LAKESIDE ENGINEERING
Engineering | Design | Permitting

Robert G. Harner, PE, PLLC
83 Fall Street
Seneca Falls, NY 13148
607-725-5824

September 12, 2022

Ms. Karen A. Cahill
Project Manager
Division of Environmental Remediation
New York State Department of Environmental Conservation – Region 7
615 Erie Boulevard West, Syracuse, NY 13204-2400

Re: Bowers Business Park
Site C734145
Response to Comments on the Final Remedial Investigation Work Plan (RIWP), 9/11/2022
Lakeside Project No.: 20210323.12

Dear Ms. Cahill:

On behalf of Bowers Business Park, LLC we are submitting the attached Response to Comments received September 11, 2022, and the Revised Final Remedial Investigation Work Plan (RIWP) revised September 11, 2022, for the Bowers Business Park site (NYSDEC # C734145).

At my direction and under my review, AECC prepared the responses and revised the RIWP. Please review our responses and advise if this plan, as revised is acceptable.

If you have any comments or questions, please call me at 607-725-5824.

Respectfully,

Lakeside Engineering

Robert Harner

Robert G. Harner, PE, CPESC, LEED-AP
President

September 11, 2022

Karen A. Cahill
Project Manager
Division of Environmental Remediation
New York State Department of Environmental Conservation – Region 7
615 Erie Boulevard West, Syracuse, NY 13204-2400

Re: Bowers Business Park - Site C734145
Response to NYSDEC / NYSDOH Comments, Received: September 6, 2022
Final Remedial Investigation Work Plan (RIWP), Revised August 2022.

Dear Ms. Cahill;

On behalf of Bowers Business Park, LLC, this letter provides our responses to your comments contained in a letter dated September 6, 2022. Also, attached to this response, is a copy of the revised final work plan for this project.

Comment: Section 5.3 Test Pit Investigation: The response to Comment #5 indicates that one additional test pit is proposed in the center of the historically disturbed area on the south (higher) portion of the site, however this is not discussed in Section 5.3. Please revise accordingly.

Response: The text has been revised to reflect the addition of this test pit.

Comment: Section 5.6 Soil Vapor Intrusion Evaluation:

- A reference must be provided to SOP #121 – Soil Vapor Sampling;
- The sample duration must be specified in the work plan;
- Item #4 under Sample Collection in the SOP indicates that the helium tracer test shroud will be sealed to the underlying concrete slab with modeling clay. Please clarify how the shroud will be sealed to the underlying ground surface;
- The initial canister pressure on the vacuum gauge must be recorded on the chain-of-custody prior to AND after sampling to ensure that the sample was collected properly. Sample collection must be stopped at a minimum value of 2 to 5 inches of mercury.
- The method of canister certification must be specified in the work plan (i.e., batch or individual). Batch certification is acceptable for this sampling.

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Response: The reference has been added to the Work Plan, the sample duration (approximately 1-hour) has been added to the Work Plan. Text has been added describing the procedure for achieving a seal to the soil surface vs. that contained in the original SOP #121. This SOP has been revised accordingly. Both the initial and final canister pressures shall be recorded on the chain of custody. Sample collection will continue to a final pressure of between 5 and 2 inches of mercury. The canisters will be certified by the laboratory on a batch basis.

Comment: Soil Pile #2: An addendum to the RIWP must be submitted which addresses sampling and characterization of the deeper soil within the pile and also the native soils below the pile. If the intent is to remove the soil as an IRM, an IRM work plan must be submitted the Department for approval. A Self-Implementing Cleanup and Disposal Notification (SICDN) complying with EPA's requirements may suffice as an IRM work plan if all the required elements are included. The soil can be characterized for disposal, however, the soil below the pile must be sampled after the pile is removed and results included in the RI/Alternatives Analysis Report(s). Please note that the EPA may require that the soil pile be sampled in accordance with CFR Part 761.61, Sampling of PCB Remediation Waste Destined for Off-site Disposal. This part provides procedures for sampling waste from existing soil piles.

Response: Understood. This addendum shall be submitted.

Comment: Groundwater Monitoring Wells: It is our understanding that some monitoring well locations have not been completed as planned due to drilling refusal at what is presumed to be the bedrock surface. Based on observations made in the field, discussions with AECC staff, and our review of the RI Report, when submitted, the Department may request additional monitoring wells, including use of drilling methods capable of characterizing bedrock at this site and/or sampling of groundwater in bedrock.

Response: Understood.

Comment: EQuIS: Section 6 indicates that "Electronic data deliverables (EDDs) for each report will also be submitted in EQuIS forms." Please note that EDDs prepared by the laboratory do not include all of the field data required by the EQuIS format. Submittals to EQuIS must use the current EQuIS EDD format.

Response: Understood. The text has been revised to make this clear

Comment: Finally, please ensure that a copy of the results of the community air monitoring during test pitting activities are submitted to Eamonn O'Neil, the NYSDOH Project Manager for this site.

Response: Understood.

If you have any questions regarding this plan, please do not hesitate to reach out to us directly to discuss the proposed procedures.

Sincerely,
Asbestos & Environmental Consulting Corporation

James Saxton
Senior Project Manager

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Remedial Investigation Work Plan

BCP Site # C734145

Site Name / Location
Bowers Business Park
Canada Drive, East Syracuse (Town of Dewitt)
Onondaga County, New York

Prepared By:
Asbestos & Environmental Consulting Corporation
6308 Fly Road
East Syracuse, New York 13057

Prepared For:
Bowers Business Park, LLC
6308 Fly Road
East Syracuse, New York 13057

Revision 1	August 30, 2022
Revision 2	September 11, 2022

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I, Robert G. Harner, certify that I am currently a NYS registered professional engineer and that this Remedial Investigation Work Plan 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).

9/12/2022

Robert G. Harner, PE
079435

Date

Stamp

It is a violation of Article 130 of New York State Education Law for any person to alter this document in any way without the express written verification of adoption by any New York State licensed engineer in accordance with Section 7209(2), Article 130, New York State Education.

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Common Acronyms & Abbreviations

AAI	All Appropriate Inquiries
ACM	Asbestos-Containing Material
AST	Aboveground Storage Tank
ASTM	American Society for Testing Materials International
BER	Business Environmental Risk
bgs	Below Ground Surface
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CESQG	Conditionally Exempt Small Quantity Generator
CFR	Code of Federal Regulations
CP-51	(NYSDEC) Commissioner's Policy #51 (Soil Cleanup Guidance)
CREC	Controlled Recognized Environmental Condition
DEC	Department of Environmental Conservation
EDR	Environmental Data Resources (Company)
ESA	Environmental Site Assessment
FOIA / FOIL	Freedom of Information Act / Freedom of Information Law
GIS	Geographic Information Systems
GWS	Groundwater Standard
HREC	Historical Recognized Environmental Condition
LBP	Lead-Based Paint
LQG	Large Quantity Generator
N/A	Not Applicable
NRCS	Natural Resource Conservation Service
NYSDEC	New York State Department of Environmental Conservation
PAH	Polycyclic Aromatic Hydrocarbons
PCB	Polychlorinated Biphenyls
pCi/L	Picocuries per Liter
ppb	Parts Per Billion
ppm	Parts Per Million
RCRA	Resource Conservation and Recovery Act
REC	Recognized Environmental Condition
RSCO	Restricted Soil Cleanup Objective
SCO	Soil Cleanup Objective
SQG	Small Quantity Generator
SVOC	Semi-Volatile Organic Compound
TOGS	Technical & Operational Guidance Series 1.1.1 (NYSDEC)
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
UST	Underground Storage Tank
VOC	Volatile Organic Compound

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1.0 Site Information

1.1 Site Location & BCP Boundary Description

The site is comprised of 34.40 acres, which includes the following tax parcels:

* Parcel ID # 017.-06-01.5 (3.50 acres): Zoned Business Transitional
* Portion of Parcel ID # 017.-06-01.1 (30.9 acres): Zoned Industrial

As shown on Figures 1 & 2, the Bowers Business Park Brownfield Area (site) is located within a rural-suburban area. There are two (2) tax parcels within the site's BCP boundary. The smaller parcel is located at the northeastern corner of the intersection of Loucks Road Extension and New York State Route 298. The larger parcel (though only a portion of tax parcel #017.-06-01.1) comprises the remainder of the brownfield site, including a small area on the southwest corner of the intersection of Loucks Road Extension and Canada Drive, with the remaining portions to the east of Loucks Road Extension as well as north of Canada Drive. The BCP area is bounded to the east by other portions of Bowers Business Park and to the south by residential properties and Collamer Cemetery. Small areas of woods are also present to the south and east.

1.1.1 Site Features

The site is currently undeveloped. It is mostly open field, along with some wooded areas. The site is gently sloping, making it highly suitable for development. There are some areas in the southern portion of the BCP area that are forested with trees ranging in size from approximately one (1) inch to twelve (12) inches in trunk diameter.

1.1.2 Geologic Setting

A United States Geologic Survey (USGS) map of the area (Syracuse East Quadrangle, 2010) indicates that the site is at an elevation of approximately 430-460 feet above mean sea level (see Figure 1). Surficial deposits reportedly consist of lacustrine sands (Surficial Geologic Map of New York, Finger Lakes Sheet). The thickness of this material is variable, but generally twelve (12) to twenty (20) feet thick. Nearby deposits consist of lacustrine silts and clays.

The Natural Resources Conservation Service maps soils within the project area as Colonie loamy fine sand, 0-6% slopes. These soils were formed in sandy glaciofluvial materials, consistent with the materials identified on the surficial geology map. They are somewhat excessively well-drained and deep, with a water table at a depth greater than eighty (80) inches. Minor units mapped in the project area include Lockport and Brockport silty clay loams and Arkport very fine sandy loam.

During prior on-site investigative activities (up to 2.5' bgs), the soil moisture content was observed to fluctuate, based upon the time of year and location on the site. The soil tended to be a tan sandy loam, particularly sandy on the southern portion of the site, with some areas of darker coloration in the forested areas.

Bedrock at the site is mapped as Skaneateles Formation shales including the Butternut, Pompey, and Delphi Station shale members and Mottville sandstone member (Bedrock Geology of New York, Finger Lakes Sheet).

To date, groundwater investigations have not been performed at the site. Neither the depth of groundwater, nor the direction of groundwater flow, are currently known. This information will be measured / calculated during remedial investigation activities (see Section 2.2.1). The

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remedial investigation will provide useful new information regarding the subsurface and hydrogeological conditions on the site.

1.2 Ownership History & Past Use

Due to multiple subdivisions and conglomerations throughout the years, the actual ownership history of the site is difficult to completely ascertain. However, based upon AECC's research, it appears that the site operated as a dairy farm from at least 1889 to 1990.

* **1889 (via a historical atlas)**

  C. Nichols (Dairy Farm) – Owner / Operator
  No address provided on this document, but the facility resides along Collamer Road.

  Note: The earliest recorded use, via a historical atlas, was the C. Nichols dairy farm in 1889.

* **1889 to 1961**

  Unknown – No property use records were identified from the time period of 1889 to 1961.

* **1961 - 1966***

  Waite Dairy, Inc. – Owner / Operator
  Thompson Road (no number provided), Syracuse, New York

  Note: Information obtained from the filing date for the corporation on record with NYS Dept of State.

* **1966 - 1990***

  Waite Dairy, Inc. (Lee L. Waite) – Owner and Operator
  Collamer Road (no number provided), Town of Dewitt, New York

  Note: From 1961 to 1990, the Site supported a dairy farm / farmstead, field crops, a pasteurized milk plant, and a sand quarry (Waite Dairy, Inc.). This information was obtained for a property record card found at the Town of Dewitt Assessor's Office.

* **1990 - 2009**

  100 Collingwood Corporation – Owner
  716 East Washington Street, Syracuse, New York 13202

  Note: In 1990 the property was sold to 100 Collingwood Corporation and the farming / quarry operations ceased. The Site remained unused until April 2008, until it was cleared and graded, and limited improvements (roadways, storm sewers, underground utilities and retention pond) were constructed.

* **2009 - April 24, 2020**

  Woodbine Business Park, Inc. – Previous Owner / BCP Applicant
  505 East Fayette Street, Syracuse, New York 13202

  Note: Woodbine Business Park, Inc. assumed title from its affiliated entity (100 Collington Corporation) in 2009.

* **April 24, 2020 - Present**

  Bowers Business Park, LLC – Current Owner / BCP Volunteer (no operations on-site)
  6308 Fly Road, East Syracuse, New York 13057

Note: The Site is currently owned by Bowers Business Park, LLC (hereby referred to as "Owner," "BBP," or "Volunteer" throughout this RIWP).

2.0 Environmental History of the Site

2.1 Initial Discovery of PCB Contamination

In early 2013, Woodbine Business Park, Inc. was informed that PCBs were detected in surface soil samples collected from a former topsoil pile located on the property (Soil Pile #1). This soil pile was created during site development activities. These samples were collected by Certified Environmental Services, Inc. (CES), on behalf of RH Law, Inc. ("RH Law") in November 2012. The laboratory analysis of the four (4) composite surface soil samples collected by CES revealed Aroclor-1248 concentrations ranging from 78 to 199 ppm (parts-per-million). No other Aroclors were detected.

In April 2013, AECC was retained by Woodbine Business Park, Inc. to duplicate CES' sampling event (see Figure 3A). PCB Aroclor-1248 was detected in all four (4) of the samples collected by AECC, ranging in concentration from 6.32 to 34.4 ppm. No other Aroclors were detected. Upon receipt of the laboratory results, AECC called the New York State Spill Hotline on behalf of Woodbine Business Park, Inc. and Spill File Number 13-00433 was assigned to the property.

2.2 Subsequent Surface Soil Investigations

After the confirmation of PCB contamination, Woodbine Business Park, Inc. retained AECC to perform a series of surface soil sampling events, plus a limited number of samples down to 2.5' bgs, in order to determine the nature and extent of PCB contamination at the property.

At the time of these investigations, AECC could not identify any applicable guidance documentation associated with the sampling frequency on large parcels. As such, AECC followed a modified grid sampling frequency, as presented in the "Guidance for Evaluation Residual Pesticides on Lands Formerly Used for Agricultural Production" published by the Oregon Department of Environmental Quality (with the exception being that none of the samples were composited and no subsurface samples were collected during the initial rounds of sampling). In accordance with this guidance document, the required number of samples for parcels of this size resulted in sampling points that were 200-feet on-center.

Due to extensive vegetative growth and the overall size of the property, AECC utilized GPS technology to locate sampling points in the field. First, AECC uploaded sample location coordinates from the planned sample grid (in AutoCAD format) into a handheld GPS device (Trimble Geo6000XH). AECC then utilized the GPS device to locate the uploaded sample location coordinates in the field.

The surface soil samples were collected at 6-8" bgs (soil immediately beneath the vegetative layer). AECC first broke the surface adjacent to each sampling location using a long-handled digging shovel, and then pried to lift / loosen the soil from beneath the sample location. Disposable plastic trowels were then used to collect the soil samples, which were immediately placed into laboratory-provided glass jars.

Post collection, the soil samples were placed into coolers and transported under proper chain-of-custody procedures to Spectrum Analytical, Inc. (hereafter referred to as "Spectrum"), an ELAP and NVLAP certified laboratory. The samples were analyzed for PCBs via USEPA SW-846 Method 8082 (PCB Aroclors) with Soxhlet preparation. Duplicate samples were collected at a rate of approximately one (1) duplicate for every twenty (20) samples, and those samples were submitted to Life Science Laboratories, Inc. (hereafter referred to as "LSL") under separate chain-of-custody procedures.

2.2.1 Woodbine Business Park, Inc. – Surface Soil Sampling Investigations

Retention Pond Area

Woodbine Business Park Inc. informed AECC that some of the stockpiled soil originated from the area around the existing retention pond (approximately 1,000 feet north of the Canada Drive cul-de-sac). As a result, AECC personnel collected four (4) grab soil samples (POND-01 through POND-04) from the berms surrounding the retention pond on May 31, 2013. No PCBs were detected in any of the four (4) samples collected from the berms.

Original BCP Area

On October 7, 2014, AECC personnel performed surface soil sampling in accordance with the Oregon Department of Environmental Quality (DEQ) modified grid layout. A total of thirty (30) surface soil samples (samples SS-37 through SS-66) were collected. In addition, four (4) samples adjacent to Loucks Road Extension (separate from the grid layout) were collected as a part of this sampling event (samples ROAD-1 through ROAD-4).

Since laboratory analysis revealed that several of the samples collected during the October 7, 2014 event contained PCB concentrations greater than ten (10) ppm, AECC personnel performed additional surface soil sampling at locations interspersed within the prior grid layout in an effort to more accurately determine the extent of PCB contamination. This supplemental sampling included the following:

- Twelve (12) samples (SS-67 through SS-78) were collected on October 29, 2014
- Seventeen (17) samples (SS-79 through SS-95) were collected on December 2, 2014.
- Five (5) samples (SS-98 through SS-101, and SS-106) were collected on December 15, 2014. In addition, AECC personnel collected soil samples from depth at four (4) locations to begin determining a vertical profile of the PCB contamination; as such, samples were collected from 1.5 and 2.5 feet bgs at locations CS-1, SS-53, SS-83, and SS-87.

17-Acre WBP Development Parcel

In order to “clear” the easterly adjacent parcel for development (known as the 17-Acre WBP Development Parcel), AECC personnel collected thirty-six (36) grab surface soil samples (SS-1 through SS-36) in accordance with the Oregon DEQ modified grid layout on July 17, 2013. Of the thirty-six (36) soil samples collected, three (3) samples (SS-02, SS-11, and SS-30) contained detectable concentrations of PCBs (concentrations ranging from 0.03 to 0.07 ppm).

On October 9, 2014, AECC personnel collected eleven (11) “confirmatory” samples around the three (3) locations which contained detectable concentrations of PCBs (July 17, 2013 sampling event) in order to determine if the original “hits” were anomalies in an otherwise “clean” eastern portion of the site, or if they were part of a larger contamination area. The sampling plan consisted of the collection of four (4) grab samples around each original sample location (except for SS-02, where only three (3) samples were collected (due to the proximity of Soil Pile #3). The confirmatory samples were located at the cardinal directions twenty feet (20’) from the original sample locations. All these results were below the unrestricted SCOs. The locations are shown on Figures 3A and 3B.

Soil samples SS-96 and SS-97 (See Figure 3A) were collected on the easterly adjacent 17-Acre WBP Development Parcel on December 2, 2014. Both samples were below the unrestricted SCOs.

Northern Parcel

On December 15, 2014, four (4) additional soil samples (SS-102 to SS-105) were collected from an area located on the northern side of Canada Drive in order to determine if PCB contamination existed to the north of the of the 17-Acre WBP Development Parcel (see Figure 3B). All these samples were below the unrestricted use SCOs.

Soil Pile Investigations

The following two (2) soil piles, generated during previous site development activities, are still present at the property: a large soil pile located on-site along Loucks Road Extension (Soil Pile #2) and a small soil pile located off of the Canada Drive cul-de-sac (Soil Pile #3). Soil Pile #1 had previously been removed from the site (deposited at the RH Law facility and remediated under a separate Self-Implementing Cleanup Plan (EPA Article No. 7012 3460 0002 1650 5477).

On May 31, 2013, AECC personnel collected ten (10) grab soil samples (SP2-01 through SP2-10) from Soil Pile #2 (see Figure 2A) and six (6) grab soil samples (SP3-01 through SP3-06) from Soil Pile #3. The soil samples were collected approximately twelve-to-eighteen inches (12-18”) below the soil pile surface.

On December 29, 2014, AECC personnel collected an additional two (2) composite soil samples (SP3-07 and SP3-08) from various depths within Soil Pile #3.

On August 26, 2016, in order to determine if the soil pile could be used as backfill at another non-affiliated Brownfield site, AECC personnel collected additional samples from Soil Pile #3 in accordance with NYSDEC Commissioner’s Policy 51 (CP-51) protocols for a soil pile with a volume between 500-800 cubic yards, which included the following:

* Six (6) grab samples (SP3-09 through SP3-14) for analysis of VOCs
* Two (2) composite samples (SP3-15 and SP3-16) for analysis of SVOCs, metals, pesticides, herbicides, and PCBs

The locations of on-site samples, including a summary of laboratory analysis results, have been presented on Figure 3A. The sample locations, including a summary of laboratory analysis results, have been presented on Figure 3A.

2.2.2 Bowers Business Park, LLC – Surface Soil Sampling Event

In July 2021, BBP hired AECC to collect nine (9) shallow soil samples from the northern section of the site. These samples were analyzed for PCBs and metals. The locations of on-site samples, including a summary of laboratory analysis results, have been presented on Figure 3B. Metals concentrations were found to be below industrial SCOs. Two (2) PCB samples (SS-108 and SS-109) were found to have PCB concentrations in exceedance of the industrial SCOs. The remaining samples did not exceed unrestricted SCOs.

2.3 Preliminary Findings & Conclusions

The results of previous surface soil investigations revealed widespread PCB contamination, generally decreasing in concentration from a “hot spot” located near the center of the site. Concentrations within the “hot spot” are approximately 100-200 ppm PCB, with a maximum concentration of approximately 4,400 ppm detected at one (1) location within this area.

Additional elevated PCB concentrations (approximately 50-100 ppm PCB) were identified near roadside areas on the northern section of the site. This observation could be attributed to the use of

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on-site soils to backfill trenches after the storm sewers were installed. Outside of the “hot spot” and roadway areas, the site generally contains soils with PCB concentrations that exceed the Unrestricted Use SCO but are less than the Industrial Use RSCO.

Soils collected at depth (1.5 and 2.5 feet bgs, respectively) at four (4) locations generally showed an order of magnitude decrease in PCB concentrations with each additional foot of depth.

Although the laboratory results from Soil Pile #3 revealed that the soil met CP-51 criteria for use as fill, Woodbine Business Park, Inc. ultimately decided to use virgin gravel for the cover at the intended site since it was cheaper to transport and place. Therefore, this pile currently exists at the end of the Canada Drive cul-de-sac and may be used as backfill during remedial activities at the Bowers Business Park.

Neither WBP nor BBP tested for petroleum, chlorinated solvents, other VOCs, other SVOCs, metals, or pesticides since these contaminants were not expected to be of concern based upon the site’s past use and previous sampling / analysis performed. As such, groundwater and soil gas were not sampled as they were not expected to be impacted.

In general, the site is characterized by the presence of elevated PCB concentrations in-and-around Soil Pile #2 and scattered locations across the site, but generally adjacent to the Soil Pile #2 area. Additional sampling is necessary to define the limits of these exceedances and to generate information regarding analytes that have not tested for to date such as VOCs, SVOCs, pesticides, metals and PFAS / PFOA compounds.

3.0 Remedial Investigation – General Protocols

The objective of this Remedial Investigation Work Plan (RIWP) is to describe the steps associated with remedial investigation (RI) activities in order to further characterize soils and groundwater at the site. As such, previous environmental investigations will serve as the basis for the activities outlined below.

3.1 Review of Personnel Certifications

Personnel performing work at the site that will involve the disturbance of soil / groundwater, including drilling sub-contractors, must provide evidence of completing OSHA 40-Hour HAZWOPER training and medical clearance. AECC’s Health & Safety Officer will review and approve personnel qualifications prior to any work at the site. If deficiencies are identified, the affected personnel will not be allowed to perform work at the site until these requirements have been satisfied.

3.2 Site Preparation

Once the RIWP has been approved by the NYSDEC, the coordinates of the proposed sampling locations will be identified using a handheld GPS and flagged in the field. Since there are several wooded areas, with trees greater than three (3) inches diameter at base height (DBH), tree removal will be necessary to allow for unencumbered access for sampling equipment during the remedial investigation. Since trees of this size are considered roosting habitat for bat species, tree removal will primarily occur during the winter months.

3.3 Soil Screening Methods

Visual, olfactory, and instrument-based soil screening will be performed by or under the supervision of, a qualified environmental professional when advancing borings into known or potentially contaminated material.

When applicable, soils will be segregated based upon:

* Previous environmental data and screening results;
* Material that requires off-site disposal;
* Material that is to be tested; and
* Material that can be returned to the subsurface.

3.4 Investigation-Derived Waste Management

Investigation-Derived Waste (IDW) will be handled, transported and disposed of in accordance with applicable federal, state, and local regulations. During the remedial investigation, IDW will be placed in sealed drums or containers at the site. Upon completion of remedial activities, these wastes shall be characterized and disposed at an appropriately licensed facility.

3.5 Materials Re-Use On-Site

Based on the nature of the proposed work, soil cuttings derived from the installation of monitoring wells will be placed within drums or on polyethylene sheeting and securely covered. Soil cuttings associated with samples that have no analytical exceedances will be returned to the borehole from which they were generated to depth no shallower than 12 inches bgs. Those with analytical exceedances will remain in drums or covered until the remediation phase of the project. No soils generated during the investigation shall be placed back on the site unless they are determined to be neither solid waste (non-hazardous) or hazardous waste.

3.6 Fluids Management

Based on the nature of the proposed work, groundwater monitoring well purge and development waters will be observed for nuisance characteristics (strong odors, sheens, etc.). Liquids will be segregated into “clean” and “contaminated” containers by location (steel drums) for subsequent characterization.

If the characterization of “clean” purge / well development fluids does not reveal exceedances of TOGS 1.1.1 effluent water quality standards, these “clean” fluids will be discharged to the ground at a controlled flow rate.

3.7 Stormwater Pollution Prevention

Although the total site is 34.40 acres in size, the area being disturbed during the Remedial Investigation will not exceed one (1) acre in size. Therefore, a Storm Water Pollution Prevention Plan (SWPPP) that conforms to the requirements of NYSDEC Division of Water guidelines and NYS regulations will not be required during the Remedial Investigation.

3.8 Contingency Plans

If underground tanks or other previously unidentified contaminant sources are encountered during the investigation, AECC will contact the NYSDEC’s Project Manager immediately in order to communicate the unforeseen condition and determine the appropriate response. If deemed necessary to address the unforeseen condition, an Interim Remedial Measure (IRM) Work Plan will be prepared for NYSDEC / NYSDOH review and approval.

Sampling will be performed on product / contents, surrounding soils, groundwater, etc. (as necessary) to determine the nature of the material and proper disposal method. Laboratory analysis will be performed for a comprehensive list of analytes (TAL metals, TCL volatiles semi-volatiles, TCL pesticides and herbicides, PCBs and PFAS), unless the assumed nature of the contamination (i.e.

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fuel oil tank) provides enough justification to limit the list of analytes. In this case, a reduced list of analytes will be proposed to the NYSDEC Project Manager for approval prior to sampling.

In the event of discovery, any reportable quantities of petroleum product will be reported to the NYSDEC spills hotline.

3.9 Odor Control Plan

Based on the nature of the proposed work and expected contaminants, it is not expected that the RI activities will result in odors that would require mitigation.

3.10 Dust Control Plan

Based on the nature of the proposed work, it is not expected that the RI activities will result in dust generation that would require suppression.

3.11 Noise Control Plan

The proposed work will follow local noise control ordinances.

4.0 Remedial Investigation – Sampling & Analysis Plan

The Sampling & Analysis Plan documents the sampling procedures and methods that will be utilized during the collection of soil and groundwater on the project, the procedures / methods utilized by the laboratory, and Quality Assurance / Quality Control (QA/QC) procedures that will ensure the accuracy and precision of data collected during the course of the project.

RI activities will be documented by AECC personnel using a Daily Site Log. This form will include, at a minimum: personnel on-site, dates and times, weather conditions, location(s) of activities and their description (soil sampling, well installation, etc.). The sampling log forms will be used for soil boring advancement and groundwater well installation and sampling. Photographs will also be taken by on-site personnel to supplement daily logbook entries.

4.1 Field Sampling

The goal of the RI is to establish the nature and extent of contamination present at the site. Therefore, field sampling at the site will be designed to obtain representative samples of environmental media to assess the potential impacts on human health and the environment. The field sampling activities will include sampling media for groundwater, surface soils, subsurface soils and soil vapor.

Remedial investigation activities will include the collection of shallow surface soils using hand tools, advancement of soil borings for the collection of subsurface soil samples and installation of monitoring wells for groundwater sampling.

Sample locations will be demarcated using wooden or metal stakes or flags (in soil) or spray paint (on asphalt or concrete) and clearly labeled. A GPS will be used to document locations of every sample location and groundwater monitoring well. Upon completion of the sampling program a NYS licensed surveyor will be utilized to survey the lateral location of each sample, and its surface elevation. The top of casing and ground surface elevation shall also be recorded for each monitoring well. Locations will be marked on a sampling plan figure like Figures 4A and 4B. All elevations are to be measured to the nearest 0.01 foot and a permanent datum is to be established on the site.

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4.2 Standard Operating Procedures

Sampling activities at the site will be conducted in accordance with the following standard operating procedures (SOPs), which have been presented in Appendix A:

- SOP #101: Surface & Shallow Soil Sampling
- SOP #102: Sample Handling Packaging
- SOP #103: Equipment Decontamination
- SOP #104: Split Spoon Soil Sampling
- SOP #105: Direct Push Soil Sampling
- SOP #106: Groundwater Sampling
- SOP #107: Monitoring Well Construction, Installation & Development
- SOP #108: Sample Labeling & COC Completion
- SOP #109: Surface Water Sampling
- SOP #110: Field Monitoring Equipment Calibration
- SOP #118: Test Pit Sampling
- SOP #120: Headspace Analysis
- SOP #121: Soil Vapor Sampling

4.3 Sample Identification

Samples of soil and groundwater will be identified and labeled. Each label shall include the site name, sample location, and the sampling date / time. The following alphanumeric system will be utilized to identify each sample and will correspond with the sample location to be identified on field-generated sampling diagrams:

Sample Type +	Location No. +	Block Number +	Depth(s) =	Example Sample I.D
Soil – Boring	SB-01, 02…	N/A	(# - #”)	SB-01 (2-6”)
Soil – Surface	SS-37…	N/A	(# - #”)	SS-37 (2-12”)
Groundwater	MW-2	N/A	N/A	MW-2
Blind Duplicate	SB, MW, SS…	N/A	N/A	SS-D1, SB-D2, MW-D1…

4.4 Quality Assurance Project Plan

The Quality Assurance Project Plan (QAPP) describes the way quality assurance / quality control (QA/QC) procedures will be implemented during RI activities to assure the accuracy and precision of the data collected. The guidance for the selection of QAPP objectives was obtained from the NYSDEC’s DER-10 Technical Guidance for Site Investigation and Remediation (May 2010).

Quality Assurance (QA) refers to the conduct of all planned and systematic actions necessary to perform satisfactorily all task-specific activities and to provide information and data confidence as a result of such activities. The QA for task-specific activities includes the development of procedures, auditing, monitoring and surveillance of the performance.

Quality Control (QC) refers to the activity performed to determine if the work activities conform to the requirements. This includes activities such as inspections of the work activities in the field. QA is an overall monitoring of the performance of QC activities through audits rather than first time inspections.

The project specific QAPP is presented as Appendix B.

5.0 Remedial Investigation Activities

5.1 Subsurface Soil & Groundwater Investigation

The purpose of the subsurface soil and groundwater investigation is to further determine the extent of contamination at the site. To this end, a total of twenty-eight (26) soil borings will be advanced throughout the site (see Figure 4A & Figure 4B), up to three (3) feet below the groundwater interference (groundwater depth fluctuates based on time of year), or approximately ten (10) feet below grade, whichever is first encountered. The borings were located at a rate of one (1) per acre in the historically disturbed areas of the site (totaling 18.5 acres) and one (1) per every two (2) acres in the undisturbed portions of the site. The limits of disturbance are depicted on Figures 3A and 3B. Two of the borings (SB-25 and SB-26) were selected at prior sampling locations SS-53 and SS-83 due to the presence of PCB contamination at depth in these locations.

A total of eight (8) groundwater wells will be installed for groundwater sampling purposes (see Figure 4A & Figure 4B). The monitoring wells are to be installed using hollow-stem auger methods, be constructed of 2-inch diameter flush jointed threaded PVC, installed with 10-foot (20 slot) screens set at a depth 7 feet below the observed water table. If bedrock depth precludes setting the screen this deeply into the aquifer, then the well will be set to the top of bedrock.

Wells shall be developed until water quality parameters (See SOP-107) stabilize and turbidity is below 50 nephelometric turbidity units (NTU). At a minimum 5 well volumes shall be removed during development or the well shall be dewatered. Well development shall be considered complete when the turbidity level has dropped below NTU and field parameters have stabilized or if asymptotic conditions have been reached after 50 minutes of purging. If the well dewaters, it shall be allowed to recover to at least 50% of its predevelopment level and development shall continue until the well is dewatered a second time.

Sampling of monitoring wells shall be accomplished following the low-flow methods contained in SOP 106. Under this method, the well shall be purged at a rate of 100 ml per minute or a rate that results in less than 0.3 feet of drawdown whichever is lower. Water quality parameters and drawdown shall be monitored throughout the purging process. Sampling shall commence once stability of water quality parameters has been achieved for three successive readings or at a time when 5 wetted well volumes have been removed. Sampling rate shall be 100 ml/min or the rate which results in less than 0.3 feet of drawdown, whichever is less.

Please refer to the SOPs in Appendix A for monitoring well, installation, development and sampling procedures. Groundwater elevations will be measured in a single event and the results of these measurements shall be used to develop a groundwater contour map for the remedial investigation report.

It may become necessary to alter the location of monitoring well installations based on field observations, site conditions and/or unforeseen circumstances. Similarly, the suite of analytical parameters to be investigated may also be subject to change. If significant relocation or changes to sampling parameters occur, the NYSDEC Project Manager will be notified and provided with the changes and the justification for those decisions. Deviations from the approved RIWP will be documented in the Site Log and RI Report.

Soil samples collected from each boring and monitoring well location will be collected at the following depths:

* Shallow subsurface soil samples will be collected with the general methodology below:
  - Collected approximately 1-5' beneath existing ground level / surface (unsaturated zone).
* Deep subsurface soil samples will be collected with the general methodology below:
  - At / near the groundwater interface (estimated 6-8' beneath existing ground level / surface)

Shallow and Deep subsurface samples collected from the borings shall be analyzed for Target Compound List (TCL) VOCs + 10 TICS, TCL SVOCs + 10 TICs, Pesticides/Herbicides, PCBs, and Target Analyte List (TAL) Metals.

One (1) groundwater sample will be collected from each groundwater well for the analyses. All groundwater samples will be analyzed for TCL VOCs + 10 TICS, TCL SVOCs + 10 TICS, Pesticides/Herbicides, PCBs and TAL Metals. One (1) presumed hydraulically upgradient and one (1) downgradient well will also be sampled for emerging contaminants (1,4-Dioxane, PFAS/PFOS).

A summary of sample locations by matrix type is provided Table 1. The sample quantities and QA/QC sampling quantities are provided in Table 3.

