of any Site activity, if any conditions change, and before each workday. The Daily Job Site Safety Brief form in Appendix A will be utilized to document the daily job Site safety briefings.

## 3.3 SAFETY TRAINING

The SSO will confirm that every person assigned to a task has had adequate training for that task and that the training is up-to-date by checking with the CHA Safety Coordinator and online database. CHA staff working on this project shall have a minimum of:

- 40-Hour Initial Hazardous Waste Operations and Emergency Response (HAZWOPER) training in accordance with 29 CFR 1910.120;
- Current 8-hour HAZWOPER Refresher Training;
- Excavation Awareness Training;
- CHA Respiratory Protection Plan;
- Field equipment safety training where applicable; and
- Applicable Job Hazard Analyses (JHAs).

Training will have been conducted and certified by CHA in accordance with Occupational Safety and Health Administration (OSHA) regulations.

### 3.4 MEDICAL SURVEILLANCE

CHA personnel will have had a medical surveillance physical consistent with CHA Procedures and/or OSHA regulations and performed by a qualified occupational health physician. The SSO shall confirm, prior to initiation of work on this site, that CHA personnel assigned to a task have had an annual occupational physical and respiratory fit test, and has been determined medically fit by the occupational health physician for respirator use and this type of work, if deemed necessary by the PM.

### 3.5 SITE MAPPING

Location mapping has been included in the Figures section of the RD Report: Figure 1 illustrates the location of the Site. Appended to this HASP is the route to the nearest hospital from the subject Site, included as Figure 1. Anticipated truck routing and loading zone, and zones of work, including the exclusion zone, contaminant reduction zone, and the support zone, are identified on Figure 2. Note that much of the work will be conducted outside, therefore the work zones may change on a daily basis depending on the wind direction and area of the site in which work is being conducted.

## 4.0 SITE CHARACTERIZATION

### 4.1 SITE DESCRIPTION

The Former Coyne Textile Facility is located in an urban area at 140 Cortland Avenue in the City of Syracuse, Onondaga County, New York. The Site is currently unoccupied, contains one building with an approximately 52,000-square foot ($ft^2$) footprint, and is zoned for commercial use. The Site is identified as two non-contiguous areas as described below:

- The former main laundry facility and offices are known as 140 Cortland Avenue (Tax Map No. 094.-05-06.0) and consist of one parcel of land totaling approximately 1.75-acres in size. 7 This parcel will be referred to as the main parcel. The parcel consists of the currently vacant former laundering facility and offices, and concrete sidewalks. The building is a concrete block building with a slab-on-grade foundation.
- The park area and employee parking area are known as 1002-1022 South Salina Street/Cortland Avenue (Tax Map No. 094.-20-01.0) and 10247-1040 South Salina Street/Tallman Street (Tax Map No. 094.-20-02.0) and consist of two parcels totaling approximately 1.70-acres (0.57 and 1.13 acres, respectively) in size. These parcels consist of a small park and a fenced in asphalt parking lot, referred to as Coyne Park and the former employee parking area, respectively.

The contaminants of concern have been described in previous reports and are summarized in the RD Report. Generally, volatile organic compounds including tetrachloroethene (PCE), trichloroethene (TCE), cis-1,2-dichloroethene (DCE), vinyl chloride, and benzene are prevalent at various locations across the Site.

### 4.2 NEIGHBORING PROPERTIES

The Site is bordered by the following:

- North: Vacant lot
- South: Tallman Street, parking lots, Central New York Regional Transportation Authority
- East: South Salina Street, vacant lot currently registered in the Brownfield Cleanup Program as Site Code C734140
- West: Warehouse and manufacturing buildings

### 4.3 SITE TOPOGRAPHY

The topography of the Site is relatively flat, with an elevation of approximately 390 feet above mean sea level. Onondaga Creek is approximately 600 feet to the west of the site and flows north to Onondaga Lake. The project area is relatively flat, but surface and groundwater movement is generally westward towards Onondaga Creek.

### 4.4 METEROLOGIC DATA

Time of year work is to be conducted is during between August and October. The weather and temperature for that time of year is expected to vary, but warmer temperatures are typically expected this time of year. Prior to each day's activities, the daily forecast should be monitored for indications of adverse work conditions. If poor weather hinders the continuation of the day's activities the Field Team Leader may notify the PM and stop work for the day. Information on heat and cold stress are included in Appendix B.

## 5.0 SITE CONTROL MEASURES

**Exclusion Zone (EZ):** Will include a 25-foot buffer around Treatment Zones 1, 2 and 3 during active intrusive work. The approximate location of the EZ is labelled in red on Figure 2. Hazards within the EZ include inhalation of hazardous vapors, explosive potential, open excavations, excessive noise, slips/trips/falls, contact with heavy equipment, direct contact with contaminated soil or groundwater, and direct contact with chemical oxidants used in treatment.

**Contamination Reduction Zone (CRZ):** Will be established immediately adjacent to the Exclusion Zone and will be utilized for management of soil samples, documentation of contractor activities, decontamination of personnel and equipment, and donning and doffing of PPE. The approximate location of the CRZ is labelled in yellow on Figure 2.

Hazards within the CRZ include contact with contaminated soil or water, inhalation of vapors from contamination, contact with heavy equipment, and slips/trips/falls. Physical hazards may pose a risk and good judgement should be utilized. Always maintain situational awareness.

**Support Zone (SZ):** Will include all areas outside the EZ and CRZ. Daily Jobsite Safety Briefings will be conducted in the support zone upon contractor arrival. Contractors and all visitors to the Site will sign in with the Field Team Leader.

Hazards within the support zone include slips/trips/falls, contact with heavy equipment, and other physical hazards associated with the work area and physical setting at the Site. Personnel within the SZ do not require HAZWOPER training.

### 5.1 COMMUNICATION

Communication shall be accomplished by person to person verbal correspondence and through the use of cellular telephones. Communication procedures will be reviewed during the Daily Jobsite Safety Briefing before entering the work zone.

## 6.0 HAZARD EVALUATION

Hazards are generally divided into three categories; 1) exposure to chemicals and hazardous materials, 2) safety/physical hazards, and 3) biological hazards. Chemical and hazards materials are further segregated by their specific compound, exposure threshold, and route of exposure.

All chemical hazards identified for the Site are denser than air, so monitoring will occur near the ground surface. Physical hazards are generally slips/trips/falls, caught in/between moving equipment or parts, traffic and excavations. Biological hazards typically include poisonous plants, wild animals, and insects.

## 6.1 CHEMICAL HAZARDS

| Chemical | OSHA PEL | NIOSH REL | IDLH | Ionization Potential (I.P) | Characteristics | Routes of Exposure | Symptoms of Exposure and Health Effects |
|---|---|---|---|---|---|---|---|
| Tetrachloroethene (PCE) | TWA 100 ppm C 200 ppm (for 5 mins in any 3-hr period) max peak of 300 ppm | NA, Ca Minimize workplace exposure concentration | 150 ppm | 9.32 eV | Colorless liquid with a mild chloroform-like odor | Inhalation, skin absorption, ingestion, skin and/or eye contact | Irritation eyes, skin, nose, throat, respiratory system; nausea; flush face, neck; dizziness, incoordination; headache, drowsiness; skin erythema, liver damage; carcinogenic |
| Trichloroethene (TCE) | TWA 100 ppm C 200 ppm 300 ppm (5 min max in 2-hr period) | NA Ca | 1000 ppm | 9.45 eV | Colorless liquid (unless dyed blue) with a chloroform-like odor | Inhalation, skin absorption, ingestion, skin and/or eye contact | Irritation eyes, skin; headache, visual disturbance; lassitude (weakness, exhaustion); dizziness, tremors, drowsiness, nausea, vomiting; dermatitis; cardiac arrhythmias; paresthesia; liver injury; carcinogenic |
| Cis- 1,2-Dichloroethene (DCE) | TWA 200 ppm | TWA 200 pm | 1000 ppm | 9.65 eV | Colorless, oily liquid with a chloroform-like odor | Inhalation, ingestion, skin and/or eye contact | Irritation skin; central nervous system depressed; liver, kidney, and lung damage |
| Vinyl Chloride | TWA 1 ppm C 5 ppm (15-minute) | NA Ca | N/A | 10.0 eV | Colorless gas or liquid (below 7°) with a pleasant odor at high concentrations | Inhalation, skin and/or eye contact (as a liquid) | Lassitude (weakness, exhaustion); abdominal pain, GI bleeding; enlarged liver; pallor or cyan of extremities; liquid: frostbite; carcinogenic |
| Benzene | TWA 1 ppm ST 5 ppm | Ca TWA 0.1 ppm | CA 500 ppm | 9.24 eV | Colorless to light-yellow liquid with an aromatic odor | Inhalation, skin absorption, ingestion, skin and/or eye contact | Irritation eyes, skin, nose, respiratory system; dizziness; headache, nausea, staggered gait; anorexia, lassitude (weakness, exhaustion); dermatitis; bone marrow depression; [potential occupational carcinogen] |

| Chemical | OSHA PEL | NIOSH REL | IDLH | Ionization Potential (I.P) | Characteristics | Routes of Exposure | Symptoms of Exposure and Health Effects |
|---|---|---|---|---|---|---|---|
| Lead | TWA 0.05 mg/m³ | TWA 0.05 mg/m³ | 100 mg/m³ | NA | Heavy, ductile, soft and gray solid. Non-combustible in solid form | Inhalation, ingestion, skin and/or eye contact | Lassitude; insomnia; facial pallor; anorexia; weight loss; malnutrition; constipation; abdominal pain; colic; anemia; gingival lead line; tremor; paralysis of the wrist, ankles; encephalopathy; kidney disease; irritation of the eyes; hypertension |
| Beryllium | TWA 0.0002 mg/m³ | Ca C 0.0005 mg/m³ | 4 mg/m³ | NA | Hard, brittle, gray-white solid. Non-combustible in bulk form, slight explosion hazard in powder/dust form. | Inhalation, skin and/or eye contact | Berylliosis (chronic exposure): anorexia, weight loss, lassitude, chest pain, cough, clubbing of fingers, cyanosis, pulmonary insufficiency, eye irritation, dermatitis |

C – Ceiling value
Ca – Potentially Cancerous
IDLH – Immediately Dangerous to Life and Health
NIOSH – National Institute for Occupational Safety and Health
OSHA – Occupational Safety and Health Administration
PEL – Permissible Exposure Limit
REL – Recommended Exposure Limit
ST – Short Term Exposure Limit
TWA – Time Weighted Average

Chemicals brought on Site for use in remedial activities require safety data sheets (SDS). The chemicals anticipated to be used include a 40% solution of sodium permanganate for the groundwater recirculation and zero-valent iron for the soil mixing. SDSs for both are included in Appendix C. However, the chemicals will be supplied by the contractor and, in the event of an emergency, the contractor supplied SDSs shall be used for guidance.

## 6.2 DISPERSION PATHWAYS

The potential exposure mechanism that can transport contaminants of concern from the areas of the intrusive site activities to other areas of the site, as well as beyond the boundaries of the Site, are:

- Inhalation of volatilized contaminants into air;

- Contact with contaminated groundwater or soil;
- Projection of contaminated material in air;
- Movement of dust particles;
- Conveyance in sediment laden water runoff;
- Failure to adhere to containerization and/or decontamination procedures; and
- Failure to adhere to the Field Sampling Plan and/or Standard Operating Procedures.

Visible emissions can be a problem at any site that involves intrusive activities and will be controlled. The primary effect of visible dust is irritation of the eyes, nose, and throat. While it is not anticipated, visible emissions will be monitored, and the following corrective actions can be implemented if irritation or concern of dust arises.

- Minimizing the amount of exposed ground surface/covering exposed surfaces;
- Reducing the speed of intrusive activities;
- Lightly wetting surfaces or applying misters;
- Using chemical or foam dust suppressants (with authorization only); and
- Reducing vehicle speeds.

The primary effect of nuisance dust is irritation of the eyes, nose, and throat with elevated concentrations.

## 6.3 PHYSICAL HAZARDS

Physical hazards such as the following may be encountered on site:

- Slip/trip/fall
- Falls from elevated surfaces
- Excavations;
- Heat stress;
- UV radiation;
- Heavy equipment operation;
- Excessive noise;
- Caught in/between moving parts or equipment;
- Lifting (generators, drums, equipment); and
- Traffic – on access roadways at the facility.

## 6.4 BIOLOGICAL HAZARDS

Biological hazards such as the following may be encountered on site:

- Ticks, mosquitoes, stinging insects, arachnids, chiggers (allergic reactions and/or infectious diseases that can be transmitted to humans by animals)

- Rodents, snakes, zoonotic diseases (physical contact and/or infectious diseases that can be transmitted to humans by animals)

## 6.5 HAZARD IDENTIFICATION AND CONTROL

Hazard controls generally consist of following specific safety procedures, training, engineering controls, air monitoring, and PPE selection. CHA employees are required to use the PPE appropriate to their work task and potential exposures as outlined in this HASP.

The levels of PPE assigned to each activity are based on available information on the estimation of exposure potential associated with each work task.

| Affected Personnel | Task/Operation | Hazards | Hazard Control |
|---|---|---|---|
| All personnel in Exclusion Zone and Contamination Reduction Zone | UST removal and excavation of contaminated soil. | • Inhalation of organic vapors, dusts, and other airborne particulates.<br>• Skin and/or eye contact with contaminated soil and/or groundwater, decontamination solutions, and sample preservation agents.<br>• Explosion hazard during cleaning and removal of the UST. | • Conduct air monitoring in accordance with Section 6.0. Wear the required personal protective equipment when conditions or activities indicate the need for it. Stand upwind to extent possible to reduce inhalation hazard.<br>• Avoid walking through puddles and contacting other potential sources of contaminants such as drums.<br>• Keep airborne dust levels to a minimum by wetting down surfaces.<br>• Remain a minimum of 5-feet away from open excavation faces.<br>• Maintain eye contact with equipment operator when moving in or around the excavation. |
| All personnel in Exclusion Zone and Contamination Reduction Zone | Collection of confirmation samples, waste disposal samples, and imported clean fill materials. | • Inhalation of organic vapors, dusts, and other airborne particulates.<br>• Skin and/or eye contact with contaminated soil, | • Conduct air monitoring in accordance with Section 6.0. Wear the required personal protective equipment when conditions or activities indicate |

| Affected Personnel | Task/Operation | Hazards | Hazard Control |
|---|---|---|---|
| | | decontamination solutions, and sample preservation agents. | the need for it. Stand upwind to extent possible to reduce inhalation hazard.<br>• Avoid walking through puddles and contacting other potential sources of contaminants such as drums.<br>• Utilize the Contractor and excavator when collecting samples from the sidewall and bottom, so as to remain a safe distance from the excavation face.<br>• Keep airborne dust levels to a minimum by wetting down surfaces. |
| All personnel in Exclusion Zone and Contaminant Reduction Zone | Observation of ZVI application with soil mixing. | • Inhalation of organic vapors, dusts, and other airborne particulates.<br>• Inhalation of dusts associated with ZVI during soil mixing.<br>• Skin and/or eye contact with contaminated soil and/or groundwater, decontamination solutions, and sample preservation agents.<br>• Skin and/or eye contact with remediation oxidants including ZVI (powder) used during soil mixing. | • Conduct air monitoring in accordance with Section 6.0. Wear the required personal protective equipment when conditions or activities indicate the need for it. Stand upwind to extent possible to reduce inhalation hazard.<br>• Avoid walking through puddles and contacting other potential sources of contaminants such as drums.<br>• Keep airborne dust levels to a minimum by wetting down surfaces, sweep/shovel material, and collect with an electrically protected vacuum cleaner or by wet-brushing into a container for disposal.<br>• Provide appropriate ventilation.<br>• Keep sources of ignition away from areas where dust may form. |
| All personnel in Exclusion Zone and Contaminant Reduction Zone | Installation and decommissioning of extraction/injection wells and associated equipment. | • Inhalation of organic vapors, dusts, and other airborne particulates.<br>• Skin and/or eye contact with contaminated soil and/or groundwater, decontamination solutions, and sample preservation agents. | • Conduct air monitoring in accordance with Section 6.0. Wear the required personal protective equipment when conditions or activities indicate the need for it. Stand upwind to extent possible to reduce inhalation hazard.<br>• Avoid walking through puddles and contacting other potential sources of contaminants such as drums. |
| All personnel | Operation of the groundwater recirculation system | • Skin and/or eye contact with sodium permanganate oxidant used in the groundwater treatment process. Immediately flush | • Wear appropriate protective clothing when handling sodium permanganate.<br>• Ensure adequate ventilation. |

| Affected Personnel | Task/Operation | Hazards | Hazard Control |
|---|---|---|---|
| | | contaminated area with water.<br>• Inhalation of aerosol from sodium permanganate may cause irritation to the respiratory tract. Seek fresh air if exposed.<br>• Ingestion of sodium permanganate may burn the mouth, throat, esophagus, and stomach. Seek medical attention immediately. If conscious, ingest large quantities of milk or water. Do not induce vomiting or undergo gastric lavage (stomach pumping). | • Wash hands thoroughly after handling the material.<br>• If released:<br>1. Dilute with water and reduce with a sodium thiosulfate or ferrous salt solution, then neutralize with sodium carbonate. Sludge should be disposed of at an approved landfill.<br>2. Absorb with inert media like diatomaceous earth, collect in a drum and dispose of properly. Do not use sawdust as the inert material. |
| All personnel | All field activities | Slips, trips, & falls | • Wear appropriate work boots.<br>• Avoid slippery surfaces.<br>• Remind field personnel to exercise good housekeeping practices<br>• Be observant of activities around. |
| All personnel | All field activities | Physical injuries, such as abrasions or cuts | • Use safe work practices<br>• Don proper PPE<br>• Have a first aid kit readily available at site |
| All personnel | Heavy lifting | Back injuries from lifting | • Practice safe lifting techniques.<br>• Always use a minimum of 2 people for heavy lifts<br>• Lift with legs. Do not twist while carrying the load. |
| All personnel | Heat stress | Exposure to elevated temperatures associated with working outdoors in warm/hot weather conditions. | • Wear lightweight clothing<br>• Drink lots of water<br>• Take breaks in the shade or cool areas |
| All personnel | Cold stress | Exposure to low temperatures associated with working outdoors in variable weather conditions | • Wear warm, dry clothing & layers<br>• Take frequent breaks in warm areas |
| All personnel | All field activities | Fire (general) | • Identify location of fire extinguisher(s) – contractor sourced<br>• Keep ignition sources away from flammable materials and atmospheres. |
| All personnel | All field activities | Noise Exposure | • Wear hearing protection if you must shout to hear someone who is standing one foot or less away. |

| Affected Personnel | Task/Operation | Hazards | Hazard Control |
|---|---|---|---|
| All personnel | All field activities | Contact with heavy equipment and traffic | • Do not stand unnecessarily close to the excavator when it is operating<br>• Do not stand in lanes of traffic. Use cones or barricades to delineate work areas when work within access roads is required.<br>• Wear a hard hat and high visibility clothing<br>• Make eye contact with the operator/drivers |
| All personnel | All field activities | Security | • Stay alert to all on-site activities<br>• Report suspicious activities to PM and/or client |
| All personnel | All field activities | Ticks | • Avoid unnecessary entry into tall grass and brushy areas.<br>• Wear insect repellents containing DEET or Permethrin.<br>• Wear light colored clothing to easily identify ticks.<br>• Inspect yourself throughout the day and following completion of field activities.<br>• Tuck pants into socks or boots, wear long sleeves and minimize skin exposure. |
| All personnel | All field activities | Stinging insects (bees, hornets, wasps and yellow jackets) | • Do not agitate nests unless absolutely necessary.<br>• Be aware of holes in the ground within the work area.<br>• Avoid wearing bright or patterned clothing.<br>• Avoid wearing/using scented items (e.g., perfume, cologne, soaps).<br>• Inspect food and drinks prior to consumption.<br>• Use insecticide when necessary. |
| All personnel | All field activities | Zoonotic diseases | • Avoid dermal contact with animals, droppings, or carcasses.<br>• Avoid inhalation of dust that is contaminated with droppings or carcasses.<br>• See Appendix D for information regarding the SARS-COV-2 (COVID-19) pandemic. |
| All personnel | All field activities | Hantavirus | • Avoid dermal contact with rodent droppings. |

| Affected Personnel | Task/Operation | Hazards | Hazard Control |
|---|---|---|---|
| | | | • Avoid inhalation of dust that is contaminated with rodent droppings. |
| All personnel | All field activities | Mosquitos/West Nile Virus | • Eliminate mosquito breeding areas (standing water) at the work site.<br>• Apply insect repellent containing DEET to exposed, unbroken skin per the manufacturer's instructions. Wear light colored clothing (pants, long sleeved shirts and socks). |
| All personnel | All field activities | Snakes | • Avoid actions which increase the risk of encountering a snake (e.g., overturning logs, rocks, etc.). |
| All personnel | All field activities | Rodents | • Avoid contact with rodents and burrowing animals. |
| All personnel | All field activities | Arachnids | • Avoid actions which increase the risk of encountering arachnids (e.g., overturning logs, placing hands in dark places). |
| All personnel | All field activities | Physically Damaging Plants (e.g., briars, thistles) | • Remove plants prior to implementing the work activity.<br>• Use briar resistant pants or chaps if working in dense thorny vegetation. |
| All personnel | All field activities | Poisonous Plants | • Avoid contact with the plant.<br>• Cover arms and hands when working in the vicinity of the plants.<br>• Frequently wash potentially exposed skin.<br>• Treat every surface that may have come in contact with the plant as contaminated. |
| All personnel | All field activities | Ultraviolet Exposure | • Cover skin and limit time in sun to extent practical.<br>• Apply sunscreen. |

## 6.6 AIR MONITORING

The following environmental monitoring instruments shall be used on site at the specified intervals. Monitoring instruments will be calibrated prior to each full day of equipment usage or more frequently in accordance with manufacturer's recommendations.