5.2 Surface Soil Investigation

The purpose of the surface soil investigation is to determine the presence of VOCs, SVOC, metals, pesticides and herbicides, additionally PCBs will be analyzed further determine the extent of PCB contamination at the site. To this end, a total of fifty-nine (59) surface soil samples will be collected throughout the site (see Figures 4A & 4B). These locations include 25 surface soil only locations, 26 borings and 8 monitoring well locations. These samples are summarized in Table 1.

The sampling locations are based on a twofold basis. The first set of samples shall be placed in locations to try to determine the extent of contamination associated with samples that exceed the one (1) PPM concentration and do not already have such samples. These locations include SS-02, SS-41, SS-42, SS-49, SS-52, SS-89, SS-96, SS-108, SS-109, and CS-1, etc. In areas without historical sampling surface soil samples are placed using a 200-foot grid to understand the extent of contamination within remaining portions of the site that have not been characterized to date.

Soil samples collected from 0"-2" below vegetative cover will be analyzed for PCBs. A second sample from the 6"-12" interval shall also be collected for PCB analysis but will be held at the lab until the shallower sample result is known. If any such shallower samples contain PCBs at a total concentration at or above 1 mg/kg then the deeper sample shall be analyzed.

Grab VOC samples will be collected from the 2"-6" interval at each location. Composite samples from the sample groupings provided in Table 2 obtained from the 2"-6" interval and 6"-12" intervals will be analyzed for TCL SVOCs + 10 TICS, pesticides, herbicides, and TAL Metals, PFAS / PFOS, and 1,4 – Dioxane. QA/QC samples will be collected at the frequencies shown on the summary table (Table 3). Some of the locations do not have other nearby samples so they will be sampled on a grab sample basis (See Table 1).

If the laboratory results reveal that the PCB concentration in 0"-2" soil sample is greater than one (1) ppm, additional surface soils will be collected within the quadrant to further delineate the area of contamination.

This iterative process will serve as the baseline for establishing horizontal extents of PCB contamination at the site.

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5.3 Test Pit Investigation

During tree removal activities within the brownfield a suspected dump area was identified on the slope in the south-central portion of the site. In order to determine the composition and extent of this fill area, four (4) test pits are proposed as depicted on Figure 4A. Additional test pits may be necessary to define the extent of this fill area. A fifth test pit is proposed for the disturbed area on the southern portion of the site as shown on Figure 4A. The materials observed in these test pits shall be logged and samples will be collected from the fill material for the purpose assessing its composition and level of contamination. At this time four (4) samples (one from each test pit) will be collected and analyzed for TCL VOCs + 10 TICS, TCL SVOCs + 10 TICS, Pesticides/Herbicides, PCBs and TAL Metals. One (1) sample will be collected for analysis for PFAS and 1,4-dioxane.

5.4 Surface-Water Sampling

Surface water samples shall be collected from each of the stormwater basins. These samples will be analyzed for TCL VOCs + 10 TICS, TCL SVOCs + 10 TICS, Pesticides/Herbicides, PCBs and TAL Metals. One (1) of the samples will be analyzed for PFAS and 1,4-dioxane.

5.5 Sediment Sampling

A total of six (6) sediment samples will be collected from the stormwater basins and their outfall/drainage. Two (2) each from each basin, one (1) at the system outfall and one (1) in the drainage channel adjacent to the eastern site boundary. The locations are depicted on Figure 4B. These samples will be analyzed for TCL VOCs + 10 TICS, TCL SVOCs + 10 TICS, Pesticides/Herbicides, PCBs and TAL Metals. One (1) of the samples will be analyzed for PFAS and 1,4-dioxane.

5.6 Soil-Vapor Intrusion Evaluation

Although no information currently exists to suggest volatile contamination at the site, six (6) soil vapor samples are proposed at the locations shown on Figures 4A and 4B. These samples shall be collected in conformance with SOP #121 and this section. These locations may be modified in the field based on observations from the soil and groundwater sampling program. These samples will consist of grab samples collected from a depth of 5 feet bgs over an approximately 1-hour period at a rate not to exceed 0.2 liters per minute, the vacuum reading on any given canister shall be between 2 and 5 inches of mercury at the end of sample collection, Samples shall be collected in 6-liter Summa canisters which will be certified in a batch. The helium tracer test shroud will be sealed to the soil surface by first removing vegetation and exposing bare soil. The soils may be wetted with distilled water to all the soil to better adhere to the edge of the shroud. The shroud to soil seal shall be augmented with the application of hydrated powdered bentonite and weight will be applied to the shroud to ensure that it stays in place. Soil vapor samples shall be analyzed by USEPA Method TO-15.

5.7 Qualitative Health Exposure / Risk Assessment

To assess potential site impacts on human health and the environment, a qualitative human health exposure assessment will be completed. This risk assessment will include five (5) elements associated with exposure pathways, including:

* A description of the contaminant source(s) including the location of the contaminant release to the environment (any waste disposal area or point of discharge) or if the original source is unknown, the contaminated environmental medium (soil, indoor or outdoor air, water) at the point of exposure;

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* An explanation of the contaminant release and transport mechanisms to the exposed population;
* Identification of all potential exposure point(s) where actual or potential human contact with contamination may occur;
* Description(s) of the route(s) of exposure (i.e. ingestion, inhalation, dermal absorption); and,
* A characterization of the receptor populations who may be exposed to contaminants at a point of exposure.

5.8 Data Usability

A data usability review effort will be completed for the analytical data generated as part of the investigation, consistent with NYSDEC-DUSR Guidance for this type of project. All laboratory data shall conform with NYSDEC Category B requirements. As part of this effort, a general evaluation of field records and analytical data will be performed by an independent 3rd party to assess whether the data is accurate and defensible.

6.0 Remedial Investigation Report

Upon completion of the fieldwork, a comprehensive Remedial Investigation Report (RIR) will be generated. The report will be consistent with NYSDEC's DER-10 Technical Guidance for Site Investigation and Remediation, and will include the following:

* Introduction and project background;
* Site description;
* Description of field procedures and methods employed;
* Discussion of the nature and rationale for any significant deviations from the RI Work Plan;
* Description of site-specific geology and hydrogeology developed from information obtained from the investigation. This shall include development of geologic cross-sections and groundwater contour maps;
* Summary of data collected, including a comparison to applicable cleanup criteria and DUSR summary. This summary shall summarize and compare the results of the investigation against the unrestricted SCOs, commercial use SCOs and groundwater SCOs (if applicable);
* Evaluation of environmental impacts to media being investigated (soil and groundwater) to include conclusions and recommendation regarding any additional investigatory steps that may be required to address data gaps identified during analysis of the investigation results;
* Conclusions of the qualitative health exposure assessment; and
* Supporting materials (i.e. site plans, boring logs, monitoring well construction details / as-builts, laboratory reports, etc.).
* Documentation of the characterization and disposition of IDW generated during the remedial investigation.

Electronic data deliverables (EDDs) and other sample data for each report will also be submitted on the appropriate EQuIS forms and contain the required information.

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7.0 Health & Safety Plan

A Health & Safety Plan (HASP) sets forth requirements for maintaining the health and safety of persons performing work at the site. The HASP addresses general health and safety issues related to the presence of specific chemical and physical hazards that may be encountered during performance of the work activities at the site. The HASP includes an Emergency Response Plan, which presents the procedures to be followed in the event of an emergency. The site-specific HASP has been presented in Appendix C.

8.0 Community Air Monitoring Plan

The intent of the Community Air Monitoring Plan (CAMP) is to provide a measure of protection for the downwind community (i.e. off-site receptors and on-site workers not directly involved with the subject work activities). Additionally, the CAMP helps confirm that work activities did not spread contamination off-site through the air. Action levels, as specified within the CAMP, require increased monitoring, corrective actions to stop emissions, and/or the shutdown of work activities.

Continuous monitoring for volatile organic compounds (VOCs) and particulates (i.e. dust) will be required during significant ground intrusive activities, if performed (i.e. test pitting); however, community air monitoring shall not be required for the remedial investigation when using hand tools for surface / shallow soil sampling, soil borings, or during groundwater sampling activities. When CAMP is required, the results of this monitoring shall be submitted daily. The CAMP has been provided in Appendix D.

9.0 Project Schedule

Bowers Business Park, LLC proposes the following project schedule; however, please note that due to the nature of the investigation work and coordination efforts between regulatory agencies, additional time may become necessary to obtain approvals in order to complete each phase of work. In such an instance, the NYSDEC Project Manager will be notified of any changes to the proposed project schedule.

Submit Draft Remedial Investigation Work Plan .... February 2022
End 30-Day NYSDEC Comment Period .... March 2022
Incorporate Final Comments / NYSDEC Approval of RIWP .... August 2022
Removal of Trees (as necessary) .... February-April 2022
Complete Remedial Investigation (RI) Field Work .... August/September 2022
Submit Draft Remedial Investigation Report (RIR) .... October 2022
Significant Threat Determination / Fact Sheet .... October 2022
Incorporate Final Comments / DEC Approval of RIR .... November 2022
Submit Draft Alternative Analysis Report / RAWP .... November 2022
End 45-Day Comment Period .... January 2023
Incorporate Final Comments / DEC Approval of RAWP .... January 2023
Begin Remediation Activities .... April 2023
Complete Remediation Activities .... June 2023
Submit Draft Environmental Easement Package .... June 2023
Submit Executed Environmental Easement Package .... July 2023
Environmental Easement Recorded .... July 2023
Submit Draft Site Management Plan .... July 2023
Submit Draft Final Engineering Report .... August 2023
Incorporate Final Comments / DEC Approval of Site Management Plan .... September 2023
Incorporate Final Comments / DEC Approval of Final Engineering Report .... September 2023
Certificate of Completion .... September 2023

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Table 1
Bowers Business Park
Remedial Investigation Workplan
Summary of Proposed Sample Locations

Location	Analyzed Compounds / Depth of Sample Collection								
	VOCs	**SVOCs**	**Metals**	**PCBs**	**Pesticides**	**Herbicides**	**1,4-Dioxane**	**PFAS**	**TO-15**
Groundwater									
MW-1	Screened Interval	Screened Interval	Screened Interval	Screened Interval	Screened Interval	Screened Interval	Screened Interval	Screened Interval	---
MW-2	Screened Interval	Screened Interval	Screened Interval	Screened Interval	Screened Interval	Screened Interval	---	---	---
MW-3	Screened Interval	Screened Interval	Screened Interval	Screened Interval	Screened Interval	Screened Interval	---	---	---
MW-4	Screened Interval	Screened Interval	Screened Interval	Screened Interval	Screened Interval	Screened Interval	---	---	---
MW-5	Screened Interval	Screened Interval	Screened Interval	Screened Interval	Screened Interval	Screened Interval	---	---	---
MW-6	Screened Interval	Screened Interval	Screened Interval	Screened Interval	Screened Interval	Screened Interval	---	---	---
MW-7	Screened Interval	Screened Interval	Screened Interval	Screened Interval	Screened Interval	Screened Interval	---	---	---
MW-8	Screened Interval	Screened Interval	Screened Interval	Screened Interval	Screened Interval	Screened Interval	Screened Interval	Screened Interval	---
Surface Soil (Refer to Compositing Table) sample depth is measured from base of vegetative root mat.									
	Grab	**Composite**	**Composite**	**Grab**	**Composite**	**Composite**	**Composite**	**Composite**	
SS-117	2"-6"	2"-6"/6"-12"	2"-6"/6"-12"	0"-2"/6"-12"	2"-6"/6"-12"	2"-6"/6"-12"	---	---	---
SS-118	2"-6"	2"-6"/6"-12"	2"-6"/6"-12"	0"-2"/6"-12"	2"-6"/6"-12"	2"-6"/6"-12"	---	---	---
SS-119	2"-6"	2"-6"/6"-12"	2"-6"/6"-12"	0"-2"/6"-12"	2"-6"/6"-12"	2"-6"/6"-12"	---	---	---
SS-120	2"-6"	2"-6"/6"-12"	2"-6"/6"-12"	0"-2"/6"-12"	2"-6"/6"-12"	2"-6"/6"-12"	---	---	---
SS-121	2"-6"	2"-6"/6"-12"	2"-6"/6"-12"	0"-2"/6"-12"	2"-6"/6"-12"	2"-6"/6"-12"	---	---	---
SS-122	2"-6"	2"-6"/6"-12"	2"-6"/6"-12"	0"-2"/6"-12"	2"-6"/6"-12"	2"-6"/6"-12"	---	---	---
SS-123	2"-6"	2"-6"/6"-12"	2"-6"/6"-12"	0"-2"/6"-12"	2"-6"/6"-12"	2"-6"/6"-12"	---	---	---
SS-124	2"-6"	2"-6"/6"-12"	2"-6"/6"-12"	0"-2"/6"-12"	2"-6"/6"-12"	2"-6"/6"-12"	---	---	---
SS-125	2"-6"	2"-6"/6"-12"	2"-6"/6"-12"	0"-2"/6"-12"	2"-6"/6"-12"	2"-6"/6"-12"	---	---	---
SS-126	2"-6"	2"-6"/6"-12"	2"-6"/6"-12"	0"-2"/6"-12"	2"-6"/6"-12"	2"-6"/6"-12"	---	---	---
SS-127	2"-6"	2"-6"/6"-12"	2"-6"/6"-12"	0"-2"/6"-12"	2"-6"/6"-12"	2"-6"/6"-12"	---	---	---
SS-128	2"-6"	2"-6"/6"-12"	2"-6"/6"-12"	0"-2"/6"-12"	2"-6"/6"-12"	2"-6"/6"-12"	---	---	---
SS-129	2"-6"	2"-6"/6"-12"	2"-6"/6"-12"	0"-2"/6"-12"	2"-6"/6"-12"	2"-6"/6"-12"	---	---	---
SS-130	2"-6"	2"-6"/6"-12"	2"-6"/6"-12"	0"-2"/6"-12"	2"-6"/6"-12"	2"-6"/6"-12"	---	---	---
SS-131	2"-6"	2"-6"/6"-12"	2"-6"/6"-12"	0"-2"/6"-12"	2"-6"/6"-12"	2"-6"/6"-12"	---	---	---
SS-132	2"-6"	2"-6"/6"-12"	2"-6"/6"-12"	0"-2"/6"-12"	2"-6"/6"-12"	2"-6"/6"-12"	---	---	---
SS-133	2"-6"	2"-6"/6"-12"	2"-6"/6"-12"	0"-2"/6"-12"	2"-6"/6"-12"	2"-6"/6"-12"	---	---	---
SS-134	2"-6"	2"-6"/6"-12"	2"-6"/6"-12"	0"-2"/6"-12"	2"-6"/6"-12"	2"-6"/6"-12"	---	---	---
SS-135	2"-6"	2"-6"/6"-12"	2"-6"/6"-12"	0"-2"/6"-12"	2"-6"/6"-12"	2"-6"/6"-12"	---	---	---
SS-136	2"-6"	2"-6"/6"-12"	2"-6"/6"-12"	0"-2"/6"-12"	2"-6"/6"-12"	2"-6"/6"-12"	---	---	---
SS-137	2"-6"	2"-6"/6"-12"	2"-6"/6"-12"	0"-2"/6"-12"	2"-6"/6"-12"	2"-6"/6"-12"	---	---	---
SS-138	2"-6"	2"-6"/6"-12"	2"-6"/6"-12"	0"-2"/6"-12"	2"-6"/6"-12"	2"-6"/6"-12"	---	---	---
SS-139	2"-6"	2"-6"/6"-12"	2"-6"/6"-12"	0"-2"/6"-12"	2"-6"/6"-12"	2"-6"/6"-12"	---	---	---
SS-140	2"-6"	2"-6"/6"-12"	2"-6"/6"-12"	0"-2"/6"-12"	2"-6"/6"-12"	2"-6"/6"-12"	---	---	---
SS-141	2"-6"	2"-6"/6"-12"	2"-6"/6"-12"	0"-2"/6"-12"	2"-6"/6"-12"	2"-6"/6"-12"			
SS-142	2"-6"	2"-6"/6"-12"	2"-6"/6"-12"	0"-2"/6"-12"	2"-6"/6"-12"	2"-6"/6"-12"	---	---	---
SS-143	2"-6"	2"-6"/6"-12"	2"-6"/6"-12"	0"-2"/6"-12"	2"-6"/6"-12"	2"-6"/6"-12"			
SS-144	2"-6"	2"-6"/6"-12"	2"-6"/6"-12"	0"-2"/6"-12"	2"-6"/6"-12"	2"-6"/6"-12"			
SS-145	2"-6"	2"-6"/6"-12"	2"-6"/6"-12"	0"-2"/6"-12"	2"-6"/6"-12"	2"-6"/6"-12"			
SB-1	2"-6"	2"-6"/6"-12"	2"-6"/6"-12"	0"-2"/6"-12"	2"-6"/6"-12"	2"-6"/6"-12"	---	---	---
SB-2	2"-6"	2"-6"/6"-12"	2"-6"/6"-12"	0"-2"/6"-12"	2"-6"/6"-12"	2"-6"/6"-12"	---	---	---
SB-3	2"-6"	2"-6"/6"-12"	2"-6"/6"-12"	0"-2"/6"-12"	2"-6"/6"-12"	2"-6"/6"-12"	---	---	---
SB-4	2"-6"	2"-6"/6"-12"	2"-6"/6"-12"	0"-2"/6"-12"	2"-6"/6"-12"	2"-6"/6"-12"	---	---	---
SB-5	2"-6"	2"-6"/6"-12"	2"-6"/6"-12"	0"-2"/6"-12"	2"-6"/6"-12"	2"-6"/6"-12"	---	---	---
SB-6	2"-6"	2"-6"/6"-12"	2"-6"/6"-12"	0"-2"/6"-12"	2"-6"/6"-12"	2"-6"/6"-12"	---	---	---
SB-7	2"-6"	2"-6"/6"-12"	2"-6"/6"-12"	0"-2"/6"-12"	2"-6"/6"-12"	2"-6"/6"-12"	---	---	---
SB-8	2"-6"	2"-6"/6"-12"	2"-6"/6"-12"	0"-2"/6"-12"	2"-6"/6"-12"	2"-6"/6"-12"	---	---	---
SB-9	2"-6"	2"-6"/6"-12"	2"-6"/6"-12"	0"-2"/6"-12"	2"-6"/6"-12"	2"-6"/6"-12"	---	---	---
SB-10	2"-6"	2"-6"/6"-12"	2"-6"/6"-12"	0"-2"/6"-12"	2"-6"/6"-12"	2"-6"/6"-12"	---	---	---
SB-11	2"-6"	2"-6"/6"-12"	2"-6"/6"-12"	0"-2"/6"-12"	2"-6"/6"-12"	2"-6"/6"-12"	---	---	---
SB-12	2"-6"	2"-6"/6"-12"	2"-6"/6"-12"	0"-2"/6"-12"	2"-6"/6"-12"	2"-6"/6"-12"	---	---	---
SB-13	2"-6"	2"-6"/6"-12"	2"-6"/6"-12"	0"-2"/6"-12"	2"-6"/6"-12"	2"-6"/6"-12"	---	---	---
SB-14	2"-6"	2"-6"/6"-12"	2"-6"/6"-12"	0"-2"/6"-12"	2"-6"/6"-12"	2"-6"/6"-12"	---	---	---
SB-15	2"-6"	2"-6"/6"-12"	2"-6"/6"-12"	0"-2"/6"-12"	2"-6"/6"-12"	2"-6"/6"-12"	---	---	---
SB-16	2"-6"	2"-6"/6"-12"	2"-6"/6"-12"	0"-2"/6"-12"	2"-6"/6"-12"	2"-6"/6"-12"	---	---	---
SB-17	2"-6"	2"-6"/6"-12"	2"-6"/6"-12"	0"-2"/6"-12"	2"-6"/6"-12"	2"-6"/6"-12"	---	---	---
SB-18	2"-6"	2"-6"/6"-12"	2"-6"/6"-12"	0"-2"/6"-12"	2"-6"/6"-12"	2"-6"/6"-12"	---	---	---
SB-19	2"-6"	2"-6"/6"-12"	2"-6"/6"-12"	0"-2"/6"-12"	2"-6"/6"-12"	2"-6"/6"-12"	---	---	---
SB-20	2"-6"	2"-6"/6"-12"	2"-6"/6"-12"	0"-2"/6"-12"	2"-6"/6"-12"	2"-6"/6"-12"	---	---	---
SB-21	2"-6"	2"-6"/6"-12"	2"-6"/6"-12"	0"-2"/6"-12"	2"-6"/6"-12"	2"-6"/6"-12"	---	---	---
SB-22	2"-6"	2"-6"/6"-12"	2"-6"/6"-12"	0"-2"/6"-12"	2"-6"/6"-12"	2"-6"/6"-12"	---	---	---
SB-23	2"-6"	2"-6"/6"-12"	2"-6"/6"-12"	0"-2"/6"-12"	2"-6"/6"-12"	2"-6"/6"-12"	---	---	---
SB-24	2"-6"	2"-6"/6"-12"	2"-6"/6"-12"	0"-2"/6"-12"	2"-6"/6"-12"	2"-6"/6"-12"	---	---	---
SB-25	2"-6"	2"-6"/6"-12"	2"-6"/6"-12"	0"-2"/6"-12"	2"-6"/6"-12"	2"-6"/6"-12"	---	---	---
SB-26	2"-6"	2"-6"/6"-12"	2"-6"/6"-12"	0"-2"/6"-12"	2"-6"/6"-12"	2"-6"/6"-12"	---	---	---
MW-1	2"-6"	2"-6"/6"-12"	2"-6"/6"-12"	0"-2"/6"-12"	2"-6"/6"-12"	2"-6"/6"-12"	---	---	---
MW-2	2"-6"	2"-6"/6"-12"	2"-6"/6"-12"	0"-2"/6"-12"	2"-6"/6"-12"	2"-6"/6"-12"	---	---	---
MW-3	2"-6"	2"-6"/6"-12"	2"-6"/6"-12"	0"-2"/6"-12"	2"-6"/6"-12"	2"-6"/6"-12"	---	---	---
MW-4	2"-6"	2"-6"/6"-12"	2"-6"/6"-12"	0"-2"/6"-12"	2"-6"/6"-12"	2"-6"/6"-12"	---	---	---
MW-5	2"-6"	2"-6"/6"-12"	2"-6"/6"-12"	0"-2"/6"-12"	2"-6"/6"-12"	2"-6"/6"-12"	---	---	---

Bowers Business Park
Remedial Investigation Workplan
Summary of Proposed Sample Locations

Location	Analyzed Compounds / Depth of Sample Collection								
	VOCs	SVOCs	Metals	PCBs	Pesticides	Herbicides	1,4-Dioxane	PFAS	TO-15
MW-6	2"-6"	2"-6"/6"-12"	2"-6"/6"-12"	0"-2"/6"-12"	2"-6"/6"-12"	2"-6"/6"-12"	---	---	---
MW-7	2"-6"	2"-6"/6"-12"	2"-6"/6"-12"	0"-2"/6"-12"	2"-6"/6"-12"	2"-6"/6"-12"	---	---	---
MW-8	2"-6"	2"-6"/6"-12"	2"-6"/6"-12"	0"-2"/6"-12"	2"-6"/6"-12"	2"-6"/6"-12"	---	---	---
Subsurface Soil - Shallow Subsurface (4-6 feet bgs) and Groundwater Interface (GWI)									
	Grab	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	**Grab**	
SB-1	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	---	---	---
SB-2	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	---	---	---
SB-3	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	---	---	---
SB-4	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	---	---	---
SB-5	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	---	---	---
SB-6	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	---	---	---
SB-7	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	---	---	---
SB-8	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	---	---	---
SB-9	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	---	---	---
SB-10	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	---	---	---
SB-11	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	---	---	---
SB-12	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	---	---	---
SB-13	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	---	---	---
SB-14	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	---	---	---
SB-15	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	---	---	---
SB-17	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	---	---	---
SB-18	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	---	---	---
SB-19	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	---	---	---
SB-20	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	---	---	---
SB-21	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	---	---	---
SB-22	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	---	---	---
SB-23	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	---	---	---
SB-24	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	---	---	---
SB-25	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	---	---	---
SB-26	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	---	---	---
MW-1	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	---	---	---
MW-2	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	---	---	---
MW-3	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	---	---	---
MW-4	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	---	---	---
MW-5	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	---	---	---
MW-6	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	---	---	---
MW-7	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	---	---	---
MW-8	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	---	---	---
TP-1	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	---	---	---
TP-2	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	---	---	---
TP-3	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	---	---	---
TP-4	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	---	---	---
TP-5	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	4-6/GWI	---	---	---
PCB Delineation Samples									
CS-1	---	---	---	6"-12"	---	---	---	---	---
CS-2	---	---	---	6"-12"	---	---	---	---	---
CS-3	---	---	---	6"-12"	---	---	---	---	---
CS-4	---	---	---	6"-12"	---	---	---	---	---
SP2-01	---	---	---	6"-12"	---	---	---	---	---
SP2-05	---	---	---	6"-12"	---	---	---	---	---
SP2-06	---	---	---	6"-12"	---	---	---	---	---
SP2-07	---	---	---	6"-12"	---	---	---	---	---
SP2-08	---	---	---	6"-12"	---	---	---	---	---
SS-37	---	---	---	6"-12"	---	---	---	---	---
SS-38	---	---	---	6"-12"	---	---	---	---	---
SS-41	---	---	---	6"-12"	---	---	---	---	---
SS-42	---	---	---	6"-12"	---	---	---	---	---
SS-45	---	---	---	6"-12"	---	---	---	---	---
SS-49	---	---	---	6"-12"	---	---	---	---	---
SS-51	---	---	---	6"-12"	---	---	---	---	---
SS-52	---	---	---	6"-12"	---	---	---	---	---
SS-59	---	---	---	6"-12"	---	---	---	---	---
SS-67	---	---	---	6"-12"	---	---	---	---	---
SS-75	---	---	---	6"-12"	---	---	---	---	---
SS-76	---	---	---	6"-12"	---	---	---	---	---
SS-81	---	---	---	6"-12"	---	---	---	---	---
SS-82	---	---	---	6"-12"	---	---	---	---	---
SS-85	---	---	---	6"-12"	---	---	---	---	---
SS-86	---	---	---	6"-12"	---	---	---	---	---
SS-87	---	---	---	6"-12"	---	---	---	---	---
SS-88	---	---	---	6"-12"	---	---	---	---	---
SS-89	---	---	---	6"-12"	---	---	---	---	---
SS-91	---	---	---	6"-12"	---	---	---	---	---

Bowers Business Park
Remedial Investigation Workplan
Summary of Proposed Sample Locations

Location	Analyzed Compounds / Depth of Sample Collection								
	VOCs	SVOCs	Metals	PCBs	Pesticides	Herbicides	1,4-Dioxane	PFAS	TO-15
SS-99	---	---	---	6"-12"	---	---	---	---	---
SS-02C	---	---	---	6"-12"	---	---	---	---	---
SS-108	---	---	---	6"-12"	---	---	---	---	---
SS-108N	---	---	---	0"-2"/6"-12"	---	---	---	---	---
SS-108W	---	---	---	0"-2"/6"-12"	---	---	---	---	---
SS108E	---	---	---	0"-2"/6"-12"	---	---	---	---	---
SS-109	---	---	---	6"-12"	---	---	---	---	---
SS-109W	---	---	---	0"-2"/6"-12"	---	---	---	---	---
SS-109S	---	---	---	0"-2"/6"-12"	---	---	---	---	---
SS-109E	---	---	---	0"-2"/6"-12"	---	---	---	---	---
Sediment									
SD-1	0-2"	0-2"	0-2"	0-2"	0-2"	0-2"			
SD-2	0-2"	0-2"	0-2"	0-2"	0-2"	0-2"			
SD-3	0-2"	0-2"	0-2"	0-2"	0-2"	0-2"			
SD-4	0-2"	0-2"	0-2"	0-2"	0-2"	0-2"			
SD-5	0-2"	0-2"	0-2"	0-2"	0-2"	0-2"			
SD-6	0-2"	0-2"	0-2"	0-2"	0-2"	0-2"	0-2"	0-2"	
Surface Water (Grab)									
SW-1	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	
SW-2	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	
Soil Vapor (Grab)									
SV-1									60"
SV-2									60"
SV-3									60"
SV-4									60"

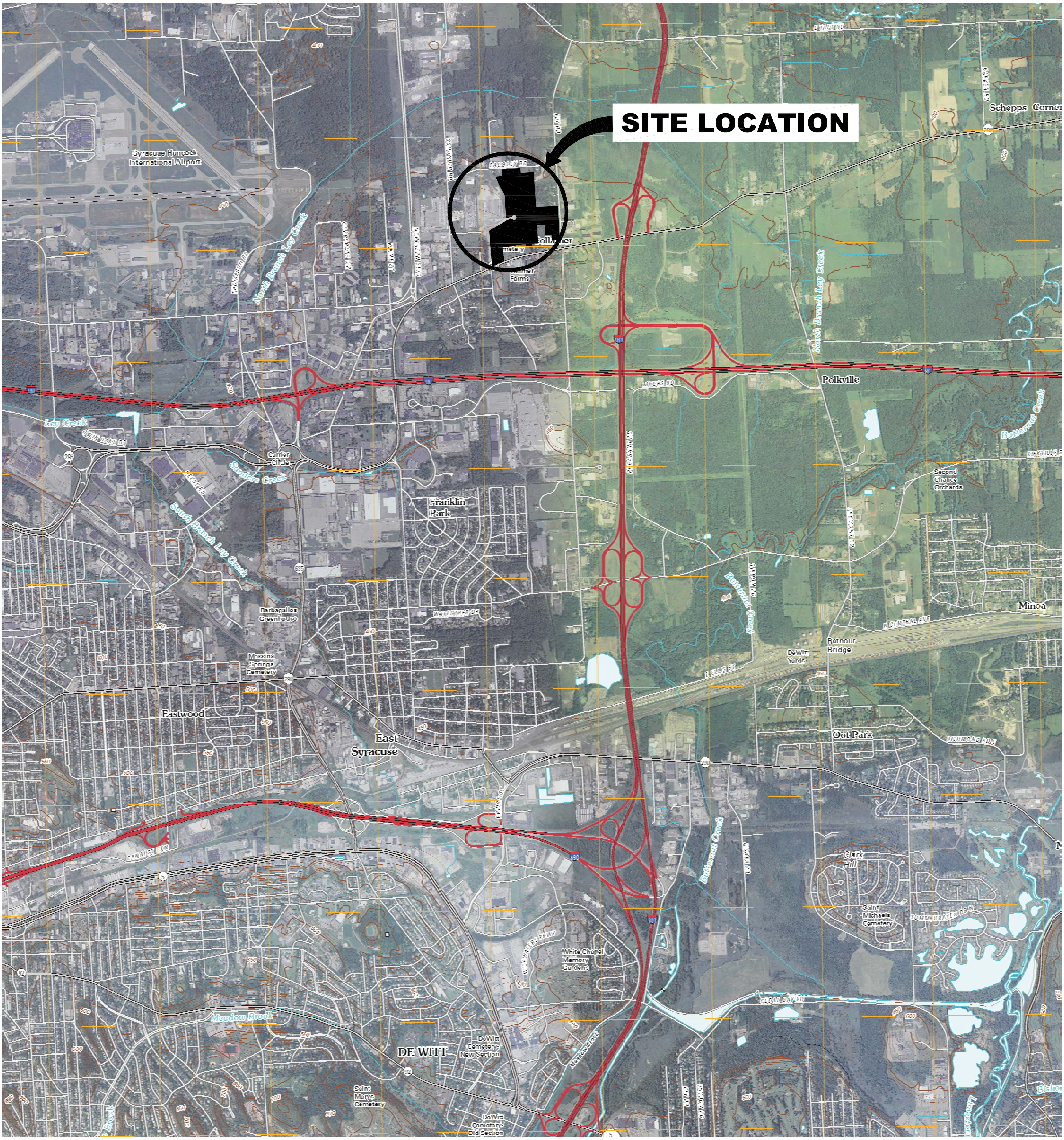
Notes:
Bold = Location of sample to be collected
--- = No sample to be collected
^ = Assumed hydraulically upgradient and downgradient wells
GWI = Groundwater Interface
CoS = Center of Section (i.e. - middle of applicable layer)
Values shown in ppm are past analytical results of soil samples collected 0"-2" below the vegetative cover
* = the 6"-12" samples will be analyzed if necessary (i.e. - if analytical results of samples above or adjacent do not meet criteria). Depth measured from base of sod layer
TBD - to be determined based on the depth of encountered fill materials
- Shaded locations to be sampled as grabs (applies only to surface samples)

Table 2	
Bowers Business Park Remedial Investigation Work Plan Summary of Composites	
	Included locations
Composite A-1, A-2	SB-1, SS-117, SS-118, SS-121, SS-122
Composite B-1, B-2	SB-2, SS-119, SS-120
Composite C-1, C-2	SB-3, SB-4, SB-5, SS-125
Composite D-1, D-2	SB-6, SS-123, SS-124, SS-126
Composite E-1, E-2	SB-7, SB-9, SB-10, SS-127
Composite F-1, F-2	SB-15, SB-16, SS-138, SS-137
Composite G-1, G-2	SB-14, SS-131, SS-132, SS-133, SS-134
Composite H-1, H-2	SB-17, SS-135, SS-137
Composite I-1, I-2	SB-22, SS-139, SS-140, SS-141, SS-142
Composite J-1, J-2	SB-24, SB-23

Notes:

x-1, x-2 refers to 2-6 and 6-12 sample respectively

Table 3											
Bowers Business Park **Remedial Investigation Workplan** **Summary of Sample Quantities and QA/QC Sample Requirements**											
	Analyte Group										
Matrix	**VOC**	**SVOC**	**Metals**	**Pesticide**	**Herbicide**	**PCB**	**PFAS**	**1,4-Dioxane**	**TO-15**	**MS/MSD**	**Duplicates**
Surface Soil	59	27	27	27	27	118	4	4		6	6
Shallow Subsurface Soil	28	28	28	28	28	28	1	1		2	2
Deep Subsurface Soil (GWI)	28	28	28	28	28	28	1	1		2	2
PCB Delineation Samples						41				3	3
Sediment	6	6	6	6	6	6	1	1		1	1
Soil Vapor									4	1	1
Surface Water	2	2	2	2	2	2	1	1		1	1
Groundwater	8	8	8	8	8	8	8	2	2	1	1



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SOURCE: USGS SYRACUSE EAST QUADRANGLE, 7.5-MINUTE SERIES. SYRACUSE EAST, NY 2010.

0 2,000' 4,000'

GRAPHIC SCALE

AECC ENVIRONMENTAL CONSULTING

Asbestos & Environmental Consulting Corporation

6308 Fly Road
East Syracuse, NY 13057

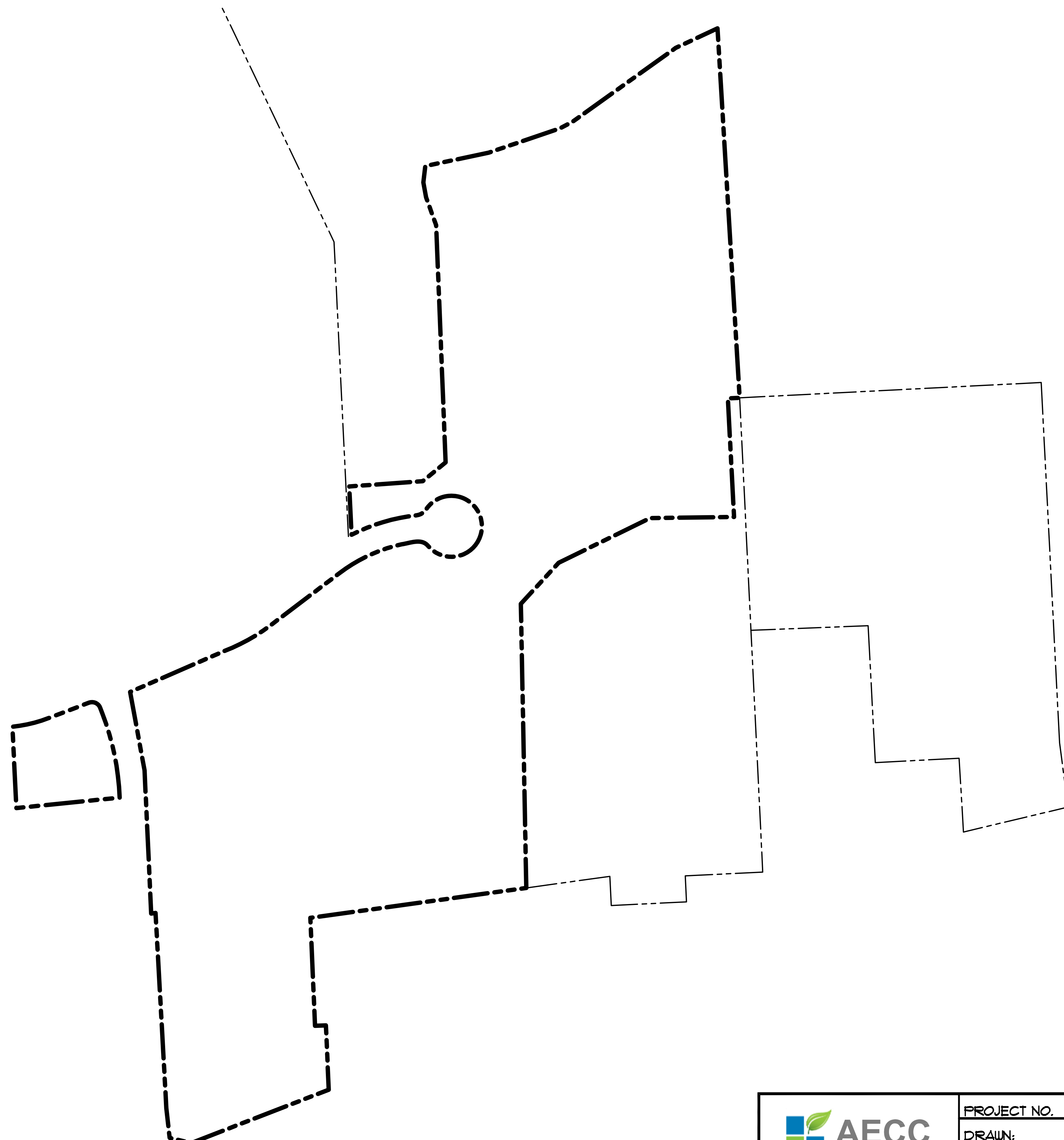
PROJECT NO.	20-044
DRAWN:	FEB. 2022
DRAWN BY:	HS
CHECKED BY:	JS

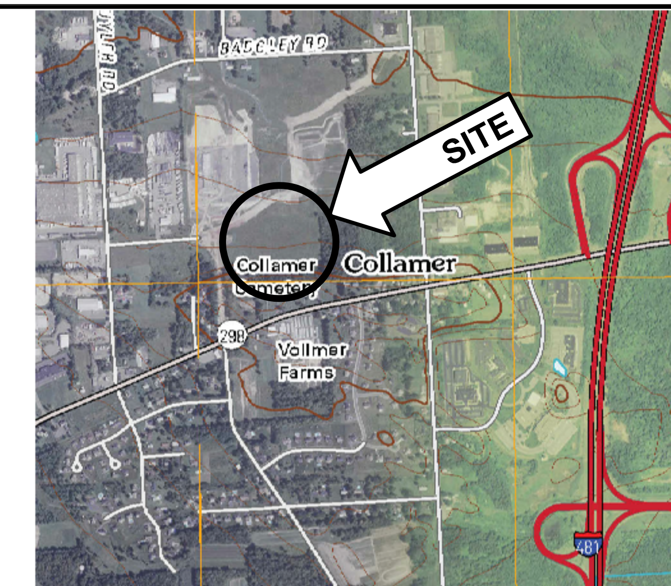
SITE LOCATION PLAN

BOWERS BUSINESS PARK
CANADA DRIVE, TOWN OF DEWITT
ONONDAGA COUNTY, NEW YORK

FIGURE

1





SITE LOCATION

LEGEND:

PROPERTY LINE

BROWNFIELD AREA EXTENTS
TOTAL AREA = 34.4 ACRES

0 150' 300'
GRAPHIC SCALE

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AECC
ENVIRONMENTAL CONSULTING
Asbestos & Environmental Consulting Corporation
6308 Fly Road
East Syracuse, NY 13057

PROJECT NO.	20-044
DRAWN:	JULY 2022
DRAWN BY:	HS
CHECKED BY:	RGH
FILE NAME:	

Site Plan

BOWERS BUSINESS PARK
CANADA DRIVE, TOWN OF DEWITT
ONONDAGA COUNTY, NEW YORK

FIGURE

2

Sample Location	Date	Total PCBs (ppm)
SS-37	10/07/14	104.38
SS-38	10/07/14	87.43
SS-39	10/07/14	0.77
SS-40	10/07/14	0.04
SS-40d	10/07/14	0.00
SS-41	10/07/14	38.53
SS-42	10/07/14	15.48
SS-43	10/07/14	0.27
SS-44	10/07/14	0.19
SS-45	10/07/14	37.12
SS-46	10/07/14	0.59
SS-47	10/07/14	0.02
SS-49	10/07/14	90.51
SS-50	10/07/14	0.19
SS-51	10/07/14	137.94
SS-52	10/07/14	66.52
SS-53	10/07/14	197.84
SS-54	10/07/14	0.13
SS-55	10/07/14	0.04
SS-57	10/07/14	0.03
SS-59	10/07/14	1.68
SS-63	10/07/14	0.09
SS-65	10/07/14	0.07
SS-67	10/29/14	121.07
SS-72	10/29/14	0.05
SS-73	10/29/14	0.57
SS-74	10/29/14	0.02
SS-75	10/29/14	1.37
SS-75d	10/29/14	6.90
SS-76	10/29/14	5.52
SS-80	12/02/14	0.18
SS-81	12/02/14	14.32
SS-82	12/02/14	367.7
SS-83	12/02/14	4,404
SS-84	12/02/14	0.27
SS-85	12/02/14	1.20
SS-86	12/02/14	77.82
SS-87	12/02/14	3.50
SS-88	12/02/14	2.81
SS-89	12/02/14	5.18
SS-90	12/02/14	0.35
SS-91	12/02/14	1.00
SS-92	12/02/14	0.22
SS-93	12/02/14	0.03
SS-94	12/02/14	0.0985

Sample Location	DATE	Total PCBs (ppm)
SS-11	7/13/13	0.05
SS-11d	7/13/13	0.26
SS-30	7/13/13	0.07
SS-30d	7/13/13	0.06
SS-30B	10/09/14	0.02
SS-30D	10/09/14	0.02
SS-96	12/02/14	0.03
SS-102	12/15/14	0.08

Sample Location	Date	Total PCBs (ppm)
SS-95	12/02/14	0.03
SS-95d	12/02/14	0.00
SS-96	12/02/14	0.03
SS-98	12/15/14	0.05
SS-99	12/15/14	96.7
SS-100	12/15/14	0.07
SS-101	12/15/14	0.13
SS-106	12/15/14	0.08

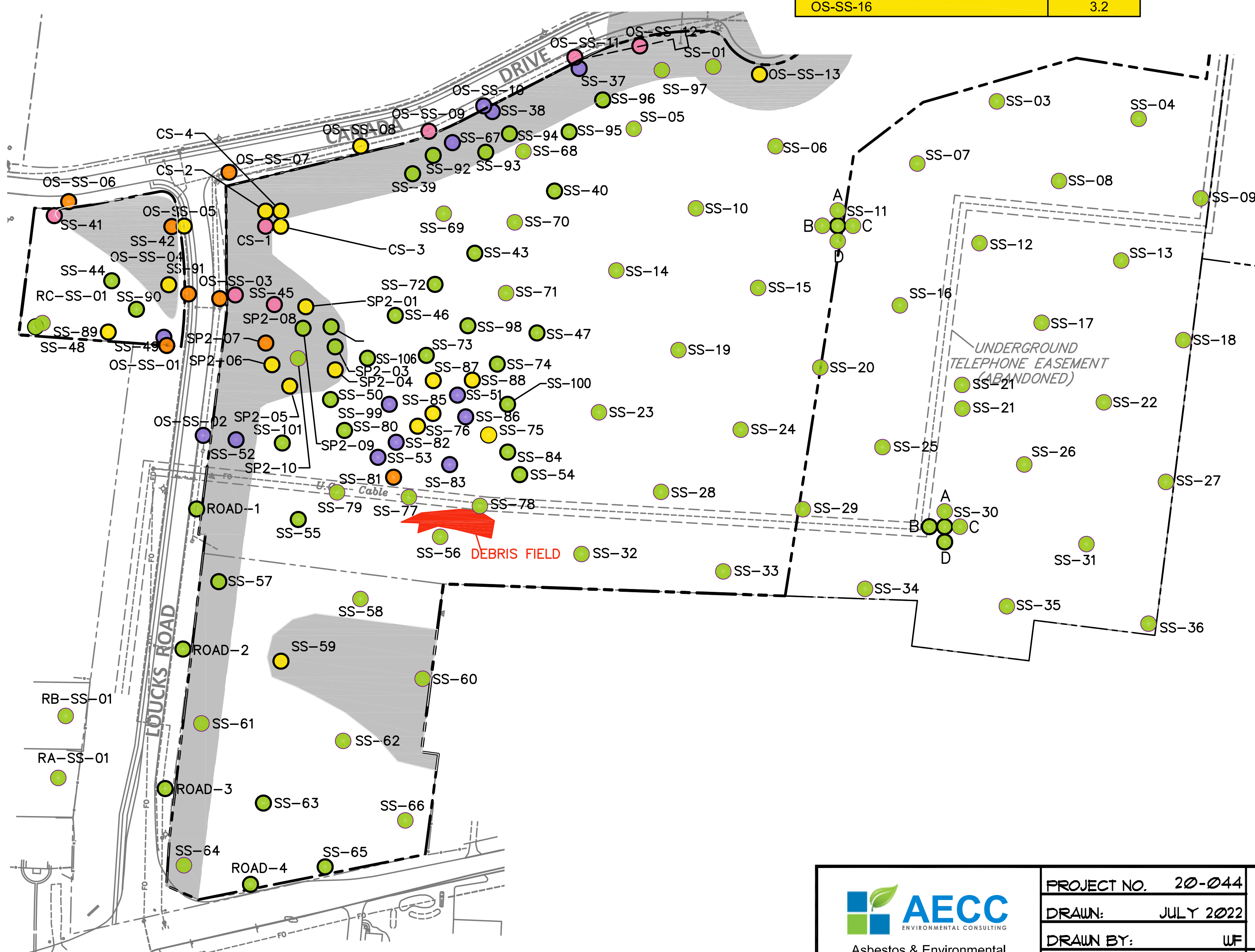
Sample Location	Date	Total PCBs (ppm)
CS-1	04/08/13	34.4
CS-2	04/08/13	6.32
CS-3	04/08/13	7.8
CS-4	04/08/13	9.41

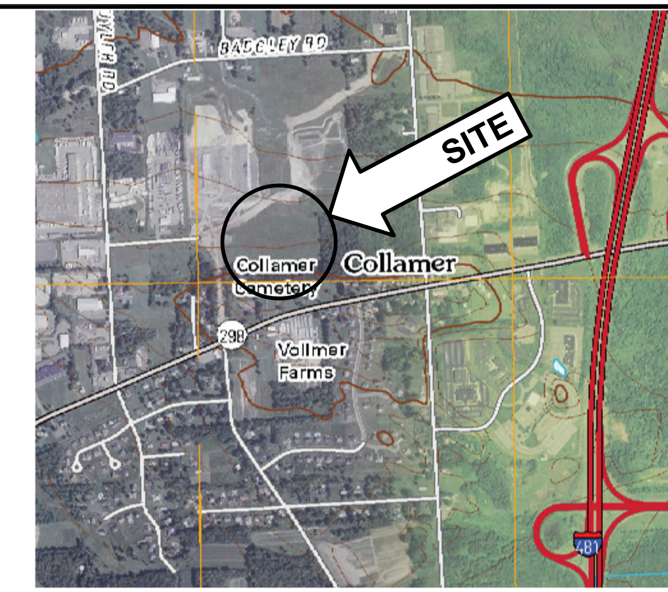
Sample Location	Date	Total PCBs (ppm)
SP2-01	05/31/13	9.072
SP2-02	05/31/13	0.110
SP2-03	05/31/13	0.0802
SP2-04	05/31/13	0.271
SP2-05	05/31/13	9.926
SP2-06	05/31/13	7.273
SP2-07	05/31/13	14.405
SP2-08	05/31/13	25.673
SP2-09	05/31/13	0.119

ROAD-1	10/07/14	0.411
ROAD-2	10/07/14	0.0297
ROAD-3	10/07/14	0.1532
ROAD-4	10/07/14	0.038

Sample Location	Date	Total PCBs (ppm)
CS-1(0.5')	04/08/13	34.4
CS-1(1.5')	12/15/14	1.65
CS-1(2.5')	12/15/14	0.30
SS-53(0.5')	10/07/14	197.84
SS-53(1.5')	12/15/14	13.31
SS-53(2.5')	12/15/14	6.06
SS-83(0.5')	12/02/14	4,404
SS-83(1.5')	12/15/14	66.6
SS-83(2.5')	12/15/14	297.0
SS-87(0.5')	12/02/14	3.50
SS-87(1.5')	12/15/14	4.88
SS-87(2.5')	12/15/14	0.17

Sample Location	Total PCBs (ppm)
OS-SS-01/OS-SS-99	20/5.8
OS-SS-02	130
OS-SS-03	21
OS-SS-04	33
OS-SS-05	7.6
OS-SS-06	29
OS-SS-07	24
OS-SS-08	1.7
OS-SS-09	47
OS-SS-10	260
OS-SS-11(0.0-0.5)	28
OS-SS-11(0.5-1.0)	1.0
OS-SS-12	42
OS-SS-13	2.7
OS-SS-14	3.5
OS-SS-15	1.0
OS-SS-16	3.2





SITE LOCATION

LEGEND:

- BROWNFIELD AREA EXTENT
- PROPERTY LINE
- RIGHT-OF-WAY
- LIMITS OF DISTURBANCE
- SURFACE SOIL SAMPLE LOCATION
- PCB CONCENTRATION <1 mg/kg
- PCB CONCENTRATION BETWEEN 1 AND 10 mg/kg
- PCB CONCENTRATION BETWEEN 10 AND 25 mg/kg
- PCB CONCENTRATION BETWEEN 25 AND 50 mg/kg
- PCB CONCENTRATION EQUAL TO OR OVER 50 mg/kg

NOTES:

1. BASE MAP MODIFIED FROM ELECTRONIC DRAWING FILES PROVIDED BY CLIENT.

0 200' 400'
GRAPHIC SCALE

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AECC ENVIRONMENTAL CONSULTING
Asbestos & Environmental Consulting Corporation
6308 Fly Road
East Syracuse, NY 13057

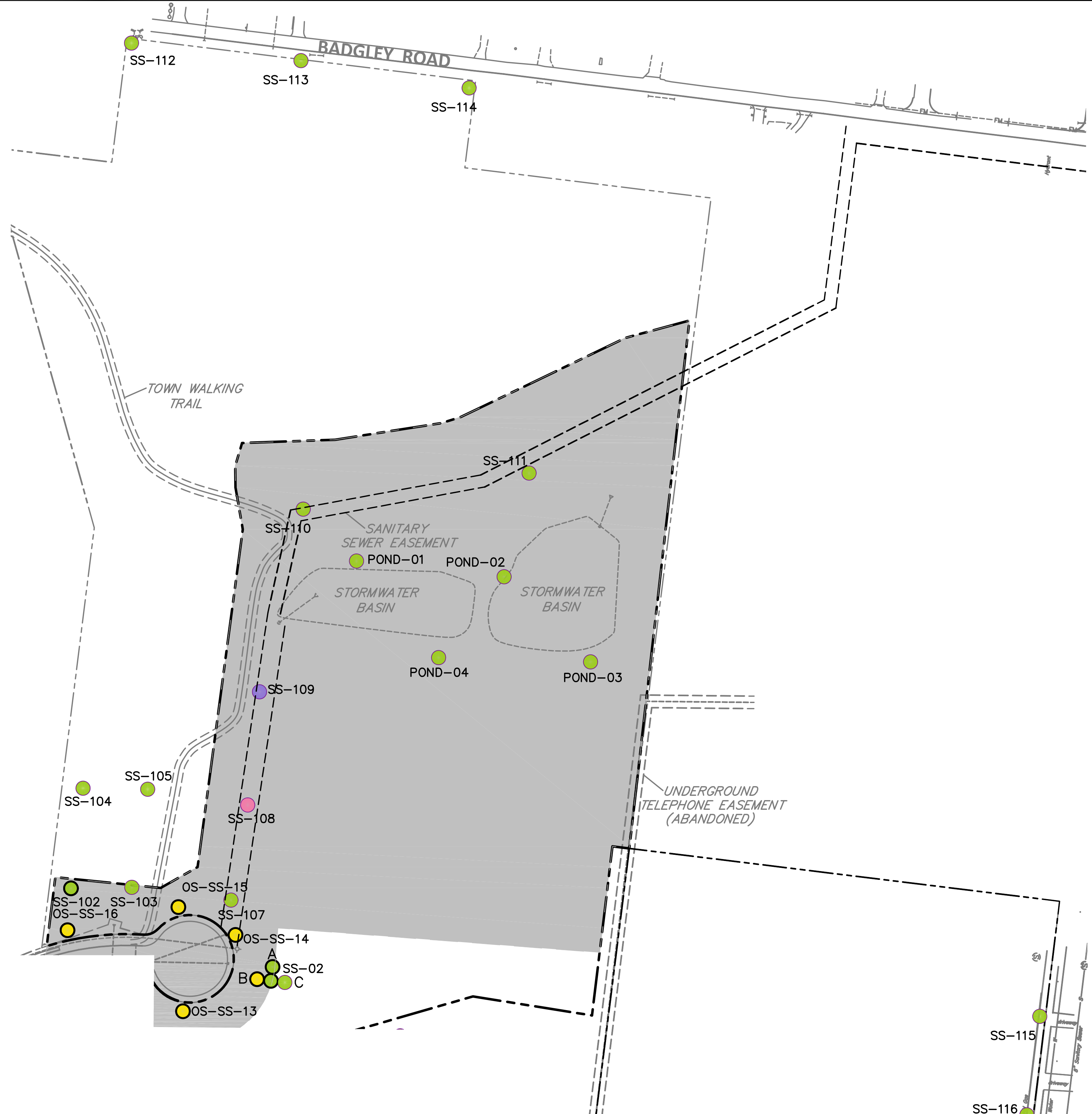
PROJECT NO. 20-044
DRAWN: JULY 2022
DRAWN BY: WF
CHECKED BY: JS
FILE NAME:

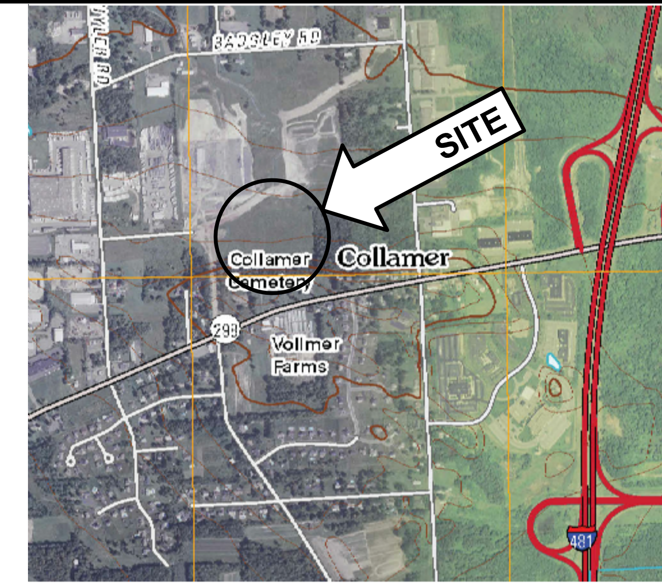
South Section Prior Results

BOWERS BUSINESS PARK
CANADA DRIVE, TOWN OF DEWITT
ONONDAGA COUNTY, NEW YORK

FIGURE **3A**

Sample Location	DATE	Total PCBs (ppm)
SS-02	7/13/13	0.03
SS-02A	10/09/14	0.08
SS-02Ad	10/09/14	0.046
SS-02B	10/09/14	2.39
SS-108	10/21/21	57
SS-109	10/21/21	49
OS-SS-13	6/23/20	2.7
OS-SS-14	6/23/20	3.5
OS-SS-15	6/23/20	1.0
OS-SS-16	6/23/20	3.2





SITE LOCATION

LEGEND:

- BROWNFIELD AREA EXTENT
- PROPERTY LINE
- RIGHT-OF-WAY
- LIMITS OF DISTURBANCE
- SURFACE SOIL SAMPLE LOCATION
- PCB CONCENTRATION <1 mg/kg
- PCB CONCENTRATION BETWEEN 1 AND 10 mg/kg
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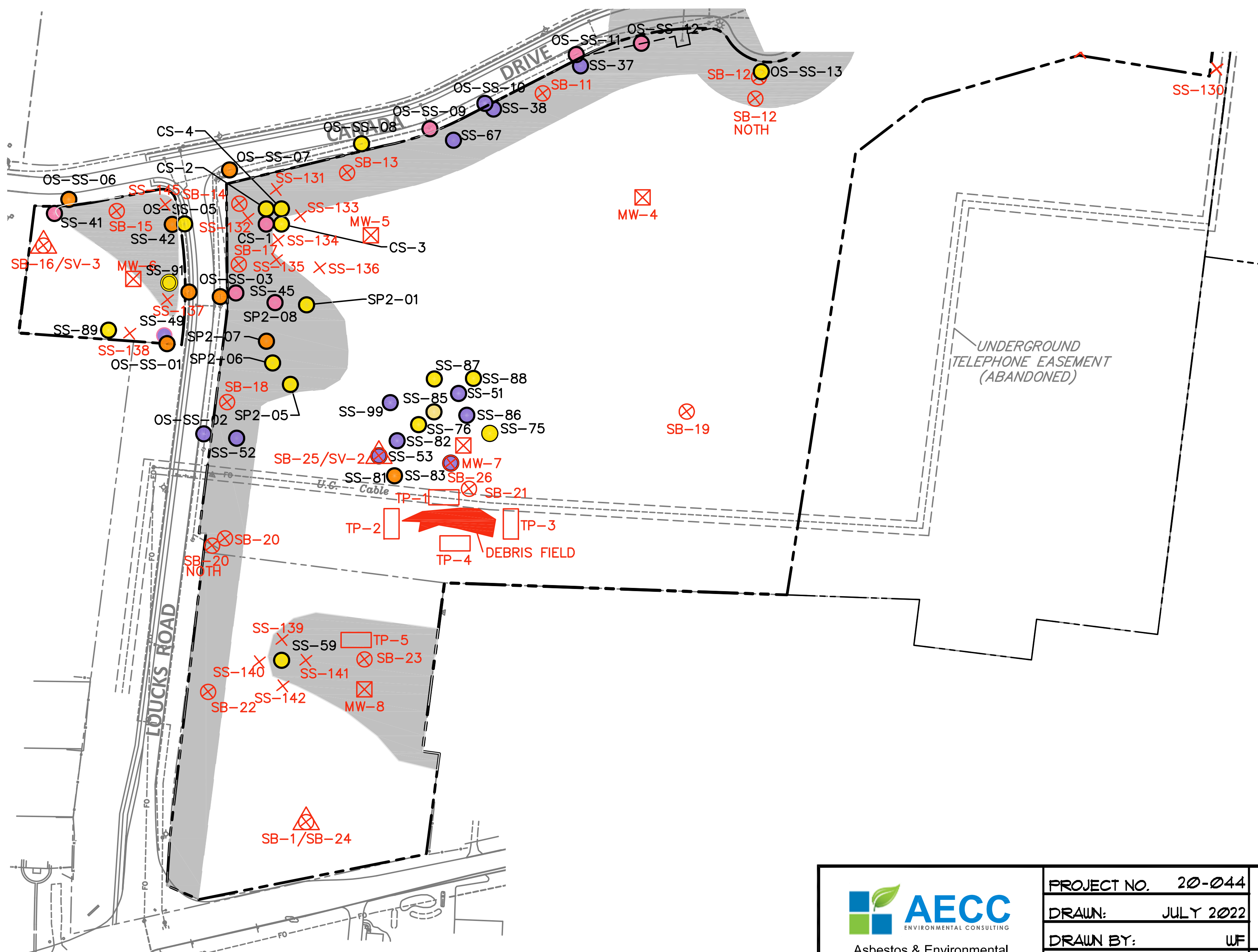
PROJECT NO.	20-044
DRAWN:	JULY 2022
DRAWN BY:	HS
CHECKED BY:	JS
FILE NAME:	

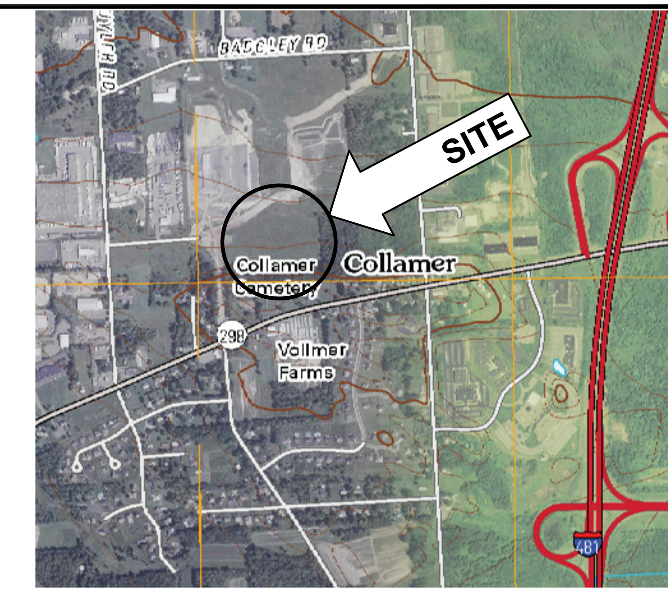
North Section Prior Results

BOWERS BUSINESS PARK
CANADA DRIVE, TOWN OF DEWITT
ONONDAGA COUNTY, NEW YORK

FIGURE

3B





SITE LOCATION

LEGEND:

- BROWNFIELD AREA EXTENT
- PROPERTY LINE
- RIGHT-OF-WAY
- LIMITS OF DISTURBANCE
- SURFACE SOIL SAMPLE LOCATION
- PCB CONCENTRATION <1 mg/kg
- PCB CONCENTRATION BETWEEN 1 AND 10 mg/kg
- PCB CONCENTRATION BETWEEN 10 AND 25 mg/kg
- PCB CONCENTRATION BETWEEN 25 AND 50 mg/kg
- PCB CONCENTRATION EQUAL TO OR OVER 50 mg/kg
- PROPOSED SURFACE SAMPLE
- PROPOSED BORING
- PROPOSED MONITORING WELL
- PROPOSED TEST PIT
- PROPOSED SEDIMENT SAMPLE
- PROPOSED SURFACE WATER SAMPLE
- PROPOSED SOIL VAPOR SAMPLE/BORING SAMPLE

NOTES:

1. BASE MAP MODIFIED FROM ELECTRONIC DRAWING FILES PROVIDED BY CLIENT.
2. ALL PREVIOUS SAMPLE LOCATIONS WILL ALSO BE SAMPLED AT THE NEXT DEEPER DEPTH.

0 200' 400'
GRAPHIC SCALE

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Asbestos & Environmental Consulting Corporation
6308 Fly Road
East Syracuse, NY 13057

PROJECT NO.	20-044
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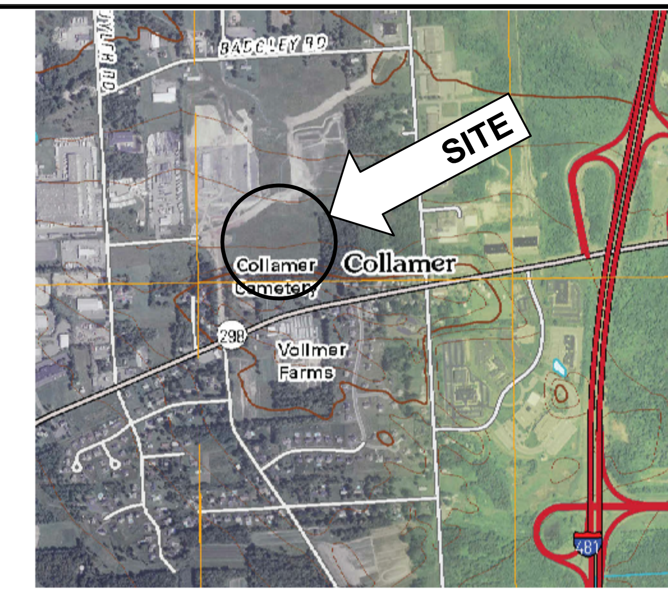
DRAWN BY:	WF
CHECKED BY:	RGH
FILE NAME:	

South Section Prior Results and Proposed Sampling Locations

BOWERS BUSINESS PARK
CANADA DRIVE, TOWN OF DEWITT
ONONDAGA COUNTY, NEW YORK

FIGURE
4A



SITE LOCATION

LEGEND:

- BROWNFIELD AREA EXTENT
- PROPERTY LINE
- RIGHT-OF-WAY
- LIMITS OF DISTURBANCE
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North Section Prior Results and Proposed Sampling Locations

BOWERS BUSINESS PARK
CANADA DRIVE, TOWN OF DEWITT
ONONDAGA COUNTY, NEW YORK

FIGURE
4B

APPENDIX A

Standard Operating Procedures

Scope and Application

The purpose of this SOP is to establish uniform procedures for the collection of soil samples from varying depths, typically those that may be easily reached with hand tools. Adherence to this SOP will promote consistency in sampling methods and if followed properly will provide a basis for sample representativeness.

It is noted that other state or federal agency standard operating procedures may exist that require deviation from this SOP. These required deviations must be identified before the sampling program begins (ideally during the work plan/sampling plan development) and must be explained in the project-specific work plan/sampling plan.

Equipment/Apparatus/Supplies

Materials needed for this SOP may include:

Spoons/Scoops/Trowels – Sampling spoon/scoops/trowels may be reusable or disposable. Reusable spoons/scoops shall be constructed of stainless steel to facilitate easy decontamination. Disposable scoops may be constructed of other materials (example: high density polypropylene (HDPE), which are preferable to stainless steel when acquiring samples for trace element analysis.) however the use of softer and more brittle materials may be less effective in higher density soils.

Shovel – Shovels may be used for the preparation of the sample collection area (i.e., to remove surface materials to allow sampling with a spoon or scoop) or for samples requiring large sample volume (i.e. bench-scale treatability samples).

Soil Auger/Bucket (Hand) Auger - A soil auger/bucket (hand) auger usually comprises a T-handle attached to a spiral-bladed metal auger (soil auger) or a hollow tube with cutting teeth at the bottom (bucket or hand auger). Turning the handle in a clockwise direction, either brings soil toward the surface (hand auger) or into the hollow tube (bucket). Only moderate down-pressure should be used as forcing the auger through hard zones or in cobble-rich soils can damage equipment and injure the individual using the equipment.

Soil Augers are typically good for sampling depths up to 3 feet. Representative samples can be collected directly from the auger flight as it is withdrawn from the ground, or from the tube-sampler attachment which can be advanced into the soil after augering to the top of the desired depth interval. It should be noted that soil augers cause considerable disturbance of the soil that can cause the loss of volatile organic compounds (VOCs) from the soil, therefore, some consideration should be given to using a tube-sampler attachment, or another less invasive method for sampling soils for (VOCs).

Bucket/hand augers are generally used to collect soil samples from depths ranging from the ground surface to approximately five (5) feet below the ground surface. In some instances, soil samples may be collected from greater depths, but often with considerably more difficulty. Bucket/hand augers allow for discrete depth interval sampling as the soil is retained within the hollow tube of the auger when it is extracted from the ground. It should be noted that if depth-discrete sampling is the objective, more than one auger may be necessary, with one larger bucket auger used to provide access to the required sampling depth and another (clean) smaller auger used for sample collection.

Upon retrieval from the ground, the soil on the flights of the auger or within the bucket can be poured directly into a collection pan or sample container (if loosely consolidated), sampled with a terra-core (or equivalent) sampler, or be removed with a clean decontaminated spoon or scoop and transferred into the appropriate container.

Collection Pan – A soil collection pan or equivalent is often used as an intermediate between removal of soil from the ground and filling the sample containers/soil jars.

Other commonly used materials –

- Stainless steel teaspoon or spatula
- Ziploc-type bags
- Aluminum Foil
- Sampling kit (i.e., bottles, labels, custody records, cooler, etc.)
- Six-foot folding tape for depth measurement
- Personal protective equipment (as required in HASP)
- Field project notebook/pen
- Photoionization detector (PID) meter, (if volatile or semi-volatile organic compounds (VOCs / SVOCs) are expected)

Procedures

General

Site-specific soil characteristics and project-specific requirements such as sampling depth will dictate the preferred type of sampling equipment to be used. In addition, the analytical program requirements will define the volume of sample needed, which will also influence the selection of the appropriate sampling equipment (i.e., sampling for semi-volatile organic compounds requires a larger soil volume and thus a larger sized bucket auger, than that necessary for total lead sampling). The project work plan/sampling plan should define specific requirements and equipment required for the given site. Sampling personnel should be equipped with a variety of sampling equipment to address deviations from anticipated sampling situations.