- PID with 10.6 eV lamp or higher;
- 4 gas meter (CO, $O_2$, $H_2S$, LEL).

The PID shall be used to detect volatile organic vapors in the ambient air and will be calibrated and setup prior to the start of the days' activities.

| Contaminant/Method | Frequency | Action Level | SSO Action |
|---|---|---|---|
| Organic Vapors (PID) | Ongoing throughout excavation activities. Background will be monitored prior to startup of daily work. | 0 to 5 ppm | Monitor every 15 minutes. Maintain Level D PPE |
| Organic Vapors (PID) | Ongoing throughout excavation activities. Background will be monitored prior to startup of daily work. | 5 to 25 ppm, sustained for 5 minutes | Stop work and notify PM of elevated organic vapors. All personnel will temporarily exit the Exclusion Zone. The contractor will implement engineering controls in attempt to mitigate vapor levels. If organic vapor levels are unable to be reduced to less than 5 ppm via engineering controls, upgrade to Level C PPE. The PM must be notified of this PPE upgrade. |
| Organic Vapors (PID) | Ongoing throughout excavation activities. Background will be monitored prior to startup of daily work. | >25 ppm, sustained for 5 minutes | Stop work and evacuate the Exclusion Zone. Notify the PM of elevated organic vapors. Consult the Health and Safety Manager for guidance. This HASP must be updated prior to any additional upgrade in PPE. |

| Contaminant/Method | Frequency | Action Level | SSO Action |
|---|---|---|---|
| Lower Explosive Limit (LEL) (4 gas meter) | Ongoing throughout excavation activities. Background will be monitored prior to startup of daily work. | 10% LEL | A 4-gas meter will be utilized to monitor for flammable concentrations of vapor when the UST and highly contaminated soils are encountered. Work shall cease and personnel will leave the Exclusion Zone when the LEL reading is 10% or higher (which is equivalent to 0.12% benzene, 0.18% phenol or 0.09% xylene by concentration). |

### 6.7 ACTION LEVELS

Should action levels be reached, work operations shall cease until further evaluation is performed and safe levels are prevalent. If through engineering controls and monitoring, safe levels (below action levels) cannot be achieved, an upgrade in PPE shall be mandated by the SSO, or operations shall cease in that portion of the Site. The PM will be notified of any changes in PPE. All PPE level changes must be authorized by PM.

## 7.0 HAZARD COMMUNICATION

In compliance with 29 CFR 1910.1200, hazardous materials brought on site by personnel (CHA or other onsite contractors) shall be accompanied with the material's Safety Data Sheet (SDS). The SSO shall be responsible for maintaining the SDSs on site, reviewing them for hazards that working personnel may be exposed to, and evaluating their use on site with respect to compatibility with other materials including PPE, and their hazards. Should the SSO deem the material too hazardous for use on the subject site, the party responsible for bringing the material on site will be required to remove it from the Site.

## 8.0 CONFINED SPACE

During this project CHA personnel will not be permitted to enter a confined space. If a confined space entry becomes necessary, the PM will be notified, this HASP will be revised to outline confined space entry procedures, techniques, and equipment consistent with OSHA regulations 29 CFR part 1926, subpart AA—Confined Spaces in Construction as set forth in 29 CFR 1926.1201. Additionally, entrants and attendants will be trained in Confined Space Entry Authorized User training consistent with the applicable regulation.

## 9.0 PERSONAL PROTECTIVE EQUIPMENT

Level A and Level B PPE are not expected to be needed. If Site conditions change and contamination is present at levels above the action level, the PM will be notified and this HASP will be updated to reflect greater protection of personnel. The following is a list of required PPE.

| Task/Operation | Level of PPE | Equipment |
|---|---|---|
| General site observation within the Contamination Reduction Zone and Exclusion Zone<br>• No free product visible<br>• Breathing Zone PID Readings < 5 ppm with the 10.6 eV bulb<br>• <50 $mg/m^3$ dust<br>• No odors present | D | • Long pants (no shorts)<br>• Hard hat<br>• Safety glasses<br>• Reflective vests or yellow Hi-Visibility shirt<br>• Work boots with safety toe<br>• Hearing protection (where required)<br>• Gloves (as appropriate) |
| Site Observation or Screening/Sampling Activities within the Contamination Reduction Zone and the Exclusion Zone<br>• No free product visible<br>• Sustained Breathing Zone PID Readings > 5 ppm with the 10.6 eV bulb<br>• >50 $mg/m^3$ dust<br>• Odors noted | C | • Same as D, plus<br>• Full-faced air purifying respirator (APR) with dual particulate-organic/acid vapor cartridges<br>• Protective coveralls (e.g. Tyvek)<br>• Protective outer boot covers<br>• Outer gloves with disposable nitrile or latex inner gloves<br>• Inner polyethylene boot covers with outer latex boot covers<br>• Both inner and outer gloves must be chemically resistant |

# 10.0 DECONTAMINATION

Personnel working in the Exclusion Zone (within 25 feet of Site activities) will be required to enter and exit the work area through the Contamination Reduction Zone. Personnel engaged in decontamination will wear protective equipment including appropriate disposable clothing and respiratory protection and will also undergo decontamination procedures prior to leaving the decontamination area. The decontamination area will be located within the Contamination Reduction Zone and placed upwind of the Exclusion Zone, and may change locations based on the wind direction that day.

The following equipment is needed for decontamination:

- Alconox®
- Water
- Impermeable Containers

The following list summarizes typical decontamination steps for personnel exiting the Exclusion Zone. Additional steps may be warranted based upon specific site conditions.

***Level D***

- Decontaminate equipment within the decontamination area, as needed.
- Discard disposable garments.
- Wash/rinse boots.
- Containerize wash and decontamination water for disposal, as necessary.

***Level C***

- Decontaminate equipment within the decontamination area, as needed.
- Wash/rinse outer boot cover and gloves.
- Remove tape.
- Remove boot cover.
- Remove outer gloves.

- Deposit disposables in container for proper disposal.
- Remove suit and dispose of in proper container.
- Wash/rinse Inner glove
- Remove air purifying respirator.
- Remove inner gloves.
- Containerize wash and decontamination water for disposal, as necessary.

***Level B***

- Will not be used at this time.
- If Level B is deemed necessary, this HASP must be updated prior to authorization to continue work.

***Level A***

- Will not be used at this time.
- If Level A is deemed necessary, this HASP must be updated prior to authorization to continue work.

PPE will be decontaminated with soap (i.e. Alconox®) and water. Disposable items will be disposed of in dry, impermeable containers.

Equipment and vehicles used in the Exclusion Zone to handle contaminated materials will undergo decontamination procedures in the Contamination Reduction Zone prior to leaving the Site. The SSO will document in the daily field log each piece of equipment that has been decontaminated prior to removal from the Site. The decontamination procedures will include, but are not limited to:

- Movement of equipment to the decontamination pad;
- Removal of heavily caked material with brushes or shovels; and
- Triple-rinsing with high pressure water or steam.

***<u>Small Equipment</u>:***

For soil sampling, dedicated sampling equipment is preferred. However, if non-dedicated equipment is used (i.e. stainless-steel soil sampling equipment), the required decontamination procedure for non-dedicated equipment is:

- Disassemble equipment, as required.
- Remove gross contamination from the equipment by brushing and then rinsing with tap water.
- Wash and scrub with low phosphate detergent (e.g. Alconox®).
- Tap water rinse.
- Distilled water rinse.
- Air dry.

Decontaminated equipment shall be placed on polyethylene sheeting or aluminum foil in order to avoid contacting a contaminated surface prior to use. Field personnel will use a new pair of outer gloves before handling sample equipment after it is cleaned. During periods of transportation and non-use, decontaminated sampling equipment shall be wrapped in aluminum foil or placed in a new/clean plastic bag

***Large Equipment*:**
CHA personnel are not responsible for the decontamination of large equipment. Information for large equipment decontamination is provided by the site contractor. Decontamination of heavy construction equipment will be performed by the contractor under the contractor's site-specific HASP.

## 11.0 EMERGENCY PROCEDURES

911 service is available and confirmed at this location. Call 911 immediately for emergency response. Only if the 911 is unavailable or has a long lead time should someone be driven to the nearest medical facility.

On-site emergencies can range in intensity from minor to serious conditions. Various procedures for responding to site emergencies are listed in this section. The designated SSO is responsible for contacting the CHA Project Manager who will notify the client as appropriate in emergency situations (however, others must assume responsibility if the situation warrants). An injured person shall be accompanied by another worker at all times.

Should an on-site emergency occur at the project Site (related to the project or otherwise) the following procedures shall be followed:

- Call 911 for additional emergency response.

- If the emergency occurs and is project specific, notify your assigned HSC after emergency care is provided to activate the appropriate actions.
- Properly trained personnel will determine if the emergency can be contained or remediated and initiate the appropriate action(s). Personnel shall not respond beyond their level of training.
- Employees are not to risk their health or life in taking aggressive action(s) to fight fire or stop releases. Only defensive actions shall occur until an action plan is resolved.
- Choose an exit route that provides fast, and safe, egress from the work area. The route taken should always be away from obvious obstructions or other hazardous conditions. Consult an evacuation map if you are unsure of where the nearest exit route is located.
- Do not delay evacuation to retrieve personal items or equipment.
- Persons shall exit areas in groups and attempt to stay together during evacuation procedures.
- While evacuating, notice any conditions which should be reported to emergency personnel. Be alert for the location of smoke, fire and/or vapors. Report any of these conditions to emergency personnel.
- Be aware of emergency response vehicles and avoid interference with these.

Remain calm, keep voices low and wait for instructions from the Incident Commander. Do not leave the scene prior to notifying your assigned Project Manager and Field Team Leader. An incident report form is included in Appendix E.

## 12.0 EMERGENCY MEDICAL CARE

In general, if emergency care is needed, personnel will call 911. However, if necessary, transport injured personnel to the nearest hospital using the following directions (map available in Figure 1):

Address: Crouse Hospital
736 Irving Ave
Syracuse, NY 13210

Emergency Room Telephone Number: (315) 470-7111

Directions from site:

1. Head north on Cortland Ave toward S. Salina St.
2. Use any lane to turn left onto S. Salina St.

3. Turn right onto S. Warren St.
4. Turn right at the 1st cross street onto E. Adams St.
5. Turn right onto Irving Ave
6. Your destination is on the right.

## 12.1 EMERGENCY NOTIFICAITON NUMBERS

Emergency Medical: 911
Fire Dept.: 911
Police Dept.: 911
Department of Emergency Services: 911
Poison Control: (800) 222-1222
CHA Project Manager: Samantha Miller, (315) 257-7154 (Office), (915) 329-9898 (Cell)
CHA Corporate Director of Health and Safety: Ronald Rogers, (518) 453-3917 (Office), (518) 810-8926 (Cell)

## 12.2 ON-SITE FIRST AID

First aid kits will be available in the Support Zone (e.g. vehicles). General first aid procedures include:

**Skin/Eye Contact:** Flush eyes and/or skin thoroughly with water for 15 minutes with tepid water. Remove contaminated clothing. If skin was contacted with a dry material, brush it off first, then flush with water. Seek medical attention if irritation develops.

**Ingestion:** Do not induce vomiting. Call Poison Control Center. Tell them what was swallowed, if possible. Follow instructions. Have SDS available for reference.

**Inhalation:** Remove person from contaminated environment without risking your own safety. DO NOT ENTER A CONFINED SPACE. DO NOT ENTER EXCLUSION ZONE UNLESS WEARING ONE LEVEL HIGHER PROTECTION THAN VICTIM WAS WEARING.

Administer cardiopulmonary resuscitation (CPR) if victim does not have a pulse and if you are currently certified in CPR.

**Injuries:** Do not move a victim who may have a back injury. Cover them with coats, blankets, or other appropriate items to keep them warm. Personnel will immediately dial emergency services (i.e. 911).

Use universal precautions such as barrier gloves and shields. Apply pressure to bleeding wounds. If the victim is able, have the victim apply pressure to the wound. If they are not able, wear gloves to protect from exposure to blood. Put gauze bandages or other clean cloth over the wound. Do not remove blood-soaked bandages or cloth - instead put additional bandages or cloths over the blood-soaked bandages. Elevate the limb with the injury above the heart.

Administer CPR if victim does not have a pulse and if you are currently certified in CPR. Have someone call for an ambulance immediately if there is any possibility that the victim is having or had a heart attack.

Shock is likely to develop in any serious injury or illness. The following are signals of shock: restlessness or irritability; altered consciousness; pale, cool, moist skin; rapid breathing; and/or rapid pulse. In the event of shock, do the following: Immediately have someone call for an ambulance; have the victim lie down; elevate legs 12 inches unless you suspect head, neck, or back injuries; if victim is cool, cover the victim to prevent chilling; do not give the victim anything to drink, even if thirsty. Note time symptoms began and report to emergency responders.

## 13.0 CERTIFICATIONS

All site personnel covered by this HASP have read the HASP and are familiar with its contents and provisions.

| Name | Title | Date |
|---|---|---|
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

## 14.0 STANDARD OPERATING PROCEDURES

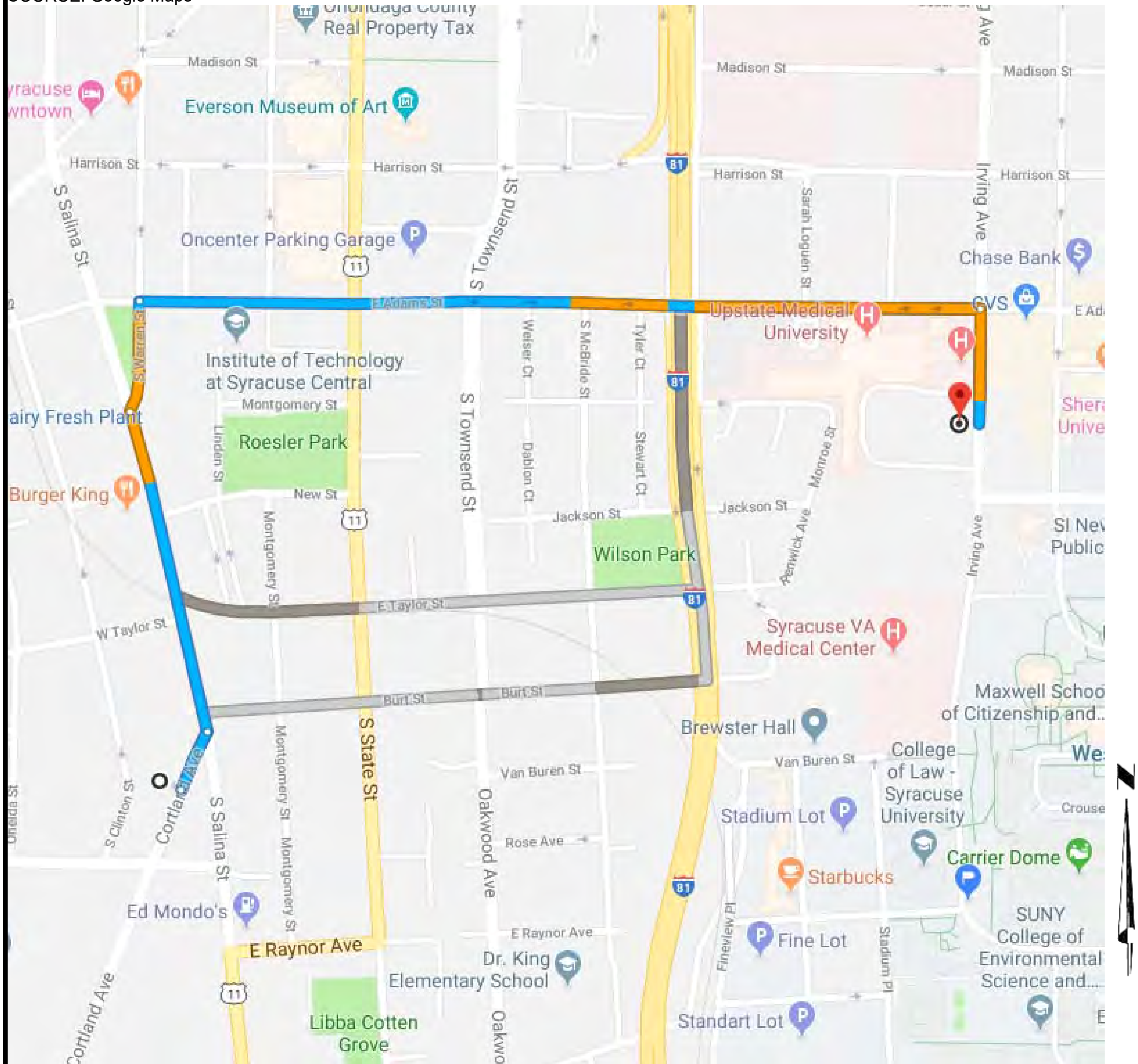
Applicable CHA Standard Operating Procedures (SOPs) are included in Appendix F of the RD Report. Appended to this HASP are CHA JHAs and OSHA Quick Cards in Appendix B, information regarding the COVID-19 global pandemic in Appendix D, the procedures and paperwork for incident reporting in Appendix E, and respiratory protection plan and respirator inspection checklist in Appendix F.

## 15.0 JOB HAZARD ANALYSIS

- ☐ Airport Safety
- ☐ Asbestos Abatement
- ☐ ATV-4 Wheeler
- ☐ Bridge Inspection
- **X** Cold Stress/Winter Weather
- ☐ Confined Space
- ☐ Dogs
- ☐ Electrical Safety
- **X Environmental Sampling-Outdoor Hazards**
- **X Excavation**
- ☐ Exposure to Electrical Transmission Lines
- ☐ Hand-Power Tools
- **X Heat Stress**
- **X Heavy Equipment**
- ☐ Pressurized Cans
- ☐ Rail Safety
- **X Slips, Trips, Falls**
- **X Working In-Around Traffic**
- ☐ Working Over Water
- ☐ Working With Ladders

# FIGURES

SOURCE: Google Maps




140 Cortland Ave
Syracuse, NY 13202

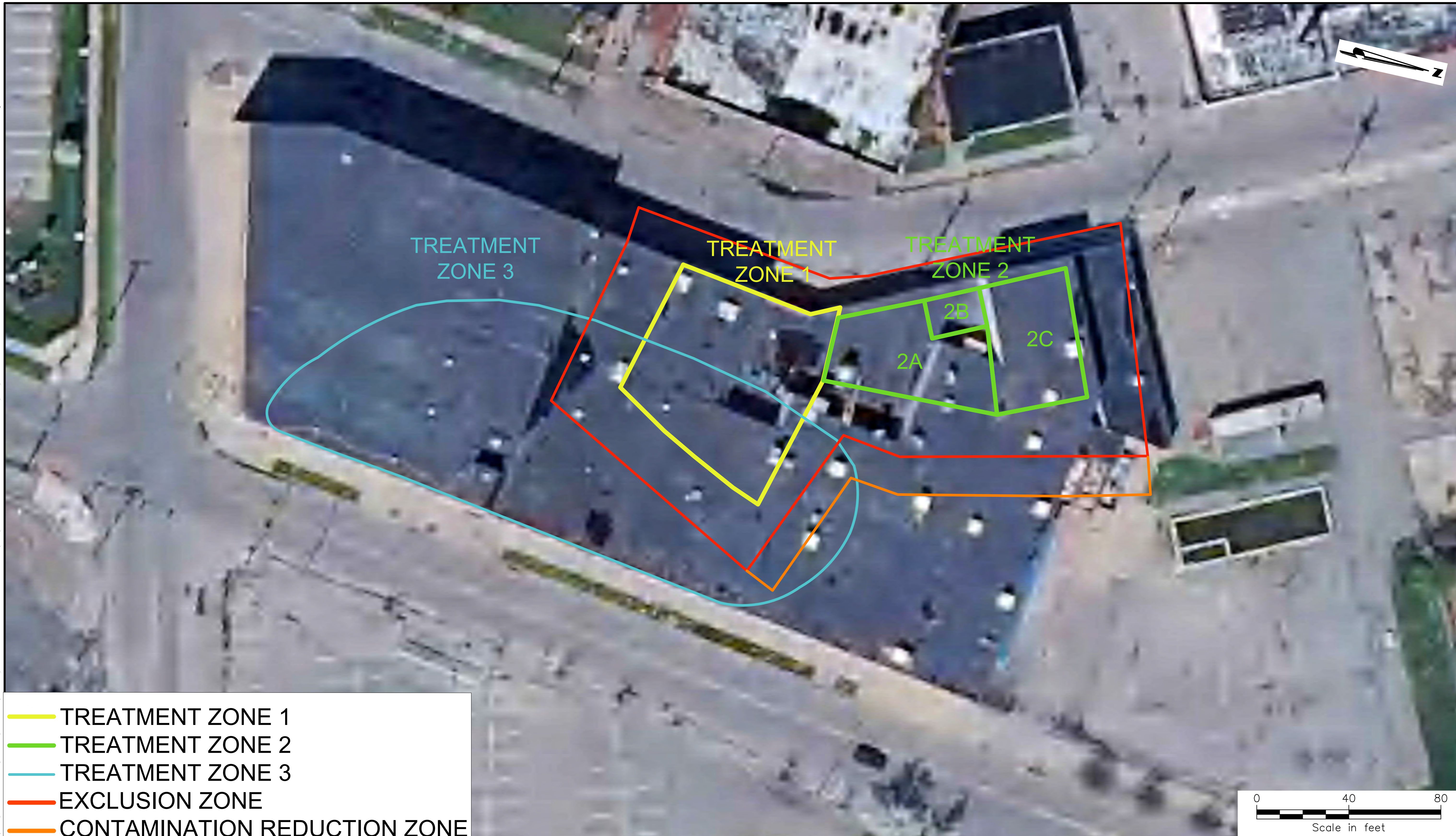
1. Head north on Cortland Ave toward S. Salina St.
2. Turn left onto S. Salina St.
3. Slight right onto S. Warren St.
4. Turn right onto E. Adams St.
5. Turn right onto Irving Ave

Crouse Hospital
Syracuse, NY 13210

CHA ©2020
300 South State Street Suite 600, Syracuse, NY 13202
www.chacompanies.com

NOT TO SCALE | DATE: June 2020

**FIGURE 1**
**DIRECTIONS TO NEAREST HOSPITAL**
Former Coyne Textile Facility
City of Syracuse, New York
Onondaga County, New York




TREATMENT ZONE 1
TREATMENT ZONE 2
TREATMENT ZONE 3
EXCLUSION ZONE
CONTAMINATION REDUCTION ZONE

NOTES:
1. EXCLUSION ZONE WILL BE 25-FT AROUND EACH INJECTION/EXTRACTION WELL DURING INSTALLATION
2. EXACT LOCATION OF THESE ZONES WILL VARY BASED ON WIND DIRECTION AND INTRUSIVE WORK BEING PERFORMED



CHA
One Park Place, 300 South State Street, Suite 600
Syracuse, NY 13202
315.471.3920 . www.chacompanies.com

CONCEPTUAL SITE CONTROL ZONES
HEALTH AND SAFETY PLAN
FORMER COYNE TEXTILE BCP SITE C734144
140 CORTLAND AVE.
SYRACUSE, NY 13202

PROJECT NO. 059294.001

DATE: 06/2020

FIGURE 2

# APPENDIX A

## Daily Jobsite Safety Brief

# DAILY JOBSITE SAFETY BRIEF

| PROJECT INFORMATION | | | |
|---|---|---|---|
| **Project Name:** | | **CHA Project No.** | |
| **Project Start Date:** | **Completion Date:** | **Weather:** | |
| **Project Location:** | | **Project Task:** *Complete a Site Health & Safety Plan per Task* | |
| **Description of Work:** *Be Specific:* | | | |
| **Key Personnel:** *Responsibilities:* | *Project Manager* | *Field Team Leader* | *Site Safety Officer* |
| **Description of Hazards:** | | | |

*The Daily Jobsite Safety Brief must be completed __before__ work begins daily or Scope of Work changes*

**Weather:** ____________________

| | | | | | |
|---|---|---|---|---|---|
| All staff have reviewed and signed site and safety plan | ☐Yes | ☐No | All staff have proper PPE | ☐Yes | ☐No |
| Hazards and precautions have been discussed | ☐Yes | ☐No | Safety Controls in place | ☐Yes | ☐No |

**Additional Notes/Comments:** ____________________

**Signed:** ____________________ **Date/Time:** ____________________

**Signed:** ____________________ **Date/Time:** ____________________

**Signed:** ____________________ **Date/Time:** ____________________

**Weather:** ____________________

| | | | | | |
|---|---|---|---|---|---|
| All staff have reviewed and signed site and safety plan | ☐Yes | ☐No | All staff have proper PPE | ☐Yes | ☐No |
| Hazards and precautions have been discussed | ☐Yes | ☐No | Safety Controls in place | ☐Yes | ☐No |

**Additional Notes/Comments:** ____________________

**Signed:** ____________________ **Date/Time:** ____________________

**Signed:** ____________________ **Date/Time:** ____________________

**Signed:** ____________________ **Date/Time:** ____________________

**Weather:** ____________________

| | | | | | |
|---|---|---|---|---|---|
| All staff have reviewed and signed site and safety plan | ☐Yes | ☐No | All staff have proper PPE | ☐Yes | ☐No |
| Hazards and precautions have been discussed | ☐Yes | ☐No | Safety Controls in place | ☐Yes | ☐No |

**Additional Notes/Comments:** ____________________

**Signed:** ____________________ **Date/Time:** ____________________

**Signed:** ____________________ **Date/Time:** ____________________

**Signed:** ____________________ **Date/Time:** ____________________

# APPENDIX B

# Job Hazard Analysis

# CHA Consulting, Inc.

# Job Hazard Analysis

# Excavations

| Task | Hazard Type and Description | Hazard Control |
|---|---|---|
| | | |
| Noise exposure | Hearing loss & psychological stress | Utilize muffler systems and other engineering controls with increasing working distance. Wear approved safety ear plugs when working close enough to heavy equipment/backhoe |
| Drilling | Inhalation hazards from dust and dirt.<br><br>Struck-by and caught between. | Wear appropriate PPE to protect from dust such as a fit- tested half-face air purifying respirator with appropriate dust cartridges. The respirator should be worn whenever field instruments indicate the need, or when wind-blown dust is obvious in combination with detected contaminates<br><br>Stay alert and maintain safe distance from operating parts. |
| General excavation activity | Contact of dirt or dust after work activities on one's skin | Wear coveralls or tyvek suits to protect clothing, boots, hair, and skin. Remove work clothes including boots before entering environments outside of the work site |
| Being near moving parts of machinery | Physical injury from moving parts<br><br>Struck-by and caught between | Avoid moving parts of machinery. Keep finger, hand and arms away from backhoe bucket and other pinch points. Wear leather gloves when using hands for activities other than sampling, and steel-toed boots. Wear hard hat at all times |
| Working in the vicinity of heavy machinery | Struck-by and caught between | Personnel on the ground should keep away from the work area and backhoe unless they are required for the task. Ask for assistance when |

| | | |
|---|---|---|
| | | carrying or moving heavy loads. Use legs to lift. Do not carry heavy equipment without first establishing eye contact with the operator. Use standard hand signals when noise levels inhibit auditory communication. Ensure that all heavy machinery have audible back-up signals. All workers must wear reflective traffic vests when appropriate. Barricade work area and permit only excavation personnel in the area |
| Working where there is site vehicle traffic | Struck-by and caught between | Restrict outside vehicular traffic on the job site. Use flaggers and a specific traffic route if necessary |
| Digging where there are unknown underground utilities and pipes | Striking underground utilities or other significant obstructions<br><br>Running into an electrical duct bank<br><br>Potential for fires, spills, damaged underground utilities, high noise<br><br>Slips, trips and falls walking in general vicinity of planned excavation | Observe marked locations of underground utilities if marked. Excavate by hand when within five feet in any direction of known underground obstructions. Machine digging allowed within two feet after visual identification and de-energized. If utilities can be confirmed as abandoned, hand digging is not required. Use detection systems if applicable!<br><br>Hand digging required to visually establish location. Machine digging per competent person evaluation and JSA/STA<br><br>Utilize a qualified spotter probe bar, appropriate PPE (hard hat, safety glasses, steel toed boots, Nomex coveralls, ear plugs and gloves as necessary)<br><br>Review general terrain and evaluate surface conditions. Look for ruts, large rocks, and uneven terrain |
| Scanning with electronic | Trips and falls, strain from | Have an assistant help spot various |

| | | |
|---|---|---|
| equipment | lifting heavy instruments | hazards in area if focusing on instrument is too distracting. If lifting or pushing scanning instruments of heavier weights, get assistance with movements to avoid strains |
| Probing with metal tipped fiberglass rods | Slips, trips, and falls walking in general area of intended excavation<br><br>Back strains, hand injury from probing rod | Review overall terrain and identify surface conditions. Look for ruts, large rocks, and uneven terrain<br><br>Avoid excessive force attempting to penetrate deeper with rods. Wear leather gloves to avoid blisters and other hand injuries |
| Working in the Ditch | Potential for cave-in, atmospheric hazards, struck0by/caught-between.<br><br>Ladder safety<br><br>Water accumulation | Have a competent person evaluate the excavations. Excavations over 5 feet deep shall properly protected from cave-ins (protective systems – sloped, benched, shoring, A competent person shall oversee all excavation safety issues and properly assess working conditions. shielding). Utilize a 4 way calibrated monitor at all times while employees are in the ditch. Only one person act as signalman, but anyone can call emergency stop. The spoil pile shall be located at least two feet from the edge of the trench if not as far away as possible and slope the pile away from the excavation<br><br>Ladders used for access must be tied off and extend 3' over landing. When ascending/descending employee must face ladder and maintain three (3) points of contact. Angle ladder at a ¼ of working length (75degrees) for safe climbing.<br><br>The competent person shall inspect the installation of the protective |

| | | |
|---|---|---|
| | | barrier and the conditions of trenching before it is entered and daily before every shift thereafter, or after a rain storm. Thus, the competent person shall also monitor the water level, and determine when safe limits have been exceeded. Any accumulation of water in the trench shall be kept at a minimum by portable pumps |
| Working near the ditch | Falling into eight foot deep trench | At a minimum, barricades shall be erected six feet away from the edge of the trench. Such barricades must be made visible by using high visibility methods when left unattended. Anyone within a six feet boundary must be protected from falls utilizing fall protection (i.e. railing or fall restrain by tethering workers). Provide a walkway or bridge with standard guardrails if employee must cross over the excavation |
| Equipment Damage | Excavations left open and unattended near roadways & walkways, equipment roll over hazard, high noise, airborne dust | Confirm location of all power lines. If lines are unable to shut-in maintain a minimum of ten feet clearance from equipment. Verify and increase distance (per approach charts) for lines in excess of 50,000 volts. Maintain spotter with no other duties than watching for interference, if power lines are within swing radius. Inform local operations and any remote operation of activities. Do not use cell phones while operating equipment. Tape and/or barricade unattended excavations. |
| Working outside | Bad weather (rain, cold/heat, etc..) | If rain and/or lightning starts, stop all activities and allow competent person to advise further regarding safety practices and procedures. |
| Excavator with grapple attachment | Employees working near building(s) can potentially have a crushing injury and atmospheric hazard. Striking | Keep personnel at a safe distance from the equipment. Monitor atmospheric conditions. Make eye contact with the operator before |

| | | |
|---|---|---|
| | a person within radius of boom | approaching equipment. Only one person is to act as signalman; however, anyone can call emergency stop |

# CHA Consulting, Inc.

# Job Hazard Analysis

# Environmental Sampling/Outdoor Hazards

| **Task** | **Hazard Type and Description** | **Hazard Control** |
|---|---|---|
| | | |
| Working in hot environments | Heat disorders including heat cramps, heat exhaustion, and heat stroke | Employers can control this hazard by providing heat stress training to exposed employees, providing access to shade, and allowing employees to gradually get used to hot environments. Employees working in hot environments are advised to take breaks in cool rest areas, rotate physically demanding tasks, save most demanding work for cooler times of day, and utilize the heat index chart to determine exposure risk. Be sure that every employee working in the hot environments is drinking one cup of water ever fifteen minutes. Recognize the signs such as above normal body temperature, headaches, nausea, cramping, fainting, increased heart rate, and pale as well as clammy skin |
| | Sunburn | The risk of sunburn is higher when working at high elevations, or when working around water (from reflection). In these conditions, you can be burned even in overcast conditions; therefore, wear protective clothing and use sunscreen |
| High wind events | Severe wind events can create | Employees should avoid areas |

| | | |
|---|---|---|
| | "wind throws" where strong winds can blow down trees | during high wind occurrences that exhibit previous wind damage |
| Working at high altitudes | Altitude sickness | Recognize signs of acute mountain sickness including headaches, light-headedness, inability to catch one's breath, nausea, and vomiting. Practice prevention by acclimating slowly to high elevations and staying hydrated. If the following symptoms progress, immediately descend to lower elevations and seek medical attention: difficulty breathing, chest pain, confusion, decreased consciousness, and loss of balance |
| Electrical storms | Being struck by lightning | While working outside, watch the sky for thunderstorms and seek shelter before the weather deteriorates. Stop working in streams and lakes. Someone at the job site must be able to begin revival techniques (i.e. CPR) if someone is struck by lightning. Do not use telephones. If caught in electrical storms, seek shelter inside a vehicle or building. When in a building, keep away from doors, windows, plugged in appliances, and metal. When in a vehicle, avoid contact with metal objects inside. If outside with no shelter, obey the following procedures: do not congregate, do not use metal objects, avoid standing near isolated trees, seek lower elevations such as valleys or canyons, and avoid being on peaks as well as trees. If you feel your hairs standing on end and your skin tingling, this is a sign that lightening might be about to strike so crouch immediately (feet together, hands on knees). |
| Being outdoors in cold weather for extended periods of time | Hypothermia | Recognize the signs including shivering, numbness, drowsiness, muscle weakness, dizziness, |

| | | |
|---|---|---|
| | | nausea, unconsciousness, low/weak pulse, and large pupils. Exercise practice prevention such as staying dry, wearing the appropriate clothing (layers), listen to the weather forecast to plan accordingly, stay hydrated, cover head with warm clothing, and stay active. Be aware of the role that wind-chill can play in hypothermia; under certain conditions, hypothermia can occur without any rain or being wet. |
| | Frostbite | Dress for the weather- layers are best, and mittens are better than gloves (keeps your warm fingers together while warming each other). Wear two pairs of socks with the inner layer made of synthetic fiber, such as polypropylene, to wick water away from the skin and the outer layer made of wool for increased insulation. Shoes should be waterproof. Keep your head, face, nose, and ears covered at all times. Clothes should fit loosely to avoid a decrease in blood flow to the arms and legs. Always travel with a friend in case help is needed. Be especially wary of wet and windy conditions; the "feels like" temperature (wind chill) is actually much lower than the stated air temperature. The very old, those who are not in good physical condition, and people with diabetes and anyone with vessel disease should take extra precautions. |
| Working in areas with limited access to clean drinking water | Giardia | Treat, filter, or boil drinking water. Do not drink untreated water from streams, lakes or springs. |
| Working outdoors | Rattlesnakes | Be alert and do not put your feet or |

| | | |
|---|---|---|
| | | hands where you cannot see what is on the ground (for example if you are stepping over a log and you cannot see what's on the other side). If you encounter a rattle snake do not pick it up- give it a wide berth and walk around it. If bitten, seek immediate professional medical attention and remove jewelry. If bitten on an extremity lower than the heart, cover wound with a sterile band while seeking medical attention. |
| | Bears | If you encounter a bear, be alert but stay calm, and give it as much room as possible. Try to leave the area, but DO NOT RUN. Back away slowly. If the bear follows, stop and hold your ground: wave your arms to make yourself look big and talk in a normal voice. Work in teams of two to deter bear attacks. If the bear makes contact, surrender: fall to the ground and play dead (a bear will break off an attack once it feels the threat has been eliminated). If the bear continues to bite after you assume a defensive posture. Their attack is predatory and you should fight back vigorously |
| | Mountain Lions | Be alert, calm, and do not panic. If you see a mountain lion, do not run as it may stimulate its predatory nature. Instead, shout and wave arms to let it know that you are not prey: fight back |

| | | |
|---|---|---|
| | Tick bites<br><br>Roughskin Newts<br><br>Bee stings | Use DEET based repellants on exposed skin and/or permethrin on clothes. Check for ticks during and after field work. If you find a tick remove it with tweezers within 24 hours, preferably immediately: do not leave the head embedded or extract the tick with matches, petroleum jelly, or other coatings (e.g. motor oil)<br><br>Avoiding handling them as their skin contains a potent neurotoxin. If necessary for the protocol, handle only when wearing gloves. Do not "lick" for "killer buzz" as people have died from attempting to eat roughskin newts<br><br>If you know or suspect you are allergic to bee stings, carry appropriate allergy kits prescribed by a doctor for treating anaphylactic shock. Carry and take diphenhydramine (Benadryl). Follow the label instructions for allergy control. Inform your supervisor if you suspect you are allergic. Watch for ground nests |
| Travel movement or work in area with poison oak or poison ivy | Allergic reaction to poison oak/poison ivy plants | Learn to recognize poison oak. Avoid contact by using ivy block and wearing long pants and long-sleeve shirts if traveling in dense areas. If skin contact is made, flush the area with cold water as soon as possible. Do not flush your skin with warm water or soap as it can open your pores and increase the reaction. To wash and rinse use Tecnu or similar product with cold water to remove oils |
| Encountering irrigation | Unfriendly encounters with | Do not wear uniforms and carry a |

| | | |
|---|---|---|
| pipes, marijuana plantation, or grow operations | criminal elements | radio backpack that is not visible. Do not confront strangers and act like a tourist if you must speak. Work in pairs or groups. If working in areas likely to contain operations, check in with park staff when leaving vehicle and returning to vehicle. Watch for black piping or other signs. If you find a definite grow operation, leave immediately, note the location, and report it to the authorities |

# CHA Consulting, Inc.

# Job Hazard Analysis

# Electrical Safety

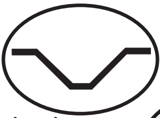
| Task | Hazard Type and Description | Hazard Control |
|---|---|---|
| | | |
| Working around electrical power poles | Potential for electric shock | Electrical installations and maintenance shall only be performed by certified electricians |
| Working around conduits | Potential for serious burns or injury | Lockout and tagout electrical equipment prior to exposing personnel |
| Working around electrical panels | | All electrical equipment shall have ground fault circuit interrupters (GFCI) or assured equipment grounding. Avoid lifting long dimensional conductors (ducts or pipes) over or around lie electrical. All extension cords shall be free of frays. All receptacles must be mounted and secure prior to use. Panel boxes must be covered to prevent accidental contact with life parts. Portable ladders used for electrical work must have non-conductive side rails. Conductive items of jewelry or clothing shall not be worn unless they are rendered non-conductive by covering, wrapping or other insulating means |

OSHA® QUICK CARD™

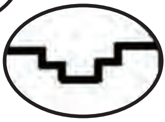
# Working Safely in Trenches

Two workers are killed every month in trench collapses. Each worker in a trench shall be protected from a cave-in by an adequate protective system. Some of the protective systems for trenches are:

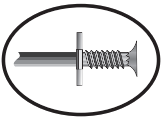
- Sloped for stability; or

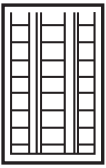


- Cut to create stepped benched grades (Type A or B soil only); or

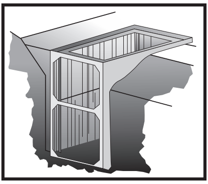


- Supported by a system made with materials such as posts, beams, shores or planking and hydraulic jacks; or

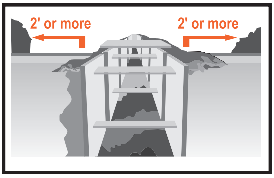




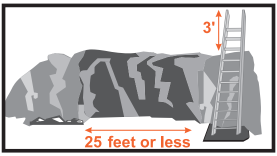
- Shielded by a trench box to protect workers in a trench.



Excavated or other materials and equipment must be at least 2 feet back from the edge of a trench; and




A safe way to exit must be provided within 25 feet of workers in a trench.




A competent person must inspect trenches daily and when conditions change. An unprotected trench is an early grave. Do not enter an unprotected trench.

**For more information:**

OSHA® Occupational Safety and Health Administration

U.S. Department of Labor

www.osha.gov (800) 321-OSHA (6742)

TTY (887) 889-5627

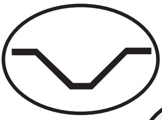
OSHA 3243-09R-11

OSHA® DATOS RÁPIDOS

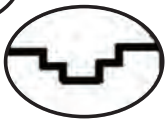
# Trabajando de forma segura en zanjas

Dos trabajadores mueren cada mes en derrumbes de zanjas. Se utilizará un sistema adecuado para proteger a cada trabajador en una zanja de los derrumbes. Algunos de los sistemas de protección en zanjas son:

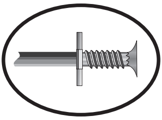
- Inclinación para lograr estabilidad, o

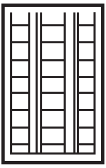


- Corte en forma de gradientes escalonados (sólo para el suelo del tipo A o B), o

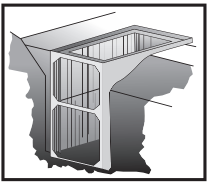


- Soporte por un sistema hecho con materiales como postes, vigas, puntales o entarimado y gatos hidráulicos, o





- Resguardo en una caja de trinchera para proteger a los trabajadores en la zanja.