Equipment Decontamination

Sampling equipment must be decontaminated prior to its initial use and following the collection of each soil sample. Site specific decontamination should be outlined in the sampling plan/work plan. If site-specific decontamination procedures are not stipulated in the work/sampling plan, the procedures described in AECC SOP # 103 – Equipment Decontamination, shall be used.

Samples for Volatile Organic Compound Analysis

Because volatile organic compounds (VOCs) can volatilize and be lost during the sampling process, precautions are necessary to minimize this effect during soil sampling. A sample collected for VOC analysis should be collected first (before collecting samples to be analyzed for other parameters) and should collected as quickly and as directly as possible, from a discrete, relatively undisturbed portion of soil. In general, it is best to transfer soils directly from the sampling device into the sampling container, without the use of an intermediate collection pan.

A separate (duplicate/split) sample should be collected for headspace analysis.

Sampling Procedures

Preparing the Ground Surface at the Sampling Location

At most locations the surface must be prepared prior to surface soil sampling. This may include removal of surface debris or vegetation to expose the actual soil surface, or the loosening of dense compacted soils such as those in heavy traffic areas or frozen soils.

Shovel Sampling

Detailed operating procedures for shovels, trowels, spoons and scoops is unnecessary, other than to state that this equipment shall be decontaminated before use.

Upon completion of sampling activities, backfill the sampling location and restore the surface to as close to pre-sampling conditions as possible to eliminate surface hazard or preferred path for contaminant migration. The sampling plan/work plan may specify the requirements for backfilling and surface restoration.

Trowel, Spoon and Scoop Sampling

Spoons, scoops, and trowels are of similarly designed construction and will therefore be operated in accordance with the following procedure, unless an alternate method is described in the site-specific work plan or sampling plan. Deviations from the standard operating procedures described herein and the rationale/justification for those deviations are to be recorded in the field logbook.

1. Select location and be sure that all surface preparation and soil sampling tools are decontaminated.

2. Prepare surface for sampling – Remove surficial material with shovel to reach the required sampling depth.
3. Turn the sampling tool into the ground and rotate so that a representative column of soil is removed.
4. If sampling for VOCs is required, collect this sample portion first.
5. If a specific depth interval has been targeted, collect soils from that depth into a collection pan.
6. If more soil is needed to meet sample volume requirements, additional soil cores may be collected from an immediately adjacent location.
7. Homogenize the soil in the collection pan (excluding soil for VOC analysis) by mixing the soil in the collection pan with the sampling tool until a uniform mixture is achieved.
8. Transfer soil from the collection pan into the appropriate sample jars/containers using the sampling tool or a clean stainless steel teaspoon or spatula. Use of fingers should be avoided.
9. Once filled, the rim and threads of the sample container should be cleaned of gross soil by wiping with a paper towel, then capped and labeled. Do not submerge the sample containers in water to clean them.
10. Label the samples and place the containers into a cooler with wet ice that has been contained within sealed plastic bag(s) as soon as possible (immediately) after collection.
11. Log the samples in field notebook, chain of custody and other required documentation.
12. Handle samples for shipment to the laboratory in accordance with AECC SOP # 102 – Environmental Sample Handling, Packaging, and Shipping.
13. Decontaminate sampling tools prior to reuse.
14. Investigation-derived waste (IDW) should be properly containerized before leaving the area.
15. Backfill the sampling location and restore the surface to as close to pre-sampling conditions as possible, to eliminate surface hazard and/or the creation of a preferred path for contaminant migration. The sampling plan/work plan may specify the requirements for backfilling and surface restoration.

Soil Auger Sampling

When using a soil auger for the collection of surface or shallow soil samples, the following procedure will be employed unless an alternate method is described in the site-specific work plan or sampling plan. Deviations from the standard operating procedures described herein and the rationale/justification for those deviations are to be recorded in the field logbook.

1. Select Location and be sure that all surface preparation and soil sampling tools are decontaminated.
2. Prepare surface for sampling – remove vegetation or surface debris as necessary.
3. Turn the soil auger gently in a clockwise direction until the top of the desired depth is achieved.
4. Remove the auger, thus clearing the disturbed soil from the augered hole.

5. If using the auger flights to collect the sample, return the auger to the hole and continue turning the auger so that it penetrates the interval of interest. Retrieve the auger and transfer soil into a collection pan.
6. If using a tube–sampler attachment, insert the tube sampler into the augered hole to the top of the desired interval and push/turn the tube sampler through the interval of interest.
7. Multiple trips and/or multiple adjacent auger holes may be necessary to sample the interval of interest at a given location.
8. Samples to be analyzed for VOCs should be collected first, directly from the auger flights or tube-sampler attachment.
9. With the exception of the VOC fraction (if required), the remaining soils should be placed into the soil collection pan.
10. Homogenize the soil in the collection pan (excluding soil for VOC analysis) by mixing the soil in the collection pan with the sampling tool until a uniform mixture is achieved.
11. Transfer soil from the collection pan into the appropriate sample jars/containers using the sampling tool or a clean stainless steel teaspoon or spatula. Use of fingers should be avoided.
12. Once filled, the rim and threads of the sample container should be cleaned of gross soil by wiping with a paper towel, then capped and labeled.
13. Label the samples and place the containers into a cooler with wet ice that has been contained within sealed plastic bag(s) as soon as possible (immediately) after collection.
14. Log the samples in field notebook, chain of custody and other required documentation.
15. Handle samples for shipment to the laboratory in accordance with AECC SOP # 102 – Environmental Sample Handling, Packaging, and Shipping.
16. Decontaminate sampling tools prior to reuse.
17. Investigation-derived waste (IDW) should be contained before leaving the area.
18. Backfill the sampling location and restore the surface to as close to pre-sampling conditions as possible, to eliminate surface hazard and/or the creation of a preferred path for contaminant migration. The sampling plan/work plan may specify the requirements for backfilling and surface restoration.

Bucket/Hand Auger Sampling

When using a bucket/hand auger for the collection of surface or shallow soil samples, the following procedure will be employed unless an alternate method is described in the site-specific work plan or sampling plan. Deviations from the standard operating procedures described herein and the rationale/justification for those deviations are to be recorded in the field logbook.

1. Select location and be sure that all surface preparation and soil sampling tools are decontaminated.
2. Prepare surface for sampling – remove vegetation or surface debris as necessary.
3. Push downward and turn the bucket/hand auger in a clockwise direction until bucket becomes filled with soil. Usually a 6 to 12-inch core of soil is obtained each time the auger is inserted.

4. Empty and repeat until the top of the interval of interest is encountered. Soil from above the interval that requires sampling and analysis can be emptied onto plastic sheeting for description/classification.
5. Using a clean/decontaminated bucket auger, insert the auger into the bottom of the hole so that it is positioned above the interval of interest. A smaller diameter bucket may be necessary to prevent the auger from being contaminated by passing through the overburden soils.
6. Turn the bucket/hand auger so that bucket fills with soil from the interval of interest.
7. Once filled, the auger should be removed from the ground and emptied into the soil collection pan. If a VOC sample is required, the sample should be taken directly from the auger bucket using a clean/decontaminated teaspoon or spatula and/or directly filling the sample container from the auger.
8. Repeat the process until the desired sample interval has been thoroughly penetrated with extracted soils placed into the collection pan.
9. Except for VOC sample fractions, the remainder of the soil sample should be collected into the collection pan.
10. Homogenize the soil in the collection pan by mixing the soil in the collection pan with the sampling tool until a uniform mixture is achieved.
11. Transfer soil from the collection pan into the appropriate sample jars/containers using the sampling tool or a clean stainless steel teaspoon or spatula. Use of fingers should be avoided.
12. Once filled, the rim and threads of the sample container should be cleaned of gross soil by wiping with a paper towel, then capped and labeled.
13. Label the samples and place the containers into a cooler with wet ice that has been contained within sealed plastic bag(s) as soon as possible (immediately) after collection.
14. Log the samples in field notebook, chain of custody and other required documentation
15. Handle samples for shipment to the laboratory in accordance with AECC SOP # 102 – Environmental Sample Handling, Packaging, and Shipping.
16. Decontaminate sampling tools prior to reuse.
17. Investigation-derived waste (IDW) should be contained before leaving the area.
18. Backfill the sampling location and restore the surface to as close to pre-sampling conditions as possible to eliminate surface hazard and/or the creation of a preferred path for contaminant migration. The sampling plan/work plan may specify the requirements for backfilling and surface restoration.

Quality Assurance/Quality Control

Quality control requirements for sample collection are dependent on project-specific sampling objectives which may be outlined in the site-specific Quality Assurance Project Plan (QAPP), if applicable, or may be included in the site-specific work plan/sampling plan. This information will include requirements for sample preservation and holding times, container types, sample packaging and shipment, as well as requirements for the collection of various quality assurance samples such as trip blanks, matrix spike/matrix spike duplicates, field blanks/equipment blanks, and field duplicates. The Project Manager is responsible for assuring that the Quality

Assurance/Quality Control objectives are specified and communicated to individuals responsible for collecting the samples.

Documentation

Documentation of sample collection, handling and shipping is required, and takes a variety of forms including:

- Field log book
- Sample collection records
- Chain-of-Custody forms
- Shipping Labels

The field book will be maintained as an overall log of all samples collected during a project. Sample collection records are generated for each sample collected during a project and must include:

- Project Number and Location
- Sampling point location location/ID
- Date and time that sample was collected
- Description/designation of the sample location
- Name of collector
- Equipment used to collect the sample
- Number of sample containers, sizes, preservatives
- Specific Sample ID
- Depth
- Soil type
- Analysis Requested
- Laboratory Designation
- Shipping ID Number/Tracking ID Number

Depending on project-specific requirements, this information may be required to be collected on a separate sample collection record form. If such a form is not required, the information will be collected in the project field log book.

Chain-of-custody forms are transmitted with the samples to the laboratory for sample tracking purposes. These may be AECC-specific or be provided by the laboratory providing analytical services for the project. Shipping labels are required if sample coolers are to be transported to the laboratory by a third-party (courier service). Original and/or copies of these documents will be retained in the appropriate project files.

Training & Qualifications

Surface soil sampling is a relatively simple procedure requiring minimal training and generally a small amount of equipment. Individuals conducting surface soil sampling for the first time will be supervised/trained by experienced personnel. Sampling personnel collecting samples that might contain petroleum compounds, heavy metals, or other potentially hazardous materials will be trained and certified in accordance with the requirements of 29 CFR 191O.120(e)(3}(i), OSHA's HAZWOPER standard.

Related AECC SOPs

SOP # 102 Sample Handling, Packaging, and Shipping
SOP # 103 Equipment Decontamination
SOP # 104 Split Spoon Sampling
SOP # 105 Direct-Push Soil Sampling
SOP # 106 Groundwater Sampling
SOP # 108 Sample Labeling & COC Completion
SOP # 109 Surface Water Sampling
SOP # 113 Taking Field Notes
SOP # 116 Core Drilling
SOP # 117 Saw Cutting
SOP # 118 Test Pit Soil Sampling
SOP # 120 Headspace Analysis

Scope and Application

The purpose of this procedure is to establish a uniform set of procedures for handling, packaging and shipping environmental samples. Adherence to this SOP will ensure that samples are received by the laboratory in good condition. This procedure will also prevent cross-contamination of samples during shipment and minimize sample container breakage.

This SOP is to be used **ONLY** for environmental samples. Hazardous material shipments shall adhere to USDOT requirements which are not presented in this document.

Equipment/Apparatus/Supplies

Required materials include the following:

Duct tape
Strapping tape (1-inch minimum width)
Clear packing tape
Re-sealable plastic bags (Ziploc® or equivalent) sized for the sample containers used
Bubble wrap
"Fragile" labels
"This Side Up" labels
Adhesive address labels

Procedures

Sample bottle shipping preparation

Each bottle shall be properly labeled using the provided labels as detailed in SOP # 108. Once the label is affixed to the bottle the label shall be covered with clear packing tape which is wrapped completely around the bottle.

Each bottle shall be sealed by placing clear packing tape completely around the neck of the bottle and the bottle cap. If a QAPP for a particular project states that a custody seal on the bottle cap is required it shall be placed across the bottle cap prior to placing the clear packing tape on the bottle.

Sample bottle packaging

Each bottle or VOA vial pair (aqueous samples) shall be placed in an appropriately sized sealable plastic bag. Care shall be taken to ensure that air is removed from each bag. The purpose of bagging the samples is to protect against sample material release and cross-contamination should the sample container leak or break during shipment.

Bubble wrap shall then be used to completely wrap the bagged sample bottle or VOA vial pair. The bubble wrap shall be secured in place using packing tape.

Cooler Inspection, Preparation and Packing

Each cooler to be used for shipment of samples shall be inspected for integrity. The hinges shall be inspected and the walls, bottom and top of the cooler shall be inspected for cracks. Coolers with broken hinges and/or cracks shall not be used for sample shipment.

Each cooler shall be clean and free of any solid or liquid residue. If the cooler is equipped with a drain then duct tape shall be placed on the inside and outside portions of the drain to ensure that liquids or solids cannot pass through it.

Prior to placement of ice and or samples in the cooler, the cooler shall be lined with bubble wrap. A layer of bagged ice (see below) shall then be placed on the bottom of the cooler.

Prepared sample containers shall then be placed upright in the cooler such that they are tightly arranged. If there are insufficient sample bottles to achieve a tight packing arrangement then the samples shall be equally spaced throughout the cooler and the interstices shall be filled with additional bubble wrap.

A second layer of bagged ice shall then be placed on top of the samples and bubble wrap shall be laid over the top of them.

If the cooler is to be shipped via an overnight carrier (i.e.FedEx®, UPS or similar) the signed chain of custody shall be placed in a sealable plastic bag and taped to the underside of the cooler lid.

Ice Bagging

Ice, consisting of commercially available cubed ice, shall be placed in sealable plastic bags sized for the cooler to be used. A second bag shall be place over the first to provide a secondary containment layer. Care shall be taken not to overfill the bags such that the bag is difficult to seal. A typical cooler will require four 1 or 2-gallon bags with two bags beneath the samples and two on top of the samples.

Cooler Sealing and Labeling

The cooler shall be closed and the lid shall be securely sealed using duct tape. Duct tape shall be placed along the entire perimeter of the lid where it meets the cooler body including hinges. Care shall be taken to ensure a tight seal by the tape on the cooler surface.

"Fragile" and "This Side Up" labels shall be placed on each side of the cooler. A "Fragile" label shall be placed on the top of the cooler. "This Side Up" labels shall have an arrow pointing upward. Clear packing tape shall be placed over labels. Examples of the labels are shown below:

An adhesive label shall be attached to the top of the cooler which has the destination information clearly shown on it. Clear packing tape shall be placed over the entire surface of the label.

Clear packing tape shall be wrapped completely around the cooler at a minimum of two points. Strapping tape (1-inch width minimum) shall then be placed on top of the packing tape and shall completely encircle the cooler.

If shipping will be by FedEx® or similar, the airbill shall be affixed to the top of the cooler.

Quality Assurance/Quality Control

Prior to shipment, the cooler shall be inspected to ensure that it is properly sealed and labeled.

Documentation

If samples are being shipped via courier or via direct delivery then a copy of the signed chain of custody shall be retained. If shipping via other carrier, the copy of the airbill shall be retained for the project records.

Scope and Application

The purpose of this procedure is to establish a uniform set of procedures for conducting decontamination of field sampling equipment. Decontamination is performed as a quality assurance measure and a safety precaution. The use of equipment that has not been properly decontaminated for collecting samples for chemical analysis can lead to erroneous data due to cross contamination. In addition, decontamination protects field personnel and others from potential exposure to hazardous materials and prevents contamination from being transported away from a site.

This SOP focuses on decontamination of non-disposable equipment used for sampling environmental media for chemical analysis. Decontamination of other materials (well-construction materials and drill stem for example)are sometimes required and are discussed in other SOPs or dealt with in project-specific work plans.

It is noted that other state or federal agency standard operating procedures may exist that require deviation from this SOP. These required deviations must be identified before the sampling program begins (ideally during the work plan/sampling plan development), and must be explained in the project-specific work plan/sampling plan.

Equipment/Apparatus/Supplies

Required materials may include:

- Tap/potable water (from a municipal or private source that has been tested and shown to meet New York State drinking water standards for PFOA and PFOS)
- Phosphate-free detergent (Liqui-nox, Alconox, or similar)
- Distilled and/or deionized water
- Solvents as defined by the Work Plan, QAPP, etc. (may include nitric acid, dilute hydrochloric acid, methanol, hexane, isopropanol, etc.)
- PPE
- Paper towels
- Wash buckets/basins/containers
- Waste containers pails/buckets with lids, drums or plastic bags.
- Cleaning brushes
- Pressure sprayers and/or squeeze bottles
- Plastic sheeting
- Aluminum foil/plastic bags
- Project notebook/pen

Procedures

AECC's standard decontamination procedure is presented in the steps listed below. The standard may be modified on a project-specific basis, as described in project specific QAPP, sampling programs or other documents, and may include additional steps, solvents, materials, etc., depending on the quality assurance objectives for the project.

1. Don PPE items appropriate to the characteristics of the contaminated material that was encountered (safety glasses, latex or nitrile gloves, and disposable Tyvek garment for example).
2. Remove gross contamination, dirt, etc from the equipment by brushing and rinsing with tap water. This step should be completed in a 5-gallon bucket or appropriately sized container.
3. Wash the equipment with a phosphate-free detergent and tap water solution. This step should be completed in a separate wash bucket using brush, or pressure sprayer.
4. Rinse the equipment with potable water until all detergent has been removed. This step can be performed over an empty bucket using a squeeze bottle or pressure sprayer.
5. Triple-rinse the equipment with distilled or de-ionized water. Rinseate should be collected in the bucket used in step 3.
6. Allow the equipment to air dry on clean plastic sheeting. If faster drying is required, use paper towels to blot the equipment dry before reuse.
7. Wrap the dried decontaminated equipment with aluminum foil, shiny side out, for storage until the equipment is to be used again. Alternately, small equipment can be placed into clean plastic bags and sealed for longer term storage.
8. Containerize and/or manage wash water and decontamination rinseate in accordance with project-specific requirements.

When decontaminating submersible pumps used for groundwater sampling (or monitoring well development), the above-listed steps 2 and 3 may be conducted in a tube or cylinder that is sealed at the bottom end (commonly a 3-foot length of PVC pipe affixed with a water-tight end cap). The pump is inserted into the cylinder which is filled with the wash water, detergent solution, or rinse water and is turned on at a low setting for approximately five (5) minutes, so as to cycle the wash solutions through the pump's impellers and internal components. After the pump is removed from the potable water rinse cycle, the triple-rinse is performed with copious amounts of distilled/deionized water, being sure to flush through the impellers.

As stated previously, project-specific decontamination procedures may be required and will be specified in the project's QAPP, sampling plan or project-specific work plan. Some project-specific modifications may include the following:

- For glass and plastic sampling equipment used for sampling environmental media for metals analyses, decontamination may include a rinse with a 10% solution of nitric acid.
- For metallic sampling equipment used for sampling environmental media for metals analyses, decontamination may include a rinse with a 10% hydrochloric acid solution.

- For sampling equipment used for sampling environmental media for organic parameters (volatile organic compounds, semivolatile organic compounds, pesticides, polychlorinated biphenyls, etc.), decontamination may include an intermediate rinse with methanol, hexane, or isopropanol.

The above-listed solvents are hazardous materials due to their toxicity and/or corrosivity, and are specifically excluded from AECC's standard decontamination procedure because of these properties. When the use of these (or other similar) solvents is required by a project-specific QAPP or Sampling Plan, the plans must also describe additional protocols and procedures regarding their safe use and handling and to assure that associated investigation-derived waste (wash water and spent rinseate) is handled, characterized, and disposed of in accordance with federal, state and local requirements.

Large Equipment Decontamination

On some projects, large equipment (excavators, backhoes, truck-mounted drilling equipment, etc) is used for sampling or site characterization activities, and may become contaminated during site activities (or may require decontamination prior to use on site). For these situations, the drilling subcontractor will construct a temporary decontamination pad that typically consists of a bermed, plastic-sheet lined area where equipment and tooling can be brought for decontamination with a high-temperature high pressure washer (steam jenny) and/or manual scrubbing. If heavy equipment decontamination is required for a specific project, the specifications for the decontamination pad, and procedures for decontamination will be stipulated in the project QAPP and/or Sampling Plan.

Quality Assurance/Quality Control

General guidelines for quality control check of field equipment decontamination usually require the collection of one equipment blank from the decontaminated equipment per day, however the collection of equipment blanks and similar QA/QC samples is to be based on specific project requirements. For projects with a QAPP, the document will specify the type and frequency of collection of each type of quality assurance sample. For projects without a QAPP, the need for and/or frequency of equipment blanks and other QA/QC samples will be specified in the scope of work, or the project work plan.

Equipment blanks are generally collected by pouring laboratory-supplied deionized water into, over, or through the freshly decontaminated sampling equipment and then transferring this water into a sample container. Field blanks should then be labeled as a sample and submitted to the laboratory to be analyzed for the same parameters as the associated sample. Field blank sample numbers, as well as collection method, time and location should be recorded in the field notebook.

Documentation

Specific information regarding decontamination procedures should be documented in the project-specific field notebook. Documentation in the notebook should thoroughly describe the construction of each decontamination facility and the decontamination steps implemented in order to show compliance with the project work plan. Decontamination events should be logged when they occur with the following information documented:

- Date, time and location of each decontamination event
- What equipment was decontaminated
- Method used for decontamination
- Solvents used
- Notable circumstances
- Date, time and location of equipment blanks collected and the methods/procedures used for collection.
- Storage of decontamination wastes (spent wash and rinse water).

Repetitive decontamination of small items of equipment does not need to be logged each time the item is cleaned, however a note should be made that such equipment was decontaminated as required and in accordance with this SOP, or project specific QAPP, Work Plan, etc.

Scope and Application

The purpose of this SOP is to lay out the specific standardized procedure to be used for collecting soil samples using split-spoon sampling methods. Subsurface soil sampling, conducted in accordance with this SOP will promote consistency in sampling and provide a basis for sample representativeness.

This SOP covers split-spoon sampling methods only, and does not cover other types of subsurface soil sampling equipment.

Split-spoon sampling generally requires use of a drilling rig, typically a hollow-stem auger rig, to drill a borehole in which the sampling equipment is used. The split-spoon sampler is inserted through the augers and driven into the subsurface soil with a weighted hammer. The sampler is then retrieved and opened to reveal the recovered soil sample.

Split spoon sampling methods are generally applicable to unconsolidated subsurface soil/fill materials. Soils may be obtained using this method for visual classification, field screening for contamination, as well as physical and/or chemical analysis.

Split-spoon sampling (and the associated drilling process) is an intrusive subsurface exploration method. By law, the clearance of underground utilities must be performed prior to the initiation of any intrusive activities. The drilling subcontractor performing drilling activities is responsible for notifying the Underground Facilities Protective Organization (UFPO) with jurisdiction over the project site.

Responsibilities

<u>Project Geologist/Scientist</u>

The project geologist/scientist is responsible for conducting subsurface soil sampling in a manner consistent with this SOP. The project geologist/scientist will observe all sampling activities to ensure that the SOP is followed, and will record all pertinent data and information on appropriate forms, logs and/or in the project field notebook.

It is also the project geologist/scientist's responsibility to indicate the specific targeted sampling depth or sampling interval to the drilling subcontractor. Sample depth intervals are usually defined on a project-specific basis with these requirements specified in the project sampling plan. Sampling intervals typically range from one (1) sample per five (5) feet of drilling to continuous sampling where the entire drilled interval is sampled.

The project geologist/sampling engineer is also responsible for the collection of representative environmental characterization samples once the sampling device has been retrieved from the subsurface, disarticulated and liner removed.

Additional sample collection responsibilities include labeling, handling, and storage of samples while in their custody.

<u>Drilling Subcontractor</u>

The drilling subcontractor is responsible for providing the necessary equipment for obtaining subsurface soil samples. This generally includes the truck-mounted drilling rig, and one or more split-spoon samplers (multiple diameters) in good operating condition, and other necessary equipment for borehole preparation and sampling. It is the drilling subcontractor's responsibility to provide and maintain their own boring logs if desired and to provide sample containers for geotechnical/stratigraphic characterization samples. Additionally, the drilling contractor is responsible for providing for decontamination of the drilling and sampling equipment, consistent with the project specifications.

Equipment/Apparatus/Supplies

In addition to the equipment and materials provided by the drilling subcontractor, required materials may include the following:

- Project-specific documents (Scope of work, HASP, QAPP, Sampling Plan)
- Boring Logs
- Stainless steel spoons, spatulas, soil mixing pans etc.
- Sampling supplies (bottles, labels, custody records and tape, cooler, ice)
- Folding rule or tape measure
- Headspace analysis containers:
  - Glass jars and aluminum foil, or
  - Sealable plastic bags (ie – Ziploc® bags)
- Photoionization Detector (PID) or Flame Ionization Detector, (if volatile or semi-volatile organic compounds (VOCs / SVOCs) are expected)
-
- Decontamination supplies (per the QAPP)
- Health and safety equipment/PPE (per the HASP)
- Portable chair & folding table
- Field project notebook/pen
- Plastic sheeting

Procedures

Split-spoon samplers are generally constructed of steel and a variety of sizes. 2-inch diameter, two-foot long samplers are most common, however 3-inch diameter samplers are often used when the use of a 2-inch sampler produces poor soil recovery. The split-spoon consists of a tubular body with two halves that split apart lengthwise, a drive head on the upper end with a ball-check valve for venting, and a steel cutting shoe at the bottom. As the sampler is driven into the ground, soil enters the split-spoon through the cutting shoe. A replaceable plastic basket is often inserted into the shoe to assist with retaining soil within the device. Upon retrieval of the sampler from the subsurface, the drive head and cutting shoe are removed and the split-spoon halves are separated and the soil is exposed.

Split-spoons used for collecting samples for chemical analysis must be decontaminated prior to their initial use and after each time they are used. Decontamination shall be completed in accordance with AECC SOP 103 – Equipment Decontamination or, if applicable, project specific specifications.

Subsurface soil sampling is typically performed as part of a drilling program where a soil boring is advanced to a designated depth prior to collection of a representative sample. The following briefly outlines the procedures for conducting split-spoon sampling in conjunction with hollow-stem auguring.

1. The drilling contractor advances the hollow-stem augers to the required depth for sampling. A temporary center plug shall be used in the lead auger to prevent the auger from becoming filled with drill cutting during advancement.
2. At the top of the interval to be sampled, the driller stops the auger, disconnects the auger from the drill rig's drive head, and retrieves the temporary center plug.
3. The drilling subcontractor will lower the split-spoon attached to a length of center rods to the bottom of the borehole.
4. The top of the center rods are attached to a 140 pound slide-hammer (or similar).
5. The slide hammer is repeatedly raised via rope and cathead and dropped to drive the split-spoon sampling device into the ground.
6. The hammer is disconnected from the center rod and the center rod and split spoon is retrieved from the augers.
7. The split-spoon is then disarticulated to allow for soil classification/description, field-screening, sampling for laboratory analysis, etc.
8. The drilling contractor re-installs the temporary center plug and advances the auger to the top of the next interval to be sampled.
9. Steps 2 through 8 are repeated until the termination depth of the borehole is reached.
10. Upon completion of auguring and sampling, the borehole can be backfilled or completed as a piezometer of monitoring well.

<u>Standard Penetration Test</u>

Split-spoon samplers are typically hammered into the ground (see steps 4 and 5 above) using a method referred to as the Standard Penetration Test (SPT) in accordance with ASTM standard D 1586-11 Standard Test Method for Standard Penetration Test (SPT) and Split-Barrel Sampling of Soils. The STP method involves driving a 2-inch diameter split spoon by dropping the 140-pound hammer through a vertical free fall of 30 inches (hydraulic hammers that simulate these conditions are common). The number of hammer blows required for each 6 inches of penetration is recorded on the boring log. Blow count information can be used as an indicator of soil density for geotechnical and stratigraphic logging purposes. If STP in accordance with the ASTM standard is required for a project, it should be communicated to the drilling subcontractor before the sampling program begins. During the program, the project geologist/scientist should verify that the equipment being during sampling meets the required specifications.

Adding Water During Drilling

Drilling in some geologic conditions may require the use of added water. The use of added water is permitted, however the volume of water used should be minimized as it may affect sample quality. The volume and source of added water should be documented in the field notebook. Sampling the added water may be necessary for QA/QC purposes (refer to the project specific QAPP).

Sampling Soils for Environmental Laboratory Analysis

Sampling soils for environmental laboratory analysis shall be conducted as described in AECC SOP #101 - Surface and Shallow Soil Sampling. If the sampling program includes laboratory analysis for volatile organic compounds (VOCs), the VOC sampling shall be performed before any other activity.

Once the split-spoon sampler has been opened, the soils contained within can be sampled for laboratory analysis and classified. Materials from the split-spoon can be removed using clean decontaminated/disposable spoons or spatulas. Except for soils to be sampled for volatile organic compound analysis (see below), the soils should be placed into a sample collection pan and homogenized, or placed directly into the appropriate sample container(s). Headspace analysis of a duplicate / split sample can be completed at this point (see SOP #120 – Headspace Analysis).

Once filled, the sample container should be properly capped, cleaned and labeled, and placed into a cooler with ice in preparation for shipping to the laboratory, in accordance with AECC SOP # 102 – Environmental Sample Handling, Packaging and Shipping.

Volatile Organic Samples

In order to minimize the loss of volatiles during the sampling process, samples should be collected into lab-supplied glassware as soon as possible after retrieving the sampler from the subsurface. Other tasks (classification, sampling for other parameters, field/headspace screening with a PID or FID, equipment decontamination, etc.) should either be performed by others, or be completed after collecting samples for VOC analysis.

Upon filling the sample container, clean and label the container and place it into a cooler immediately. Residual sample may then be used to fill other sample or logging requirements

When using split-spoon methods for collecting soil samples for VOC analysis, the drilling subcontractor shall not retrieve more than one subsequent sampler from the subsurface while the project geologist/scientist collects samples from a previous interval.

Soil Classification

Soils will be visually classified in using the Modified Burmeister Soil Classification System or alternate methods required by project specifications.

Equipment Decontamination

Sampling equipment must be decontaminated prior to its initial use and following the collection of each soil sample. Site specific decontamination should be outlined in the sampling plan/work plan. If site-specific decontamination procedures are not stipulated in the work/sampling plan, the procedures described in AECC SOP # 103 – Equipment Decontamination, will be used.

Quality Assurance/Quality Control

Quality control requirements are dependent on project-specific sampling objectives. The QAPP will provide requirements for equipment decontamination (frequency and materials), sample preservation and holding times, sample container types, sample packaging and shipment, as well as requirements for the collection of various quality assurance samples such as trip blanks, field blanks, equipment blanks, and field duplicate samples.

In the absence of a QAPP, QA/QC will be attained through adherence to SOPs and requirements stipulated in project-specific specifications.

Documentation

Various forms are required to ensure that adequate documentation is made of sample collection activities. These forms will vary from project to project and may include:

- Field Log Books
- Soil Boring Logs
- Sample Collection Records
- Chain of Custody Forms
- Shipping Labels

Boring logs (Figure 1) will provide visual and descriptive information for each sample collected and are often the most critical form of documentation generated during a soil sampling program. The field log book is kept as a general log of activities. Occasionally, sample collection records are used to supplement boring logs, especially for environmental samples which have been collected for laboratory analysis. Chain-of-custody forms are transmitted with the samples to the laboratory for sample custody tracking purposes. Shipping labels are required if sample coolers are to be transported to the laboratory by a third party (courier service). Original copies of these records should be maintained in the appropriate project files.

Figure 1 – Soil Boring Log

AECC Environmental Consulting Soil Boring Log	Client:	Project:	**BORING ID:**
	Project Number:		
	Site Location:		
	Coordinates:	Elevation:	Sheet: of
	Drilling Method:		Monitoring Well Installed:
	Sample Type(s):	Boring Diameter: in.	Screened Interval:
Weather:	Logged By:	Date/Time Started:	Depth of Boring:
Drilling Contractor:	Ground Elevation:	Date/Time Finished:	Water Level:

Depth (feet)	Geologic sample ID	Sample Depth (ft)	Blow Count (per 6-inches)	Recovery (ft.)	(Headspace (ppmv)	U.S.C.S	**MATERIALS: Color, size, range, MAIN COMPONENT, minor component(s), moisture content, structure, angularity, maximum grain size, odor, and Geologic Unit (If Known)**	Lab Sample ID	Lab Sample Depth
0									
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									

NOTES:	Date	Time	Depth to groundwater while drilling

Scope and Application

The purpose of this SOP is to lay out the specific standardized procedure to be used for collecting soil samples using direct-push methods. Subsurface soil sampling, conducted in accordance with this SOP will promote consistency in sampling and provide a basis for sample representativeness.

Direct push sampling involves the hydraulic pushing and/or percussive hammering of a sampling tube into the subsurface. The inside of the sampling tube is generally lined with a sleeve or liner made of acetate or (it may also be made of stainless steel, brass, plastic, Teflon, etc.), that catches the soil during the samplers advancement. The sampler includes a cutting shoe, and may also include an internal locking piston (or similar device) that seals the sampling tube until it is unlocked at the top of a specific depth to facilitate the collection of soils from a discrete interval. The sampling tube is threaded onto direct-push rods. The rods and tooling are driven into, and subsequently pulled from the subsurface with the hydraulic/percussive direct-push equipment. The direct-push “rig” may be mounted on wheels so that it can be manually moved about. More typically, however, the direct-push rig is mounted in the back of a pick up truck, on a skid-steer or the unit is track mounted so that it can be driven from location to location in areas of a site that are not accessible to truck-mounted units.

Direct-push sampling methods are generally applicable to unconsolidated soil/fill materials to a maximum recommended depth of approximately 30 feet below ground surface (bgs). Soils may be obtained using this method for visual classification, field screening for contamination, as well as for physical and/or chemical analysis. Sampling shall be continuous throughout the length of the boring.

Direct-push sampling is an intrusive subsurface exploration method. By law, the clearance of underground utilities must be performed prior to the initiation of any intrusive activities. The drilling subcontractor performing the direct-push activities is responsible for notifying Dig Safely New York or another Underground Facilities Protective Organization (UFPO).

The ability to drive the sample tooling to a desired depth (as well as the ability to retrieve the sampling device from the subsurface) depends on the density and composition of the soil and the power of the hydraulic equipment. Additionally, sample recovery is somewhat dependent on grain size. Coarse gravel, cobbles, and boulders may plug a small diameter sample tube, preventing material from entering, or may cause refusal of the tooling altogether.

Likely soil types that might be encountered and preliminary site information (accessibility, surface conditions, etc) should be used to determine whether direct-push methods are appropriate for a site, and to determine the specific tooling best suited for subsurface characterization. Subcontractors/direct-push service providers should then be selected on the basis of whether or not they have equipment and tooling necessary for those specific site/soil conditions.