Los materiales excavados o de otro tipo y los equipos deben estar por lo menos a 2 pies hacia atrás del borde de la zanja.


Se deberá ofrecer una vía segura de salida dentro de 25 pies de los trabajadores en una zanja.


Una persona competente debe inspeccionar las zanjas a diario y cuando las condiciones cambien. Una zanja sin protección es una tumba. No entre a una zanja que no está protegida.

**Para más información:**

OSHA® **Administración de Seguridad y Salud Ocupacional**

**Departamento del Trabajo de EE.UU.**

**www.osha.gov (800) 321-OSHA (6742)**

# OSHA® FactSheet

# Trenching and Excavation Safety

**Two workers are killed every month in trench collapses. The employer must provide a workplace free of recognized hazards that may cause serious injury or death. The employer must comply with the trenching and excavation requirements of 29 CFR 1926.651 and 1926.652 or comparable OSHA-approved state plan requirements.**

**An excavation is any man-made cut, cavity, trench, or depression in an earth surface formed by earth removal.**

**Trench (Trench excavation) means a narrow excavation (in relation to its length) made below the surface of the ground. In general, the depth is greater than the width, but the width of a trench (measured at the bottom) is not greater than 15 feet (4.6 meters).**

## Dangers of Trenching and Excavation

Cave-ins pose the greatest risk and are much more likely than other excavation-related accidents to result in worker fatalities. Other potential hazards include falls, falling loads, hazardous atmospheres, and incidents involving mobile equipment. One cubic yard of soil can weigh as much as a car. An unprotected trench is an early grave. Do not enter an unprotected trench.

## Trench Safety Measures

Trenches 5 feet (1.5 meters) deep or greater require a protective system unless the excavation is made entirely in stable rock. If less than 5 feet deep, a competent person may determine that a protective system is not required.

Trenches 20 feet (6.1 meters) deep or greater require that the protective system be designed by a registered professional engineer or be based on tabulated data prepared and/or approved by a registered professional engineer in accordance with 1926.652(b) and (c).

## Competent Person

OSHA standards require that employers inspect trenches daily and as conditions change by a competent person before worker entry to ensure elimination of excavation hazards. A competent person is an individual who is capable of identifying existing and predictable hazards or working conditions that are hazardous, unsanitary, or dangerous to workers, soil types and protective systems required, and who is authorized to take prompt corrective measures to eliminate these hazards and conditions.

## Access and Egress

OSHA standards require safe access and egress to all excavations, including ladders, steps, ramps, or other safe means of exit for employees working in trench excavations 4 feet (1.22 meters) or deeper. These devices must be located within 25 feet (7.6 meters) of all workers.

## General Trenching and Excavation Rules

- Keep heavy equipment away from trench edges.
- Identify other sources that might affect trench stability.
- Keep excavated soil (spoils) and other materials at least 2 feet (0.6 meters) from trench edges.
- Know where underground utilities are located before digging.
- Test for atmospheric hazards such as low oxygen, hazardous fumes and toxic gases when > 4 feet deep.
- Inspect trenches at the start of each shift.
- Inspect trenches following a rainstorm or other water intrusion.
- Do not work under suspended or raised loads and materials.
- Inspect trenches after any occurrence that could have changed conditions in the trench.
- Ensure that personnel wear high visibility or other suitable clothing when exposed to vehicular traffic.

## Protective Systems

There are different types of protective systems.

**Benching** means a method of protecting workers from cave-ins by excavating the sides of an excavation to form one or a series of horizontal levels or steps, usually with vertical or near-vertical surfaces between levels. *Benching cannot be done in Type C soil.*

**Sloping** involves cutting back the trench wall at an angle inclined away from the excavation.

**Shoring** requires installing aluminum hydraulic or other types of supports to prevent soil movement and cave-ins.

**Shielding** protects workers by using trench boxes or other types of supports to prevent soil cave-ins. Designing a protective system can be complex because you must consider many factors: soil classification, depth of cut, water content of soil, changes caused by weather or climate, surcharge loads (e.g., spoil, other materials to be used in the trench) and other operations in the vicinity.

## Additional Information

Visit OSHA's Safety and Health Topics web page on trenching and excavation at

www.osha.gov/SLTC/trenchingexcavation/index.html

www.osha.gov/dcsp/statestandard.html

**This is one in a series of informational fact sheets highlighting OSHA programs, policies or standards. It does not impose any new compliance requirements. For a comprehensive list of compliance requirements of OSHA standards or regulations, refer to Title 29 of the Code of Federal Regulations. This information will be made available to sensory-impaired individuals upon request. The voice phone is (202) 693-1999; teletypewriter (TTY) number: (877) 889-5627.**

**For assistance, contact us. We can help. It's confidential.**

**OSHA® Occupational Safety and Health Administration**

U.S. Department of Labor

**www.osha.gov (800) 321-OSHA (6742)**

DOC FS-3476 9/2011

OSHA® QUICK CARD™

# Protecting Workers from Cold Stress

Cold temperatures and increased wind speed (wind chill) cause heat to leave the body more quickly, putting workers at risk of cold stress. Anyone working in the cold may be at risk, e.g., workers in freezers, outdoor agriculture and construction.

## Common Types of Cold Stress

### *Hypothermia*

- Normal body temperature (98.6°F) drops to 95°F or less.
- **Mild Symptoms:** alert but shivering.
- **Moderate to Severe Symptoms:** shivering stops; confusion; slurred speech; heart rate/breathing slow; loss of consciousness; death.

### *Frostbite*

- Body tissues freeze, e.g., hands and feet. Can occur at temperatures above freezing, due to wind chill. May result in amputation.
- **Symptoms:** numbness, reddened skin develops gray/ white patches, feels firm/hard, and may blister.

### *Trench Foot (also known as Immersion Foot)*

- Non-freezing injury to the foot, caused by lengthy exposure to wet and cold environment. Can occur at air temperature as high as 60°F, if feet are constantly wet.
- **Symptoms:** redness, swelling, numbness, and blisters.

## Risk Factors

- Dressing improperly, wet clothing/skin, and exhaustion.

## For Prevention, Your Employer Should:

- Train you on cold stress hazards and prevention.
- Provide engineering controls, e.g., radiant heaters.
- Gradually introduce workers to the cold; monitor workers; schedule breaks in warm areas.

For more information:

OSHA® **Occupational Safety and Health Administration**

**U.S. Department of Labor**

www.osha.gov (800) 321-OSHA (6742)

OSHA 3156-02R 2014

# OSHA® QUICK CARD™

## How to Protect Yourself and Others

- Know the symptoms; monitor yourself and co-workers.
- Drink warm, sweetened fluids (no alcohol).
- Dress properly:
  - Layers of loose-fitting, insulating clothes
  - Insulated jacket, gloves, and a hat (waterproof, if necessary)
  - Insulated and waterproof boots

## What to Do When a Worker Suffers from Cold Stress

### *For Hypothermia:*

- Call 911 immediately in an emergency.
- To prevent further heat loss:
  - Move the worker to a warm place.
  - Change to dry clothes.
  - Cover the body (including the head and neck) with blankets, and with something to block the cold (e.g., tarp, garbage bag). Do **not** cover the face.
- If medical help is more than 30 minutes away:
  - Give warm, sweetened drinks if alert (no alcohol).
  - Apply heat packs to the armpits, sides of chest, neck, and groin. Call 911 for additional rewarming instructions.

### *For Frostbite:*

- Follow the recommendations "**For Hypothermia**".
- Do not rub the frostbitten area.
- Avoid walking on frostbitten feet.
- Do not apply snow/water. Do not break blisters.
- Loosely cover and protect the area from contact.
- Do not try to rewarm the area unless directed by medical personnel.

### *For Trench (Immersion) Foot:*

- Remove wet shoes/socks; air dry (in warm area); keep affected feet elevated and avoid walking. Get medical attention.

**For more information:**

OSHA® Occupational Safety and Health Administration

U.S. Department of Labor

www.osha.gov (800) 321-OSHA (6742)

OSHA® QUICK CARD™

# Protecting Workers from Heat Stress

## Heat Illness

Exposure to heat can cause illness and death. The most serious heat illness is heat stroke. Other heat illnesses, such as heat exhaustion, heat cramps and heat rash, should also be avoided.

There are precautions your employer should take any time temperatures are high and the job involves physical work.

## Risk Factors for Heat Illness

- High temperature and humidity, direct sun exposure, no breeze or wind
- Low liquid intake
- Heavy physical labor
- Waterproof clothing
- No recent exposure to hot workplaces

## Symptoms of Heat Exhaustion

- Headache, dizziness, or fainting
- Weakness and wet skin
- Irritability or confusion
- Thirst, nausea, or vomiting

## Symptoms of Heat Stroke

- May be confused, unable to think clearly, pass out, collapse, or have seizures (fits)
- May stop sweating

## To Prevent Heat Illness, Your Employer Should

- Establish a complete heat illness prevention program.
- Provide training about the hazards leading to heat stress and how to prevent them.
- Provide a lot of cool water to workers close to the work area. At least one pint of water per hour is needed.

U.S. Department of Labor

For more information:

OSHA® Occupational Safety and Health Administration

www.osha.gov (800) 321-OSHA (6742)

OSHA 3154-06R 2014

# OSHA® QUICK CARD™

- Modify work schedules and arrange frequent rest periods with water breaks in shaded or air-conditioned areas.
- Gradually increase workloads and allow more frequent breaks for workers new to the heat or those that have been away from work to adapt to working in the heat (acclimatization).
- Routinely check workers who are at risk of heat stress due to protective clothing and high temperature.
- Consider protective clothing that provides cooling.

## How You Can Protect Yourself and Others

- Know signs/symptoms of heat illnesses; monitor yourself; use a buddy system.
- Block out direct sun and other heat sources.
- Drink plenty of fluids. Drink often and BEFORE you are thirsty. Drink water every 15 minutes.
- Avoid beverages containing alcohol or caffeine.
- Wear lightweight, light colored, loose-fitting clothes.

## What to Do When a Worker is Ill from the Heat

- Call a supervisor for help. If the supervisor is not available, call 911.
- Have someone stay with the worker until help arrives.
- Move the worker to a cooler/shaded area.
- Remove outer clothing.
- Fan and mist the worker with water; apply ice (ice bags or ice towels).
- Provide cool drinking water, if able to drink.

**IF THE WORKER IS NOT ALERT or seems confused, this may be a heat stroke. CALL 911 IMMEDIATELY and apply ice as soon as possible.**

**If you have any questions or concerns, call OSHA at 1-800-321-OSHA (6742).**

U.S. Department of Labor

For more information:

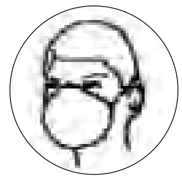
OSHA® Occupational Safety and Health Administration

www.osha.gov (800) 321-OSHA (6742)

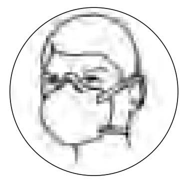
# OSHA QUICK CARD™

## Protect Yourself
# Respirators

Respiratory protection must be worn whenever you are working in a hazardous atmosphere. The appropriate respirator will depend on the contaminant(s) to which you are exposed and the protection factor (PF) required. Required respirators must be NIOSH-approved and medical evaluation and training must be provided before use.



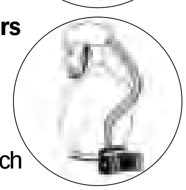
**Single-strap dust masks** are usually not NIOSH-approved. They must not be used to protect from hazardous atmospheres. However, they may be useful in providing comfort from pollen or other allergens.



**Approved filtering facepieces** (dust masks) can be used for dust, mists, welding fumes, etc. They do not provide protection from gases or vapors. DO NOT USE FOR ASBESTOS OR LEAD; instead, select from the respirators below.

**Half-face respirators** can be used for protection against most vapors, acid gases, dust or welding fumes. Cartridges/filters must match contaminant(s) and be changed periodically.

**Full-face respirators** are more protective than half-face respirators. They can also be used for protection against most vapors, acid gases, dust or welding fumes. The face-shield protects face and eyes from irritants and contaminants. Cartridges/filters must match contaminant(s) and be changed periodically.



**Loose-fitting powered-air-purifying respirators** (PAPR) offer breathing comfort from a battery-powered fan which pulls air through filters and circulates air throughout helmet/hood. They can be worn by most workers who have beards. Cartridges/filters must match contaminant(s) and be changed periodically.

**A Self-Contained Breathing Apparatus** (SCBA) is used for entry and escape from atmospheres that are considered immediately dangerous to life and health (IDLH) or oxygen deficient. They use their own air tank.

**For more complete information:**


OSHA Occupational Safety and Health Administration

**U.S. Department of Labor**

www.osha.gov (800) 321-OSHA



OSHA 3280-10N-05

OSHA® QUICK CARD™

# Electrical Safety

Electrical hazards can cause burns, shocks and electrocution (death).

- Assume that all overhead wires are energized at deadly voltages. Never assume that a wire is safe to touch even if it is down or appears to be insulated.
- Never touch a fallen overhead power line. Call the electric utility company to report fallen electrical lines.
- Stay at least 10 feet (3 meters) away from overhead wires during cleanup and other activities. If working at heights or handling long objects, survey the area before starting work for the presence of overhead wires.
- If an overhead wire falls across your vehicle while you are driving, stay inside the vehicle and continue to drive away from the line. If the engine stalls, do not leave your vehicle. Warn people not to touch the vehicle or the wire. Call or ask someone to call the local electric utility company and emergency services.
- Never operate electrical equipment while you are standing in water.
- Never repair electrical cords or equipment unless qualified and authorized.
- Have a qualified electrician inspect electrical equipment that has gotten wet before energizing it.
- If working in damp locations, inspect electric cords and equipment to ensure that they are in good condition and free of defects, and use a ground-fault circuit interrupter (GFCI).
- Always use caution when working near electricity.

For more information:

OSHA® Occupational Safety and Health Administration

U.S. Department of Labor

www.osha.gov (800) 321-OSHA (6742)

OSHA 3294-04R-13

# OSHA® DATOS RÁPIDOS

## Seguridad eléctrica

Los riesgos eléctricos pueden causar quemaduras, choques eléctricos y electrocución (muerte).

- Sepa que probablemente todos los cables aéreos están energizados (vivos) a voltajes fatales. Nunca asuma que se puede tocar un cable de manera segura aún si está fuera de servicio o parece que está aislado.
- Nunca toque una línea de energía eléctrica que se haya caído. Llame a la compañía de servicio eléctrico para reportar líneas eléctricas caídas.
- Manténgase al menos 10 pies (3 metros) alejado de los cables aéreos durante limpiezas y otras actividades. Si está trabajando desde alturas o manejando objetos largos, antes de comenzar a trabajar evalúe el área para detectar la presencia de cables aéreos.
- Si un cable aéreo cae sobre su vehículo cuando esté guiando, manténgase dentro del vehículo y continúe guiando, alejándose del cable. Si el motor de su vehículo se detiene, no salga del vehículo. Adviértale a las personas que no toquen el vehículo o el cable. Llame, o pídale a alguien que llame, a la compañía local de servicio eléctrico y a servicios de emergencia.
- Nunca opere equipos eléctricos mientras esté parado sobre agua.
- Nunca repare cables o equipo eléctrico a menos que esté calificado y autorizado.
- Antes de energizar el equipo eléctrico que se ha mojado, haga que un electricista calificado lo inspeccione.
- Si está trabajando en áreas húmedas, inspeccione los cables y equipo eléctrico para asegurarse que estén en buenas condiciones y sin defectos, y use un interruptor de circuito con pérdida a tierra (GFCI, por sus siglas en inglés).
- Siempre tenga cuidado cuando esté trabajando cerca de electricidad.

**Para más información:**

OSHA® **Administración de Seguridad y Salud Ocupacional**

**Departamento de Trabajo de los EE. UU.**

**www.osha.gov (800) 321-OSHA (6742)**

# CHA Consulting, Inc.

# Job Hazard Analysis

# Slips/Trips/Falls

## Common hazards

- Slippery surfaces (e.g., wet, oily or greasy)
- Seasonal trip hazards (snow and ice)
- Spills of wet or dry substances
- Changes in walkway levels and slopes
- Unsecured mats
- Poor lighting
- Debris and items stored in walkways
- Trailing cables in pedestrian walkways
- Smoke, steam or dust obscuring view
- Unsuitable footwear

## Controlling hazards

When establishing safe work practices, consider:

- Characteristics of physical work area
- Weather conditions (snow, ice, rain)
- Tasks performed
- Workers' work practices
- Equipment

## Hazard Control/Engineering Controls

- Type of flooring
- Slope of surface (ramps, handrails)
- Surface free of obstructions/holes
- Drainage
- Lighting levels, non-glare, contrast
- Equipment to be used/not carrying too much at once
- Signage
- Sufficient space
- Minimizing environmental influences, e.g., blocking wind to prevent wet surfaces icing at entrances

# Hazard Control/Administrative Controls

- Training workers/awareness
- Safe practices such as a procedure for cleaning spills or requirement for two workers to transport a large equipment that one worker cannot see around or can't handle
- Reporting hazards
- Prompt maintenance
- Job design (identifying tasks requiring excessive pushing/pulling, line-of-sight obstruction)
- Equipment readily available
- Addressing poor work practices
- Inspections
- Review slips, trips and same-level fall hazards

# Hazard Control/Housekeeping

- Clean spills
- Remove debris, snow and ice
- Keep equipment clean
- Keep wires, etc. controlled, taped, etc.

# Hazard Control/Personal Protective Equipment

- Appropriate footwear for task, which may include appropriate heels, soles and anti-slip boots

# CHA Consulting, Inc.

# Job Hazard Analysis

# Working in/Around Traffic

| **Task** | **Hazard Type and Description** | **Hazard Control** |
|---|---|---|
| | | |
| Workers working in/around traffic | Workers getting hit by oncoming traffic because they are not visible to drivers | Wear the appropriate PPE including an **ANSI/Class II** high visibility safety apparel. Employers should make sure their employees are provided with the proper performance class |
| Workers working with contractors | Contractor workers could be unfamiliar with specific traffic control requirements (spacing requirements, number of traffic control devices required, training of flaggers, etc.) A vehicular or personnel accident could result from this | Ensure those involved with traffic control are familiar with MUTCD (manual of uniform traffic control devices) requirements |
| Utilizing flagmen to control traffic | Flagmen not trained/ qualified | Flagmen for traffic control must be trained in proper flagging requirements |
| Making sure the contractor has control over the flow of traffic | Traffic not cooperative in slowing down or driving recklessly | Contact local police department for assistance in patrolling area more frequently, strategic placement of traffic control devices to make drivers feel as if they need to slow down (i.e. creating a narrower approach or path, devices that look like law enforcement, etc.) |
| Working on the traffic side of trucks | Being struck by an oncoming vehicle | Set up job so all work is done on the ditch side of trucks |
| Utilizing traffic control devices for controlling traffic | Inadequate traffic control for advance warning of work zone | Ensure traffic control devices meet MUTCD (Manual of Uniform Traffic Control Devices) |

| | | |
|---|---|---|
| | | requirements. Use arrow boards. Use the site plan to review traffic details |
| Working around very heavy traffic | Being struck by traffic | Plan work for low traffic hours if possible. Shut down lanes of traffic if possible |
| Operating a vehicle in a construction/ heavy traffic area | Striking or being struck by others | Use a spotter when visibility is limited |
| Setting up equipment near traffic | Backing into workers, vehicles, ditches, oncoming traffic, other property damage | Have someone watch when you back up |
| Entering/Exiting the job site | Being hit by oncoming traffic | As you are entering site, continue in the direction of traffic, slow down, use flashers or beacon lights well in advance, and pull completely on shoulder, etc. Park vehicles as to not interrupt traffic. Exit vehicle on non-traffic side. If performing data collection and need to continue movement in vehicle, continue to use flashers if not completely stopping. Use beacon lights on larger vehicles. Be sure they are not blocked by equipment (ladders, trailers, etc.).<br><br>Exit safely by considering all traffic. Use a spotter when backing out if at all possible. Check that all equipment (ladders, trailers) is secure. |
| Crossing highway on foot, making visual observations, taking photos, taking measurements | Noise<br><br>Traffic | Use proper warning signage/cones, work facing traffic, frequently observe traffic, plan escape route ahead of time, keep a firm grasp of equipment |

# CHA Consulting, Inc.

# Job Hazard Analysis

# Heavy Equipment

| Task | Hazard Type and Description | Hazard Control |
|---|---|---|
| | | |
| Heavy equipment | Pinch points<br>Struck-by/Caught between | Never work or walk under loads, and only one person is to act as the signal person.<br>Avoid working near swing radius's.<br>Maintain eye contact with operators when approaching equipment.<br>Rigger s and Operators must possess additional safety training for competency. (Competent/Qualified Training) |
| Road grading and material cleanup | Potential for personnel to be run over with equipment<br>Struck-by/Caught between | Ensure equipment is operated by qualified operator, and all personnel working on or near roadway wear reflective vests. Be sure that equipment back-up alarms are working properly. Always make eye contact with equipment operators prior to approaching |
| Personnel working near heavy equipment | Slips and falls<br>Struck-by/Caught between | Make sure there is a good working surface. Cover or barricade excavations as soon as practical. Wear a hard hat, safety glasses, ear plugs, a Class II ANSI safety vest as well as steel toed boots when necessary |
| Operation | Strains and sprains | Think about your body position; avoid over- reaching, hyper-extending, location/ position of extremities, and think if you are in the best position for leverage |

# APPENDIX C

# Safety Data Sheets

SAFETY DATA SHEET
ZERO VALENT IRON

Revision Date 2/24/2017

## 1. PRODUCT AND COMPANY IDENTIFICATION

### 1.1 Product identifiers

Product name: Zero valent iron

Brand: Compass Remediation Chemicals

CAS-No.: 7439-89-6

### 1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses: Environmental remediation, water treatment, various

### 1.3 Details of the supplier of the safety data sheet

Company Compass Remediation Chemicals
2028 East Ben White Blvd
#240-1974
Austin, TX 78741

Telephone: (866) 221-9167

### 1.4 Emergency telephone number

Emergency Phone #: CHEMTREC 1-800-424-9300

## 2. HAZARDS IDENTIFICATION

### 2.1 Classification of the substance or mixture

**GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)**
Not classified as hazardous

### 2.2 GHS Label elements, including precautionary statements

Signal Word: not applicable
Hazard Statements: not applicable
Precautionary Statements: not applicable

### 2.3 Hazards not otherwise classified (HNOC) or not covered by GHS –

Compass currently knows no risk to people or the environment from this class of product.