Responsibilities

Project Geologist/Scientist

The project geologist/scientist is responsible for conducting subsurface soil sampling in a manner consistent with this SOP. The project geologist/scientist will observe all sampling activities to ensure that the SOP is followed, and will record all pertinent data and information on appropriate forms, logs and/or in the project field notebook.

It is also the project geologist/sampling engineer's responsibility to indicate the specific targeted sampling depth or sampling interval to the drilling subcontractor.

The project geologist/sampling engineer is also responsible for the collection of representative environmental characterization samples once the sampling device has been retrieved from the subsurface, disarticulated and liner removed.

Additional sample collection responsibilities include labeling, handling, and storage of samples until further chain-of-custody procedures are implemented.

Drilling Subcontractor

The drilling subcontractor is responsible for providing the necessary equipment for obtaining subsurface soil samples. This generally includes the truck or ATV-mounted percussion/probing machine and one or more sampling tubes (multiple diameters) in good operating condition, appropriate liners, and other necessary equipment for borehole preparation and sampling. It is the drilling subcontractor's responsibility to provide and maintain their own boring logs if desired. Equipment decontamination materials should also be provided by the subcontractor and should meet project specifications.

Equipment/Apparatus/Supplies

In addition to the equipment and materials provided by the drilling subcontractor, required materials may include the following:

- Project-specific documents (Scope of work, HASP, QAPP, Sampling Plan)
- Boring Logs
- Stainless steel spoons, spatulas, soil mixing pans etc.
- Headspace analysis containers:
  - Glass jars and aluminum foil, or
  - Sealable plastic bags (ie – Ziploc® bags)
- Photoionization Detector (PID) or Flame Ionization Detector, (if volatile or semi-volatile organic compounds (VOCs / SVOCs) are expected)
- Sampling supplies (bottles, labels, custody records and tape, cooler)
- Folding rule or tape measure
- Portable chair and/or folding table
- Decontamination supplies (per the QAPP)
- Health and safety equipment/PPE (per the HASP)

- Field project notebook/pen
- Steel tape measure
- Stainless steel spoons, spatulas
- Plastic sheeting

Procedures

<u>Typical Direct-Push Sampling Procedure</u>

1. Don PPE as per the project HASP.
2. Decontaminate sample tooling and components that may come in contact with soil during sampling activities. Note: the level of decontamination will depend on whether soils are being sampled for laboratory analysis, field screening, or simply for visual classification.
3. Assemble the sampling tube including the liner, discrete sample tooling (if appropriate), sand-basket (if appropriate), and cutting shoe.
4. Prepare the surface for direct-push sampling. Direct push tooling can generally penetrate several inches of asphalt and/or crushed stone surface materials. If several inches of concrete are present at the location, coring or another method will be necessary to penetrate the surface pavement.
5. The direct-push rig operator will thread on a push/drive cap on the top of the device and push the sample tube into the ground.
6. The direct-push rig operator removes the push/drive cap, replaces it with a pull-cap and pulls sampler from the ground with the machine hydraulics.
7. The sample tube is then opened, to allow the soil-filled liner to be removed so that it can be cut open by the project geologist/scientist/ engineer to allow for soil classification/description, field-screening, sampling for laboratory analysis, etc.
8. The sampling tube and components that contact soil during the sampling process are decontaminated, re-assembled, with a new, disposable liner and the process is repeated. The advancement of the sampling tube to depth is achieved through the addition of drive-rods, each of which is typically the same length as the sampling tube (commonly 3, 4, or 5 feet in length).
9. Upon completion of the corehole, the hole is backfilled with soil cuttings or hydrated granular bentonite, or is completed as a piezometer or monitoring well.

<u>Exposing Soils for Classification/Characterization and/or Sampling for Laboratory Analysis</u>

Upon extraction of the liner from the direct-push sampling tube, the liner must be opened so as to expose the soils for visual classification/description, field screening and/or sampling for laboratory analysis. This is accomplished through the use of a liner cutting system, typically comprising a liner holder, and a liner cutter. The liner holder is a trough-like device that holds the liner securely in place so that it can be cut open.

The liner cutter is a tool affixed with two parallel hook-shaped blades that is drawn along the liner to cut a lengthwise opening in the liner for easy access and viewing of the sampled material. Liner cutters come in one-handle and two-handle varieties.

1. Place the soil-filled liner into the soil holder. Be sure that the liner holder is placed on a solid surface such as a sturdy work table, tailgate, etc.
2. Install the liner in the liner holder. Adjust the stop on the liner holder to secure the liner tightly in the holder.
3. Wearing leather work gloves, grasp the cutter by the handle(s) (avoid accidental contact with the blades) and place the cutter on the liner. The liner holder will usually have a bent bar that secures the liner in place, which provides resistance against the draw of the liner cutter. Begin the cut at the end of the liner opposite this bar. Be sure that blades are positioned just beyond the end of the liner to initiate the cut.
4. With slight downward pressure on the cutter, draw the cutter slowly and smoothly along the liner. If excessive force is required to open the liner, the cutter blades may be dull and should be replaced immediately.
5. When the cutter has been drawn the entire length of the liner, the cut section of the liner may be removed to access the sampled material.

The equipment described above is standard practice for most drilling subcontractors and is required by this SOP. This requirement should be communicated and confirmed with the drilling subcontractor before going into the field. Alternate methods of cutting sample liners open (i.e., holding a liner with one hand and using a hook-blade utility knife with the other to open the liner) can result in severe cuts and nasty infections, and **are not to be used**.

Sampling Soils for Environmental Laboratory Analysis

Sampling of soils for environmental laboratory analysis shall be conducted as described in AECC SOP # 101 - Surface and Shallow Soil Sampling. The intervals to be sampled shall be specified in the Project Work Plan. If the sampling program includes laboratory analysis for volatile organic compounds (VOCs), the VOC sampling shall be performed before any other activity.

Once the liner has been opened, the soils contained within can be sampled for laboratory analysis and classified. Materials from the liner can be removed using clean decontaminated/disposable spoons or spatulas. Except for soils to be sampled for volatile organic compound analysis, the soils should be placed into a sample collection pan and homogenized, or placed directly into the appropriate sample container(s). Headspace analysis of a duplicate / split sample can be completed at this point (see SOP #120 – Headspace Analysis).

Once filled, the sample container should be properly capped, cleaned and labeled, and placed into a cooler with ice in preparation for shipping to the laboratory, in accordance with standard operating procedures pertaining to sample handling, packaging and shipping.

Volatile Organic Samples

In order to minimize the loss of volatiles during the sampling process, samples should be collected into lab-supplied glassware as soon as possible after retrieving the sampler from the subsurface. Other tasks (classification, sampling for other parameters, field-screening, equipment decontamination, etc.) should either be performed by others, or be completed after collecting samples for VOC analysis.

Upon filling the sample container, clean and label the container and place it into a cooler immediately. Residual sample may then be used to fill other sample or logging requirements

When using direct-push methods for collecting soil samples for VOC analysis, the drilling subcontractor shall not retrieve more than one subsequent sampler from the subsurface while the project geologist/scientist collects samples from a previous interval.

Soil Classification

Soils will be visually classified in using the Modified Burmeister Soil Classification System or alternate methods required by project specifications.

Equipment Decontamination

Sampling equipment must be decontaminated prior to its initial use and following the collection of each soil sample. Site specific decontamination should be outlined in the sampling plan/work plan. If site-specific decontamination procedures are not stipulated in the work/sampling plan, the procedures described in AECC SOP # 103 – Equipment Decontamination, will be used.

Quality Assurance/Quality Control

Quality control requirements are dependent on project-specific sampling objectives. The QAPP will provide requirements for equipment decontamination (frequency and materials), sample preservation and holding times, sample container types, sample packaging and shipment, as well as requirements for the collection of various quality assurance samples such as trip blanks, field blanks, equipment blanks, and field duplicate samples.

In the absence of a QAPP, QA/QC will be attained through adherence to SOPs and requirements stipulated in project-specific specifications.

Documentation

Various forms are required to ensure that adequate documentation is made of sample collection activities. These forms will vary from project to project and may include:

- Field Log Books
- Soil Boring Logs
- Sample Collection Records
- Sample Container Labels
- Chain of Custody Forms
- Shipping Labels

Boring logs (see Example in AECC SOP # 104 – Split Spoon Soil Sampling) will provide visual and descriptive information for each sample collected and are often the most critical form of documentation generated during a soil sampling program. The field log book is kept as a general log of activities and should not be used in place of the boring log. Occasionally, sample collection records are used to supplement boring logs, especially for environmental samples which have been collected for laboratory analysis. Sample container labels are affixed to individual sample containers and then completed. Chain-of-custody forms are transmitted with the samples to the laboratory for sample custody tracking purposes. Shipping labels are required if sample coolers are to be transported to the laboratory by a third party (courier service). Original copies of these records should be maintained in the appropriate project files.

Scope and Application

The purpose of this SOP is to establish uniform procedures for the collection of groundwater samples. Adherence to this SOP will promote consistency in sampling methods and if followed properly will provide a basis for sample representativeness.

This SOP focuses on the collection of groundwater samples from properly developed monitoring wells, and may be applicable from other wells, springs etc that can be accessed for sampling. Groundwater samples might also need to be collected from residential potable water wells, industrial supply wells, open soil borings/core holes, and other sources which are not readily accessible, or that might require additional instruction and protocols for sampling. The collection of groundwater samples from these sources will vary according to the project and protocols, and procedures for collecting groundwater samples from these features will be discussed in the project-specific QAPP, or sampling plan.

State or federal agency mandated operating procedures may exist that require deviation from this SOP. These required deviations must be identified before the sampling program begins (ideally during the work plan/sampling plan development), and must be explained in the project-specific work plan/sampling plan.

Responsibilities

Project Manager

The project manager is responsible for assuring that project specific requirements are communicated to the project team and for providing the materials, resources, and guidance necessary to perform the work in accordance with this SOP and associated project-specific work plan.

Sampling Technician

The sampling technician is responsible for conducting groundwater sampling in a manner consistent with this SOP and/or in accordance with the QAPP, sampling plan or other project documents. The sampling technician will observe all sampling activities to ensure that the SOP is followed, and will record all pertinent data and information on appropriate forms, logs and/or in the project field notebook.

The sampling technician is responsible for ensuring that he/she has the appropriate laboratory supplied sampling supplies, the sampling equipment and supplies, and the supplies and materials for equipment decontamination.

Generally, the sampling technician is also responsible for handling the collected samples, maintaining custody documentation and preparing the samples for shipping/delivery to the analytical laboratory. On larger projects, a separate team may be assigned this task.

Equipment/Apparatus/Supplies

Required materials will vary depending on the method of groundwater sampling being conducted. In general, the equipment necessary may include:

- Project-specific plans (QAPP, sampling plan, scope of work, HASP).
- Appropriate PPE and safety equipment.
- Plastic sheeting
- Bailers (disposable or re-usable) and bailer-line/string.
- Development pumps (submersible, peristaltic, bladder, Waterra, centrifugal, air-lift, etc.)
- Sampling pumps (typically submersible, peristaltic or bladder)
- Monitors/meters (water quality meter) with calibration standards.
- Water Level Indicator (WLI) or Oil/Water Interface Probe
- Decontamination equipment and supplies (see AECC SOP-103)
- Sample bottles, labels, preservatives, chains of custody, coolers, etc. (sampling kits)
- Sample handling and shipping supplies (see AECC SOP–102),
- Field notebook, and records/forms for documentation/pen(s).
- Buckets and/or drums for carrying/containing purge water.
- Sampling cup/clear container for checking field parameters during purging
- Cooler and ice for samples
- Filters if required for metals analysis.
- Paper Towels

It is important that the sampling technician understand how to use all equipment and supplies that are provided for, and expected to be used, for collection of groundwater samples. If you have never used a particular piece of equipment, be sure to talk to the project manager for direction/instructions prior to deploying to the jobsite.

All equipment/supplies/apparatus that will be inserted into a well to facilitate well purging or groundwater sample collection, or that will come into contact with potentially contaminated groundwater during the sampling process must be decontaminated before and after each use.

Field monitoring equipment/meters should be calibrated and operated in accordance with manufacturer's instructions.

Procedures

General

During a groundwater sampling event, the first activity upon arrival at the site is typically the measurement/collection of depth-to-water data at each well location. Each of the wells to be gauged should be opened so that they are each able to equilibrate with the atmosphere, and should be gauged with a water level indicator, for depth to water and total well depth. If free phase product is anticipated at a given location, this should be field verified with a clean new disposable bailer and/or an oil/water interface probe.

Data on depth to water, depth to the base of the welland the diameter of each well should be recorded on the groundwater sample collection record and/or in the field notebook, as should any other pertinent information such as length and vertical position of well screen (if present), depth and thicknesses of immiscible layers, odors, lack of water, etc. The water level indicator/oil water separator must be decontaminated between use at each well. Flushing the probe and tape of the WLI with distilled water is generally sufficient for wells with no free product, however decontamination with detergents or solvents may be necessary if wells contain non-aqueous phase liquids (NAPLs).

NOTE: Historical water-level and groundwater quality data if available, should be used be used by the sampling technician. These data will aid in identifying changes in water levels over time, changes in well conditions (e.g., gradual silting up of a well screen), and which wells may be the most contaminated.

The length of the water column and the well diameter are used to calculate the volume of water in the well (calculated well volume) and is recorded on the groundwater sample collection record and/or the field notebook. Well volume is calculated as presented below.

$V = 0.041D^2(d2-d1)$, where
V = Calculated well volume in gallons
D = inside diameter of well casing in inches
d2 = total well depth in feet
d1 = depth to water surface in feet

Groundwater Sampling

Groundwater sampling is conducted in two general stages, well purging and sample collection.
During purging, groundwater is removed from the well so as to remove the water that might have been affected by exposure to the atmosphere. This is commonly done by pumping or bailing a minimum of three (3) calculated well volumes from a well, prior sample collection. Field parameters such as temperature, specific conductivity, turbidity, and pH may be collected during the purging process. When such field parameters are collected, purging continues until

the parameters have stabilized to within 10-percent of their preceding measurement, or until a maximum of five (5) calculated well volumes have been removed from the well.

Sample collection involves the filling of sample containers and the measurement of field-measured parameters. A summary of the most common groundwater sampling methods, and procedures to be followed for each method, are presented below.

Sampling with a Bailer

Bailing is a common and convenient method for purging and sampling groundwater, especially for situations where the depth of groundwater and the total depth of groundwater and well depth are both relatively shallow.

A bailer is a tube shaped device with a check valve at its lower end. Bailers come in a variety of sizes and volumes and are commonly disposable, although reusable bailers are available. Clean braided nylon or cotton cord is tied to the top of the bailer and the bailer is lowered into groundwater. When filled, the bailer is lifted from the well and the check-valve prevents water from draining out.

Procedures

Purging

1. Don PPE as per the project HASP section regarding groundwater sampling.
2. Obtain a clean bailer and a spool of clean polypropylene or nylon bailer cord.
3. Uncover the top end of the bailer and tie the cord to the bailer loop. Test the knot to ensure that it is secure, and remove the wrapping from the bailer.
4. Gently lower the bailer to bottom of the well.
5. Cut the cord at a proper length and tie a hand loop at the end of the cord, and attach it to your arm, or other fixed feature to prevent losing it down the well.
6. Gently raise the bailer, using the cord. The bailer cord should never touch the ground surface during purging or sampling.
7. Grab the bailer with one hand as it emerges from the well. Pour the bailed groundwater from the bailer into a graduated purge container.
8. Repeat this procedure until one calculated well volume of water is removed from the well.
9. After purging one calculated well volume, place a small volume of purged water into a sample cup and measure any required field parameters and record results on the Groundwater Sample Collection Record or in the field logbook or groundwater sampling form. If using a flow through apparatus for monitoring field parameters, record the readings from the display at this time and record in the filed logbook or groundwater sampling form.
10. Continue purging, by repeated bailing until the required purge volume has been removed from the well or until field parameters have stabilized.

Sample Collection

1. After completing purging, allow the well to recover to 90% of its static level before collecting the sample.
2. Insert the bailer into the well and gently lower the bailer to the bottom of the well.
3. Gently raise and retrieve the filled bailer from the well.
4. Grab the bailer with one hand as it emerges from the well. Insert a sample discharge tube into the bottom of the bailer to open the check valve and collect the discharging water into sample containers. In general, samples to be analyzed for VOCs are to be collected first, followed by samples to be analyzed for other organic compounds and inorganic constituents.
5. The samples to be analyzed for volatile organic compounds (VOCs) should be collected as gently as possible; so as to minimize the disturbance and aeration of the water as it enters the sample vials. Care should be taken to fill the vials such that no air bubbles are visible within the vial.
6. Repeat the sampling process until all sample containers are filled, adding required preservatives as necessary before capping.
7. After all sample containers are filled, fill the sampling cup with water and collect any required field-measured data (may include: temperature, pH, specific conductance, dissolved oxygen, total dissolved solids, oxidation-reduction potential, turbidity, salinity, etc) on the Groundwater Sample Collection Record, or in the field notebook.
8. Label and log the samples and place the containers into a cooler with ice as soon as possible (immediately) after collection.
9. Handle samples for shipment to the laboratory in accordance with AECC SOP # 102 – Environmental Sample Handling, Packaging, and Shipping.

Sampling with a Peristaltic Pump

Peristaltic pumps are commonly used for groundwater samples when the volume of water required to be purged is low, and when the depth to the groundwater surface is less than approximately 20 feet. Peristaltic pumps provide a low flow rate, typically in the range of 0.02-0.2 gallons/minute (75-750 ml/min), and are therefore best suited to low-flow sampling techniques, or for collecting samples from wells with low purge volumes.

A peristaltic pump is a type of positive displacement pump. During operation, a series of rollers rotate inside the pump casing, over a section of flexible silicone tubing. The silicone tubing is compressed and continued rotation forces water to be pumped through the system. A suction tube typically made of polyethylene or Teflon-lined polyethylene is attached to the intake end of the silicone tubing, and a discharge tube of similar material is attached to the outflow end of the silicone tubing. The suction tube is lowered into the water surface far enough so that it will remain submerged if drawdown occurs. Upon turning the pump on, the water is drawn up the suction tube, through the pump tube, and pushed out the discharge tube. Because each of the sections of hose comes in contact with groundwater, clean, new tubing must be used for each sampling location, and it is common practice to dedicate tubing to a specific well for use during future groundwater sampling events.

Procedure

Purging

1. Don PPE as per the project HASP section regarding groundwater sampling.
2. Attach new (or dedicated) sections of suction, silicone and discharge tubing, and install the silicone tubing into the peristaltic pump.
3. Insert the suction tubing into the well so that the open end is below the water surface (commonly set midway along the well screen, or so the intake is situated halfway between the lower screen slot and the uppermost submerged screen slot).
4. Start the pump and direct the discharging purge water into a graduated purge bucket, and adjust the pump speed to produce a smoothly flowing discharge.
5. Calculate the purge rate by recording the time required to purge a given volume and adjust to a flow rate of between 250 and 500 ml/min (if possible).
6. Measurements of temperature, pH and specific conductance (and/or other assigned parameters) should be made after each well purge volume and documented on the Groundwater Sample Collection Record or in the field logbook.
7. Samples may be collected after the required purge volume has been removed or the field-parameters have stabilized.

Sample Collection

1. After completing purging, allow the well to recover to 90% of its static level before collecting the sample.
2. During sample collection from a given well, samples to be analyzed for VOCs are collected first, and samples to be analyzed for other organic compounds and inorganic constituents are collected last.
3. When sampling for VOCs, reduce the flow rate so that the flow approximates 50 ml/min and use the discharge to fill the sample vials. This should be done as gently as possible, minimizing the disturbance and aeration of the water as it enters the vials. Care should be taken to fill the vial completely such that no air bubbles are visible in the vial.
4. For subsequent, non VOC samples, return the flow rate to approximately 250 ml/min and fill sample containers, being sure to add the required preservatives as necessary before capping.
5. After all sample containers are filled, fill the sampling cup with water and collect any required field-measured data (may include: temperature, pH, specific conductance, dissolved oxygen, total dissolved solids, oxidation-reduction potential, turbidity, salinity, etc) on the Groundwater Sample Collection Record or in the field notebook.
6. Label and log the samples and place the containers into a cooler with ice as soon as possible (immediately) after collection.
7. Handle samples for shipment to the laboratory in accordance with AECC SOP # 102 – Environmental Sample Handling, Packaging, and Shipping.

<u>Sampling with a Submersible Pump</u>

Submersible pumps are commonly used for groundwater sampling activities when groundwater is deep, or when a large volume of water must be purged prior to sampling. Because this type of pump is inserted into the groundwater being sampled, thorough decontamination between sampling locations is necessary to prevent cross-contamination. As an additional measure to prevent potential cross-contamination, historic groundwater quality data should be used (if available) to establish the order in which sampling occurs. Groundwater sampling with submersible pumps should proceed from the least contaminated wells to the most contaminated wells.

Discharge tubing, typically made of polyethylene or Teflon lined polyethylene is attached to the outflow of the pump. The pump, discharge tubing, and power cord/ air hose is lowered into the groundwater far enough so that the pump intake will remain submerged if drawdown occurs. A support cable/line is used to support the weight of the pump while it is suspended in the well, and the power cable/air hose is attached to a controller at the ground surface. Upon turning the pump on, the water is pushed up the discharge tube. Because the tubing comes in contact with groundwater, clean, new tubing must be used for each sampling location, and it is common practice to dedicate tubing to a specific well for use during subsequent groundwater sampling events.

Purging

1. Attach new or dedicated discharge tubing to the submersible pump.
2. Insert the pump, discharge hose, power cable/air hose, and support cable into the well so that the pump's intake is below the water surface (commonly set midway along the well screen, or so the intake is situated halfway between the lower screen slot and the uppermost submerged screen slot).
3. Start the pump and direct discharge into graduated purge bucket, and adjust the pump speed to produce a smoothly flowing discharge.
4. Calculate the purge rate by recording the time required to purge a given volume.
5. Measurements of temperature, pH and specific conductance (and/or other assigned parameters) should be made after each well purge volume and documented on the Groundwater Sample Collection Record or in the field logbook.
6. Samples may be collected after the required purge volume has been removed or until field parameters have stabilized.

Sample Collection

1. After completing purging, allow the well to recover to 90% of its static level before collecting the sample.
2. In general, samples to be analyzed for VOCs are to be collected first, followed by samples to be analyzed for other organic compounds and inorganic constituents.
3. If sampling for VOCs, reduce the flow rate so that the flow approximates 50 ml/min and use the discharge tube to fill the sample vials. This should be done as gently as possible, minimizing the disturbance and aeration of the water as it enters the vials. Care should be taken to completely fill the vial such that no air bubbles are visible in the vial.

4. For other parameters, adjust the flow rate to approximately 250 ml/min, and fill other sample containers, being sure to add the required preservatives as necessary before capping.
5. After all sample containers have been filled, fill the sampling cup with water and collect any required field-measured data (may include: temperature, pH, specific conductance, dissolved oxygen, total dissolved solids, oxidation-reduction potential, turbidity, salinity, etc) on the groundwater sample collection record or in the field notebook.
6. Label and log the samples and place the containers into a cooler with ice as soon as possible (immediately) after collection.
7. Handle samples for shipment to the laboratory in accordance with AECC SOP # 102 – Environmental Sample Handling, Packaging, and Shipping.

Quality Assurance/Quality Control

Quality assurance sampling is a common component of groundwater sampling programs. QA/QC sampling involves the collection and analysis of additional samples for the purposes of verifying that sampling equipment is suitably clean (equipment blanks), to check the laboratory's accuracy and/or precision (field duplicate), whether the sample matrix may be affecting the analytical results (Matrix Spike/Matrix Spike Duplicate), and whether samples might have been affected by conditions during shipment of the sample containers or samples (trip blank). The specific types of samples to be collected, the procedures to be used for collection, and the frequency QA/QC sample collection will be defined in the QAPP, work plan or project-specific work plan.

Documentation

Groundwater sampling activities should be documented in the field notebook, as well as on forms including the chain of custody record and sample collection records. Purge data collected during well purging prior to sample collection may be collected in the field notes, or on Groundwater Sample Collection Records (See Figure 1 Groundwater Sample Collection Record and Figure 2 for Low Flow Groundwater Sample Collection Record). Labels for sample jars must replicate the information provided on the chain-of-custody and at a minimum must include site ID/project number, sample ID, sampling date, sampling time, preservative, and sampler's initials. Other documentation such as meter calibration records, certifications for pre-cleaned sample containers, and shipping paperwork should be maintained as part of the project file.

Related AECC SOPs

SOP # 102 Sample Handling, Packaging, and Shipping
SOP # 103 Equipment Decontamination
SOP # 108 Sample Labeling & COC Completion
SOP # 113 Taking Field Notes

FIGURE 1 Groundwater Sample Collection Record

AECC ENVIRONMENTAL CONSULTING

Well/Piezo ID:

Groundwater Sample Collection Record

Client: ______________________ Date: ____________
Project No: ______________________ Time: Start _______ am/pm
Site Location: ______________________ Finish _______ am/pm
Weather Conds: ______________ Collector(s) ______________

WATER LEVEL DATA: (measured from Top of Casing) Well ☐ Piezometer ☐

a. Total Well Length ________ c. Casing Material ______ e. Length of Water Column ________ 0

b. Water Table Depth ________ d. Casing Diameter ______ f. Calculated Well Vol.see back) ________

WELL PURGING DATA

a. Purge Method ____

b. Acceptance Criteria defined (from workplan)
- Minimum Required Purge Volume (@ ______ well volumes) ______________________
- Maximum Allowable Turbidity __________ NTUs
- Stabilization of parameters __________ %

c. Field Testing Equipment Used: Make Model Serial Number

d. Field Testing Equipment Calibration Documentation Found in Field Notebook # ______ Page #______

Time	Volume Removed (gal)	T° (C/F)	pH	Spec. Cond (umhos)	Turbidity (NTUs)	DO	Color	Odor	Other

e. Acceptance criteria pass/fail

	Yes	No	N/A
Has required volume been removed	☐	☐	☐
Has required turbidity been reached	☐	☐	☐
Have parameters stabilized	☐	☐	☐

If no or N/A - Explain below.

SAMPLE COLLECTION: Method: ______________________

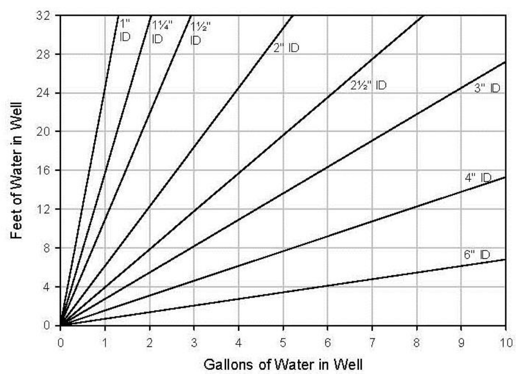
Sample ID	Container Type	No. of Containers	Preservation	Analysis	Time

Comments ______________________________

Signature ______________________________ Date ______________________________

FIGURE 1 (Cont'd) Groundwater Sample Collection Record

Purge Volume Calculation



Volume / Linear Ft. of Pipe		
ID (in)	Gallon	Liter
0.25	0.0025	0.0097
0.375	0.0057	0.0217
0.5	0.0102	0.0386
0.75	0.0229	0.0869
1	0.0408	0.1544
1.25	0.0637	0.2413
1.5	0.0918	0.3475
2	0.1632	0.6178
2.5	0.2550	0.9653
3	0.3672	1.3900
4	0.6528	2.4711
6	1.4688	5.5600

(continued from front)

Time	Depth to GW	Temp	pH	Spec. Cond.	Turbidity	Flow Rate	Volume Removed	Draw-down	Other
(24 hr)	(feet)	(°C/F)	(SU)	(µS/cm)	(NTU)	(liters/min)	(liters)	(feet)	(Color, odor, sheen, etc.)

FIGURE 2 Low Flow Groundwater Sample Collection Record

Well ID:

Low Flow Groundwater Sample Collection Record

Client:__________ Date:________ Time: Start _____ am/pm
Project No: __________ Finish _____ am/pm
Site Location: __________
Weather Conds: __________ Collector(s): __________

1. WATER LEVEL DATA: (measured from Top of Casing)

a. Total Well Length _____ c. Length of Water Column __0__ (a-b) Casing Diameter/Material

b. Water Table Depth _____ d. Calculated System Volume (see back) _____

2. WELL PURGE DATA

a. Purge Method:__________

b. Acceptance Criteria defined (see workplan)

- Temperature	3%	-D.O.	10%
- pH	± 1.0 unit	- ORP	± 10mV
- Sp. Cond.	3%	- Drawdown	< 0.3'

c. Field Testing Equipment used: Make Model Serial Number

Time (24hr)	Volume Removed (Liters)	Temp. (°C/F)	pH (SU)	Spec. Cond. (mS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Flow Rate (ml/min)	Drawdown (feet)	Color/Odor

d. Acceptance criteria pass/fail

	Yes	No	N/A
Has required volume been removed	☐	☐	☐
Has required turbidity been reached	☐	☐	☐
Have parameters stabilized	☐	☐	☐

(continued on back)

If no or N/A - Explain below.

3. SAMPLE COLLECTION: Method:__________

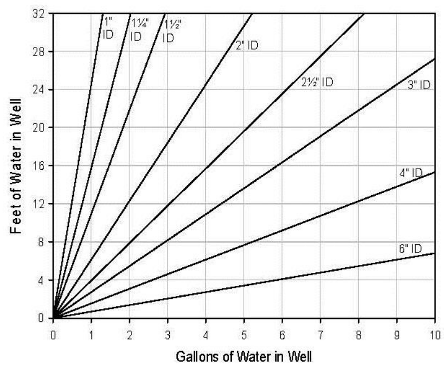
Sample ID	Container Type	No. of Containers	Preservation	Analysis Req.	Time

Comments __________

Signature__________ Date _____

FIGURE 2 (Cont'd) Low Flow Groundwater Sample Collection Record

Purge Volume Calculation



Volume / Linear Ft. of Pipe		
ID (in)	Gallon	Liter
0.25	0.0025	0.0097
0.375	0.0057	0.0217
0.5	0.0102	0.0386
0.75	0.0229	0.0869
1	0.0408	0.1544
1.25	0.0637	0.2413
1.5	0.0918	0.3475
2	0.1632	0.6178
2.5	0.2550	0.9653
3	0.3672	1.3900
4	0.6528	2.4711
6	1.4688	5.5600

(continued from front)

Time (24 hr)	Volume Removed (Liters)	Temp (°C/F)	pH	Spec. Cond. (µS/cm)	DO (mg/L)	ORP (mV)	Turbidity (NTU)	Flow Rate (ml/min)	Drawdown (ft)	Color/Odor

Scope and Application

The purpose of this SOP is to provide guidance on the installation of overburden and bedrock monitoring wells and the subsequent development of monitoring wells after they are installed. Monitoring wells are installed to monitor the depth to groundwater, aquifer properties, and to obtain samples of groundwater for chemical analysis.

If monitoring wells are not properly installed, they may act as a route of contaminant migration between separate aquifers or may allow contamination at the ground surface to migrate to the subsurface. This condition represents a huge liability to the Company, and in many states, to the individual Professional Geologist responsible for installing the well. It is vitally important that monitoring wells be constructed and maintained so as to ensure that such migration of contamination does not occur.

Some states and EPA Regions have implemented strict requirements for monitoring well construction. These requirements must be reviewed in advance of the field program and specified in the project work plan.

Monitoring wells are generally constructed in a soil boring or core hole that has been advanced using conventional drilling equipment, using commercially-available well construction and filter/sealing materials. After installation, and prior to groundwater sample collection, the wells must be properly developed to enhance/maximize the interconnectivity between the well and the formation, and to remove fine grained material from the filterpack. Procedures for monitoring well development are outlined at the end of this SOP, and procedures for groundwater sample collection are provided in AECC SOP# 106 – Groundwater Sampling.

Responsibilities

Project Manager

The project manager is responsible to make sure that projects involving the installation of monitoring wells are properly planned and executed, and to assure that project-specific well construction specifications are effectively communicated to the Project Geologist/Scientist and to the Drilling Subcontractor that will be responsible for monitoring well construction.

Project Geologist/Scientist

The project geologist/scientist is responsible for directly overseeing the construction and installation of monitoring wells by the drilling subcontractor. He/she is also responsible for making sure that well installation procedures are consistent with this SOP and that the specifications defined in the project work plan are adhered to. The project geologist/scientist is responsible for recording all pertinent data on the appropriate forms and/or in the field notebook.

Subcontractors

The drilling subcontractor is responsible for providing the necessary equipment for well construction and installation consistent with the project requirements. In addition to the drilling equipment, this will typically include:

- Threaded flush-joint riser pipe of an approved material that typically consist of polyvinyl chloride (PVC) or stainless steel. Other specialty riser pipe materials may be required (e.g., Teflon). Note that glue or PVC cements for joining lengths of riser pipe are not permitted.
- Threaded flush-joint slotted screen of appropriate slot size and approved material (PVC, stainless steel). The use of glues or PVC cements is not permitted.
- Properly sized and washed filter pack material (quartz sand).
- Bentonite (granular, and chips or pellets)
- Steel surface casing (if required)
- Tremie pump and pipe

Commonly a surveying subcontractor is retained to survey aspects of a subsurface site characterization project. Depending on the project work plan, the surveyor may be responsible for providing a monitoring well's horizontal coordinates, ground surface elevation, gauging point (i.e., top of casing) elevation and/or the top of the protective casing elevation.

Equipment/Apparatus/Supplies

In addition to the equipment and materials provided by the drilling subcontractor, required materials may include the following:

- Project-specific documents (Scope of work, HASP, QAPP, Sampling Plan)
- Monitoring Well As-Build Diagrams (Figure 1)
- Weighted tape measure for verifying well and hole depths and well material dimensions. Stainless steel spoons, spatulas, soil mixing pans etc.
- Health and safety equipment/PPE (per the HASP)
- Field project notebook/pen

Procedures

Monitoring well installation begins with the completion of a soil boring or corehole to the required depth, and often begins while hollow-stem augers (or other temporary casing material) are still in the ground to prevent the open hole from collapsing. The soil boring/core hole should be at least 2-inches larger in diameter than the screen/riser so that filter pack, seals, and grouting materials can be installed effectively and without causing bridging. The well construction materials are carefully emplaced into the soil boring/corehole while the hollow stem augers/temporary casing is progressively withdrawn from the ground.

Before starting the well construction process, the field geologist/scientist should verify that the well construction materials are new/clean or whether decontamination of the materials is required. The geologist/scientist should also measure and record the dimensions of the various components that will collectively become the well. Upon completion, a person should be able to use these measurements to precisely locate the depth of any well feature (i.e., flush-joint, bottom of end cap, top screen slot, etc.) as measured from the top of the well casing.