If dust is generated during the use of handling of these materials, extra precaution for eye protection (eye glasses or goggles), skin (gloves and long sleeves) and respiration (particle dust mask) are recommended. Spills of these materials may present a slip / fall hazard.

## 3. COMPOSITION/INFORMATION ON INGREDIENTS

### 3.1 Substances

Formula: Fe
Molecular Weight: 55.85 g/mol
CAS-No.: 7439-89-6
EC-No.: 231-096-4

| | | | |
|---|---|---|---|
| C | 0.70 – 2.5% | Mn | <0.60% |
| Si | <2.0% | S | <0.12% |
| P | <0.14% | Fe | Balance |

## 4. FIRST AID MEASURES

### 4.1 Description of first aid measures

**General advice**
Move out of dangerous area. Consult a physician. Show this safety data sheet to the doctor in attendance.

**If inhaled**
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

**In case of skin contact**
Wash off with soap and plenty of water. Consult a physician.

**In case of eye contact**
Flush eyes with water as a precaution.

**If swallowed**
Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

### 4.2 Most important symptoms and effects, both acute and delayed
No data available

### 4.3 Indication of any immediate medical attention and special treatment needed
No data available

## 5. FIREFIGHTING MEASURES

### 5.1 Extinguishing media

**Suitable extinguishing media**
Use Class D or other metal extinguishing agent.

### 5.2 Special hazards arising from the substance or mixture
These materials, as coarse particles, are non-flammable and do not react with water or other materials used for extinguishing fire. Fine metal dust may pose a risk of fire or explosion if accumulated, mixed and confined with an ignition source. When handling fine particles generated from this material, avoid creating dust clouds and ignition sources. May release iron oxide fume if involved in a fire.

### 5.3 Advice for firefighters
Wear self-contained breathing apparatus for fire fighting if necessary.

### 5.4 Further information
Use water spray to cool unopened containers.

## 6. ACCIDENTAL RELEASE MEASURES

### 6.1 Personal precautions, protective equipment and emergency procedures
Avoid dust formation. Avoid breathing vapors, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas.
For personal protection see section 8.

### 6.2 Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

### 6.3 Methods and materials for containment and cleaning up
Sweep up and shovel. Contain spillage, and then collect with an electrically protected vacuum cleaner or by wet- brushing and place in container for disposal according to local regulations (see section 13). Keep in suitable, closed containers for disposal. Contain spillage, pick up with an electrically protected vacuum cleaner or by wet-brushing and transfer to a container for disposal according to local regulations (see section 13).

## 7. HANDLING AND STORAGE

### 7.1 Precautions for safe handling
Avoid formation of dust and aerosols.
Provide appropriate exhaust ventilation at places where dust is formed. Keep away from sources of ignition - No smoking. Take measures to prevent the buildup of electrostatic charge.

### 7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place. Store under inert gas. Moisture sensitive.

Keep in a dry place.

### 7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

## 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

### 8.1 Control parameters

**Components with workplace control parameters**

Contains no substances with occupational exposure limit values.

### 8.2 Exposure controls

**Appropriate engineering controls**

Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

**Personal protective equipment**

**Eye/face protection**

Safety glasses with side-shields conforming to EN166. Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

**Skin protection**

Impermeable gloves, protective work clothing as necessary.

**Respiratory Protection**

Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

**Control of environmental exposure**

Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

## 9. PHYSICAL AND CHEMICAL PROPERTIES

### 9.1 Information on basic physical and chemical properties

| | |
|---|---|
| Form: Solid metallic particles | Solubility in water: very low - may form rust |
| Odor: None | Non-flammable, except as fine dust |
| Bulk Density: 2.4 to 4.8 tonne/$m^3$ | Color: various - grey, lustrous metallic, black |
| Specific Density: 6.8 to 7.8 tonne/$m^3$ | Vapor pressure: Very low at room temperature |
| Melting Temperature: $1200^o$ to $1500^o$C | |

## 10. STABILITY AND REACTIVITY

### 10.1 Reactivity
No data available

### 10.2 Chemical stability
Stable under recommended storage conditions.

### 10.3 Possibility of hazardous reactions

No data available

### 10.4 Conditions to avoid
Heat, flames and sparks. Extremes of temperature and direct sunlight.

### 10.5 Incompatible materials
Acids, Oxygen, Strong oxidizing agents, Halogens, Phosphorus

### 10.6 Hazardous decomposition products
Other decomposition products - no data available
In the event of fire: see section 5

## 11. TOXICOLOGICAL INFORMATION

### 11.1 Information on toxicological effects

No known severe toxicity. No known local effects. Nuisance dust exposure may cause eye and/or throat irritation.

## 12. ECOLOGICAL INFORMATION

Non-hazardous

## 13. DISPOSAL CONSIDERATIONS

**Waste Disposal Method:**

May be disposed as non-hazardous solid waste in compliance with local regulations. Special conditions may apply if mixed with other material.

## 14. TRANSPORT INFORMATION

| | |
|---|---|
| Shipping Regulations: | Not regulated |
| UN Number: | N/A |
| UN Proper Shipping Name: | N/A |
| Transport Hazard Class: | N/A |
| Packing Group: | N/A |
| Marine Pollutant: | No |

## 15. REGULATORY INFORMATION

None apply

## 16. OTHER INFORMATION

**Further information**

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Compass Remediation Chemicals and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product.

Version: 1.1 Revision Date: 2/4/2017

# APPENDIX D

# COVID-19

**059294.001 – Site Specific HASP COVID-19 Supplement**

Date: 6/8/2020
**CHA Proj. No.: 059294.001**
Project Location: Former Coyne Textile Remedial Design
140 Cortland Avenue
Syracuse, NY 13202
Prepared by: Karyn Ehmann

**SITE SPECIFIC RISK: COVID-19**

**Description:** Due to the current global pandemic and concerns related to the coronavirus COVID-19, and the Executive Orders (EO) issued by Governor Andrew Cuomo for the state of New York, this supplement is to be added to the Site Specific Health and Safety Plan (HASP) for the provision of remedial design implementation. Design implementation will consist of multiple weeks of construction oversight of intrusive activities. Following intrusive activities, CHA staff will remain on-site for operation of the groundwater recirculation system for several additional weeks. The timeframe anticipated to complete this work is August 1 through October 1, 2020.

**Assumptions:** It is assumed CHA representatives will not be in direct contact with infected patients, members of the general public, with those testing positive for the virus, or with those known to have previously been infected. This Site-Specific HASP supplement does not provide guidance or recommendations for working in areas with known infected individuals testing positive for or are being treated for COVID-19.

**Guidance:** CHA representatives will implement and follow the below guidance at a minimum while providing services associated with this contract from commencement to completion, and in conjunction with current CHA Health and Safety Guidelines:

- Maintain Social Distancing at a minimum of six (6) feet whenever practical while within the field office location, the contractors field location, all areas within the hospital intended for access by CHA, and within designated construction areas

- To the extent possible, meetings will be scheduled to allow for remote access to reduce the potential for contact
    - CHA representatives will not attend face-to-face meetings in which Social Distancing policies cannot be maintained or in locations which have not been approved by the CHA Health and Safety Officer (ie. A conference room in the wing of the facility treating patients)

- CHA representatives will don the appropriate PPE gear such as, protective latex gloves and medical / dust masks as recommended by the CDC, while working within construction areas including, but not limited to, inspections, investigations, approvals, and punch-list.

- Masks and gloves are to be replaced at regular intervals as recommended by the CDC, and disposed of appropriately

- CHA representatives will adhere to hand washing and hand sanitizing practices consistent with updated CHA Health and Safety Guidance, and the CDC guidance – links attached within the listed below references.

**Additionally,** All CHA Employees will adhere to the following protocols:

1.) All field staff will have the CHA essential employee letter (attached to this email) with them at all times in the field and will also have the applicable client letter stating they are essential employees if provided by the client.

2.) If employees have a badge for the client they are working with the badge will be made clear and present.

3.) We will make all attempts to have 1 person per car for field work, all attempts possible to make this happen.

4.) Employee's will practice Social Distancing where it can be safely performed.

5.) No handshaking is permitted

**References:** OSHA 3990-03 2020 "Guidance on Preparing Workplaces for COVID-19;" NYS Executive Orders (EO) No.202 through No. 202.13[1]; Center for Disease Control and Prevention (CDC) Guidance Documents on COVID-19 https://www.cdc.gov/; CHA Intranet COVID-19 Information Portal https://intranet.cha-llp.com/cms/news/.

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[1] NYS Executive Orders issued by Gov. Andrew Cuomo have extended from 202 through 202.13 as of 4/4/2020. EO No. 202 Declaring a Disaster Emergency in State of New York was issued on 1/30/2020.

# COVID-19 JOBSITE PRACTICES

## EMPLOYERS

Social distancing:
Plan work for 6 feet of separation between workers

Designate a social distancing officer (SDO)

Plan gatherings and breaks for groups of 10 or less

Clean and disinfect surfaces

Ensure you have adequate hand washing stations

Provide PPE to prevent transmission

Restrict the number of visitors to the jobsite

Screen visitors prior to arrival

## EMPLOYEES

Prevent transmission:
stay home if you're sick or have symptoms

Cover your cough

Wash your hands often

Avoid touching your face

Avoid sharing transportation to and from the job site

Wear PPE at all times to prevent transmission

Inform your employer of symptoms or possible exposure to COVID-19

Please refer to www.agc-oregon.org for additional accurate and updated information.

# APPENDIX E

## Incident Report

# Incident Report

**Please note: This form must be completed within (24) hours of an employee's injury or illness during the workday. This form can be completed by the employee or supervisor (or a witness if his/her supervisor is unavailable).**

| **Employee Information** | | | |
|---|---|---|---|
| **Employee's Name** | **Title** | **Group** | **Supervisor** |
| | | | |

| **Incident Details** | | |
|---|---|---|
| **Date of Incident** | **Time of Incident** | **Location of Incident** *(provide address, if available)* |
| | | |

**List the Nature of the Employee's Injury & Body Parts Affected (**Indicate whether a similar work-related injury has occurred in the past)**:**

**Explain What the Employee Was Doing When the Incident Occurred:**

**Describe How the Incident Occurred:**

**List any Applicable Objects That Were Directly Involved in the Injury** *(i.e. motor vehicle, etc):*

| **Did the Employee Stop Work Due to the Injury?** | **If Yes, Has the Employee Returned to Work?** |
|---|---|
| | |

| **Medical Treatment** ***(if known)*** | | | | |
|---|---|---|---|---|
| **Did the Employee Seek Medical Treatment?** | **Date of First Medical Treatment** | **Location of Treatment** *(provide address, if available)* | **Type of Facility** *(i.e. emergency room, hospital, urgent care, doctor's office)* | **What Type of Treatment** |
| | | | | |

| **Acknowledgment** | |
|---|---|
| **Employee Signature:** | **Date:** |
| | |
| **Supervisor (or Witness) Name (Printed):** | **Supervisor (or Witness) Signature:** |
| | |

**RETURN COMPLETED FORM TO MEGAN ROBERTSON IN HUMAN RESOURCES**

*PHONE NUMBER - (518) 453-8750*
*FAX NUMBER – (518) 453-2889*
*E-MAIL ADDRESS – MROBERTSON@CHACOMPANIES.COM*

**cc: Health & Safety**
**M. Platt**

## CHA (Your Location) Office

## - What to do for Accidents, Incidents, Safety Hazards & Near Misses

1) **<u>If any injury occurs, no matter how minor:</u>**

   a. Get it treated immediately as required. Notify supervisor.
   b. Contact Megan Robertson as soon as possible. Contact Margaret Rudzinski if Megan cannot be reached.
   c. Complete a CHA incident report form and return to Megan Robertson within 24 hours. (V:\Public\ANY\Health_&_Safety\Incident Reporting)

'Contact' means phone until you talk to the person directly. Voicemails and emails do not count.

*<u>(Employees should not provide their personal medical insurance information to the medical facility for work-related incidents. Please contact HR for further direction on how your work-related medical claim will be paid.)</u>*

2) **<u>For any accident, incident, safety hazard or near miss (no injury occurs)</u>**

   a. Use your 'Stop Work' Authority as required. EVERYONE has the authority to stop work if they see a significant safety issue.
   b. For all – Report to your supervisor within 24 hours.

'Report' means phone, leave voicemail or email as appropriate.

| | | |
|---|---|---|
| Megan Robertson<br>(Director of HR Operations) | 1-518-453-8750 – Office phone<br>1-518-453-2889 – Fax<br>mrobertson@chacompanies.com | For all Project accidents and incident and/or potential workmen's compensation claims |
| Margaret Rudzinski<br>(Sr. VP, Corporate Environmental Health & Safety) | 1-518-453-2830 – Office phone<br>1-518-469-9259 – Cell phone<br>mrudzinski@chacompanies.com | Report all safety hazards/issues to Margaret Rudzinski |

Recommendations for additional contacts:

- Office Leader
- Safety Coordinator

# APPENDIX F

## Respirator Inspection Checklist

# RESPIRATOR INSPECTION RECORD

Make ______________________________ Model ______________________________

Style ______________________________ Size ______________________________

| | INSPECTED | COMMENTS |
|---|---|---|
| Facepiece | | |
| Inhalation Valve | | |
| Exhalation Valve Assembly | | |
| Headbands | | |
| Cartridge Holder | | |
| Cartridge/Canister | | |
| Filter | | |
| Harness Assembly | | |
| Hose Assembly | | |
| Speaking Diaphragm | | |
| Gaskets | | |
| Connections | | |
| Other Defects | | |

| | DATE | PASS/FAIL |
|---|---|---|
| Qualitative Fit Test | | |

Certification: I ________________________________ certify that I performed and understand the above inspection procedure and the qualitative fit test. I certify that I have performed these tasks myself prior to wearing my respirator.

______________________________ ______________________________

Date Signature

CHA

# APPENDIX H

# CAMP/CERP

# Community and Environmental Response Plan And Community Air Monitoring Plan

## Former Coyne Textile Facility
## 140 Cortland Avenue
## Syracuse, New York 13202

## Site No. C734144

*CHA Project Number: 059294.001*

***Prepared for:***
***JMA Wireless d/b/a GEC Consulting***
*168 Brampton Road*
*Syracuse, New York 13205*

***Prepared by:***

CHA

*300 South State Street, Suite 600*
*Syracuse, New York 13202*
*Phone: (315) 471-3920*

***June 2020***

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# LIST OF ACRONYMS & ABBREVIATIONS

| | |
|---|---|
| 6 NYCRR | Title 6 New York Codes, Rules and Regulations |
| BCP | Brownfield Cleanup Program |
| CAMP | Community Air Monitoring Plan |
| CERP | Community and Environmental Response Plan |
| CHA | CHA Consulting, Inc. |
| DER-10 | DER-10: Technical Guidance for Site Investigation and Remediation |
| ISSS | In-Situ Soil Stabilization |
| NYSDEC | New York State Department of Environmental Conservation |
| NYSDOH | New York State Department of Health |
| PID | Photoionization Detector |
| PM10 | Particulate Matter less than 10 microns |
| PPE | Personal Protective Equipment |
| QA/QC | Quality Assurance/Quality Control |
| RD Report | Remedial Design Report |
| SDS | Safety Data Sheets |
| SOP | Standard Operating Procedures |
| SSO | Site Safety Officer |
| STEL | Short Term Exposure Limit |
| SWPPP | Stormwater Pollution Prevention Plan |
| UST | Underground Storage Tank |
| VOC | Volatile Organic Compound |
| ZVI | Zero-valent Iron |

| | |
|---|---|
| eV | Electron Volts |
| $g/m^3$ | Grams per Cubic Meter |
| $mg/m^3$ | Milligrams per Cubic Meter |
| ppm | Part per Million |
| $\mu g/m^3$ | Micrograms per Cubic Meter |
| µm | Micrometers/microns |

# 1.0 INTRODUCTION

This Community Environmental Response Plan (CERP) and Community Air Monitoring Plan (CAMP) have been prepared for the Former Coyne Textile Facility (Site), located at 140 Cortland Avenue in the City of Syracuse, New York, and is to be utilized during implementation of the remedial design implementation at the Site. The Site is a part of the New York State Department of Environmental Conservation's (NYSDEC) Brownfield Cleanup Program (BCP).

This CAMP/CERP has been prepared in accordance with the NYSDEC and New York State Department of Health (NYSDOH) guidelines to address the potential short-term impacts to the surrounding community and is Appendix H to the Remedial Design Report (RD Report). The RD includes various remedial activities and the treatment zones and associated technologies/techniques to be used within each zone are depicted on Figure 7 of the RD Report. This CAMP/CERP provides information to members of the community regarding the procedures in place to protect their health and minimize disturbance caused by the work. All work will be conducted in accordance with the NYSDEC approved RD Report and in accordance with CHA Consulting's (CHA) Standard Operating Procedures (SOPs).

Generally, the remediation will include the following activities.

- Removal of the underground storage tank (UST) and excavation of contaminated soils in Treatment Zone 1;
- Collection of documentation soil samples;
- Import and placement of clean fill material in Treatment Zone 1;
- Excavation of surface soils in Treatment Zone 2;
- Soil mixing with zero-valent iron (ZVI) at the applicable depths within Treatment Zone 2;
- Installation of injection and extraction wells and associated equipment in Treatment Zone 3;
- Operation of a groundwater recirculation system;
- Decommissioning of the injection and extraction wells;
- Restoration or replacement of soil cover system to all portions of the Site that are disturbed by remedial activities;
- Equipment decontamination and cleaning; and
- Waste handling and transportation.

# 2.0 PUBLIC AND COMMUNITY OUTREACH

A CAMP/CERP has been developed for this RD Report to address the protection of the public due to the proximity of adjacent occupied properties. If members of the community have questions or concern, the following contact information and documents are provided.

## 2.1 CONTACT INFORMATION

**Project Related Questions**
Michael Belveg
NYSDEC Project Manager
315 Erie Boulevard West
Syracuse, New York 13204
(315) 426-7446
Michael.belveg@dec.ny.gov

**Project Related Health Questions**
Angela Martin
NYSDOH
Corning Tower
Empire State Plaza
Albany, New York 12237
(518) 402-7860
beei@health.ny.gov

## 2.2 DOCUMENT REPOSITORY

CHA has established a local document repository for Site-related documents. The Site documents are available to the community for review throughout the remedial program at the following location:

New York State Department of Environmental Conservation
Region 7 Headquarters
615 Erie Boulevard West
Syracuse, New York 13204
(315) 426-7400

Onondaga County Public Library
Central Branch
447 S. Salina Street
Syracuse, New York 13202
(315) 435-1900

# 3.0 PUBLIC AND COMMUNITY OUTREACH

## 3.1 GENERAL SCOPE OF WORK

The Contractor will conduct all work within the BCP property boundary and along the sidewalk of South Clinton Street. A section of the building will be demolished prior to remedial activities and is not part of the site remediation. The two-story section consisting of approximately two-thirds of the structure, will be demolished while the three-story section will remain. Demolition will not include removal of the concrete slab in order to prevent unnecessary exposure to contaminated soil and groundwater. Demolition of a portion of the building is part of the site redevelopment plan. Therefore, the CERP and CAMP do not apply to that work that precedes the site remedial activities.

Remediation of the three treatment zones will occur post-demolition of the two-story structure. Treatment Zones 1 and 2 will be entirely open to the environment. Treatment Zone 3 will be partially within the remaining three-story structure and partially exposed to the environment.

## 3.2 TEMPORARY SECURITY MEASURES

The Site is secured with temporary construction fencing, locked gates and/or doors at all entrances. If a door is propped open for ventilation purposes, orange construction fence and appropriate signs will be placed at that location to indicate the area is considered an active construction site and only authorized personnel are allowed to enter. The proposed limits of work are identified on Figure 2 of the RD Report.

## 3.3 OFF-SITE TRUCKING ROUTES

Traffic routes and traffic management at the project Site will be utilized when:

- Mobilizing/Demobilizing heavy equipment;
- Hauling impacted soil and debris off-Site;
- Importing clean fill to the project Site;
- Contractor access and parking; and,
- Equipment access and storage.

The Contractor will provide traffic control personnel when all trucks are entering or exiting the project Site on Cortland Avenue and South Clinton Street. Traffic control personnel will also direct traffic as needed upon delivery of equipment, trailers, excavation support materials, etc. To maintain access and lines of sight, the Contractor will arrange for and coordinate with the appropriate local authorities so that on-street parking nearest to the work area is limited throughout the duration of the work. Truck access, particularly for work associated with the UST removal and contaminated soil excavation, will occur on the South Clinton Street side of the Site. Trucks will only enter from the north and continue south when pulling out of the Site. Although traffic is less frequent on South Clinton Street, traffic and pedestrian control personnel are necessary during these activities.

All roadways utilized by the Contractor during the work will be checked daily for spillage, debris and dust and cleaned to the satisfaction of the Engineer, as necessary.

All transport of materials requiring off-site disposal at a permitted facility will be performed by licensed haulers in accordance with appropriate local, State, and Federal regulations, including Title 6 New York Codes, Rules and Regulations (6 NYCRR) Part 364. Loaded vehicles leaving the Site will be appropriately lined, securely covered, manifested, and placarded in accordance with appropriate Federal, State, and local requirements.

Material transported by trucks exiting the Site will be secured with tight-fitting plastic covers. Loose-fitting canvas and/or mesh-type truck covers will be prohibited. Trucks will be prohibited from transporting saturated soil. Rather, saturated soil should be placed on a containment pad to facilitate dewatering prior to transport. Upon arrival to the project site, each truck will be visually inspected by the contractor to verify appropriate permits are in place. When applicable, odorous truckloads of soil will be sprayed with odor control foam. The trucks will also utilize a heavy tarp which will be extended over the cargo area and overlap the sides and rear of the cargo area to prevent soil from becoming airborne during transport. If necessary, vehicles exiting the Site will pass through a decontamination station as described in Section 3.4. Care will be taken to prevent truck tires from coming into contact with contaminated materials to avoid the need for decontamination prior to leaving the Site.

## 3.4 VAPOR/ODOR MANAGEMENT PLAN

Measures to control vapor/odor during the remediation are discussed in the CAMP, Section 4.0 of this report.

## 3.5 WATER MANAGEMENT

The Contractor is responsible for water management on Site including the management of stormwater runoff, dewatering of excavations (if necessary) and water generated from decontamination activities. Site disturbance during the remedial activities is anticipated to be less than one acre, therefore a SWPPP has not been prepared. Stormwater will be managed through the use of best management practices and temporary controls. Wastewater from excavations and associated with small equipment decontamination may be containerized for waste disposal. Large equipment will be decontaminated at the conclusion of intrusive activities and prior to demobilizing equipment from the project Site. Appropriate precautions should be taken throughout the intrusive processes to limit contact with contaminated soil. Only parts of equipment that have come in contact with the soil will require decontamination. Examples of such precautions include, but are not limited to:

- Where possible, all trucks and/or roll-off containers will be loaded adjacent to the excavation. Care will be taken such that impacted soil is not spilled on the sides of the trucks/containers as they are loaded and that the trucks do not drive through contaminated soils.

- Efforts will be made to minimize the amount of equipment and machinery that comes into contact with the impacted soils. This includes maintaining the concrete slab in areas adjacent to the treatment zones, placing polyethylene sheeting between the excavation and the truck/container during loading to limit incidental spillage onto clean surfaces.

During operation of the groundwater recirculation system for Treatment Zone 3, water will be contained within a system of pipes, tubes, and tanks. All rigid piping and process equipment will be located within secondary containment. In the event of a release, spill containment pads and Speedi-Dry will be available on Site. Spill cleanup materials will be disposed of in drums in accordance with Section 3.7.

## 3.6 WASTE MANAGEMENT

The Contractor is responsible for waste management. It is anticipated that impacted soils removed from the Site will be directly loaded into trucks for shipment to the approved waste facility. The Contractor will schedule trucks in a manner that will minimize the wait time for loading. Vehicles containing excavated soils will be covered with a solid plastic tarpaulin. If necessary, spray-on odor suppressing materials such as Rusmar® Foam may be used to reduce potential volatile organic compound (VOC) emissions or odors during transit. In the event direct loading of soil for off-site disposal is not feasible, soil will be stockpiled on a containment pad within the work area. The stockpile shall have a sufficient berm and be graded toward a corner of the stockpile in order collect water draining from the material. The stockpile will be covered with polyethylene sheeting at the end of each day or on days when excavation and stockpiling are not occurring.

Waste generated from remedial activities that contacted contaminated soil or groundwater, such as spill cleanup supplies, will be contained and disposed of in 55-gallon steel drums or totes. Other construction derived waste that was not directly in contact with Site soils and/or groundwater will be managed as municipal solid waste.

### 3.7 DECONTAMINATION

Personnel working in the Exclusion Zone (within 25 feet of intrusive Site activities) will be required to enter and exit the work area through the Contamination Reduction Zone. Personnel working within the Exclusion Zone will wear the appropriate personal protective equipment (PPE). The decontamination area will be placed upwind of the Exclusion Zone, and the location may vary daily based on wind direction.

The following equipment is needed for decontamination:

- Alconox®
- Water
- Impermeable Containers

Non-disposable PPE will be decontaminated with soap (i.e. Alconox®) and water. Disposable items will be disposed of in dry, impermeable containers.

Equipment and vehicles that come into contact with contaminated materials will undergo decontamination procedures in the Contamination Reduction Zone prior to leaving the Site. CHA's field personnel will document in the daily field log any equipment that has been decontaminated prior to removal from the Site. The decontamination procedures will include, but are not limited to:

- Movement of equipment to the decontamination pad;
- Removal of heavily caked material with brushes or shovels; and
- Triple-rinsing with high pressure water or steam.

***Small Equipment:***

For soil sampling, dedicated sampling equipment is preferred. However, if non-dedicated equipment is used (i.e. stainless-steel soil sampling equipment), the required decontamination procedure for non-dedicated equipment is:

- Disassemble equipment, as required.
- Remove gross contamination from the equipment by brushing and then rinsing with tap water.
- Wash and scrub with low phosphate detergent (e.g. Alconox®).
- Tap water rinse.
- Distilled water rinse.
- Air dry.

Decontaminated equipment shall be placed on polyethylene sheeting or aluminum foil in order to avoid contacting a contaminated surface prior to use. Field personnel will use a new pair of outer gloves before handling sample equipment after it is cleaned. During periods of transportation and non-use, decontaminated sampling equipment shall be wrapped in aluminum foil or placed in a new/clean plastic bag.

***Large Equipment:***

The Contractor is responsible for decontamination of large equipment that comes into contact with Site media. Decontamination of heavy construction equipment will be performed by the contractor under the contractor's site-specific health and safety plan.

## 4.0 COMMUNITY AIR MONITORING PLAN

Air monitoring at the Site will be performed during all intrusive activities where there is a potential to come into contact with existing soil in accordance with the NYSDOH Generic CAMP, and Appendix 1A and 1B of DER-10: Technical Guidance for Site Investigation and Remediation (DER-10). All air monitoring will be conducted on a real-time basis for particulates (i.e. dust) and organic vapors.

The primary contaminants of concern associated with the Site are solvents, which are volatile organic compounds (VOCs). Particulates and VOCs will be monitored concurrently within a CAMP station containing a DustTrak aerosol monitor and photoionization detector (PID), or similar.

Air monitoring readings will be uploaded in real time and made available for review by both the NYSDEC and NYSDOH. Any exceedances that may occur will be addressed and recorded in the field logbook. Given that the work within all three treatment zones is anticipated to be performed simultaneously, air monitoring will be performed during all ground intrusive activities at one location upwind and one location downwind of each active treatment zone (i.e. 1 upwind and up to 3 downwind). The direction of wind will be monitored daily to determine upwind and downwind locations.

Enclosures will be provided for remote air monitoring stations to reduce potential weather-induced performance issues. The enclosures will be located in areas where they are not subject to damage from vehicular traffic and there is minimal potential for tampering in publicly accessible areas. Additionally, all intake ports on the instruments will be equipped with rain guards/shields to minimize the potential for water intrusion.

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 remedial activities. Reliance on the CAMP should not preclude simple common-sense measures to keep VOCs and dust to a minimum around the work areas. Supplements to the CAMP may be required depending on the nature of the planned intrusive 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.

**"Continuous monitoring"** will be required for all ground intrusive activities. Ground intrusive activities include, but are not limited to, underground storage tank removal and soil/waste excavation and handling, soil mixing and application of ZVI, and installation of the extraction/injection well field.

**"Periodic monitoring"** will be conducted on excavated material and during soil sampling. Excavated soil will be screened for the presence of VOCs with a handheld PID. Soil will be loaded directly into trucks or stockpiled for characterization and off-Site disposal in accordance with the RD Report.

To verify that the fugitive dust and VOC measurements are performed correctly, there must be appropriate Quality Assurance/Quality Control (QA/QC). It is the responsibility of the Engineer to conduct periodic instrument calibration, operator training, daily instrument performance checks, and maintain a record keeping plan.

## 4.1 FUGITIVE DUST AND PARTICULATE MONITORING, RESPONSE LEVELS, AND ACTIONS

Fugitive dust is described as discrete particles, liquid droplets or solids, which become airborne and contribute to air quality as a nuisance and potential threat to human health and the environment. The following fugitive dust suppression and particulate monitoring program will be employed at the Site during 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 placement of clean fill. These control measures are not considered necessary for the placement of clean fill.
3. Particulate monitoring will be performed using real-time particulate monitors and will 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 µg/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 (mass median diameter (mmd)= 2 to 3; 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 to 10 microns (µm);
    g. Total Number of Data Points in Memory: 10,000 or greater;
    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 short-term exposure limit (STEL) (15 minutes), alarms required. Personnel conducting air monitoring must be immediately notified of any alarms by remote sensors, text messaging, or other similar equipment. Utilizing periodic checks of instrumentation in alarm mode only is not acceptable monitoring practice.
    k. Operating Time: 48 hours (fully charged NiCd battery); continuously with charger;
    l. Operating Temperature: 0 to 50˚ C (14 to 122˚ F); and
    m. Operating Humidity: 10 to 99 percent Relative Humidity.

4. Particulate levels will be monitored immediately downwind at the working Site and integrated over a period not to exceed 15 minutes. Consequently, instrumentation shall require necessary averaging hardware to accomplish this task.

5. The action level will be established at 150µg/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 150µg/m³, the upwind background level must be confirmed immediately. If the working site particulate measurement is greater than 100 µg/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. Should the action level of 150µg/m³ continue to be exceeded, work must stop and Project Managers from CHA, NYSDEC, and NYSDOH must be notified. 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.

The following techniques have been shown to be effective for the controlling of the generation and migration of dust during construction activities:

- Wetting equipment and excavation faces;
- Spraying water on buckets during excavation and dumping;
- Hauling materials in properly tarped or watertight containers;
- Restricting vehicle speeds to 10 miles per hour (on site); and
- Covering excavated areas and material after excavation activity ceases.

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.

The evaluation of weather conditions is necessary for proper fugitive dust control. When extreme wind conditions make dust control ineffective, 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.

## 4.2 VOLATILE ORGANIC COMPOUND MONITORING, RESPONSE LEVELS, AND ACTIONS

VOCs will be monitored at upwind and downwind locations adjacent to the ground intrusive work area. VOCs will be monitored on a continuous basis, concurrently with fugitive dust monitoring. The monitoring work should be performed using a 10.6 eV PID. 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.

If the ambient air concentration of total organic vapors at the downwind perimeter of the work area 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.

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.

If the organic vapor level is above 25 ppm at the perimeter of the work area; activities must be shutdown. The NYSDEC, NYSDOH, and the CHA Project Manager will be notified of the situation. Emergency Response Contacts identified in the Health and Safety Plan, including the local police and fire departments, may be contacted by CHA.

Air monitoring will be conducted at 15-minute intervals at a 20-foot offset from the exclusion zone. If two successive readings below 25 ppm are measured by the field instrument and documented, the work may resume following the previously described monitoring plan.

All 15-minute readings will be recorded and be available for State (NYSDEC and NYSDOH) personnel to review. Instantaneous readings, if any, used for decision purposes will also be recorded.

## 5.0 EMERGENCY RESPONSE PROCEDURES

911 service is available and confirmed at this location. Call 911 immediately for additional emergency response. Only if 911 is unavailable or has a long lead time should someone be driven to the nearest medical facility.

On-Site emergencies can range in intensity from minor to serious conditions. Various procedures for responding to Site emergencies are listed in this section. The designated Site Safety Officer (SSO) is responsible for contacting the CHA Project Manager who will notify the client as appropriate in emergency situations (however, others must assume responsibility if the situation warrants). An injured person shall be accompanied by another worker at all times.

Should an on-Site emergency occur at the project Site (related to the project or otherwise) the following procedures shall be followed:

- Call 911 for additional emergency response.
- If the emergency occurs and is project specific, notify your assigned Health and Safety Coordinator after emergency care is provided to activate the appropriate actions.
- Properly trained personnel will determine if the emergency can be contained or remediated and initiate the appropriate action(s). Personnel shall not respond beyond their level of training.
- Employees are not to risk their health or life in taking aggressive action(s) to fight fire or stop releases. Only defensive actions shall occur until an action plan is resolved.
- Choose an exit route that provides fast, and safe, egress from the work area. The route taken should always be away from obvious obstructions or other hazardous conditions. Consult an evacuation map if you are unsure of where the nearest exit route is located.
- Do not delay evacuation to retrieve personal items or equipment.

- Persons shall exit areas in groups and attempt to stay together during evacuation procedures.
- While evacuating, notice any conditions which should be reported to emergency personnel. Be alert for the location of smoke, fire and/or vapors. Report any of these conditions to emergency personnel.
- Be aware of emergency response vehicles and avoid interference with these.

Remain calm, keep voices low and wait for instructions from the Incident Commander. Do not leave the scene prior to notifying your assigned Project Manager and Site Field Team Leader.

In general, if emergency care is needed, personnel will call 911. Provide any emergency medical service personnel with the appropriate safety data sheets (SDS). However, if necessary, transport injured personnel to the nearest hospital using the following directions:

Address: Crouse Hospital
736 Irving Ave
Syracuse, NY 13210

Emergency Room Telephone Number: (315) 470-7111

Directions from site:

1. Head north on Cortland Ave toward S. Salina St.
2. Use any lane to turn left onto S. Salina St.
3. Turn right onto S. Warren St.
4. Turn right at the 1st cross street onto E. Adams St.
5. Turn right onto Irving Ave
6. Your destination is on the right.

**Emergency Contact Information**

Emergency Medical: 911

Fire Dept.: 911

Police Dept.: 911

Department of Emergency Services: 911

Poison Control: (800) 222-1222

CHA Project Manager: Samantha Miller, (315) 257-7154 (Office), (915) 329-9898 (Cell)

CHA Corporate Director of Health and Safety: Ronald Rogers, (518) 453-3917 (Office), (518) 810-8926 (Cell)

CHA

# APPENDIX I

## Field Sampling Plan

# Field Sampling Plan

## Former Coyne Textile Facility
## 140 Cortland Avenue
## Syracuse, New York

## Site No. C734144

*CHA Project Number: 059294.001*

***Prepared for:***
***JMA Wireless d/b/a GEC Consulting***
*168 Brampton Road*
*Syracuse, New York 13205*

***Prepared by:***


CHA

*300 South State Street, Suite 600*
*Syracuse, New York 13202*
*Phone: (315) 471-3920*


***June 2020***

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# LIST OF ACRONYMS & ABBREVIATIONS

| | |
|---|---|
| 6 NYCRR | Title 6 New York Codes, Rules and Regulations |
| AST | Aboveground Storage Tank |
| bgs | Below Ground Surface |
| BCP | Brownfield Cleanup Program |
| CHA | CHA Consulting, Inc. |
| DER-10 | Division of Environmental Remediation Technical Guidance for Site Investigation and Remediation |
| FSP | Field Sampling Plan |
| HASP | Health and Safety Plan |
| ISSS | In-Situ Soil Stabilization |
| NYSDEC | New York State Department of Environmental Conservation |
| NYSDOH | New York State Department of Health |
| PCB | Polychlorinated Biphenyls |
| PID | Photoionization Detector |
| QAPP | Quality Assurance Project Plan |
| RD Report | Remedial Design Report |
| SCO | Soil Cleanup Objectives |
| SOP | Standard Operating Procedures |
| SVOC | Semivolatile Organic Compounds |
| TAL | Target Analyte List |
| TCL | Target Compound List |
| USEPA | United States Environmental Protection Agency |
| VOCs | Volatile Organic Compounds |
| ZVI | Zero-valent Iron |

# 1.0 INTRODUCTION

This Field Sampling Plan (FSP) has been prepared for the Former Coyne Textile Facility (Site), located at 140 Cortland Avenue in the City of Syracuse, New York, and is to be utilized during remedial activities as described in the Remedial Design Report (RD Report). The Site is a part of the New York State Department of Environmental Conservation's (NYSDEC) Brownfield Cleanup Program (BCP).

This FSP outlines the protocols which will be followed during the remedial activities and has been prepared as Appendix I to the RD Report for the project. In general, all activities will be performed in accordance with the CHA Consulting, Inc. (CHA) Standard Operating Procedures (SOPs) included in Appendix F of the RD Report.

The following activities will be conducted as part of the remedial activities:

- Removal of the aboveground storage tank (AST) and excavation of contaminated soils in Treatment Zone 1;
- Collection of confirmatory soil samples;
- Import and placement of clean fill material in Treatment Zone 1;
- Excavation of surface soils in Treatment Zone 2;
- Soil mixing with zero-valent iron (ZVI) at the applicable depths within Treatment Zone 2;
- Installation of injection and extraction wells and associated equipment in Treatment Zone 3;
- Operation of a groundwater recirculation system;
- Decommissioning of the injection and extraction wells;
- Restoration or replacement of soil cover system to all portions of the Site that are disturbed by remedial activities;
- Equipment decontamination and cleaning; and
- Waste handling and transportation.

Sampling of Site media is only anticipated as part of the UST excavation within Treatment Zone 1.

# 2.0 GENERAL SAMPLING PROTOCOLS

The sampling approach and rationale for sample collection is described in Table 1. The Data Quality Objectives for the project and the quality assurance and quality control procedures for the project are described in the Quality Assurance Project Plan (QAPP), found in Appendix J of the

RD Report. Sampling activities will be conducted in a manner to protect both workers and the general public in accordance with the Health and Safety Plan (HASP), found in Appendix G of the RD Report.

## 2.1 SAMPLE DESIGNATION

Samples will be identified in accordance with CHA SOP#103 Sample Naming and Numbering. In summary, each sample will be uniquely defined by including the media type and sequential number.

The following abbreviations will be used to identify media types:

Subsurface Soil…………………………SOIL
Subsurface Soil - Sidewall……………..SOIL-SW
Subsurface Soil – Bottom………………SOIL-B
Waste Characterization Soils…………..SOIL-WC
Blind Duplicate…………………………CHA-001

So as not to be confused with the sampling performed as part of the Source Area IRM, sample numbers will begin starting at sample number 300 (SOIL-B-300 and SOIL-SW-300). Confirmation sampling for the AST and contaminated soil removal within Treatment Zone 1 will begin with SOIL-B-300 and SOIL-SW-300.

## 2.2 SAMPLING HANDLING

A new pair of disposable latex gloves will be used at each location. Additional glove changes will be undertaken as conditions warrant.

Sample containers will be new and delivered from the laboratory prior to the sampling event. Sample containers will come with the proper volume of chemical preservative appropriate for the type of analysis as detailed in CHA SOP#603.

After sample collection, the sample containers will be logged onto a chain of custody record as described in the QAPP. The sample containers will be placed on ice and/or ice packs in laboratory-supplied rigid coolers after collection and labeling. Remaining space will be filled with packing material to cushion the containers during transport or shipment.

For this project CHA staff will hand deliver the sample coolers to the Alpha Analytical Service Center located in Syracuse, New York, or coordinate with their courier service. Samples will remain under the control of CHA's field representative until relinquished to the laboratory under chain-of-custody protocols. Samples will then be shipped to their laboratory located in Westborough, Massachusetts.