Procedures

The following general procedure will be used during the installation of monitoring wells:

1. Advance the hollow stem augers/temporary casing to the required termination depth and remove center rods.
2. Check the total depth of the soil boring/corehole with a decontaminated, weighted tape.
3. Emplace lowermost portion of the filter-pack sand into the boring through the hollow-stem augers/temporary casing, withdrawing the augers/temporary casing as necessary, so that 6-inches of filter pack sand lies in the bottom of the boring.
4. Verify depth with weighted tape.
5. Thread the bottom cap onto screened section(s), and tighten so that joints are flush.
6. Insert screen into the boring, and add lengths of riser pipe, adding centralizers as necessary (especially in deeper installations), until the well string rests on the bottom of and is centered in the soil boring/corehole.
7. Cut the top riser off at the appropriate height for stick-up or flush mount type well installation and insert locking expansion plug. Be sure to measure the length of riser removed and subtract from the total riser length measured previously.
8. Continue adding filter pack sand into the annular space between the well casing and the augers/temporary casing, progressively withdrawing the augers/temporary casing as necessary, until the filter pack sand is 2 to 3 feet above the uppermost screen slot.
9. Verify depth to top of filter pack with weighted tape.
10. Tremie, or for shallow wells (<35 feet in depth) gravity feed a 2-foot thick (minimum) layer of bentonite chips, pellets or slurry above the filter pack, being sure that the bentonite does not bridge or accumulate within the hollow stem auger/temporary casing.
11. Verify depth to the top of the filter pack seal with weighted tape.
12. Prepare bentonite-cement grout approximating the ratio:

    2 # bentonite powder: 94 # Portland cement: 7 gal. potable water

13. Tremie the grout into the annulus using a tremie pipe and pump (gravity feed bentonite pellets if emplacing them at a shallow depth range). Grout the well to within 2 to 3 feet of the surface but not higher than the average frost line.

14. Install protective cover (stick-up or flush-mount) and prepare concrete pad and finish so that it slopes away from the wellhead in all directions. Pads will have a minimum thickness of 4 inches. Drill vent hole in casing or expansion plug/well cap (stick up installations only) and lock the protective cover (or the expansion plug for flush mount installations).
15. If the well design specifies guard posts/bollards, dig the holes and set the guard posts in concrete separate from the concrete well pad. Bollards must extend to a depth of 2 feet.
16. Record the appropriate construction/completion information in the field logbook and on the monitoring well as-built detail (Figure 1).
17. If a form was used for the concrete pad, return to the well site after the concrete has cured for at least 24 hours and remove the form. Backfill around the pad with native soil and restore surface as appropriate.
18. The well identification should be marked on the protective casing and PVC cap. Paint the well cover and posts, if required.

<u>Monitoring Well Development:</u>

Monitoring wells are developed to enhance the interconnection between the well and the aquifer. Drilling methods inherently cause disturbance of the saturated portion of a monitoring well, and if mud rotary techniques are used when drilling in bedrock, the drilling mud may cake up on and seal off, or partially obstruct the water-bearing zone in a well. Development is the process of removing the caked material from the bore/corehole wall, and/or removing fine-grained materials from the filter pack. Development using vigorous methods should occur a minimum of 48 hours after the well is completed to allow the filter pack seal grout to sufficiently cure. Development may occur before the 48 hour minimum if the development occurs before the emplacement of the filter-pack and grout, or if development is to be completed by hand bailing or other relatively low stress method that will not draw the seal/grout materials into the filter-pack or well.

Equipment needed:

- Pump, pump tubing, or bailer and bailer cord, surge block (or other method-specific equipment as appropriate)
- Water-level indicator.
- Temperature, conductivity and pH meters.
- Personnel protective equipment as specified in the site-specific HASP.
- Decontamination supplies.

- Disposal drums, if required.

The most common well development methods utilized by AECC are: surging with a surge block, over-pumping, and bailing. Surging involves raising and lowering a surge block or surge plunger inside the well. The resulting surging motion forces water into the formation and loosens sediment, pulled from the formation into the well. Occasionally, sediments must be removed from the well with a bailer or pump.

Over-pumping involves pumping at a rate high enough to draw the water level in the well down as low as possible, and then allowing the well to recharge to near the original level. This process is repeated until sediment-free water is produced.

Bailing includes the use of a simple manually operated check-valve bailer to remove water from the well. The bailing method, like other methods, should be repeated until sediment free water is produced. Bailing may be the method of choice in a shallow well or in slowly-recharging wells.

These are standard (i.e., typically applicable) operating procedures which may be varied or changed and/or combined as required, dependent on site conditions, equipment limitations or limitations imposed by the procedure. Other less-common methods may also be applicable, depending on project/site specific situations. In all instances, the procedures employed are to be documented in the field notebook and development data log.

The following steps will be followed when developing monitoring wells:

1. Obtain information on each well to be developed and list on the Development Data Logs (i.e., drilling method, well diameter, well depth, screened interval, anticipated contaminants).
2. Obtain a water level meter, air monitoring instruments, materials for decontamination, and water quality instrumentation (if stipulated in the QAPP/Work Plan or other project specific documents).
3. Assemble drums or containers for temporary storage of water produced during well development.
4. Assemble necessary equipment on a plastic sheet surrounding the wellhead.
5. Record pertinent information in the field logbook and or development data log (personnel, time, location ID, etc.) and don appropriate PPE as specified in the site specific HASP or Job Safety Analysis (JSA).
6. Open the monitoring well, take air monitor reading with a PID at the top of casing and in the breathing zone as appropriate.
7. Measure depth to water and the total depth of the monitor well. Calculate the water column volume of the well (refer to the groundwater sampling logs in AECC SOP# 106 - Groundwater Sampling) to approximate well volume based on well diameter.

8. Begin development and measure the initial pH, temperature, turbidity, and specific conductivity of the water and record in the site logbook. Note the initial color, clarity, and any other observable conditions.
9. Continue to develop the well and periodically measure the water quality parameters indicated in step 8 (above). Depending on project objectives and available time, development should proceed until these water quality parameters stabilize, or until the water has a turbidity of less than 50 nephelometric turbidity units (NTUs).
10. Record the final water quality parameters in the field notebook and purge data sheets.
11. Remove the pump assembly or bailers from the well, decontaminate, and cleanup the site.
12. Lock the well cover before leaving. Dispose of produced water as required by the project work plan

Terms/Definitions:

Annulus: The space between the borehole wall and the outside of the well screen or riser pipe.

Bentonite Seal: A granular, chip, or pellet bentonite material that is often used to provide an annular seal above the well screen filter pack. This seal is typically installed dry followed by in-place hydration with or without the addition of water. Hydrated bentonite is sometimes used as a grout seal.

Bottom Cap/Plug: Threaded or slip-on cap placed at the bottom of the well prior to installation. Often serves as a sump for accumulation of silt which settles within the well. The measured length from the lowermost well screen slot to the bottom of the bottom cap is known as the sump or tail pipe portion of the well.

Centralizers: Stainless steel expansion clamps which, when fitted to well screens or riser pipe, expand to contact the borehole walls positioning the well centrally (and plumb) within the open borehole so as to allow for even placement and distribution of filter pack, seals and grout.

Expansion Plug/Well Cap: Cap used to cover the opening at the top of the well riser pipe. Expansion plugs are equipped with a rubber gasket and threaded wing nut which, when turned, provides a watertight seal. Expansion caps may also be locked, and generally are recommended for use with flush-constructed wells where road box protective casings are also used. Other well caps may include slip-on or threaded caps made of the same material as the well casing.

Filter Pack: A well-graded, clean sand or gravel placed around the well screen to act as a filter in preventing the entry of very fine soil particles into the well.

Grout Seal: A cement/bentonite mixture used to seal a borehole that has been drilled to a depth greater than the final well installation depth or to seal the remaining borehole annulus once the filter pack seal has been installed above the filter pack. Occasionally, pure bentonite is used as a grout seal.

Measuring Point: A selected point at the top of the well casing (riser pipe) used for obtaining periodic water-level measurements. The measuring point should consist of either a notch or indelibly marked point on the upper surface of the casing. Typically, the highest point on the casing (if not level) is used as the measuring point. The measuring point is also the point that is surveyed when well elevation data is obtained.

Protective Casing: A locking metal casing, placed around that portion of the well riser pipe that extends above the ground surface. The protective casing is generally cemented in place when the concrete pad is constructed around the well.

Riser Pipe: The non-perforated portion of well casing material used above the well screen, that extends to the ground surface. Riser pipe is typically available pre-cleaned and pre-threaded for immediate use.

Road Box/Flush Mount Protective Cover: A protective casing that is flush-mounted with the ground surface, and are used in areas where the monitoring well cannot extend above the ground surface for traffic or security reasons.

Tremie Pipe: A small diameter pipe which fits in the open borehole annulus and is used to inject filter sands or hydrated seal materials or grouts under pressure.

Well Screen: That portion of the well casing material that is perforated in some manner so as to provide a hydraulic connection to the aquifer. Typically a well screen is purchased pre-slotted, pre-cleaned, and pre-threaded for immediate use.

Vent Hole: Small diameter hole drilled in the upper portion of the well riser pipe (or in the expansion plug/well cap which provides atmospheric venting of the well. The vent holes allow for constant equilibration of the water level with changing atmospheric conditions. In flood-prone areas, or with flush-mount wells, vent holes should not be used.

Quality Assurance/Quality Control

Quality control requirements are project-specific and can vary greatly from project to project. QA/QC protocols regarding the decontamination of well construction materials or the collection and analysis of equipment blanks and/or well material blanks, if required, will be specified in the QAPP. In the absence of a QAPP, QA/QC will be attained through adherence to SOPs and requirements stipulated in other project-specific specifications (i.e., work plan, sampling plan, etc.).

Documentation

All well construction data will be recorded on the Monitoring Well As-Built Detail form (Figure 1). Well locations are to be identified on field maps, and additional information collected during installations will be recorded in the field notebook.

Well development will be documented on the Monitoring Well Development Record (Figure 2).

Deviations from this SOP, and the rationale for those deviations should be documented in the field project notebook.

Scope and Application

The purpose of this procedure is to establish a uniform set of procedures for labeling environmental sample containers and properly completing a Chain of Custody (COC) form. Adherence to this SOP will ensure that sample containers are properly labeled, the sample collection and descriptive information is documented and that the required analytical parameters are specified on the COC form.

Sample labels provide the information necessary during handling to complete the COC forms and they reduce the possibility of confusing sample containers. The COC form is intended as a legal record of possession of a sample.

This SOP is to be used **ONLY** for the labeling and COC documentation of environmental samples. The labeling of hazardous material sample containers and the completion of COC forms shall adhere to USDOT regulations.

Equipment/Apparatus/Supplies

Required materials include the following:

Adhesive Sample Labels (laboratory-provided)
COC form(s)
Clear packing tape

Procedures

Sample bottle labeling

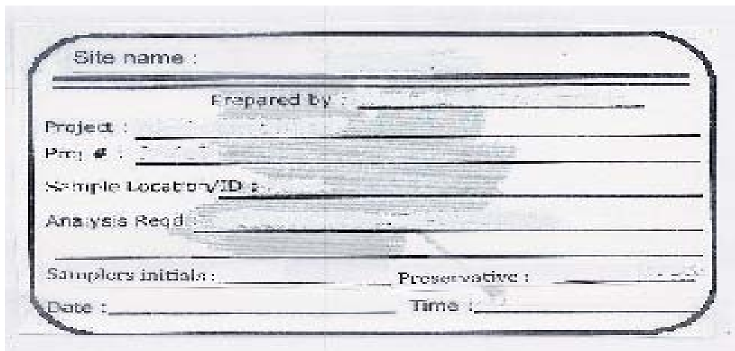
Sample containers shall be pre-labeled with blank adhesive label before samples are collected. The container shall be labeled using the adhesive labels provided by the analytical laboratory

Once a sample has been placed into a container and the container is properly sealed, the sampler shall record the following information on the label:

- Site name
- Label prepared by (lab name)
- Project name
- Project number
- Sample Location / ID
- Analysis required
- Samplers' initials
- Preservative (if present)
- Date and time that the sample was acquired

The label shall then be covered with clear packing tape which is wrapped completely around the bottle.

An example of a sample container label is shown below.


Site name :

Prepared by :

Project :

Proj # :

Sample Location/ID :

Analysis Reqd :

Samplers initials : Preservative :

Date : Time :

Chain of Custody Completion

The COC form is typically provided by the analytical laboratory and must be partially completed by the sampler prior to releasing custody of the sample. The essential information that must be provided on the COC form by the sampler is as follows:

- Project Name/Site Name
- Details of who the lab report should be routed to
- Details of who should be invoiced for the analytical services
- Project number
- Turnaround time requested
- Date and time that each sample was collected
- Type of sample collection method (composite or grab)
- Matrix sampled (liquid, soil, sludge)
- Number of containers filled per sample number
- Requested analyses
- Remarks

Most importantly, each COC form has a section where the sampler signs, dates and records the time that he/she releases the samples to a shipping agent or the sample receiver at the laboratory. Once the samples are released a copy of the COC form shall be retained by the sampler and routed to the project file. If the cooler is to be shipped via an overnight carrier (i.e. FedEx®, UPS or similar) the signed chain of custody shall be placed in a sealable plastic bag and taped to the underside of the cooler lid. The COC form should be initiated at the lab at sample container receipt and it remains with the sample at all times.

Quality Assurance/Quality Control

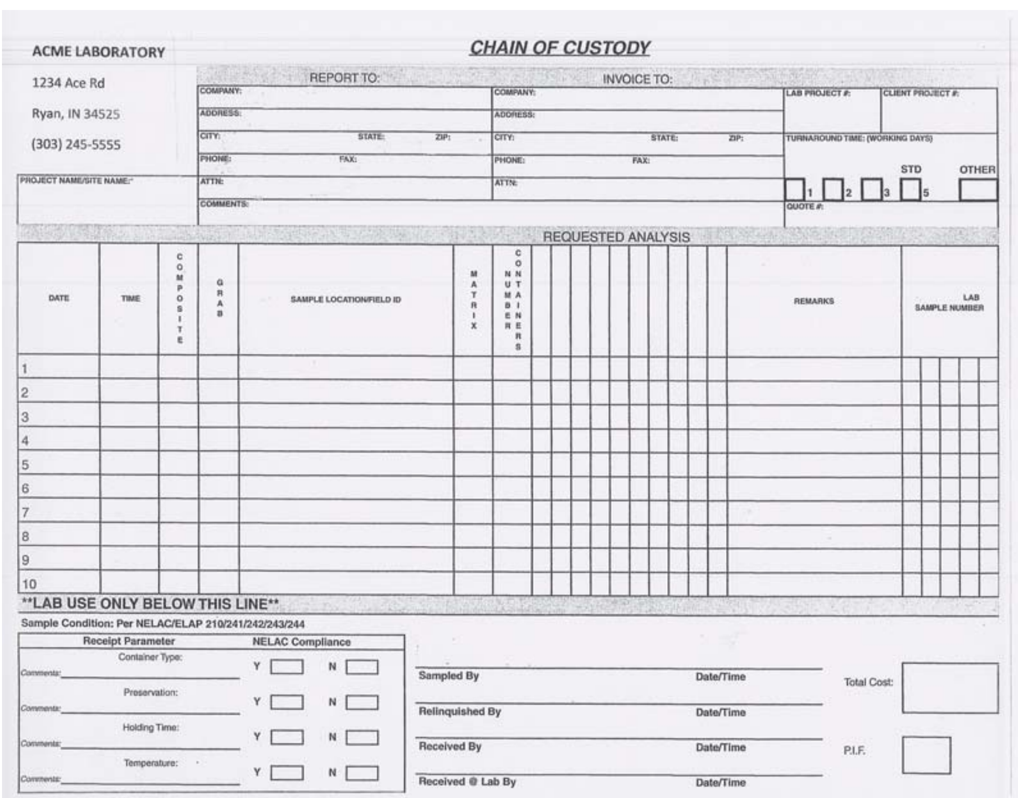
Prior to affixing a container label to a sample container, and then completing the label, the sampler shall review the project sampling plan/scope of work to ensure that the required label information has been recorded on the label.

Prior to sealing the COC for shipment the sampler shall review the project sampling plan/scope of work to ensure that the form has been fully and accurately completed (e.g., all sample Location / ID information, the appropriate laboratory analyses, and the required turn-around-time for analytical results are requested).

Documentation

If samples are being shipped via courier or via direct delivery then a copy of the signed chain of custody shall be retained. If shipping via other carrier, the copy of the airbill shall be retained for the project records.

An example of a chain of custody form is presented below.



ACME LABORATORY
1234 Ace Rd
Ryan, IN 34525
(303) 245-5555

CHAIN OF CUSTODY

REPORT TO: COMPANY: ADDRESS: CITY: STATE: ZIP: PHONE: FAX: ATTN: COMMENTS:

INVOICE TO: COMPANY: ADDRESS: CITY: STATE: ZIP: PHONE: FAX: ATTN:

LAB PROJECT #: CLIENT PROJECT #:

TURNAROUND TIME: (WORKING DAYS) 1 2 3 STD 5 OTHER

QUOTE #:

PROJECT NAME/SITE NAME:*

REQUESTED ANALYSIS

DATE	TIME	COMPOSITE	GRAB	SAMPLE LOCATION/FIELD ID	MATRIX	NUMBER CONTAINERS										REMARKS	LAB SAMPLE NUMBER
1																	
2																	
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10																	

LAB USE ONLY BELOW THIS LINE

Sample Condition: Per NELAC/ELAP 210/241/242/243/244

Receipt Parameter	NELAC Compliance	
Container Type: Comments:	Y	N
Preservation: Comments:	Y	N
Holding Time: Comments:	Y	N
Temperature: Comments:	Y	N

Sampled By — Date/Time
Relinquished By — Date/Time
Received By — Date/Time
Received @ Lab By — Date/Time

Total Cost:
P.I.F.

Figure 1 – Monitoring Well Construction Detail

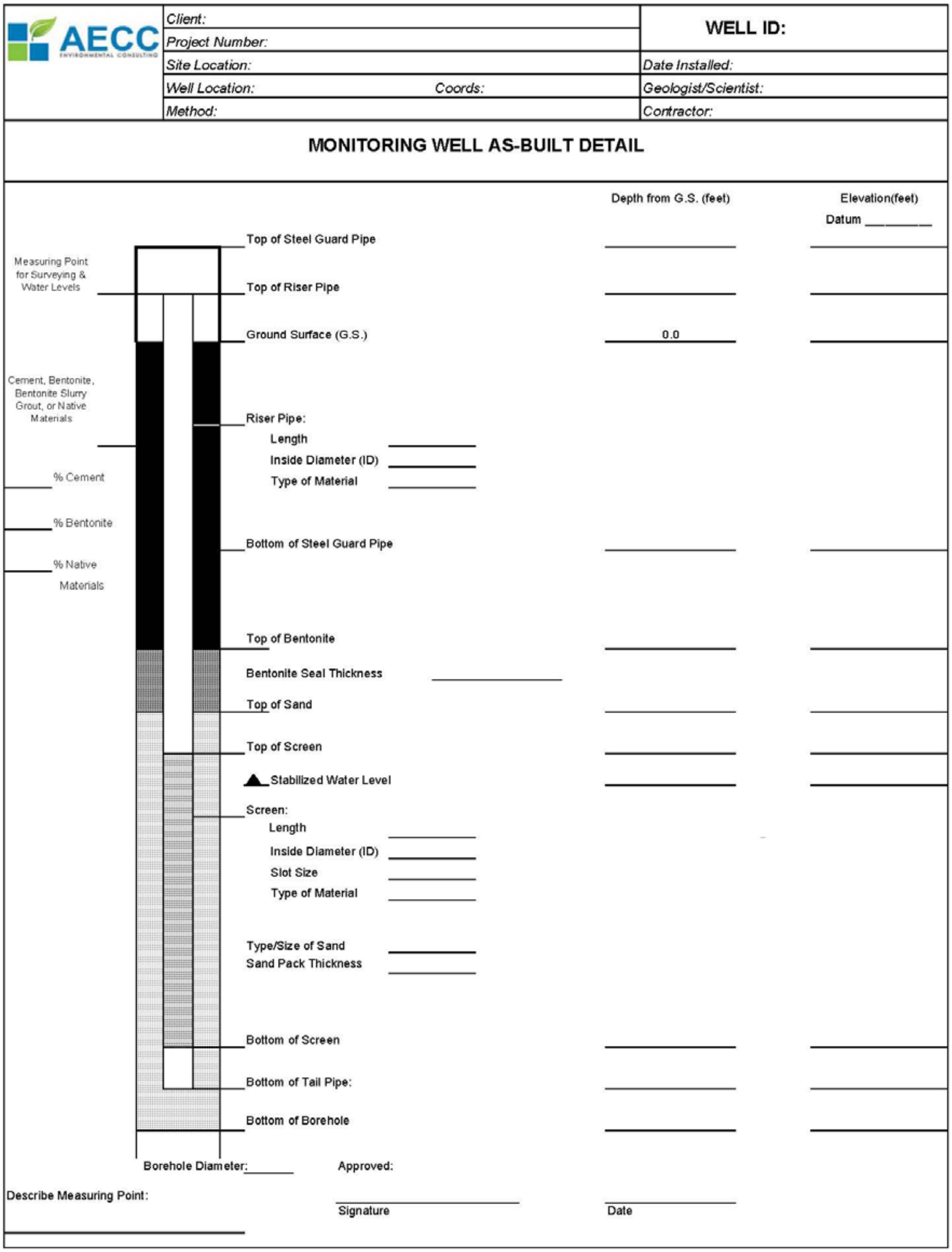


Figure 2
Monitoring Well Development Record

AECC ENVIRONMENTAL CONSULTING

Well/Piez. ID:

Monitoring Well Development Record

Client: ____________ Site Location: ____________

Project #: ____________ Date: ____________ Developer: ____________

WELL DATA

Well ☐ Piezometer ☐ Diameter ________ Material ________

Measuring Point Description ________

Depth to Top of Screen (ft.) ________

Depth to Bottom of Screen (ft.) ________

Total Well Depth (ft.) ________

Depth to Static Water Level (ft.) ________

Geology at Screen Interval (if known) ________

Time of Water Level Measurement ________

Calculate Purge Volume (gal.) ________

Disposal Method ________

Wellhead PID/FID ________

Original Well Development ☐ Redevelopment ☐ Date of Original Development ________

DEVELOPMENT METHOD ________ **PURGE METHOD** ________

Field Testing Equipment Used: Make Model Serial Number

Field Testing Calibration Documentation Found in Field Notebook # ________ Page # ________

Time	Volume Removed (gal)	T° (C/F)	pH	Spec. Cond (umhos)	Turbidity (NTUs)	DO	Color	Odor	Other

ACCEPTANCE CRITERIA (from workplan)

Min. Purge Volume (____ well volumes) _____gallons

Maximum Turbidity Allowed _____ NTUs

Stabilization of parameters _____%

	Yes	No	N/A
Has required volume been removed	☐	☐	☐
Has required turbidity been reached	☐	☐	☐
Have parameters stabilized	☐	☐	☐

If no or N/A explain below:

Signature ____________ Date: ____________

8/13/2012 Well-Piez. developing

Figure 2 Monitoring Well Development Record (Cont'd)

Continued from front

Well ID: __________

Time	Volume Removed (gal)	T° (C/F)	pH	Spec. Cond (umhos)	rbidity (NTU	DO	Color	Odor	Other

Scope and Application

The purpose of this SOP is to establish uniform procedures for the collection of surface water samples. Adherence to this SOP will promote consistency in sampling methods and if followed properly will provide a basis for sample representativeness.

This SOP focuses on the collection of surface water samples from water bodies and wetlands. In cases where the depth of the surface water body presents sampling from the banks of the water body, sampling from a boat may be required. Some wetlands may not have a sufficient depth of water from which to collect a sample.

Surface water samples might also need to be collected from other sources which are not readily accessible, or that might require additional instruction and protocols for sampling. The collection of surface water samples from these sources will vary according to the project and protocols, and procedures for collecting surface water samples from these features will be discussed in the project-specific QAPP, or sampling plan. Personnel safety associated with surface water sampling is the first priority when selecting the appropriate equipment and related procedures to use.

State or federal agency mandated operating procedures may exist that require deviation from this SOP. These required deviations must be identified before the sampling program begins (ideally during the work plan/sampling plan development), and must be explained in the project-specific work plan/sampling plan.

Responsibilities

Project Manager

The project manager is responsible for assuring that project specific requirements are communicated to the project team and for providing the materials, resources, and guidance necessary to perform the work in accordance with this SOP and associated project-specific work plan.

Sampling Technician

The sampling technician is responsible for conducting surface water sampling in a manner consistent with this SOP and/or in accordance with the QAPP, sampling plan or other project documents. The sampling technician will observe all sampling activities to ensure that the SOP is followed, and will record all pertinent data and information on appropriate forms, logs and/or in the project field notebook.

The sampling technician is responsible for ensuring that he/she has the appropriate laboratory supplied sampling supplies, the sampling equipment and supplies, and the supplies and materials for equipment decontamination.

Generally, the sampling technician is also responsible for handling the collected samples, maintaining custody documentation and preparing the samples for shipping/delivery to the analytical laboratory. On larger projects, a separate team may be assigned this task.

Equipment/Apparatus/Supplies

Required materials will vary depending on the method of surface water sampling being conducted. In general, the equipment necessary may include:

- Project-specific plans (QAPP, sampling plan, scope of work, HASP).
- Rubber boots and/or rubberized waders.
- A boat to sample from, if required.
- Personal protective clothing and equipment (PPE) as required in the site-specific HASP.
- Decontamination equipment and supplies (see AECC SOP #103).
- Temperature probe or thermometers, specific conductance meter, pH meter, dissolved oxygen meter, and turbidimeter as required by QAPP.
- Appropriate sample containers (some will be pre-preserved) and labels.
- Chain of custody form.
- Filters as required.
- Decontamination equipment and supplies
- Sample handling and shipping supplies (see AECC SOP #102),
- Field notebook, and records/forms for documentation/pen(s).
- Paper Towels

It is important that the sampling technician understand how to use all equipment and supplies that are provided for, and expected to be used, for collection of surface water samples. If you have never used a particular piece of equipment, be sure to talk to the project manager for direction/instructions prior to deploying to the jobsite.

All equipment/supplies/apparatus that will come into contact with potentially contaminated surface water during the sampling process must be decontaminated before and after each use.

Field monitoring equipment/meters should be calibrated and operated in accordance with manufacturer’s instructions.

Procedures

The following steps will be taken when collecting samples of surface water for volatile organic compounds (VOCs) and target analyte list (TAL) inorganics analyses:

1. Don PPE as per the project specific HASP.
2. Slowly submerge unpreserved one-liter amber glass-capped bottle (SVOA) completely into the water. Open and fill bottle from below the water surface. If wading is required, approach the sample site from downstream and do not enter the actual sample area. Do not disturb bottom sediments. Open-end of the bottle should be pointed at approximately 90-degrees relative to the upstream direction, in undisturbed gently flowing water. This procedure will be performed to minimize the effects due to high turbulence and aeration, or if surface scum is prevalent.
3. Collect a sufficient volume of water to fill all sample containers.
4. For VOA analyses, slowly pour surface water sample into pre-preserved 40 ml VOA vials taking care not to let it over flow and lose preservative. Place cap with Teflon septum on each vial as filled. Turn the vial upside down and check for air bubbles. Tap the bottom of the VOA vials to dislodge any bubbles that may have formed around the cap or sides. If bubbles are present, discard vial and re-sample using new VOA vial.
5. For TAL metals, slowly pour surface water sample into pre-preserved 500 ml plastic container to sufficiently fill the container. Surface water samples may be collected as totals (unfiltered) or dissolved (filtered).
6. Seal sample container.
7. Place labeled sample container(s) into a sample cooler with ice. A small plastic temperature blank will be filled with water and placed in the cooler with the samples. The temperature of the samples will be determined at the laboratory by measuring the temperature of the temperature blank. The sample temperature should be a maximum of 4 degrees Celsius (°C).
8. Record samples (e.g., sample ID, location, method, etc.) in the field logbook and complete the Surface Water Sample Log form (see Figure 1).
9. Collect an additional grab sample in an unpreserved sample container and measure and record field parameters in the log book or on sampling sheets. Measured field parameters include pH, temperature, specific conductance, turbidity and Eh.

The following steps will be followed when collecting surface water samples for semi-volatile organic compounds (SVOCs) and polychlorinated biphenyls (PCBs).

1. Don PPE as per the project specific HASP.
2. Slowly submerge capped sample containers completely into the water. Open and fill containers from below the water surface. If wading is required, approach the sample site from downstream and do not enter the actual sample area. Do not disturb

underlying sediments. Open end of the containers should be pointed at approximately 90 degrees relative to the upstream direction in undisturbed, gently flowing water. This procedure will be performed to minimize the effects due to high turbulence and aeration, or if surface scum is prevalent.

3. Collect a sufficient volume of water to fill all sample containers.
4. Seal sample container.
5. Place labeled sample container(s) into a sample cooler containing ice and temperature blank.
6. Record samples (e.g., sample ID, location, method, etc.) in the field logbook, and complete the Surface Water Sample Log form (see Figure 1).
7. Collect an additional grab sample in an unpreserved sample vial and measure and record field parameters in the log book or on sampling sheets. Measured field parameters include pH, temperature, specific conductance, turbidity and Eh.

QA/QC

QA/QC procedures are outlined in the Sampling procedures discussed above. Quality assurance sampling is a common component of surface water sampling programs. QA/QC sampling involves the collection and analysis of additional samples for the purposes of verifying that sampling equipment is suitably clean (equipment blanks), to check the laboratory's accuracy and/or precision (field duplicate), whether the sample matrix may be affecting the analytical results (Matrix Spike/Matrix Spike Duplicate), and whether samples might have been affected by conditions during shipment of the sample containers or samples (trip blank). The specific types of samples to be collected, the procedures to be used for collection, and the frequency QA/QC sample collection will be defined in the QAPP, work plan or project-specific work plan. Duplicates, blanks, and spikes have been incorporated into the QAPP to assess potential for sampling, shipping, and laboratory impacts on data quality. Additionally, field monitoring equipment/meters should be calibrated and operated in accordance with manufacturer's instructions.

Documentation

Surface water sampling activities should be documented in the field notebook, as well as on forms including the chain of custody record and sample collection records. Labels for sample jars must replicate the information provided on the chain-of-custody and at a minimum must include site ID/project number, sample ID, sampling date, sampling time, preservative, and sampler's initials. Other documentation such as meter calibration records, certifications for pre-cleaned sample containers, and shipping paperwork should be maintained as part of the project file.

FIGURE 1 Surface Water Sample Collection Record

AECC ENVIRONMENTAL CONSULTING

Location ID:

Surface Water Sample Collection Record

Client: ______________________ Date: ___________
Project No: ______________________ Time: Start _______ am/pm
Site Location: ______________________ Finish _______ am/pm
Weather Conds: __________ Collector(s) __________

Surface Water Sample Location Information:

____

____

a. Field Testing Equipment Used: Make Model Serial Number

b. Field Testing Equipment Calibration Documentation Found in Field Notebook # _______ Page #_______

____

____

SAMPLE COLLECTION: Method: ______________________

Sample ID	Container Type	No. of Containers	Preservation	Analysis	Time

Comments ______________________________

____

Signature ______________________________ Date ___________________________

Surface Water Sample Collection Record 9/28/2012 Surface Water Sample

Scope and Application

The purpose of this procedure is to establish a uniform general set of procedures for the calibration of field monitoring equipment. Calibration is performed as a quality assurance measure and a safety precaution. The use of equipment that has not been properly calibrated can lead to erroneous data. In addition, proper calibration of monitoring equipment helps to protect field personnel and others from potential exposure to hazardous materials.

This SOP focuses on calibration of equipment used for monitoring field activities and sampling environmental parameters.

It is noted that other state or federal agency standard operating procedures may exist that require deviation from this SOP. These required deviations must be identified before the sampling program begins (ideally during the work plan/sampling plan development), and must be explained in the project-specific work plan/sampling plan.

Equipment/Apparatus/Supplies

Examples of commonly used equipment items that require calibration include:

- Organic vapor monitors – a Photoionization detector (PID) for sampling volatile organic compounds (VOCs) in air for example.
- Combustible gas monitors – an explosimeter for detecting concentrations of explosive gases in air for example.
- Water quality meters for measuring parameters such as temperature, pH, and turbidity

Required materials may include:

- Distilled and/or deionized water
- Paper towels
- Cylinder containing standard reference gas (span gas)
- Cylinder containing clean dry air
- Calibration standards/reagents
- Tedlar® bags
- Project notebook/pen

Procedures

Given that there exist a wide variety of monitoring equipment items, and that such items are supplied by many different manufacturers, AECC does not have a standard equipment calibration procedure. However, at a minimum, each item of field monitoring equipment shall be calibrated on a daily basis. Note that specific calibration instructions are not addressed in this SOP, and personnel shall consult the equipment manufacturer supplied documents (e.g., User's

Guidebook) for detailed instructions. Equipment must be calibrated as per the manufacturer's requirements. In the case where equipment is procured on a rental basis the calibration records specific to each piece of equipment shall be provided by the vendor and remain with the equipment item. Manufacturer's specification for calibration frequency may be superseded if required by a project-specific QAPP, sampling program or other documents, depending on the quality assurance objectives for the project.

Chemical reagents used for calibration purposes sometimes can be hazardous. When the use of these (or other similar) reagents solvents is required by a project-specific QAPP or Sampling Plan, the plans must also describe additional protocols and procedures regarding their safe use and handling. If associated investigation-derived waste is generated through the use of chemical reagents the plans should detail how it is to be handled, characterized, and disposed of in accordance with federal, state and local requirements.

Quality Assurance/Quality Control

General guidelines for quality control check of field equipment calibration usually require the equipment to be calibrated on a daily basis. As stated above, AECC's procedure is that each item of field monitoring equipment shall be calibrated on a daily basis. Additional calibration shall be performed whenever an exceptionally high reading ("spike") is detected. For projects with a QAPP, the document will specify the frequency of equipment calibration. For projects without a QAPP, the need for and/or frequency of equipment calibration will be specified in the scope of work, or the project work plan.

Documentation

Specific information regarding equipment calibration procedures should be documented in the project-specific field notebook. Documentation in the notebook should thoroughly describe the calibration steps implemented in order to show compliance with the project work plan. Calibration events should be logged when they occur with the following information documented:

- Date, time and location of each calibration event
- What equipment was calibrated
- Method used for calibration
- Notable circumstances.

Scope and Application

The purpose of this SOP is to lay out the specific standardized procedure to be used for collecting soil samples from test pits, trenches, or longwall cuts. Soil sampling conducted in accordance with this SOP will promote consistency in sampling and provide a basis for sample representativeness.

Test pit sampling involves the excavation of areas of soil, typically defined during the remedial investigative phase of a project. There may be instances where test pits are investigated during other phases of remediation as needed.