## 2.3 FIELD DOCUMENTATION

Pertinent field sampling information shall be recorded in a logbook or on field logs during each day of the field effort per CHA SOP#101 Field Logbook and Photographs and CHA SOP#903 Remedial Construction Oversight and Documentation. At a minimum, entries in a logbook shall include:

- Date and time of starting work
- Names of all personnel at site
- Weather conditions
- Purpose of proposed work effort
- Sampling equipment to be used and calibration of equipment
- Description of work area
- Location of work area, including map reference
- Details of work effort, particularly any deviation from the field operations plan or standard operating procedures
- Field observations
- Field measurements (e.g., photoionization detector (PID) readings)
- Field laboratory analytical results
- Daily health and safety entries, including levels of protection
- Type, number, and location of samples
- Sampling method, particularly deviations from the standard operating procedures
- Sample location and number
- Sample handling, packaging, labeling, and shipping information (including destination)

In addition to keeping logs, photographs will be taken to provide a physical record to augment the fieldworker's written observations. For each photograph taken, several items shall be recorded in the field logbooks:

- Date and time
- Name of photographer
- General direction faced
- Description of the subject

Additional protocols specific to each sampling method are presented in the following sections.

# 3.0 REMEDIAL ACTIVITIES

## 3.1 UST REMOVAL AND EXCAVATION OF CONTAMINATED SOIL

Generally, the remedial action to be completed within Treatment Zone 1 consists of UST removal and excavation of contaminated soil identified during the pre-design investigations. The following are the anticipated components of the selected remedy:

- The northern two-thirds section of the building will be demolished to facilitate access to the Treatment Zones and to allow redevelopment of the Site to meet project goals.
- Concrete slab will be removed in select locations to access the UST and contaminated soil.
- The UST will be cleaned, removed, rendered useless, and transported for off-Site disposal.
- Contaminated soil within Treatment Zone 1 will be excavated no deeper than the water table, which is anticipated between 8 and 10 ft below ground surface (bgs).
- If a smear zone on is observed at the water table, effort will be made to remove this zone as described in the RD Report.
- Upon removal of the contaminated soil, post-excavation confirmatory samples will be collected along the excavation sidewalls and bottom.
- The excavation area will be backfilled with clean structural fill material for future Site redevelopment.

## 3.2 CONFIRMATION SAMPLING

Once soil is removed from the excavation, confirmatory soil sampling will be conducted in accordance with DER-10, Section 5.5. One soil sample will be collected from near the bottom of the sidewalls from the interior area of the excavation support system, for every 30 linear feet of sidewall. A minimum of one bottom of excavation sample will be collected at a depth from zero to two feet below the bottom of excavation for every 900 square feet of the excavation. Based on estimated size of the excavation, up to 17 confirmation soil samples will be collection from the excavation at completion, including 10 sidewall samples and 7 bottom samples are anticipated. It is noted that the required number of bottom samples is based upon the areal extent of the excavation rather than the length of tank given that the extent of the excavation is intended to extend beyond the footprint of the tank. Based upon the conditions encountered following tank removal and contaminated soil excavation, additional samples may be required based upon several factors, including but not limited to, observed contamination remaining in the excavation. All samples will be submitted to an ELAP approved laboratory, following proper chain-of-custody protocols and analyzed for the following minimum parameters:

- Target Compound List (TCL) Volatile Organic Compounds (VOCs) via USEPA Method 8260;

- TCL Semivolatile Organic Compounds (SVOCs) via USEPA Method 8270;
- Target Analyte List (TAL) Metals via USEPA Methods 6010C and 7470A;

Analytical methods, sample volumes, preservation techniques and holding times associated with the above samples are provided in the QAPP included as Appendix J to the RD Report.

The analytical results of the confirmation sampling will be provided to the NYSDEC and New York State Department of Health (NYSDOH) once available from the laboratory. The decision to backfill the excavation will be determined in consultation with the NYSDEC based upon the analytical results meeting the Title 6 New York Codes, Rules and Regulations (6 NYCRR) Part 375 Commercial Soil Cleanup Objectives (SCOs) and/or the feasibility of continued excavation (e.g., proximity to building foundation footers, property boundaries, etc.).

Soil samples will be analyzed for the presence of VOCs will be collected using a Terra Core™ sampler or equivalent. The 5-gram plug of soil will be capped and sent to the laboratory where it will be preserved, extracted, and analyzed. The remaining sample volume will be homogenized by the following process:

1. Remove rocks, twigs, leaves and other debris from the sampling device.
2. Place the sample into a stainless-steel bowl and thoroughly mix using a stainless-steel spoon.
3. Scrape the sample from the sides, corners and bottom of bowl, roll to the middle of the bowl and mix.
4. Quarter the sample and move to the four corners of the bowl. Each quarter will be individually mixed and rolled to the center of the bowl and then the entire sample will be mixed again.
5. Place the sample into the appropriate glassware required for each of the remaining parameters; SVOCs, TAL) metals, and total PCBs.

## 3.3 WASTE CHARACTERIZATION SAMPLING

Soil waste characterization will occur prior to excavation and removal of contaminated soil to facilitate live loading of soils. The remedial Contractor will be responsible for the collection of waste characterization samples, coordination with regulated facilities, and licensed haulers. Analytical data and approved waste profiles, weight tickets, manifests, and bill of ladings will be provided to the Engineer in accordance with the RD Report and Technical Specifications.

### 3.4 IMPORTED FILL SAMPLING

Sampling of imported fill material will be conducted by the remedial Contractor in coordination with the source quarry and CHA. Imported fill sampling requirements stated on Table 5.4 of DER-10 will be followed. It is anticipated a maximum of 1,900 cubic yards of imported soil is required to fill the excavation within Treatment Zone 1. Therefore, it is anticipated that ten discrete samples analyzed for VOCs via USEPA Method 8260C and 4 composite samples analyzed for the following:

- TCL SVOCs via USEPA Method 8270D;
- TAL Metals via USEPA Methods 6010C and 7470A;
- TCL Pesticides via USEPA Method 8081B;
- Total PCBs via USEPA Method 8082;
- PFAS via USEPA Method Modified 537; and,
- 1,4-Dioxane via USEPA Method 8270.

The remedial Contractor will be required to provide the analytical results to the Engineer for approval prior to importing the material to the Site, in accordance with the RD Report and Technical Specifications.

## 4.0 INVESTIGATION DERIVED WASTE

It is anticipated that all soil removed from intrusive activities will be live loaded into trucks with tight fitting covers. If the soil is saturated, polyethylene liners will be installed in the truck box to prevent spillage or dripping of liquids from the contaminated soil. If live loading of soil is not feasible, soil may be stockpiled on polyethylene sheeting and covered in accordance with the RD Report and Technical Specifications.

Gloves, personal protection equipment, sampling materials, etc. will be collected daily and disposed of as solid waste. All work will be performed in accordance with CHA SOP#507.

# TABLES

**Table 1: Sampling Rationale**

| Sample ID | Matrix | Sample Depths | Sample Location | Analytical Parameters | Rationale |
|---|---|---|---|---|---|
| SOIL-SW-300 – SOIL-SW-309 | Subsurface Soil, sidewall sample | Near bottom of the excavation | Treatment Zone 1, Sidewall of excavation of #6 fuel oil tank | TCL VOCs, TCL SVOCs, TAL Metals, PCBs, PFAS, 1,4-Dioxane | Confirmation sample for contaminant source removal. It is anticipated the contamination will extend past the limits of excavation, but gross contamination shall be removed to the greatest extent feasible. |
| SOIL-B-300 – SOIL-B-306 | Subsurface Soil, bottom sample | 0 to 2 feet below the bottom of the UST | Treatment Zone 1, Bottom of excavation of #6 fuel oil tank | TCL VOCs, TCL SVOCs, TAL Metals, PCBs, PFAS, 1,4-Dioxane | Confirmation sample for contaminant source removal. It is anticipated the contamination will extend past the limits of excavation, but gross contamination shall be removed to the greatest extent feasible. |

CHA

# APPENDIX J

# QAPP

# Quality Assurance Project Plan

## Former Coyne Textile Facility
## 140 Cortland Avenue
## Syracuse, New York

## Site No. C734144

*CHA Project Number: 059294.001*

***Prepared for:***
***JMA Wireless d/b/a GEC Consulting***
*168 Brampton Road*
*Syracuse, New York 13205*

***Prepared by:***


CHA

*300 South State Street, Suite 600*
*Syracuse, New York 13202*
*Phone: (315) 471-3920*


***June 2020***

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# LIST OF ACRONYMS & ABBREVIATIONS

| | |
|---|---|
| ASP | Analytical Services Protocol |
| BCP | Brownfield Cleanup Program |
| CHA | CHA Consulting, Inc. |
| COC | Chain of Custody |
| DER-10 | Division of Environmental Remediation Technical Guidance for Site Investigation and Remediation |
| ELAP | Environmental Laboratory Approval Program |
| FSP | Field Sampling Plan |
| GC/MS | Gas Chromatography/Mass Spectrometry |
| ISSS | In-Situ Soil Stabilization |
| MS/MSD | Matrix Spike/Matrix Spike Duplicate |
| NYSDEC | New York State Department of Environmental Conservation |
| NYSDOH | New York State Department of Health |
| PCB | Polychlorinated Biphenyl |
| QA | Quality Assurance |
| QAPP | Quality Assurance Project Plan |
| QC | Quality Control |
| RD Report | Remedial Design Report |
| RPD | Relative Percent Difference |
| SOP | Standard Operation Procedure |
| SVOC | Semivolatile Organic Compound |
| TAL | Target Analyte List |
| TCL | Target Contaminant List |
| USEPA | United States Environmental Protection Agency |
| UST | Underground Storage Tank |
| VOCs | Volatile Organic Compounds |
| ZVI | Zero-valent Iron |

# 1.0 INTRODUCTION

This Quality Assurance Project Plan (QAPP) presents the policies, organization, objectives, functional activities and specific Quality Assurance (QA) and Quality Control (QC) activities designed to achieve the specific data quality goals associated with the Remedial Design that will be implemented at the Former Coyne Textile Facility located at 140 Cortland Avenue, Syracuse, New York (Site). The Site is in the Brownfield Cleanup Program (BCP) as BCP Site No. C734144. The scope of work associated with the remedial activities are summarized in the Remedial Design Report (RD Report).

This QAPP has been prepared to identify procedures for sample preparation and handling, sample chain-of-custody (COC), laboratory analyses, and reporting to be implemented during this investigation to ensure the accuracy and integrity of the data generated during the investigation. This QAPP has been prepared in accordance with the New York State Department of Environmental Conservation's (NYSDEC) Department of Remediation (DER-10) Technical Guidance for Site Investigation and Remediation. Field activities will be performed in accordance with CHA Consulting, Inc. (CHA) standard operating procedures (SOPs), included in Appendix F of the RD Report.

## 1.1 SCOPE OF WORK

The remedial contractor will conduct all work within the property boundary and along the sidewalk of South Clinton Street. A section of the building will be demolished prior to remedial activities. The two-story section consisting of approximately two-thirds of the structure, will be demolished while the three-story section will remain. Demolition will not include removal of the concrete slab in order to prevent unnecessary exposure to contaminated soil and groundwater.

Remediation of the three treatment zones will occur post-demolition of the two-story structure. Treatment Zones 1 and 2 will be entirely open to the environment. Treatment Zone 3 will be partially within the remaining three-story structure and partially exposed to the environment.

Generally, the remediation will include the following activities.

- Removal of the underground storage tank (UST) and excavation of contaminated soils in Treatment Zone 1;
- Collection of documentation soil samples;
- Import and placement of clean fill material in Treatment Zone 1;

- Excavation of surface soils in Treatment Zone 2;
- Soil mixing with zero-valent iron (ZVI) at the applicable depths within Treatment Zone 2;
- Installation of injection and extraction wells and associated equipment in Treatment Zone 3;
- Operation of a groundwater recirculation system;
- Decommissioning of the injection and extraction wells;
- Restoration or replacement of soil cover system to all portions of the Site that are disturbed by remedial activities;
- Equipment decontamination and cleaning; and
- Waste handling and transportation.

This QAPP has been prepared in accordance with NYSDEC DER-10 (May 2010) to outline the procedures and protocols that will be utilized collect waste characterization samples and confirmation samples from the sidewalls of the excavation.

## 2.0 PROJECT ORGANIZATION AND RESPONSIBILITY

**<u>NYSDEC Regulatory Authority</u>**

**Michael Belveg - NYSDEC Project Manager**

- Approve the RD Report and all appendices, including this QAPP, and any modifications to the project

**<u>NYSDOH Regulatory Authority</u>**

**Angela Martin – NYSDOH Project Manager**

- Review and approve the RD Report and all appendices, including this QAPP, and any modifications to the project

**<u>JMA Wireless</u>**

**Gail Cawley – JMA Wireless d/b/a GEC Consulting Project Manager**

- Client representative, responsible for the overall Brownfield Cleanup Program management of the Former Coyne Textile Facility.

**<u>CHA</u>**

**Samantha Miller – CHA Project Manager, Technical Manager/Project Coordinator**

- Responsible for design of the remedial activities;
- Responsible for following the approved remedial design report (RD Report), notifying the NYSDEC of any deficiencies, and obtaining approval by the NYSDEC for all modifications to the project;
- Provide overall and day-to-day project management;
- Ensure all resources of CHA are available on an as-required basis;
- Participate in key technical negotiations with the NYSDEC, as necessary;
- Evaluate data;
- Prepare and coordinate the issuance of reports;
- Provide immediate supervision of all on-site activities;
- Assist in preparation and review of final report; and
- Provide technical representation for field activities.

**Scott Smith, PE - CHA Site Investigation and Remediation Technical Leader**

- Responsible for design of the remedial activities;
- Provides oversight and guidance on implementation of the design;
- Assist in preparation and review and providing Professional Engineering seal for final report; and
- Provide managerial guidance to CHA's technical group.

**Dr. Christopher Burns, PG - CHA QA/QC**

- Conduct internal audit of field investigation and sampling;
- Review laboratory activities;
- Determine laboratory data corrective action;
- Review analytical data validation and assessment;
- Review laboratory QA/QC;
- Assist in preparation and review of final report; and,
- Provide technical representation for analytical activities.

**Karyn Ehmann - Field Oversight and QC Coordinator**

- Serve as Field Team Leader;
- Work with field crew to prepare for field activities and conduct investigations; and,
- On-Site to
  1. Provide oversight and coordination of field activities.
  2. Verify that required QC procedures are followed for soil boring and monitoring well installation activities, material handling, and sample collection.
  3. Initiate informal and/or formal corrective actions as necessary.
  4. Maintain and report QC records (i.e. chain-of-custody, field equipment calibration, etc.).
  5. Report to the Project Manager.
- Provide field management of sample collection and field QA/QC;
- Responsible for maintenance of the field equipment; and
- Assist in preparation and review of final report.

## <u>Laboratory</u>

Alpha Analytical, Inc. is the analytical laboratory chosen to perform the proposed work and is certified by the New York State Department of Health (NYSDOH) Environmental Laboratory Approval Program (ELAP) Number 11148 to perform the required analyses in accordance with the most recent version of the NYSDEC Analytical Services Protocol (ASP).

**Project Manager, Analytical Contractor**

- Ensure resources of laboratory are available on an as-required basis;
- Coordinate laboratory analyses;
- Supervise laboratory's in-house COC;
- Schedule analyses of samples;
- Oversee review of data;
- Oversee preparation of analytical reports; and,
- Approve final analytical reports prior to submission to CHA.

**Quality Assurance/ Quality Control Officer, Analytical Contractor**

- Overview laboratory QA/QC;
- Overview QA/QC documentation;
- Conduct detailed data review;
- Decide laboratory corrective actions, if required; and,
- Provide technical representation for laboratory QA/QC procedures.

**Sample Custodian, Analytical Contractor**

- Receive and inspect the sample containers;
- Record the condition of the sample containers;
- Sign appropriate documents;
- Verify chain-of-custodies and their correctness;
- Notify laboratory project manager and laboratory QA/QC Officer of sample receipt and inspection;
- Assign a unique laboratory identification number correlated to CHA's sample identification number, and enter each into the sample receiving log;
- Initiate transfer of the samples to the appropriate lab sections with assistance from the laboratory project manager; and,
- Control and monitor access to and storage of samples and extracts.

Table 1 below, identifies key personnel assigned to the project and provides contact information.

**Table 1: Key Project Personnel**

| Name | Address | Responsibilities |
|---|---|---|
| Michael Belveg<br>NYSDEC<br>Project Manager | 615 Erie Boulevard West<br>Syracuse, NY 13204<br>(315) 426-7400<br>Michael.Belveg@dec.ny.gov | Mr. Belveg will represent the NYSDEC in its review and oversight function, in its financial sponsorship, and as arbiter on technical matters |

| Name | Address | Responsibilities |
|---|---|---|
| Angela Martin<br>NYSDOH<br>Project Manager | Corning Tower<br>Empire State Plaza<br>Albany, New York<br>(518) 402-7860<br>angela.martin@health.ny.gov | Ms. Martin will represent the NYSDOH in its review and oversight function. |
| Gail Cawley<br>GEC Consulting<br>Owner's Representative | 168 Brampton Road<br>Syracuse, New York 13205<br>(315) 569-1482<br>gcawley@jmawireless.com | Ms. Cawley will represent JMA Wireless in the review and oversight of the project, participate in citizen participation activities, and serve as the point of contact for JMA Wireless. |
| Samantha Miller<br>CHA<br>Project Manager | 300 South State Street<br>Syracuse, NY 13202<br>(315) 257-7154<br>smiller@chacompanies.com | Ms. Miller will oversee the project, provide quality control on documents and mentor the daily task manager. Additionally, Ms. Miller will assist in preparation and review of final report and provide technical representation for field activities. |
| Scott Smith, PE<br>CHA<br>Site Investigation and Remediation Technical Leader | 300 South State Street<br>Syracuse, NY 13202<br>(315) 257-7227<br>Ssmith2@chacompanies.com | Mr. Smith will provide guidance for the implementation of the remedial design including technical review of on-site alterations. Mr. Smith will provide technical review of the final report. |
| Dr. Christopher Burns, P.G.<br>CHA<br>CHA Quality Assurance/ Quality Control Officer | 9020 Stony Point Parkway<br>Suite 160<br>Richmond, VA 23235-4700<br>(804) 897-0954 ext. 248<br>cburns@chacompanies.com | Dr. Burns will act as CHA's QA/QC Officer, which will include providing an internal audit of field sampling procedures, a review of laboratory activities and QA/QC, assistance in the preparation and review of final reports. |
| Karyn Ehmann<br>CHA<br>Field Leader & Site Safety Officer | 300 South State Street<br>Syracuse, NY 13202<br>(315) 257-7250 (office)<br>(585) 721-2402 (cell)<br>kehmann@chacompanies.com | Ms. Ehmann will supervise field investigation activities and will also serve as database manager. Ms. Ehmann will serve as the Health and Safety point of contact for CHA staff. |

| Name | Address | Responsibilities |
|---|---|---|
| Melissa Deyo<br>Alpha Analytical, Inc.<br>Laboratory Project Manager | 8 Walkup Drive<br>Westborough, MA 01581<br>(508) 898-9220 | Ms. Deyo will act as CHA's point of contact with the contracted laboratory. |

## 3.0 QUALITY ASSURANCE OBJECTIVES FOR MEASUREMENT DATA

The overall QA objective is to develop and implement procedures for sample preparation and handling, sample COC, laboratory analyses, and reporting, in order to provide accurate data. Specific procedures to be followed for sampling, sample custody and document control, calibration, laboratory analyses and data reduction, validation, assessment and reporting are presented in Sections 4.0 through 10.0 of this QAPP.

The purpose of this Section is to define the goals for the level of QA effort; namely, accuracy; precision and sensitivity of analyses; and completeness, representativeness and comparability of measurement data from the analytical laboratories. QA objectives for field measurements are also discussed.

# 4.0 LEVEL OF QA EFFORT

To assess the quality of data resulting from the field sampling program, field duplicate samples, field blank samples, samples for laboratory matrix spike/matrix spike duplicate (MS/MSD) analyses, and trip blank samples will be collected (where appropriate) and submitted to the contract laboratory. CHA SOP#605 will be adhered to for all QAQC procedures.

For field samples collected, field duplicate samples will be submitted at a frequency of one per 20 investigative samples, or in the event that a sampling round consists of less than 20 samples, one field duplicate will be collected. MS/MSD samples will be analyzed at a minimum frequency of one set per 20 investigative samples. In the event that a sampling event consists of less than 20 samples, one MS/MSD sample will be collected.

The sampling and analysis program is summarized below and lists the specific parameters to be measured, the number of samples to be collected and the level of QA effort required for each matrix.

Soil samples will be analyzed for all or some of the following:

- Target compound list (TCL) VOCs via USEPA Method 8260C;
- TCL semi-volatile organic compounds (SVOCs) via USEPA Method 8270D;

Field duplicate samples for subsurface soil matrices will be collected and analyzed as a check on the aggregate analytical and sampling protocol precision. MS/MSD samples will be analyzed as a check on the analytical method's accuracy and precision. Trip blank samples (for VOC determinations only) will be shipped by the laboratory to the Site and back to the laboratory without opening in the field. The trip blank will provide a measure of potential cross contamination of samples resulting from shipment, handling and/or ambient conditions at the Site.

## 4.1 ACCURACY, PRECISION AND SENSITIVITY OF ANALYSIS

The fundamental QA objective with respect to the accuracy, precision and sensitivity of analytical data is to achieve the QC acceptance of each analytical protocol. The method(s) precision (relative percent difference of duplicate analysis) will be determined from the duplicate analyses of MS samples. A minimum of one sample will be spiked and analyzed in duplicate. Additional details are provided in CHA SOP#605. Analysis will compare with the criteria presented in the appropriate methods identified in Section 4.0.

The method(s) accuracy (percent recovery) for water and soil samples will be determined by spiking selected samples (matrix spikes) with test compounds. Accuracy will be reported as the percent recovery of the test compound and will compare with the criteria given in the appropriate methods as identified in Section 4.0.

Project-specific accuracy and precision goals are identified in Section 9.0.

## 4.2 COMPLETENESS, REPRESENTATIVENESS AND COMPARABILITY

It is expected that all analyses conducted in accordance with the selected methods will provide data meeting QC acceptance criteria for 80 percent of all samples tested. Any reasons for variances will be documented.

The sampling program has been designed to provide data representative of Site conditions. During development of these networks, consideration was given to location of historic activities, existing data from past studies completed for the Site and the physical Site setting. The extent to which existing and planned analytical data will be comparable depends on the similarity of sampling and analytical methods. The procedures used to obtain the planned analytical data are documented in this QAPP. Comparability of laboratory analyses will be confirmed by the use of consistent units. Following completion of data collection, the existing database will be evaluated for representativeness.

## 4.3 FIELD DOCUMENTATION

Pertinent field survey and sampling information shall be recorded in a logbook or on field logs during each day of the field effort per CHA SOP#101 Field Logbook and Photographs.

At a minimum, entries in a logbook shall include:

- Date and time of starting work;
- Names of all personnel at site;
- Weather conditions
- Purpose of proposed work effort;

- Sampling equipment to be used and calibration of equipment;
- Description of work area;
- Location of work area, including map reference;
- Details of work effort, particularly any deviation from the field operations plan or standard operating procedures;
- Field observations;
- Field measurements (e.g., Photoionization Detector (PID) readings);
- Field laboratory analytical results;
- Daily health and safety entries, including levels of protection;
- Type, number, and location of samples;
- Sampling method, particularly deviations from the standard operating procedures;
- Sample location and number; and
- Sample handling, packaging, labeling, and shipping information (including destination).

In addition to keeping logs, photographs will be taken to provide a physical record to augment the fieldworker's written observations. For each photograph taken, several items shall be recorded in the field logbooks:

- Date and time;
- Name of photographer;
- General direction faced and description of the subject

Additional protocols specific to each sampling method are presented in the following sections.

The general QA objective for measurement data is to obtain reproducible and comparable measurements to a degree of accuracy consistent with the use of standardized procedures.

## 5.0 SAMPLING PROCEDURES

The sampling program to be implemented will include the collection and analyses waste characterization and confirmation soil samples. Details regarding specific sampling activities are provided in the RD Report and the procedures for collecting samples and for performing related field activities are described in detail in the Field Sampling Plan (FSP), included in Appendix I of the RD Report. The number of samples, analytical methods, sample volumes, preservation techniques and holding times are provided in Table 2, below.

| Table 2: Analytical Methods/Quality Assurance Summary | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Matrix (Sample Type)** | **Type of Sample** | **Analysis** | **Parameter/Fraction** | **Number of Primary Samples** | **Number of Duplicates/ MS/MSD** | **Number of Trip Blanks/Field Blanks/Equipment Blanks** | **Sampling Locations** | **Minimum Sample Volume/ Container** | **Sample Preservation** | **Technical Holding Time** |
| Soil - Confirmation Samples | Subsurface Soil | EPA Method 8260C | TCL VOCs | 17 | 1/1/1 | 0/0/0 | Excavation Sidewalls SOIL-SW-300 through SOIL-SW-309 Excavation Bottom SOIL-B-300 through SOIL-B-306 | 5 grams/40mL Amber VOA | Cool to 4ºC | 14 days |
| | Subsurface Soil | EPA Method 8270D | TCL SVOCs | 17 | 1/1/1 | 0/0/0 | Excavation Sidewalls SOIL-SW-300 through SOIL-SW-309 Excavation Bottom SOIL-B-300 through SOIL-B-306 | 8 oz. Amber jar | Cool to 4ºC | 14 days |

# 6.0 SAMPLE CUSTODY AND DOCUMENT CONTROL

## 6.1 CHAIN-OF-CUSTODY

As per CHA SOP#105, a COC will be maintained to document the transfer of all samples. Each sample container will be properly sealed. Sample container labels will include the sample name, required analysis, and date and time of collection. Sample containers will be taken to the Contract Laboratory courier center at 4°C (±2°C) in sealed coolers.

Each sample cooler will contain an appropriately completed COC form. One copy will be returned to CHA upon receipt of the samples by the laboratory. One copy will be returned to CHA with the data deliverables package.

Upon receipt of the cooler at the laboratory, it will be inspected by the designated sample custodian. The condition of the cooler and sample containers will be noted on the COC record sheet by the sample custodian. The sample custodian will also document the date and time of receipt of the container and sign the form.

If damage or discrepancies are noticed, they will be recorded in the remarks column of the record sheet, and be dated and signed. Any damage or discrepancies will be reported to the lab supervisor who will inform the lab manager, QA Officer and CHA Project Manager.

## 6.2 SAMPLE DOCUMENTATION IN THE LABORATORY

Each sample or group of samples shipped to the laboratory for analysis will be given a unique identification number by the laboratory. The laboratory sample custodian will record the client name, number of samples and date of receipt of samples in the Sample Control Log Book.

The Contract Laboratory will be responsible for maintaining analytical log books and laboratory data as well as sample inventory on hand for submittal to CHA on an "as required" basis. Samples will be maintained by the laboratory for a period of 30 days, under the conditions prescribed by the appropriate USEPA methods, for additional analyses, if necessary. Raw laboratory data files will be inventoried and maintained by the Contract Laboratory for a period of five years, at which time CHA will advise them as to the need for additional storage.

### 6.3 STORAGE OF SAMPLES

Evidentiary files for the entire project will be inventoried and maintained by CHA and will consist of the following:

1) Project related plans;
2) Project log books;
3) Field data records;
4) Sample identification documents;
5) Chain-of-Custody records;
6) Report notes, calculations, etc.;
7) References, literature;
8) Miscellaneous - photos, maps, drawings, etc.; and
9) Copies of all final reports pertaining to the project.

The project file materials will be the responsibility of CHA's Project Manager with respect to document maintenance and management.

## 7.0 CALIBRATION PROCEDURES AND FREQUENCY

### 7.1 INSTRUMENT CALIBRATION AND TUNING

Calibration of instrumentation is required to ensure that the analytical system is operating correctly and functioning at the proper sensitivity to meet established reporting limits. Each instrument is calibrated with standard solutions appropriate to the type of instrument and the linear range established for the analytical method. The frequency of calibration and the concentration of calibration standards is determined by the manufacturer's guidelines, the analytical method, or the requirements of special contracts.

### 7.2 FIELD INSTRUMENT CALIBRATION

Calibration of the field instruments will be completed prior to each day's use in accordance with the manufacturer's instructions. The field equipment will be maintained, calibrated and operated in a manner consistent with the manufacturer's guidelines and EPA standard methods. However, since the majority of field measurements will be limited to organic vapor readings (PID readings) the calibration procedures will be conducted at a minimum frequency of once per day. Records of calibration, repair or replacement will be filed and maintained by the Field Team Leader.

# 8.0 DATA REDUCTION, VALIDATION, ASSESSMENT AND REPORTING

## 8.1 GENERAL

The Contract Laboratory will perform analytical data reduction and validation in-house under the direction of the laboratory QA Officer. The laboratory's QA Officer will be responsible for assessing data quality and advising of any data which were rated "preliminary" or "unacceptable" or other qualifications based on the QC criteria outlined in the methods, which would caution the data user of possible unreliability.

Assessment of analytical and field data will include checks for data consistency by looking for comparability of duplicate analyses, laboratory QA procedures, adherence to accuracy and precision criteria, transmittal errors and anomalously high or low parameter values. The results of these data validations will be reported to the project managers, noting any discrepancies and their effect upon acceptability of the data.

## 8.2 FIELD DATA

Raw data from field measurements and sample collection activities that are used in project reports will be appropriately identified and appended to the report. Where data have been reduced or summarized, the method of reduction will be documented in the report. Field data will be reviewed for anomalously high or low values that may appear to be inconsistent with other data.

Field sampling data will be reviewed by the CHA QA/QC Officer to ensure the following information has been properly documented:

- Sample identification;
- Source;
- Date and time of sampling;
- Sampling equipment;
- Person(s) collecting the sample; and
- Results of field monitoring and/or observations.

In addition, the field sampling data will be evaluated to ensure:

- The use of approved sampling and sample handling procedures;
- Proper packing/shipping procedures were used; and
- Proper COC was maintained.

## 8.3 LABORATORY REPORTING

Reporting and deliverables for soil samples will be in accordance with NYSDEC July 2005 ASP Category B Deliverable. Reports will be received by CHA within 30 days of the last day of sampling. Sample data and its corresponding QA/QC data shall be maintained accessible to CHA in hard copy. All other reporting and deliverables (i.e. waste characterization samples) will be in accordance with standard laboratory procedure.

## 8.4 ELECTRONIC DATA

The laboratory will provide the analytical data in an electronic format. The data will be added into the existing database maintained by CHA staff. From there the data can be processed and compared to existing standards using the existing software. An electronic copy of the analytical data in EQuIS format will be provided to NYSDEC.

## 8.5 DATA VALIDATION

A qualified third party will conduct an independent evaluation of the Category B data reduction and reporting by the laboratory. The data validation will be performed in accordance with the following documents: "USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review EPA 540/R-99-008, October 1999" and "USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review EPA 540/R-04-004, October 2004". Data analyzed using methods not covered in these documents will be validated using the general principles used in these documents, and the analytical requirements specified in the methods pertaining to USEPA Region 2 Data Validation.

# 9.0 INTERNAL QUALITY CONTROL CHECKS AND FREQUENCY

## 9.1 FIELD QUALITY CONTROL

QC procedures for field measurements will be limited to checking the reproducibility of the measurement in the field by obtaining multiple readings and by calibrating the instruments (where appropriate).

QC of field sampling will involve collecting field duplicates and trip blanks with the applicable site activities described in the RD Report and FSP. Field QC samples are also discussed in Section 4.0.

## 9.2 LABORATORY QUALITY CONTROL

Specific procedures related to internal laboratory QC samples (namely blanks, MS/MSD, surrogates and QC check samples) are described in the following subsections.

### 9.2.1 Blank Samples

A reagent blank will be analyzed by the laboratory at a frequency of one blank per 10 analyses, or in the event that an analytical round consists of less than 10 samples, one reagent blank will be analyzed. The reagent blank, an aliquot of analyte-free water or solvent, will be carried through the entire analytical procedure.

### 9.2.2 Matrix Spike/Matrix Spike Duplicates

An MS/MSD sample will be analyzed at a minimum frequency one sample for every 20 investigative samples that are collected. For sampling events consisting of less than 20 investigative samples, one MS/MSD sample set will be collected. Acceptable criteria and compounds that will be used for matrix spikes are identified in the appropriate methods. Percent spike recoveries will be used to evaluate analytical accuracy while percent relative standard deviation or the relative percent difference (RPD) between matrix spike analyses will be used to assess analytical precision.

### 9.2.3 Surrogate Analyses

Surrogates are organic compounds which are similar to the analytes of interest, but which are not normally found in environmental samples. Surrogates are added to samples, by the laboratory, to monitor the effect of the matrix on the accuracy of the analysis. Every blank, standard and environmental sample analyzed by GC or GC/MS, including MS/MSD samples, will be spiked with surrogate compounds prior to sample preparation.

Surrogates will be spiked into samples according to the appropriate analytical methods. Surrogate spike recoveries will be compared with the control limits set by procedures specified in the method (or from laboratory specific control limits) for analytes falling within the quantification limits without dilution. Dilution of samples to bring the analyte concentration into the linear range of calibration may dilute the surrogates out of the quantification limit; assessment of analytical quality in these cases will be based on the quality control embodied in the check and MS/MSD samples.

# 10.0 PROCEDURES USED TO ASSESS PERFORMANCE

## 10.1 PRECISION

Precision will be assessed by comparing the analytical results between duplicate spike analyses. Precision as RPD will be calculated as follows:

$$\text{Precision} = \frac{[D_2 - D_1]}{(D_1 + D_2)/2} \times 100$$

$D_1$ = matrix spike recovery
$D_2$ = matrix spike duplicate spike recovery

Acceptance criteria for duplicate soil samples will be ≤30% RPD. Acceptance criteria for duplicate water samples will be ≤20% RPD between field and laboratory data.

Percent relative standard deviation or the RPD between matrix spike analyses will be used to assess laboratory analytical precision. Acceptable criteria and compounds that will be used are identified in the appropriate EPA methods.

## 10.2 ACCURACY

Accuracy will be assessed by comparing a set of analytical results to the accepted or "true" values that would be expected. In general, MS/MSD and surrogate spike recoveries will be used to assess accuracy. Accuracy as percent recovery will be calculated as follows:

$$\text{Accuracy} = \frac{A-B}{C} \times 100$$

A = The analyte determined experimentally from the spike sample.
B = The background level determined by a separate analysis of the unspiked sample.
C = The amount of spike added.

Percent spike recoveries in MS/MSD and surrogate spike recoveries will be used to evaluate analytical accuracy. Acceptable criteria and compounds that will be used for matrix spikes are identified in the appropriate EPA methods.

The evaluation of accuracy of field measurements will be limited to checking the reproducibility of the measurement in the field by obtaining multiple readings and by calibrating the instruments (where appropriate).

## 10.3 COMPLETENESS, REPRESENTATIVENESS AND COMPARABILITY

Completeness is a measure of the amount of valid data obtained from a measurement system compared with the amount that was expected to be obtained under normal conditions.

To be considered complete, the data set must contain all QC check analyses verifying precision and accuracy for the analytical protocol. In addition, all data are reviewed in terms of stated goals in order to determine if the database is sufficient.

When possible, the percent completeness for each set of samples will be calculated as follows:

$$\text{Completeness} = \frac{\text{valid data obtained}}{\text{total data planned}} \times 100 \text{ percent}$$

A completeness goal of 100 percent has been established for this project. However, if the completeness goal is not met, site decisions may be based on any, or all of, the remaining, validated data. Representativeness will be addressed by collecting the samples as described in this document. Comparability will be addressed by collecting, analyzing, and reporting the data as described in this document.

## 10.4 OUTLIERS

Procedures discussed previously will be followed for documenting deviations. In the event that a result deviates significantly from method established control limits, this deviation will be noted and its effect on the quality of the remaining data will be assessed and documented.

## 11.0 QUALITY ASSURANCE REPORT TO MANAGEMENT

The CHA Project Manager will receive reports on the performance of the measurement system and the data quality following each sampling round and at the conclusion of the project.

At a minimum, these reports will include:

1) Assessment of measurement quality indicators; (i.e. data accuracy, precision and completeness);
2) Results of systems audits; and
3) QA problems and recommended solutions.

CHA's QA/QC Officer will be responsible within the organizational structure for preparing these periodic reports. The final report for the project will also include a separate QA section which will summarize data quality information contained in the periodic QA/QC reports to management and present an overall data assessment and validation in accordance with the data quality objectives outlined in this QAPP.

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# APPENDIX K

## Recirculation Calculations

Table K-1
Treatment Area Information

| Treatment Area Parameter | Units | Value | Notes |
|---|---|---|---|
| Surface Area | *$ft^2$* | 20,000 | Based on Figure provided by CHA |
| Target Interval | *ft* | **10.0** | Assumed (15 to 25 ft. bgs) - may vary |
| Soil Volume | *$ft^3$* | 200,000 | |
| Soil Mass | *kg* | 10,000,000 | |
| | *lb* | 22,050,000 | |
| Pore Volume *(based on **Effective Porosity**)* | *$ft^3$* | 45,000 | |
| | *gal* | **336,623** | |

**GENERAL SOIL PARAMETERS**

| Parameter | Units | Value | Notes |
|---|---|---|---|
| Effective Porosity - Sand & Gravel | *vol/vol* | 0.23 | Assumes 75% of total porosity |
| Dry Bulk Density ($r_b$) | *$kg/ft^3$* | **50** | Assumed value |
| Fraction of Organic Carbon ($f_{oc}$) | *mass/mass* | **0.003** | Site Specific Value based on results of soil analysis of PT-SOIL-2 |

Table K-2
Treatment Pore Volume Scenarios

Assumes all COC mass in GW is treated with each PV Exchange

**Based on treatment pore volumes calculated using Effective Porosity**

| Contaminant | GW Concentration *(µg/L)* | COC Mass in GW *(lb)* | Soil Sorption Coefficient $K_{oc}$ *($cm^3/g$)* | Organic carbon fraction in soil $f_{oc}$ | Distribution Coefficient $K_d$ *($cm^3/g$)* | Calculated Conc. on Soil *(mg/kg)* | COC Mass on Soil *(lb)* | **Total COC Mass in TA** *(lb)* | % COC Mass in GW | GW Conc. After **1 PV Exchange** *(µg/L)* | GW Conc. After **2 PV Exchanges** *(µg/L)* |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Average Concentration (GW-100 and GW-102)** | | | | | | | | | | | |
| cis-1,2-DCE | 13.9 | 0.04 | 39.6 | 0.003 | 0.12 | 0.002 | 0.04 | **0.08** | 58.9% | 6.7 | **3.2** |
| vinyl chloride | 29.0 | 0.1 | 21.7 | 0.003 | 0.07 | 0.002 | 0.04 | **0.12** | 72.3% | 9.8 | 3.3 |

Table K-3
Injection Scenarios

| Injection Volume Based on Effective Porosity | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Simultaneous Injection Locations** | **10.0** | | | | **16.0** | | | | |
| Average injection rate per well *(gpm)* | **4.0** | **5.0** | **4.0** | **5.0** | **4.0** | **5.0** | **4.0** | **5.0** | **5.0** |
| Total Injection Rate *(gpm)* | 40.0 | 50.0 | 40.0 | 50.0 | 64.0 | 80.0 | 64.0 | 80.0 | 7,680 per batch |
| Hours per day | **10.0** | **10.0** | **11.0** | **11.0** | **10.0** | **10.0** | **11.0** | **11.0** | **4 batches per day** |
| Injection volume per day *(gal)* | 24,000 | 30,000 | 26,400 | 33,000 | 38,400 | 48,000 | 42,240 | 52,800 | 30,720 |
| Total injection volume*** *(gal)* | 168,312 | 168,312 | 168,312 | 168,312 | 168,312 | 168,312 | 168,312 | 168,312 | 168,312 |
| **Expected days of injection** | **8** | **6** | **7** | **6** | **5** | **4** | **4** | **4** | **5.5** |
| **Expected days of injection (2 PV)** | **16** | **12** | **14** | **12** | **10** | **8** | **8** | **8** | **11.0** |

Table K-4
Oxidant Mass Determination

| Number of Injection Wells | Number Pore Volumes to be Applied | Treatment Area Pore Volume *(gal)* | Treatment Volume *(gal)* | Injection Volume Per Well *(gal)* | Mass $NaMnO_4$ *(lb)* | Mass $NaMnO_4$ (normalized to totes) *(lb)* |
|---|---|---|---|---|---|---|
| | | Effective Porosity | | | | |
| 29 | 1.0 | 336,623 | 336,623 | 11,608 | 14,045 | 14,484 |
| 29 | 2.0 | 336,623 | 673,247 | 23,215 | 28,090 | 28,968 |
| 29 | 3.0 | 336,623 | 1,009,870 | 34,823 | 42,135 | 42,245 |

| | |
|---|---|
| **Target permanganate concentration:** | **5 g/L** |
| Mass of $NaMnO_4$ per 263-gallon tote: | **1207 lb** |

Table K-5
Injection Flow Rates
Batching Size

| Application Details | |
|---|---|
| Target Injection Concentration (g/L) | **5.0** |
| Total Mass of $NaMnO_4$ (lb) | 28,968 |
| Total Mass of 40% $NaMnO_4$ Solution (lb) | 72,420 |
| Total Volume of 40% $NaMnO_4$ Solution (gal) | 6,311 |
| Number of Totes of 40% $NaMnO_4$ Solution | 24.0 |
| Total Injection Volume (gal) | 673,247 |
| Number of Injection Locations (Total) | 29 |
| Volume of Injection Solution per Well (gal) | 23,215 |
| Simultaneous Extraction/Injection Locations | 16 |
| Anticipated Flow Rate per Well (gpm) | 4.0 |
| Anticipated Total Flow Rate (gpm) | 64.0 |

| $NaMnO_4$ Properties | |
|---|---|
| 3,000 | lb 40% solution per tote |
| 263 | gallons 40% solution per tote |
| 1,207 | lb sodium permanganate per tote |
| 1.375 | g/mL relative density of 40% solution |
| 11.47 | lb/gal of 40% solution |
| 4.59 | lb $NaMnO_4$ per gallon 40% solution |
| 549.85 | g/L $NaMnO_4$ in 40% solution |

| Total Batch Volume | Volume Water | Volume 40% $NaMnO_4$ Solution |
|---|---|---|
| *(gallons)* | | |
| **7,751** | **7,680** | **70.5** |

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