Test pit sampling methods are generally applicable to unconsolidated soil/fill materials to a depth of approximately 12-16 feet (or excavator reach) below ground surface (bgs). Soils may be obtained using this method for visual classification, field screening for contamination, as well as for physical and/or chemical analysis. Sampling shall be defined based on individual project requirements throughout the depth of the test pit.

Test pit sampling is an intrusive subsurface exploration method. By law, the clearance of underground utilities must be performed prior to the initiation of any intrusive activities. The excavation subcontractor performing the test pit activities is responsible for notifying Dig Safely New York or another Underground Facilities Protective Organization (UFPO).

The ability to excavate to a desired depth depends on the density and composition of the soil and the power of the hydraulic equipment. In most cases, a mini excavator will be adequate for excavation of test pits. In rare circumstances a larger piece of equipment may be needed if subsurface conditions reveal substantial debris (large pieces of concrete, steel, etc.).

At the direction of the project geologist/scientist, the excavation contractor will excavate the indicated test pit area and stage spoils on polyethylene sheeting as material is removed from the test pit. The project geologist/scientist will indicate to the excavation subcontractor's operator when material to be sampled is encountered and will collect samples directly from the excavator bucket as determined by the project geologist/scientist.

Responsibilities

Project Geologist/Scientist

The project geologist/scientist is responsible for conducting subsurface soil sampling in a manner consistent with this SOP. The project geologist/scientist will observe all sampling activities to ensure that the SOP is followed and will record all pertinent data and information on appropriate forms, logs and/or in the project field notebook.

It is also the project geologist/sampling engineer's responsibility to indicate the specific targeted sampling depth or sampling interval to the excavation subcontractor.

The project geologist/sampling engineer is also responsible for the collection of representative environmental characterization samples once the material has been removed from the test pit.

Additional sample collection responsibilities include labeling, handling, and storage of samples until further chain-of-custody procedures are implemented.

Excavation Subcontractor

The excavation subcontractor is responsible for providing the necessary equipment for obtaining subsurface soil samples. This generally includes the excavation equipment. It is the excavator subcontractor's responsibility to provide and maintain their own test pit logs if desired. Equipment decontamination materials should also be provided by the subcontractor and should meet project specifications.

Equipment/Apparatus/Supplies

In addition to the equipment and materials provided by the drilling subcontractor, required materials may include the following:

- Project-specific documents (Scope of work, HASP, QAPP, Sampling Plan)
- Stainless steel spoons, spatulas, soil mixing pans etc.
- Headspace analysis containers:
  - Glass jars and aluminum foil, or
  - Sealable plastic bags (ie – Ziploc® bags)
- Photoionization Detector (PID) or Flame Ionization Detector, (if volatile or semi-volatile organic compounds (VOCs / SVOCs) are expected)
- Sampling supplies (bottles, labels, custody records and tape, cooler)
- Folding rule or tape measure
- Portable chair and/or folding table
- Decontamination supplies (per the QAPP)
- Health and safety equipment/PPE (per the HASP)
- Field project notebook/pen
- Steel tape measure
- Stainless steel spoons, spatulas
- Plastic sheeting

Procedures

Typical Test Pit Sampling Procedure

1. Don PPE as per the project HASP.
2. Stage excavation equipment and polyethylene sheeting at the proposed test pit location.
3. Decontaminate sample tooling and components that may come in contact with soil during sampling activities. Note: the level of decontamination will depend on whether soils are being sampled for laboratory analysis, field screening, or simply for visual classification.

4. At the direction of the project geologist/scientist, the excavation subcontractor will start excavation of the test pit, placing spoils from the test pit onto the polyethylene sheeting.
5. The project geologist/scientist will observe the excavation and maintain visual/auditory communication with the operator.
6. As targeted material is encountered, the project geologist/scientist will direct the operator to either place spoils on the polyethylene sheeting or stage the excavator bucket for visual classification/description, field screening and/or sampling for laboratory analysis.
7. Upon completion of the test pit, the hole is backfilled with spoils previously staged on the polyethylene sheeting.

<u>Sampling Soils for Environmental Laboratory Analysis</u>

Sampling of soils for environmental laboratory analysis shall be conducted as described in AECC SOP # 101 - Surface and Shallow Soil Sampling. The intervals to be sampled shall be specified in the Project Work Plan. If the sampling program includes laboratory analysis for volatile organic compounds (VOCs), the VOC sampling shall be performed before any other activity.

Once the excavator bucket has been staged for screening/sampling, the soils contained within can be sampled for laboratory analysis and classified. Except for soils to be sampled for volatile organic compound analysis, the soils should be placed into a sample collection pan and homogenized, or placed directly into the appropriate sample container(s). Headspace analysis of a duplicate / split sample can be completed at this point (see SOP #120 – Headspace Analysis).

Once filled, the sample container should be properly capped, cleaned and labeled, and placed into a cooler with ice in preparation for shipping to the laboratory, in accordance with standard operating procedures pertaining to sample handling, packaging and shipping.

Volatile Organic Samples

In order to minimize the loss of volatiles during the sampling process, samples should be collected into lab-supplied glassware as soon as possible after retrieving the material from the test pit. Other tasks (classification, sampling for other parameters, field-screening, equipment decontamination, etc.) should either be performed by others, or be completed after collecting samples for VOC analysis.

Upon filling the sample container, clean and label the container and place it into a cooler immediately. Residual sample may then be used to fill other sample or logging requirements

When excavating test pits for collecting soil samples for VOC analysis, the excavation subcontractor shall not perform additional excavation until directed by the project geologist/scientist.

<u>Soil Classification</u>

Soils will be visually classified in using the Modified Burmeister Soil Classification System or alternate methods required by project specifications.

Equipment Decontamination

Sampling equipment must be decontaminated prior to its initial use and following the collection of each soil sample. Site specific decontamination should be outlined in the sampling plan/work plan. If site-specific decontamination procedures are not stipulated in the work/sampling plan, the procedures described in AECC SOP # 103 – Equipment Decontamination, will be used.

Quality Assurance/Quality Control

Quality control requirements are dependent on project-specific sampling objectives. The QAPP will provide requirements for equipment decontamination (frequency and materials), sample preservation and holding times, sample container types, sample packaging and shipment, as well as requirements for the collection of various quality assurance samples such as trip blanks, field blanks, equipment blanks, and field duplicate samples.

In the absence of a QAPP, QA/QC will be attained through adherence to SOPs and requirements stipulated in project-specific specifications.

Documentation

Various forms are required to ensure that adequate documentation is made of sample collection activities. These forms will vary from project to project and may include:

- Field Log Books
- Soil Boring Logs
- Sample Collection Records
- Sample Container Labels
- Chain of Custody Forms
- Shipping Labels

Test pit logs (see Example in AECC SOP # 104 – Split Spoon Soil Sampling) will provide visual and descriptive information for each sample collected and are often the most critical form of documentation generated during a soil sampling program. The field log book is kept as a general log of activities and should not be used in place of the test pit log. Occasionally, sample collection records are used to supplement test pit logs, especially for environmental samples which have been collected for laboratory analysis. Sample container labels are affixed to individual sample containers and then completed. Chain-of-custody forms are transmitted with the samples to the laboratory for sample custody tracking purposes. Shipping labels are required if sample coolers are to be transported to the laboratory by a third party (courier service). Original copies of these records should be maintained in the appropriate project files.

Related AECC SOPs

SOP # 101 Surface and Shallow Soil Sampling

SOP # 102 Sample Handling, Packaging, and Shipping
SOP # 103 Equipment Decontamination
SOP # 108 Sample Labeling & COC Completion
SOP # 109 Surface Water Sampling
SOP # 113 Taking Field Notes
SOP # 117 Saw Cutting
SOP # 120 Headspace Analysis

Scope and Application

The purpose of this procedure is to establish a uniform set of procedures for collecting ambient concentrations of volatile vapors using a Photoionization Detector (PID) or Flame Ionization Detector (FID). The SOP is designed to be a step-by-step procedure for collecting the appropriate data. Equipment shall be operated in accordance with the manufacturer's operator's manual.

Typically, the vapors monitored by AECC personnel during environmental investigation / remediation projects can be divided into two general categories: organic vapors from petroleum products, and non-petroleum vapors such as vapors from chlorinated compounds. Vapors are monitored for a variety of reasons, including:

- Monitoring vapor levels in soil from borings/excavations as a means of establishing whether the material is contaminated and the approximate level of contamination.
- Monitoring vapor levels in the unsaturated (vadose) zone of in-situ soils as an indicator of whether the material is contaminated and the approximate level of contamination.
- Monitoring vapor levels in soil from excavations to establish whether the material must be considered hazardous and, therefore, disposed of accordingly.

Equipment/Apparatus/Supplies

Required materials include the following:

- Headspace analysis containers:
  - Glass jars and aluminum foil, or
  - Sealable plastic bags (ie – Ziploc® bags)
- Photoionization detector (PID) or Flame Ionization Detector
- Personal protective equipment (as required in HASP), including but not limited to:
  - Hard Hat
  - Safety Glasses or face shields
  - Steel toe boots with slip-resistant soles
  - Hearing protection
  - Gloves
  - High-Visibility Safety Vest
- Field project notebook/pen

Procedures

For the purpose of environmental assessment of soils during environmental investigation / remediation projects, two general methods monitor vapors can be identified: 1. headspace screening of collected soil samples, and 2. measurement of in-situ soil vapors (i.e., soil gas survey). The methodology for conducting a soil gas survey to monitor in-situ vapors is fully discussed in SOP #115, and therefore is not presented here.

AECC field personnel commonly conduct soil sampling for subsequent headspace sampling (commonly referred to as headspace screening). Similar methodology is also used at times to screen water samples to indicate the presence of dissolved phase contaminants. This practice is not however recommended for water except as a preliminary indicator, and as such it is not considered reliable. Even when performed on soils, headspace screening is qualitative at best, and should be used as a preliminary indicator of contamination for the selection of samples that will be laboratory analyzed. The following are recommended procedures for conducting headspace screening of volatile contaminated soil samples using a portable photoionization detector (PID) or flame ionization detector (FID).

This procedure is used to monitor vapor concentrations in collected soil samples (i.e., samples collected from boreholes during drilling or from open excavations while digging):

- The person(s) who are performing the sampling should not be wearing perfumes or colognes, as associated vapors may erroneously be recorded by the FID/PID. Similarly, the use of markers (i.e. – Sharpies®) should be avoided to the extent possible.
- Insert probe into sample container (glass jar or sealable plastic bag (ie – Ziploc® bags). Verify that the PID/FID reading is ‘zero’ (i.e. – that no vapors are emanating from the container).
- Half-fill the bag / jar with the sample to be analyzed.
- Quickly seal the bag, or cover the jar top with a sheet of clean aluminum foil and subsequently apply screw caps to tightly seal the jars. Bags / jars with a volume of 16 oz. (approx. 500 ml) or greater are preferred; bags / jars less than 8 oz. (approx. 250 ml) total capacity are not recommended.
- Allow headspace development for at least 10 minutes.
- Vigorously shake the bag / jar for 15 seconds both at the beginning and end of the headspace development period.
- Where ambient temperatures are below 32 F (0 C), headspace development should be within a heated vehicle or building. Soil samples should be at 50 F(10 C) or warmer.
- Note temperature and background VOC levels in field notes during screening.
- Subsequent to headspace development:
    - Bags: Create a small opening in the seal, and insert probe into the jar to about one-half of the headspace depth
    - Jars: Remove screw lid and expose foil seal. Quickly puncture foil seal with instrument sampling probe, and insert probe into the jar to about one-half of the headspace depth.
- Exercise care to avoid uptake of water droplets or soil particles
- Following probe insertion, record the highest meter response as the headspace concentration. For reference, gasoline-related compounds may achieve a maximum

response at about 2 to 5 seconds, while oil-related compounds may achieve a maximum response at about 10-15 seconds.

- Note that instrumentation with digital (LED/LCD) displays may not be able to discern maximum headspace response unless equipped with a "maximum hold" feature or strip-chart recorder.
- Erratic meter response may occur at high organic vapor concentrations or conditions of elevated headspace moisture, in which case headspace data should be discounted.
- When monitoring for petroleum hydrocarbon vapors, PID and FID field instruments shall be operated and calibrated to yield "total organic vapor" in ppm (v/v) as benzene, and PID/FID instruments must be operated with a 10.2* eV (=/-) lamp source.
  - Reference the operator's manual to verify if 10.2 eV is the correct energy level for optimum detection of the chemicals of concern. Many chlorinated solvents require higher (11.7) eV lamp.
- Operation, maintenance, and calibration shall be performed in accordance with the manufacturer's specifications. For jar headspace analysis, instrument calibration shall be checked/adjusted no less than once every 10 analyses, or daily, whichever is more frequent.
- Record all vapor measurements, other than those taken during drilling, onto a relevant form used to record project data, making certain to fully describe the sample location and sampling conditions so that the vapor monitoring procedure can be duplicated, if necessary.
- Measurements taken during drilling should be noted on the associated Boring Log (see SOPs #104 and/or #105, if applicable)
- Deviations, departures and/or additions to the above procedures will be considered on a case-by case basis by the regulatory representative, on-site coordinator or project manager. In such cases, compelling technical justification must be presented and documented by the methodology proponent.

Equipment Use

Calibration

One of the most important steps in analyzer operation is proper calibration of the instrument. Various calibration techniques may be used depending on the sample’s physical or chemical property requiring measurement. Frequency of calibration depends largely on the application, degree of accuracy, and reliability expected. The following general procedures apply to calibration of field instruments typically used for field vapor monitoring (i.e., PIDs and FIDs):

- Perform calibration using a standard reference sample and utilize the analyzer adjustments recommended by the manufacturer.

- Consult the instrument supplier to determine the calibration procedure necessary for the particular analysis involved as preliminary instrument adjustments using zero and upscale standards may be necessary. Charts and calibration curves are essential and should be routinely verified.
- The standard used for calibration must be as representative as possible of the compound(s) to be analyzed (e.g., isobutylene to simulate benzene), although it cannot always contain representations of all potential interfering substances. Use a calibration standard of known concentration.
- Check all operating parameters of the system in accordance with the instrument specifications and data for specific analysis.
- Allow sufficient time for the analyzer to reach equilibrium as indicated by a stable output.
- Introduce the standard reference sample into the analyzer using the recommended instrument operational procedure. After sufficient standard has been allowed to flow through the analyzer, adjust the readout to conform with the benchmark value (this applies to the use of both zero gas and calibration gas). This establishes a single calibration point. Many newer instruments calibrate their readouts automatically during this procedure. Continue introducing standard sample and record analysis after a stable response is achieved. Discard any standard when any change in composition is detected.
- Specific instructions for calibrating each type of instrument are presented in the operational procedures presented below.

Flame Ionization Detectors (FIDs)

FIDs generate electrical current when gases containing carbon atoms are oxidized to carbon dioxide in a hydrogen flame and potential is applied across the flame. The magnitude of the electric current generated is termed the detector response. FIDs are responsive to hydrocarbon contaminants in a vapor stream and are commonly employed for this purpose. FIDs are durable for field use, and have a wide linear range and nearly uniform response to organic gas species. FIDs are generally unresponsive to inorganic gases and water vapor. Although versatile, these detectors are not selective for halogenated compounds (i.e., chlorinated organics). Also, They require supplies of fuel gas which require careful safety practices in handling and flame ignition. Older models of FIDs have analog (needle gauge) readouts while newer models are generally digital. The older models also contain more manual controls and adjustments while the newer computerized instruments perform certain standard functions (such as flame ignition and shut-down) automatically. The following are general procedures for operating a typical FID.

Procedures will vary from one brand to another and one model to another, so these procedures may not all apply to a specific instrument. A field instrument should never be used without first reading through the owner's manual because improper operation of an FID is potentially dangerous and is likely to yield erroneous data.

- Review owner's manual before use.

- CAUTION: The FID uses hydrogen gas which is extremely flammable and potentially explosive. Great care should be taken to avoid all external sources of ignition when re-filling the gas cylinder and when operating the instrument. Follow start-up and shut-down procedures exactly to avoid leakage of hydrogen gas. And follow all safety regulations for transporting flammable pressurized gases when transporting or shipping an FID.
- Always start with a fully charged battery and a half to full supply of hydrogen in the gas cylinder.
- Turn the instrument on and follow the designated start-up procedure for the specific unit: it will involve a sequence that includes opening the gas cylinder valve (some instruments will inform the user when to open the gas valve).
- Once the gas is turned on it must be ignited, either using a manual ignition switch or automatically by the instrument itself.
- Wait the appropriate time before igniting the flame (some instruments will prompt the user when ready for ignition).
- Observe flame (ignition) indicator; if the indicator does not show that the flame has ignited, repeat the flame ignition procedure according to instrument instructions.
- Once the flame has been ignited, allow the unit to stabilize for at least 5 minutes.
- Follow manufacturer's instructions to calibrate the instrument to a zero reading. This will involve connection of the instrument probe to a container of 'zero gas' (i.e., ultra-clean air) which allows the instrument to be 'zeroed'. If zero air gas is unavailable, the instrument can be zeroed to clean ambient air (i.e., move away from work areas, storage facilities, motor vehicles and any other potential source of vapors before calibrating).
- Follow manufacturer's instructions to calibrate the instrument using a standard calibration gas. This will involve connection of the instrument probe to a container of calibration gas (standard calibration gas is a known concentration of isobutylene in air). Generally, the 'response' of the calibration gas against the actual contaminant (e.g., isobutylene to benzene) must be entered into the calibration sequence - the owner's manual should provide a procedure and conversion table to facilitate this. This will adjust the instrument's response so that it will read the concentration of the actual contaminant correctly.
- When calibration is completed, the instrument is ready to use.
- If the instrument has a manual range setting (e.g., readout x10, x100, x1,000) set it for the anticipated contaminant concentrations.
- Place the end of the sampling probe near the material being tested. Air will be drawn into the probe by suction.
- Read vapor concentrations on the appropriate scale.
- DO NOT allow pressure in the gas cylinder to drop below a prescribed amount (about 50 psi) because loss of pressure will cause contamination of the cylinder.

- When finished using the instrument, check the amount of charge left in the battery and the pressure in the gas cylinder.
- Follow the manufacturer's instructions for shutting the instrument off. It is extremely important to be certain the flame has been properly extinguished and the gas flow turned completely off.
- If gas in the cylinder is not sufficient for another day's use, refill the cylinder with hydrogen gas following all safety precautions involving hydrogen.
- If the battery is not sufficiently charged for another day's use, recharge it. Note in the owner's manual if there is a maximum allowable recommended charging time and don't exceed it (some battery chargers automatically shut off and some don't). Also, certain types of batteries last longer if fully discharged before recharging while others can be damaged by fully discharging them. Find out what kind of battery your instrument has and treat it accordingly.
- Most instruments have one or more filters (air inlet and/or outlet filters) that should be removed, inspected and cleaned between daily uses.

Photoionization Detectors (PIDs)

PIDs employ ultraviolet radiation to ionize contaminant molecules. Positive ions and free electrons are formed which migrate to the detector electrode(s), resulting in an electric current that is proportional to contaminant concentration at the detector. PIDs are extremely sensitive to aromatic hydrocarbons due to the great efficiency of ionization of pi bonds under ultraviolet radiation. Efficiency of ionization of sigma bonds is lower, resulting in a higher PID detection limit for aliphatic hydrocarbons. The selectivity of the method can be adjusted by selecting lamps of different energies, causing a change in response of contaminants with fixed ionization potentials to changing lamp energies. Tables exist of ionization potentials of compounds within classes common to vapor-phase contaminants. Methane has an ionization potential higher than the energies of commercially available lamps, limiting the PID to detection of compounds other than methane. PIDs are further limited by their tendency to conceal the presence of low-sensitivity compounds when high sensitivity compounds (aromatics) are present. PID response can be impacted by condensation of water vapor in the lamp. As with FID, older models of PIDs have analog (needle gauge) readouts and manual controls while newer models are generally computerized and digital. The following are general procedures for operating a typical PID.

Procedures will vary from one brand to another and one model to another, so these procedures may not all apply to a specific instrument. A field instrument should never be used without first reading through the owner's manual because improper operation of an PID can yield erroneous readings.

- Review owner's manual before use.
- Check to see that the battery is properly charged before use.
- Follow manufacturer's instructions to calibrate the instrument to a zero reading. This will involve connection of the instrument probe to a container of 'zero gas'(i.e., ultra-clean air) which allows the instrument to be 'zeroed'. If zero air gas is unavailable, the

instrument can be zeroed to clean ambient air (i.e., move away from work areas, storage facilities, motor vehicles and any other potential source of vapors before calibrating).

- Follow manufacturer's instructions to calibrate the instrument using a standard calibration gas. This will involve connection of the instrument probe to a container of calibration gas (standard calibration gas is a known concentration of isobutylene in air). Generally, the 'response' of the calibration gas against the actual contaminant must be entered into the calibration sequence - the owner's manual should provide a procedure and conversion table to facilitate this. Also PIDs generally have a 'span' setting that is used to calibrate the instrument to a known gas. Follow manufacturer instructions regarding the proper span setting as this is critical for obtaining accurate readings.
- When calibration is completed, the instrument is ready to use. If the instrument has a manual range setting (e.g., readout x10, x100, x1,000) set it for the anticipated contaminant concentrations.
- Place the end of the sampling probe near the material being tested. The internal fan will draw an air sample through the probe tip. Avoid placing the probe too close to the sample to reduce the intake of excessive soil and dirt which may damage the probe or cause the fan to lock.
- PID readings are relative to the ambient air temperature; the same sample will yield a higher concentration reading at a higher ambient air temperature than at a lower air temperature. For consistency, monitor all soil samples at room temperature (not less than 70 degrees F (21o C)).
- Record the ambient air temperature at which the samples were measured.
- Be particularly careful not to allow the probe to suck in moisture. Even a small amount of moisture can condense on the lamp and affect its performance (or cause it to stop working). If this happens, shut off the instrument and follow the owner's manual procedures for disassembling, inspecting and cleaning the lamp. Be extremely careful not to scratch or mar the surface of the lamp when cleaning or drying it Use only a very soft cloth or tissue. In-line moisture traps are available for use in wet conditions.
- Some PIDs are sensitive to air currents; widely fluctuating readings will usually indicate air movement past the end of the probe.
- When finished using the instrument, check the amount of charge left in the battery. Follow the manufacturer's instructions for shutting the instrument off. If the battery is not sufficiently charged for another day's use, recharge it. Follow manufacturer's instructions regarding recommended battery charge/discharge procedures.
- Inspect the lamp between daily uses to make sure its surface is clean, dry and undamaged. If cleaning is necessary, follow the owner's manual procedures for disassembling, inspecting and cleaning the lamp. Be extremely careful not to scratch or mar the surface of the lamp when cleaning or drying it Use only a very soft cloth or tissue. If the lamp surface is scratched, inform the person in charge of instrument maintenance.
- Most instruments have one or more filters (air inlet and/or outlet filters) that should be removed, inspected and cleaned between daily uses.
- PIDs are outfitted with 10.2 eV lamps for monitoring petroleum hydrocarbon vapors. This lamp will not detect methane nor will it detect the volatilized halogenated (chlorinated)

compounds. To monitor chlorinated compounds, an 11.7 eV lamp must be used. The 11.7 eV lamp cannot be used to monitor petroleum hydrocarbons.

Documentation

All data must be documented on field data sheets and/or field notes. Equipment checkout and calibration activities must occur prior to sampling/operation, and they must be documented.

Related AECC SOPs

SOP # 101 Surface and Shallow Soil Sampling Using Hand-Operated Sampling Equipment
SOP # 104 Split-Spoon Soil Sampling
SOP # 105 Direct-Push Soil Sampling
SOP # 110 Field Monitoring Equipment Calibration
SOP # 115 Vapor Sampling
SOP # 118 Test Pit Soil Sampling

Scope and Application

The purpose of this procedure is to establish a uniform set of procedures for collecting soil vapor samples for volatile organic compounds (VOCs) using a Summa canister or similar negative pressure (sub atmospheric) vessel. The SOP is designed to be a step by step procedure for operating the sampling system described and is to be used in conjunction with manufacturer's operator's manual, and/or information provided by the laboratory conducting the laboratory analysis.

Sub atmospheric pressure sampling uses an initially evacuated canister. The canister comes pre-cleaned from the laboratory performing the VOC analyses. The canister has a hand valve with a fixed orifice to regulate flow for grab sampling, and can be affixed with a time release regulator for time integrated sampling. The primary valve is opened to commence sampling, and is closed at the completion of sample collection. Following sample collection, the canister is returned to the laboratory for GC/MS analysis of volatile organic compounds.

Equipment/Apparatus/Supplies

Required materials include the following:

- Sub atmospheric Pressure Sampling Vessel (6-Liter Summa Canister)
- Time Release Regulator (if collecting time released samples).
- Soil Vapor Point
- HDPE tubing
- Test shroud
- Helium tracer gas
- Electronic leak detector
- photoionization detector (PID)
- Personal protective equipment (as required in HASP), including but not limited to:
    - Hard Hat
    - Safety Glasses or face shields
    - Steel toe boots with slip-resistant soles
    - Hearing protection
    - Gloves
    - High-Visibility Safety Vest
- Field project notebook/pen
- Chain of Custody Form
- Shipping materials to send the sample vessels to the laboratory.

Procedures

This procedure describes the step by step process for installing the soil vapor collection point and collecting grab or time integrated samples. The sampling system used in this procedure consists of a sampling vessel with a primary valve to which a time-release regulator can be attached for time-integrated samples. There are various types and sizes of canisters available, and different laboratories will provide different valve assemblies, gauges and fittings (quick connect or swage lock connectors). The procedure presented below is generalized and is provided for guidance purposes only. Sampling instructions provided by the laboratory supplying the air sampling equipment should be used for details specific to their vessels, gauges, fittings, etc.

Soil Vapor Point installation:

1. Soil vapor points shall be installed using either direct push drilling equipment or a hand auger to place the vapor monitoring point to the prescribed depth (typically 5-feet below ground surface). The vapor point shall be attached to plastic (HDPE) tubing extending to the surface.
2. Clean washed sand shall be placed in the annulus above the probe to a thickness of 6 inches.
3. A bentonite slurry or bentonite chips shall be placed in the annulus above the sand pack to the soil surface. If bentonite chips are used, they must be wetted with distilled water after placement and the vapor point shall not be sampled until 48 hours has passed to allow for the establishment of a proper seal.

Sample Collection

1. Obtain the appropriate air sampling equipment from the laboratory. Verify that all components (valves, fittings, gauges, etc.) have been received as necessary to complete the scope work defined in the proposal, work plan, SAMP, etc.
2. Perform pre-sampling inspection for conditions that might interfere or affect the proposed testing. The inspection should evaluate the physical conditions of the area being sampled.
3. A PID will be used prior to sampling to screen the ambient air at each vapor sampling location. PID reading will be logged at each sample location as well as olfactory observations (odors, etc.).
4. Prior to sampling, helium tracer gas will be utilized at each vapor sampling location to ensure that an adequate seal is achieved between the surface and the sampling point. The tracer gas will be introduced into a shroud that is installed over the tubes once they are installed and sealed. The shroud will be sealed to the underlying soil by first removing the vegetation around the sampling point to allow the shroud to contact the soil directly. The soil may be wetted with distilled water is necessary to enhance the seal. The seal shall be further enhanced through the application of hydrated powdered

bentonite. A weight shall be placed on the shroud ot ensure that it stays in place. Air will be drawn from the sampling tubes by an Electronic Leak Detector that will provide real-time measurement of helium in the soil vapor. An alarm will sound if helium in the extracted soil vapor exceeds 10%, indicating a short circuiting between the vapor point and the surface.

5. Prior to sampling from the vapor points, one (1) to three (3) times the volume of the sampling tubing will be purged to remove air that is not representative of the subsurface environment. The purging will occur at a flow rate below 0.2 liters per minute to minimize the potential for air from the surface to be pulled into the vapor point.
6. Ensure that the sampling canister's primary valve is fully closed (the primary valve knob should be turned completely clockwise).
7. Using a wrench, remove the valve cap from the valve on the top of the Summa canister.
8. **If collecting a grab sample**, open the canister valve, turning the primary valve knob counterclockwise. You will hear a hissing noise as the vacuum dissipates and draws air into the vessel. Record the time sampling began in the field notes. Then skip to step #10**. If collecting a Time Integrated sample, proceed to steps 9-10.**
9. Attach the time release regulator to the primary valve on the top of the vessel. Tighten down with your fingers first, then tighten **gently** with wrench.
10. To open the canister valve, turn the primary valve knob counterclockwise until fully open. Since the flow controller restricts the airflow, you will NOT hear a hissing noise as the vacuum dissipates and draws air in. Record the time sampling starts in the field notes.
11. At the end of the sampling period, close the canister valve by turning the green knob clockwise. Do not over tighten. Record the time sampling ended in the field notes.
12. Remove the time release regulator. Wrap it in bubble wrap or packaging materials provided by the laboratory for return shipment.
13. Replace the valve cap on the canister valve and tighten with a wrench.
14. Label the sample with the ID tag provided and attach the tag to the canister.
15. Complete a chain of custody form. Note the canister ID number on the COC. For time integrated sampling, note the flow controller or critical orifice assembly identification number with the corresponding canister.
16. Place the chain of custody form, the bubble-wrapped Time Release Regulator, and the canister back into the original boxes in which they were shipped to you.
17. Ship/deliver and relinquish the samples to the laboratory.

Important Notes

- The person(s) who are doing the sampling should not be wearing perfumes or colognes. As this is whole air sampling, these items can become part of the sample.
- Care must be used with the canister valves. Do not over tighten the canister valves. Hand-tighten only, do not use tools.

- Regulators are fragile and must be securely protected for shipping.
- Do not remove labels, bar codes or serial number labels from the canisters.
- Do not make any markings directly on the canister or affix any labels.
- Call the laboratory with any questions regarding the segregation of canisters.
- Regulators are calibrated such that some residual vacuum should remain after sampling.

Quality Assurance/Quality Control

All instrumentation must be operated in accordance with operating instructions as supplied by the manufacturer, unless otherwise specified in the work plan. Equipment check and calibration activities must occur prior to sampling/operation and must be documented. All regulators should be calibrated by the lab which provides the sampling equipment.

Duplicate samples will be taken at a frequency of 1 per 20 samples unless otherwise noted in the project specific work plan.

Documentation

All data must be documented on the chain of custody records, field data sheets and/or field notes. Equipment checkout and calibration activities must occur prior to sampling/operation, and they must be documented.

Related AECC SOPs

SOP # 102 Sample Handling, Packaging, and Shipping
SOP # 108 Sample Labeling & COC Completion
SOP # 110 Field Monitoring Equipment Calibration
SOP # 113 Taking Field Notes

APPENDIX B

QUALITY ASSURANCE PROJECT PLAN

AECC
ENVIRONMENTAL CONSULTING

Quality Assurance Project Plan

Remedial Investigation

Bowers Business Park – NYSDEC BCP #734145

Canada Drive

East Syracuse

Onondaga County, New York

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Attachments:

1.0 Introduction

This Quality Assurance Project Plan (QAPP) is an appendix to the Remedial Investigation Work Plan (RIWP), which is required as an element of the remedial program at the Bowers Business Park (hereinafter referred to as the "Site") under the New York State (NYS) Brownfield Cleanup Program (BCP), administered by New York State Department of Environmental Conservation (NYSDEC). The Site is being remediated in accordance with Brownfield Cleanup Agreement (BCA) Index # C734145, which was executed on December 15, 2021.

1.1 Scope of the QAPP

This QAPP was prepared to provide quality assurance (QA) guidelines to be implemented during the Remedial Investigation (RI). The QAPP will assure the accuracy and precision of data collection during the RI. The QAPP identifies procedures for sample collection to mitigate the potential for cross-contamination, as well as analytical requirements necessary to allow for independent data validation. The QAPP has been prepared in accordance with USEPA's Requirements for Quality Assurance Project Plans for Environmental Data Operations; the EPA Region II CERCLA Quality Assurance Manual, and NYSDEC DER-10 Technical Guidance for Site Investigation and Remediation (May 2010). This document may be modified for subsequent phases of investigative and remedial work, as necessary. The QAPP provides:

- A means to communicate to the persons executing the various activities exactly what is to be done, by whom, and when
- A culmination to the planning process that ensures that the program includes provisions for obtaining quality data (e.g., suitable methods of field operations)
- A document that can be used by the Project Managers and QA Officer to assess if the activities planned are being implemented and their importance for accomplishing the goal of quality data
- A plan to document and track project data and results
- Detailed descriptions of the data documentation materials and procedures, project files, and tabular and graphical reports

The QAPP is primarily concerned with the quality assurance and quality control aspects of the procedures involved in the collection, preservation, packaging, and transportation of samples; field testing; record keeping; data management; chain-of-custody procedures; laboratory analyses; and other necessary matters to assure that the investigation activities, once completed, will yield data whose integrity can be defended.

QA refers to the conduct of all planned and systematic actions necessary to perform satisfactorily all task-specific activities and to provide information and data confidence as a result of such activities. The QA for task-specific activities includes the development of procedures, auditing, monitoring and surveillance of the performance.

QC refers to the activity performed to determine if the work activities conform to the requirements. This includes activities such as inspections of the work activities in the field (verification that the items and materials installed conform to applicable codes and design specifications). QA is an overview monitoring of the performance of QC activities through audits rather than first time inspections.

Asbestos & Environmental Consulting Corp. ~ 6308 Fly Road, East Syracuse, New York 13057 (315) 432-9400, (315) 432-9405 Fax

2.0 Project Organization and Responsibility

The following section provides a generic organization for sampling activities, including roles, responsibilities, and required qualifications of these organizations.

2.1 Project Team

2.1.1 NYSDEC and NYSDOH

It is the responsibility of the NYSDEC, in conjunction with the New York State Department of Health (NYSDOH), to review the project documents for completeness and conformance with the site-specific cleanup objectives and to make a decision to accept or reject these documents based on this review. The NYSDEC also has the responsibility and authority to review and approve QA documentation collected during investigative and remedial activities and to confirm that the QA Plan was followed.

2.1.2 Property Owner

For this BCP project, the property owner (Owner) is also the BCP Volunteer. The Owner will be responsible for complying with the QA requirements as specified herein and for monitoring and controlling the quality of the Brownfield cleanup activities either directly or through their designated environmental consultant and/or legal counsel. The Owner will also have the authority to select Contractor(s) to assist them in fulfilling these responsibilities. The Owner is responsible for implementing the project and has the authority to commit the resources necessary to meet project objectives and requirements.

2.1.3 Environmental Consultant

On behalf of the Owner, AECC will be responsible for the coordination and performance of the RI activities, interpretation of the analytical data, and evaluation of the need for and performance of Interim Remedial Measures (IRMs).

Project Manager

The Project Manager has the responsibility for ensuring that the project meets the overall project objectives, reports directly to the Owner, coordinates with the NYSDEC/NYSDOH Project Coordinators, and is responsible for technical and project oversight. The PM will:

- Define project objectives and develop a detailed work plan schedule
- Establish project policy and procedures to address the specific needs of the project as a whole, as well as the objectives of each task
- Acquire and apply technical and corporate resources as needed to assure performance within budget and schedule constraints
- Develop and meet ongoing project and/or task staffing requirements, including mechanisms to review and evaluate each task product
- Review the work performed on each task to assure its quality, responsiveness, and timeliness
- Review and analyze overall task performance with respect to planned requirements and authorizations
- Review and approve all deliverables before their submission to NYSDEC
- Develop and meet ongoing project and/or task staffing requirements, including

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mechanisms to review and evaluate each task product

- Ultimately be responsible for the preparation and quality of interim and final reports
- Represent the project team at meetings

Field Team Leader

The Field Team Leader has responsibility for implementation of specific project tasks identified at the Site, including supervision of project field personnel, subconsultants, and subcontractors. The Field Team Leader reports directly to the Project Manager and will:

- Define daily develop work activities
- Orient field staff concerning the project's special considerations
- Monitor and direct subcontractor personnel
- Review the work performed on each task to ensure its quality, responsiveness, and timeliness
- Assure that field activities, including sample collection and handling, are carried out in accordance with this QAPP

Quality Assurance Officer

The QA Officer will have direct access to corporate executive staff as necessary, to resolve any QA dispute, and is responsible for auditing the implementation of the QA program in conformance with the demands of specific investigations and policies, and NYSDEC requirements. Specific function and duties include:

- Performing QA audits on various phases of the field operations
- Reviewing and approving QA plans and procedures
- Providing QA technical assistance to project staff
- Reporting on the adequacy, status, and effectiveness of the QA program on a regular basis to the Project Manager for technical operations
- Responsible for assuring third party data review of sample results from the analytical laboratory

2.1.4 Subcontractors

During the remedial investigation, subcontractors and subconsultants will be utilized to perform various project tasks, likely including:

- Environmental Drilling Contractor - to install soil borings and groundwater monitoring wells and other sampling points to monitor environmental media (as needed)
- Environmental Laboratory - to analyze soil and groundwater samples
- Data Validator - to prepare Data Usability Summary Reports
- Licensed Land Surveyor - to determine location and/or elevation data associated with excavations, monitoring wells, sample locations, etc.

2.1.5 Key Personnel

Key personnel anticipated for this project are as follows:

Team Member	Organization	Telephone	Role/Title
Bryan Bowers	Bowers Business Park, LLC	315.432.9400	Owner Contact
Karen Cahill	NYSDEC	315.426.7551	Project Manager
Gary Priscott	NYSDEC	607.775.2545	Project Manager
Gregory Rys	NYSDOH	315.866.6879	DOH Project Coordinator
James Saxton	AECC	315.432.9400	Project Manager
Robert G. Harner	Lakeside Engineering	607.725.5824	Project Engineer
George Fischer	AECC	315.432.9400	Health & Safety Officer
James Saxton	AECC	315.432.9400	QAPP Officer

2.2 Laboratory Responsibilities

Environmental laboratories utilized for sample analysis for this project must be an independent, NYSDOH Environmental Laboratory Approval Program (ELAP)-certified facility approved to perform the analyses prescribed herein.

Laboratory Director

The Laboratory Director is a technical advisor and is responsible for summarizing and reporting overall unit performance. Responsibilities of the Laboratory Director include:

- Provide technical, operational, and administrative leadership
- Allocation and management of personnel and equipment resources
- Quality performance of the facility
- Certification and accreditation activities
- Blind and reference sample analysis

Quality Assurance Manager (QA Manager)

The QA Manager has the overall responsibility for data after it leaves the laboratory. The QA Manager will be independent of the laboratory but will communicate data issues through the Laboratory Director. In addition, the QA Manager will:

- Oversee laboratory QA
- Oversee QA/QC documentation
- Conduct detailed data review
- Determine whether to implement laboratory corrective actions, if required
- Define appropriate laboratory QA procedures
- Prepare laboratory SOPs

3.0 QA/QC Objectives

The overall objectives and criteria for assuring quality for this effort are discussed below. This QAPP addresses how the acquisition and handling of samples and the review and reporting of data will be documented. The objectives of this QAPP are to address the following:

- The procedures to be used to collect, preserve, package, and transport soil, groundwater and air samples

* Field data collection
* Record keeping
* Data management
* Chain-of-custody procedures
* Precision, accuracy, completeness, representativeness, for sample analysis and data management under EPA analytical methods

3.1 Data Quality Objectives

Data Quality Objectives (DQOs) are statements that describe the desired quality of data necessary to meet the objectives of the sampling program. The DQOs for the project were prepared in anticipation of the various media that would require sampling for laboratory analysis. DQO Forms have been completed for each type of sampling media and are in Attachment A.

The DQO forms include information on the type of media sampled, the intended use of the data being collected, the type of analyses that will be requested, the level of analytical methodology and documentation required, sampling procedures, and the type of QAPP field samples that will be collected in support of the project. The sections of the DQO forms are described below.

Sampled Media: This section describes the material that is being sampled (groundwater, soil, surface water, waste material, etc.).

Data Use: This section is used to indicate the intended purpose of the sampling and analytical data. (i.e., for site characterization, evaluation or remedial alternatives, risk assessment, monitoring of existing sampling points, or waste characterization, etc.).

Data Type: This section identifies the compounds/analytes that samples collected during the program will be analyzed for. Also indicates whether field parameters such as pH, specific conductivity, temperature and turbidity will be monitored during sample collection.

Level of Analysis: This section identifies the level of analytical support required of the samples collected for a specific purpose as described below:

- Level I - Field Screening: This level is characterized using portable type instruments that provide real-time data.
- Level II - Field Analysis: This level is characterized using portable analytical instruments in an on-site lab or transported to the site. This section identifies the field analysis to be used.
- Level III - Standard Analytical Protocols: This level may include standard analytical protocols in accordance with NYSDOH Environmental Laboratory Approval Program (ELAP) certification requirements, without the NYSDEC Analytical Services Protocol (ASP) Category B QAPP and deliverables / reportables documentation.
- Level IV - NYSDEC ASP Reportables / Deliverables: This level is characterized by rigorous QAPP NYSDEC ASP protocols and Category B reportable / deliverable documentation that is suitable for data validation.

Sampling Procedures: This section provides information on sampling procedures to be used in sample collection or provides directions to where to find this information in the project plans.

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Data Quality Factors: This section describes factors that influence the quality or quantity of data to be collected. Primary contaminants and associated levels of concern are identified concerning ARARs or potential risks. The required detection limits are also given or referenced.

QAPP Samples: This section indicates additional samples to be collected to support QA/QC procedures. Additional samples to be collected include:

- Split Samples –Split samples (or duplicates) are two samples taken from the same source; digested, distilled or otherwise processed; and then analyzed. Duplicate sample analysis is used to determine reproducibility or consistency in the analysis. For this RI, spilt samples will noted in AECC's log book, but will not be identified on the sample label (known as a blind duplicate), preventing the laboratory from knowing which samples are duplicates. Duplicate / split samples shall be collected at a rate of 1 per 20 samples (5%).
- Matrix Spike / Matrix Spike Duplicates – Matrix spike duplicate samples are collected as a duplicate sample, to which the analytical laboratory will add known amounts of analyte. These QA/QC samples are intended to assess the extraction procedure used by the laboratory. These samples shall be collected at a rate of 1 per 20 samples (5%) or sample delivery group whichever is smaller and for each sample matrix.
- Trip Blanks – Trip blanks are samples that are prepared prior to the sampling event in the same type of sample container and are kept with the collected samples throughout the sampling event. Trip blank vials are not opened in the field and are analyzed for volatile organics only, and trip blanks are only collected when the sampling program includes samples that are being analyzed for VOCs. Trip Blanks shall accompany any shipment of aqueous samples for VOCs.
- Equipment Blanks – Equipment blanks are samples that are obtained by running analyte-free water through or over the sample collection equipment in a way that is identical to the sample collection procedures. Field blanks may be used during QA/QC procedures to evaluate if sampling equipment has contributed contaminants to the samples. These samples shall be collected daily whenever re-usable sampling equipment is used.

3.2 Sampling Procedures

Objectives and procedures for soil, groundwater, and soil vapor sampling have been designed to allow for the acquisition of accurate and precise data and are detailed in the Field Sampling Plan and Standard Operating Procedures attached to this RIWP.

3.3 Laboratory Coordination

Laboratory coordination will be conducted under the direction of the Project Manager and QA Officer.

All chemical analyses for matrices will be completed by a laboratory capable of performing project-specific analyses as indicated in this QAPP and approved by the NYSDOH/NYSDEC as having the appropriate standard operating procedures, QA/QC programs, resumes, and organizational structure to complete analytical work as specified in this Work Plan. The laboratory will have current certification for standard methodologies and QA/QC, and will be required to remain certified as such throughout the project.

The laboratory utilized for laboratory analysis required under this project will be certified under the NYSDOH Environmental Laboratory Approval Program (ELAP) and will be required to maintain this certification for the duration of the program.

The laboratory will be capable of producing ASP Category B deliverables, as needed for subsequent data validation / data usability evaluation purposes.

3.4 Analytical Methodologies

All analyses will be performed by SW-846 methodologies with QAPP guidelines of 2005 ASP Category B. The following criteria will describe the appropriate methodologies for extraction, digestion, and analysis of the previously listed matrices. The specific analytes to be identified by each method, along with the Contract Required Quantitation Limits, are listed in Appendix C of the NYSDEC ASP (http://www.dec.ny.gov/data/der/asp2005cd/asp2005cd.zip).

Parameter Group	Analytical Method
TCL VOCs	USEPA Method 8260B + TICS
TCL SVOCs	USEPA Method 8270C +TICS
TAL Metals	USEPA Method 6010, 7470/7471 (Hg), 9014 (CN)
PCB Aroclors	USEPA Method 8082 (Soxhlet Extraction for soils)
Herbicides	USEPA Method 8151
Organochlorine Pesticides	USEPA Method 8081
1,4-Dioxane*	USEPA Methods 8270SIM (soil) and 522 (groundwater)
PFAS**	NYSDOH Method 537 (Modified) – Groundwater Only

*The detection limit for 1,4-Dioxane in aqueous samples is to be no greater than 0.35 ug/L
**Polyfluoroalkyl substances, 2ng/L reporting limit for PFOA and PFOS

Soil / Groundwater Analysis – Soil and groundwater samples will be analyzed for certain parameters listed above, based on location (see Section 3.0 - Sampling and Analysis Plan of the RIWP). In addition, groundwater samples will also be field analyzed for a limited group of field parameter analyses to include pH, specific conductance, dissolved oxygen (DO), redox potential (ORP), temperature, and turbidity.

Soil Vapor Sampling – Soil vapor sampling will not be performed as part of the RI since the site history does not suggest the presence of volatile organic contaminants. If the RI soils analysis determines that volatile organic contamination is present, then a supplemental soil vapor sampling may be conducted during the remedial design investigation phase.

Waste Characterization Samples – Samples collected for waste characterization/disposal purposes will be analyzed in accordance with the appropriate SW-846 methodologies, for the parameters required by the disposal facility.

3.5 Analytical Quality Control

As stated previously, analytical quality for samples collected for site characterization or monitoring purposes will be in accordance with NYSDEC-ASP Category B. Analysis in accordance with NYSDOH-ELAP certification requirements may be used for samples collected for waste characterization or disposal purposes. The following holding times will be required from the contracted analytical laboratory, regardless of sample matrix:

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Parameter	Task	Aqueous Holding Time	Solids Holding Time
VOCs	Analysis*	14 days	14 days
SVOCs	Extraction	7 days	14 days
	Analysis**	40 days	40 days
PCBs	Extraction	7 days	14 days
	Analysis**	40 days	40 days
Pesticides	Extraction	7 days	14 days
	Analysis**	40 days	40 days
Herbicides	Extraction	7 days	14 days
	Analysis**	40 days	40 days
Metals	Analysis	180 days	180 days
Mercury	Analysis	28 days	28 days
Cyanide	Analysis	14 days	14 days
1,4-Dioxane	Extraction	7 days	7 days
	Analysis**	40 days	40 days
PFAS	Analysis	14 days	Not Applicable

* The extraction time for Encore samplers is 48 hours.
** Days after extraction.

3.6 Laboratory Deliverables

The analytical data will be presented in 2005 ASP Category B reportable/deliverables format. Category B deliverables will not be requested for waste characterization samples.

4.0 Sample Custody Procedures

Sample custody is controlled and maintained through the chain-of-custody procedures. Chain of custody is the means by which the possession and handling of samples will be tracked from the source (field) to their final disposition, the laboratory. A sample is considered to be in a person’s custody if it is in the person’s possession or it is in the person's view after being in his or her possession or it was in that person's possession and that person has locked it in a vehicle or room. Sample containers will be cleaned and preserved at the laboratory before shipment to the Site.

4.1 Sample Storage

Samples are stored in secure limited-access areas. Walk-in coolers or refrigerators are maintained at 4°C, ± 2°C, or as required by the applicable regulatory program. The temperatures of all refrigerated storage areas are monitored and recorded a minimum of once per day. Deviations of temperature from the applicable range require corrective action, including moving samples to another storage location if necessary.

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4.2 Sample Custody

Sample custody is defined by this document as when any of the following occur:

- It is in someone's actual possession
- It is in someone's view after being in his or her physical possession
- It was in someone's possession and then locked, sealed, or secured in a manner that prevents unsuspected tampering
- It is placed in a designated and secured area

Samples are removed from storage areas by the sample custodian or analysts and transported to secure laboratory areas for analysis. Access to the laboratory and sample storage areas is restricted to laboratory personnel and escorted visitors only; all areas of the laboratory are therefore considered secure. If required by the applicable regulatory program, internal chain-of-custody is documented in a log by the person moving the samples between laboratory and storage areas.

Laboratory documentation used to establish COC and sample identification may include the following:

- Field COC forms or other paperwork that arrives with the sample
- The laboratory COC
- Sample labels or tags are attached to each sample container
- Sample custody seals
- Sample preparation logs (i.e., extraction and digestion information) recorded in hardbound laboratory books that are filled out in legible handwriting, and signed and dated by the chemist
- Sample analysis logs (e.g., metals, GC/MS, etc.) information recorded in hardbound laboratory books that are filled out in legible handwriting, and signed and dated by the chemist
- Sample storage log (same as the laboratory COC)
- Sample disposition log, which documents sample disposal by a contracted waste disposal company

4.3 Sample Tracking

All samples are maintained in the appropriate coolers prior to and after analysis. The analysts remove and return their samples as needed. Samples that require internal COC are relinquished to the analysts by the sample custodians. The analyst and sample custodian must sign the original COC relinquishing custody of the samples from the sample custodian to the analyst. When the samples are returned, the analyst will sign the original COC returning sample custody to the sample custodian. Sample extracts are relinquished to the instrumentation analysts by the preparatory analysts. Each preparation department tracks internal COC through their logbooks/spreadsheets.

Any change in the sample during the time of custody will be noted on the COC (e.g., sample breakage or depletion).

5.0 Calibration Procedures and Frequency

This section describes the calibration procedures and the frequency at which these procedures will be performed for both field and laboratory instruments.

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5.1 Field Instruments

Field equipment that will likely be used for the project includes:

- Photoionization detector (PID)
- Peristaltic pump
- Multi-parameter water quality meter (includes pH, turbidity, temperature, Eh, and specific conductance)
- Electric water level indicator
- Hand-held Global Positioning System (GPS) device

5.2 Preventative Maintenance

Each piece of field equipment is checked according to its routine maintenance schedule and before field activities begin. Field personnel will report all equipment maintenance and/or replacement needs to the Project QA Officer and will record the information on the daily field record.

5.3 Field Instrument Calibration

All instruments and equipment used during sampling and analysis will be operated, calibrated, and maintained according to the manufacturer's guidelines and recommendations as well as criteria set forth in the applicable analytical methodology references. Operation, calibration, and maintenance will be performed by personnel properly-trained in these procedures. Brief descriptions of calibration procedures for field and laboratory instruments follow.

- Photoionization detector (PID) – Standard operating procedures for the PID require that routine maintenance and calibration be performed every six months. Field calibration will be performed on a daily basis. The packages used for calibration are non-toxic analyzed gas mixtures available in pressurized containers. All calibration procedures will follow the manufacturer recommendations.
- Peristaltic pump – No calibration required.
- Multi-parameter water quality meter - This instrument is factory-calibrated and is also re-calibrated on a regular interval by the equipment rental company. The certification of calibration is provided by the equipment rental company. A calibration check shall be performed at the start of each day.
- Electric water level indicator – No calibration required.
- Hand-held GPS device – This instrument is self-calibrating.

Further calibration procedures can be reviewed in AECC Standard Operating Procedure #110 – Field Monitoring Equipment Calibration, which attached to the RIWP.

6.0 Data Validation and Reporting

All data generated through field activities, or by the laboratory operation shall be reduced and validated (as required in the RIWP) before reported.

6.1 Data Usability Evaluation

Data evaluation will be performed by a third-party data validator using the most current methods and quality control criteria from the USEPA's Contract Laboratory Program (CLP) *National Functional Guidelines for Organic Data Review*, and Contract Laboratory Program, *National Functional*

Guidelines for Inorganic Data Review.

6.1.1 Procedures Used to Evaluate Field Data Usability

The performance of field activities, calibration checks on field instruments at the beginning of each day of use, manual checks of field calculations, checking for transcription errors and review of field logbooks is the shared responsibility of the Field Team Manager and Head Field Technician.

6.1.2 Procedures Used to Evaluate Laboratory Data Usability

The data review guidance will be used only to the extent that it is applicable to the SW-846 methods. SW-846 methodologies will be followed primarily and given preference over CLP when differences occur. Also, results of blanks, surrogate spikes, MS/MSDs, and laboratory control samples will be reviewed / evaluated by the data validator. Sample analytical data for each sample matrix will be evaluated. The third-party data validation expert will also evaluate the overall completeness of the data package. Completeness checks will be administered on all data to determine whether deliverables specified in this QAPP are present. The reviewer will determine whether all required items are present and request copies of missing deliverables.

6.2 Data Reporting

6.2.1 Field Data Reporting

All field documents will be accounted for when they are completed. Accountable documents include items such as field notebooks, sample logs, field data records, photographs, data packages, computer disks, and reports.

6.2.2 Laboratory Data Reporting

Analytical data will be summarized in tabular format with such information as sample identification, sample matrix description, parameters analyzed and their corresponding detected concentrations, and the detection limit. Analytical results will be incorporated into reports as data tables, maps showing sampling locations and analytical results, and supporting text.

7.0 Corrective Action

Corrective action is the process of identifying, recommending, approving, and implementing measures to counter unacceptable procedures or out of quality control performance that can affect data quality. Corrective action can occur during field activities, laboratory analyses, data validation, and data assessment. Corrective actions proposed and implemented should be documented in the regular quality assurance reports to management. Corrective action should be implemented only after approval by the Project Manager, or his/her designee. If immediate corrective action is required, approvals secured by telephone from the Project Manager should be documented in an additional memorandum.

7.1 Field Corrective Action

If errors in field procedures are discovered during the observation or review of field activities by the Project QA Officer or his/her designee, corrective action will be initiated. Nonconformance to the QA/QC requirements of the field operating procedures will be identified by field audits or immediately by project staff who know or suspect that a procedure is not being performed in accordance with the requirements. The Project QA Officer or his/her designee will be informed immediately upon discovery of all deficiencies. Timely action will be taken if corrective action is necessary.

Corrective action in the field may be needed when the sample network is changed (i.e., more/less

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samples, sampling locations other than those specified in the Work Plan, etc.) or when sampling procedures and/or field analytical procedures require modification due to unexpected conditions. In general, the Project Manager and QA Officer may identify the need for corrective action. The Project Manager will approve the corrective measure that will be implemented by the field team. It will be the responsibility of the Project Manager to ensure that corrective action has been implemented.

If the corrective action will supplement the existing sampling using approved procedures in the QAPP, the corrective action approved by the Project Manager will be documented. If the corrective actions result in less samples (or analytical fractions), alternate locations, etc., which may result in non-achievement of project QA objectives, it will be necessary that all levels of project management, including the NYSDEC Project Coordinator, concur with the proposed action.

Corrective actions will be implemented and documented in the project field record book. No staff member will initiate corrective action without prior communication of findings through the proper channels. If corrective actions are insufficient, work may be stopped by the NYSDEC Project Coordinator.

If at any time a corrective action issue is identified which directly impacts project data quality objectives, the NYSDEC Project Coordinator will be notified immediately.

7.2 Laboratory Corrective Action

Corrective actions may be initiated if the quality assurance goals are not achieved. The initial step in a corrective action is to instruct the analytical laboratory to examine its procedures to assess whether analytical or computational errors caused the anomalous result. If no error in laboratory procedures or sample collection and handling procedures can be identified, then the Project Manager will assess whether reanalysis or resampling is required or whether any protocol should be modified for future sampling events.

7.3 Data Validation & Assessment Corrective Action

The need for corrective action may be identified during the data validation or assessment processes. Potential types of corrective action may include resampling by the field team, or reinjection / reanalysis of samples by the laboratory.

These actions are dependent upon the ability to mobilize the field team, whether the data to be collected is necessary to meet the QA objectives (the holding time for samples is not exceeded, etc.). If the data validator identifies a corrective action situation, the Project Manager will be responsible for approving the corrective action implementation. All required corrective actions will be documented by the laboratory Quality Assurance Coordinator.

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APPENDIX C

HEALTH AND SAFETY PLAN

HEALTH AND SAFETY PLAN

Remedial Investigation Work Plan
Bowers Business Park
Town of Dewitt, New York

<table>
<tr><th colspan="3">EMERGENCY CONTACT NUMBERS</th></tr>
<tr><td colspan="2">Emergency Response Number</td><td>911</td></tr>
<tr><td colspan="2">Poison Control Center</td><td>(800) 222-1222</td></tr>
<tr><td colspan="2">State Police (North Syracuse)</td><td>(315) 455-2826</td></tr>
<tr><th colspan="3">NEAREST HOSPITAL</th></tr>
<tr><td colspan="2">St. Joseph’s Hospital
301 Prospect Avenue
Syracuse, New York 13203</td><td>(315) 448-5111</td></tr>
<tr><th colspan="3">OWNER</th></tr>
<tr><td>Bowers Business Park, LLC.
(315) 432-9400</td><td>Owner Representative</td><td>Bryan Bowers
(315) 382-7727 (cell)</td></tr>
<tr><th colspan="3">ENVIRONMENTAL CONSULTANT</th></tr>
<tr><td rowspan="3">Asbestos & Environmental Consulting Corporation (AECC)
(315) 432-9400</td><td>Project Manager</td><td>James Saxton</td></tr>
<tr><td>Safety Coordinator</td><td>George Fischer
(315) 569-0474 (cell)</td></tr>
<tr><td>Head Field Technician</td><td>George Fischer</td></tr>
<tr><th colspan="3">DRILLING CONTRACTOR</th></tr>
<tr><td rowspan="3">TBD</td><td>HSO</td><td>TBD</td></tr>
<tr><td>Supervisor</td><td>TBD</td></tr>
<tr><td>Operator</td><td>TBD</td></tr>
</table>

February 2022

REVISION #	DATE	SUMMARY OF REVISION

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1.0 INTRODUCTION

A Brownfield Cleanup Program site investigation is being performed at the site (See Figure 1) as a result of the detection of polychlorinated biphenyls (PCBs) in site soils.

This project-specific Health and Safety Plan (HASP) sets forth requirements for maintaining the health and safety of persons at the Site. This HASP addresses general health and safety issues related to the presence of specific chemical and physical hazards that may be encountered during performance of the work activities at the Site. Any Contractors or Subcontractors are required to prepare and maintain their own project-specific HASP that incorporates the minimum requirements of this HASP.

An Emergency Response Plan is included at the end of this Section, which presents the procedures to be followed in the event of an emergency situation.

2.0 GENERAL DEFINITIONS

The following definitions shall apply to and are used throughout the HASP:

Contamination Reduction Zone – Area between the Exclusion Zone and Support Zone that provides a transition between contaminated and clean areas. Decontamination stations are located in this zone.

Contractor – Any contractor responsible for performing work that will disturb contaminated Site soils or involve management of other contaminated waste streams such as decontamination residues.

Environmental Consultant – A consultant to the Owner that will specialize in the environmental aspects of the project, namely preparation and implementation of the Remedial Investigation Work Plan, collection of soil samples, collection of groundwater samples, oversight of contractor activities, and decontamination of equipment at the end of the project.

Exclusion Zone – Any portion of the Site where hazardous substances are present, or may reasonably be suspected to be present, in the air, water, or soil.

HSO – The Health & Safety Officer is a qualified professional designated by the Consultant who is responsible for the execution and maintenance of the HASP.

Monitoring – The use of field instrumentation to measure the levels of contaminants. Monitoring will be conducted, if deemed necessary (i.e., excessive airborne dust and particulates), to evaluate potential exposures to chemical and physical hazards.

On-site personnel – All consultant, contractor, and subcontractor personnel working at the Site.

PPE – Personal Protective Equipment; clothing / gear worn by personnel within the work area that is designed to reduce exposure to chemical and / or physical hazards.

Project – All on-site work performed at the Site involving potentially contaminated soil disturbance (i.e., investigations and potential interim remedial measures).

Site – The subject property where the disturbance of potentially contaminated soil may occur.

Subcontractor – All subcontractors to the Contractor hired to work on this project.

Support Zone – The remainder of the Site outside of the Contamination Reduction Zone and Exclusion Zone. Support equipment is located in this zone.

Visitor – All other personnel, excluding the on-site personnel.

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3.0 RESPONSIBILITIES

Implementation of the HASP will be accomplished through an integrated team effort. The following key personnel will be involved with this project:

OWNER		
Bowers Business Park LLC. (315) 432-9400	Owner Representative	Bryan Bowers
ENVIRONMENTAL CONSULTANTS		
Asbestos & Environmental Consulting Corporation (AECC) (315) 432-9400	Safety Coordinator	George Fischer
	Project Manager	James Saxton
	Head Field Technician	George Fischer
DRILLING / EXCAVATION CONTRACTOR		
TBD	HSO	
	Supervisor	
	Operator	
GOVERNMENTAL AGENCIES		
US Environmental Protection Agency (USEPA)		TBD
NYS Department of Environmental Conservation (NYSDEC) (315) 426-7432		Karen Cahill
NYS Department of Health (NYSDOH) (518) 402-7860		Christine Vooris
Onondaga County Health Department (315) 435-3252		TBD

This HASP will be periodically reviewed by all parties during the project to verify that it is in accordance with the operations conducted at the site. Changes in site conditions or changes in the work tasks at the site will necessitate a review and modification of the HASP. The Contractor's HSO shall contact the Environmental Consultant and Decontamination Contractor if site conditions change that warrant modifications to the HASP, and vise versa. Changes, modifications, and amendments to the HASP will be made in the form of addenda, and will be attached to the HASP.

All parties to the project will perform their duties in a manner consistent with generally accepted practices, and will be responsible for the following (of their own employees) during the project:

- Verification that medical examinations and training requirements for all personnel are current
- Reviewing the HASP with all on-site personnel
- Implementation and maintenance of the HASP
- Providing all on-site personnel with proper PPE
- Compliance with applicable state and federal health and safety standards

The HSO for this project is designated with the following responsibilities:

- Maintain a daily log book for recording all significant health and safety activities

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- Have authority to suspend work due to health or safety-related concerns
- Provide on-site technical assistance and conduct health and safety briefings at the Site
- Verify that first aid kits, eye wash kits, and fire extinguishers are at the Site
- Verify that on-site personnel have received the necessary training and physical examinations
- Verify that on-site personnel have been provided with and are using the required PPE
- Review of the adequacy of the HASP and amend the HASP as necessary during the project
- Prepare addenda to the HASP and maintain required documents for recordkeeping purposes

4.0 SITE HAZARDS EVALUATION

4.1 CHEMICAL HAZARDS

The site soils have been sampled for PCBs. No sampling for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), heavy metals, PCBs, pesticides, and herbicides has been conducted to date. The associated laboratory analysis and on-site observations revealed that the following chemicals / materials of concern exist at the Site:

- PCBs

A fact sheet and Safety Data Sheet for PCBs are presented in Appendix A.

At this time PCBs pose the only known health threat at the Site. In certain areas, PCB concentrations are above the threshold for hazardous (TSCA) waste (50 mg/kg or ppm). One sample was observed to contain PCBs in excess of 4,000 ppm. As the investigation progresses and additional data is collected for the other classes of chemicals, this HASP shall be updated to reflect this information.

PCBs at the Site may enter the human body in a variety of ways. The chemical routes of exposure anticipated from the remedial activities at this Site include:

Absorption - Dermal (skin) contact with impacted soil on-site resulting in absorption of chemicals of concern through the skin and into the blood stream. Proper use of PPE as specified later in this Section will minimize risks of exposure at the Site.

Ingestion - Chemicals / materials of concern can come in direct contact with the mouth from soil or other contaminated areas (PPE, skin, tools, etc.) and enter the bloodstream through the stomach lining. Proper care in handling PPE and tools, refraining from eating and drinking at the Site, and frequent hand washing with soap and water will minimize risks of exposure.

Inhalation - PCBs attached to dust and particulates, can be entrained by wind and become airborne across the Site and be subsequently inhaled through the nose and / or mouth. This exposure route is the most likely way for worker exposure to occur. The Contractor shall employ methods that minimize the creation of dust and utilize dust suppression techniques to minimize dust and particulates. Respirators with appropriate organic cartridges should be available to on-site workers in case volatile compounds become a nuisance or health hazard. The Contractor is responsible for any personal air monitoring of employees, as deemed necessary.

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4.2 PHYSICAL HAZARDS

Based upon the anticipated field activities, the following potential hazardous conditions may exist:

- The use of typical mechanical equipment such as drill rigs and sampling vehicles can create a potential for crushing and pinching hazards due to movement and positioning of the equipment, movement of lever arms and hydraulics, and entanglement of clothing and appendages in exposed drives and tracks. Mechanical equipment can also create a potential for impact of steel tools, masts, and cables should equipment rigging fail, or other structural failures occur during hydraulic equipment operation. Heavy equipment work must be conducted only by trained, experienced personnel. If possible, personnel must remain outside the turning radius of large, moving equipment. At a minimum, personnel must maintain visual contact with the equipment operator. When not operational, equipment must be set and locked so that it cannot be activated, released, dropped, etc. The mechanical equipment stated above represents typical equipment that is ordinarily used during this scope of work, but is not meant to be an all-inclusive list. Similar precautions should be used around other mechanical equipment deployed to the Site that is not listed above.

- The contractor is responsible for ensuring compliance with OSHA's construction standard for excavations (29 CFR 1926 Subpart P), and for designating the Competent Person responsible for selecting and implementing the appropriate protective system(s), assuring appropriate means of access and egress for excavations greater than four (4) feet in depth (not anticipated for this project), and for ensuring that potential atmospheric and physical hazards associated with any excavation / trenching activities are completed in accordance with Subpart P and other applicable OSHA Standards as applicable.

- Work around large equipment often creates excessive noise. Noise can cause workers to be startled, annoyed, or distracted; cause pain, physical damage to the ear, and temporary and / or permanent hearing loss; and can interfere with communication. If workers are subjected to noise exceeding an 8-hour time-weighted average sound level of 85 dBA, hearing protection will be required with an appropriate noise reduction rating to comply with 29 CFR 1910.95 and to reduce noise levels below levels of concern.

- Personnel may be injured during physical lifting and handling of heavy equipment, construction materials, or containers.

- Personnel may encounter slip, trip, and fall hazards associated with excavations, manways, and construction debris and materials. Precautionary measures should be taken by identifying and removing slip, trip, and fall hazards prior to commencing work. In the event slip, trip, and fall hazards cannot be removed or minimized, site workers will be shown the location of the physical hazard and be asked to avoid it during work activities.

- The potential for fire and / or explosion emergencies is always present on the Site. Field vehicles will be equipped with a fire extinguisher. Employees must be trained in the proper use of fire suppression equipment. However, large fires that cannot be controlled with a fire extinguisher should be handled by professionals. The proper authorities should be notified in these instances.

- Persons working outdoors in temperatures at or below freezing may be subject to frostbite. Extreme cold for a short time may cause injury to exposed body surfaces or result in a profound generalized cooling which can cause death. Areas of the body such as fingers, toes, and ears,

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are the most susceptible to cold stress. Ambient air temperature and wind velocity are two factors which influence the development of a cold weather injury. Local injury resulting from exposure to cold temperatures is known as "frostbite." There are several degrees of damage in which frostbite of the extremities can be categorized, as follows:

  - Frost nip or incipient frostbite is characterized by sudden bleaching or whitening of the skin.
  - Superficial frostbite occurs when the skin has a waxy or white appearance and is firm to the touch, but tissue beneath is resilient.
  - Deep frostbite is characterized by tissues that are cold, pale, and solid; this is an extremely serious injury.

- Heat stress is another potential hazard condition that may arise. Heat stress can result from a number of contributing factors, including environmental conditions, clothing, and workload as well as the physical condition of the individual. Since heat stress is one of the most common injuries / symptoms associated with outdoor work conducted with direct solar load, and, in particular, because wearing PPE can increase the risk of developing heat stress, workers must be capable of recognizing the signs and symptoms of heat-related illnesses. Signs and symptoms of heat-related illnesses which all on-site personnel should be aware, include the following:

  - Heat rash may result from continuous exposure to heat or humid air.
  - Heat cramps are caused by heavy sweating and may include muscle spasms and pain in the hands, feet, and abdomen.
  - Heat exhaustion is indicated by pale, cool, and moist skin; heavy sweating; dizziness; nausea; and fainting.
  - Heat stroke is indicated by red, hot, and unusually dry skin; lack of or reduced perspiration; nausea; dizziness and confusion; rapid pulse; and coma. Immediate action must be taken to cool the body before serious injury or death occurs.

- It should be noted that there are no known overhead or underground utilities within or adjacent to the Work Areas. Utility location reports are provided in Attachment B.

5.0 PERSONAL PROTECTIVE EQUIPMENT

Personnel will be required to wear Level D and Modified Level D PPE ensembles, at a minimum. The following PPE ensembles shall be worn by on-site personnel for the following tasks:

Level D Protection, as listed below, shall be worn by on-site personnel at all times when tasks are performed which DO NOT INVOLVE dermal exposure, or contact with chemical hazards:

- Standard outer garments (i.e. long pants and long-sleeve shirt)
- Durable leather steel-toed work boots
- Rubber boots worn over work boots
- Durable leather gloves
- Eye protection
- Hard hat
- Hearing protection

Modified Level D Protection, as listed below, shall be worn by on-site personnel at all times when tasks are performed which INVOLVE dermal exposure or contact with chemical hazards and/or during excavation of PCB soils with concentrations greater than 50 ppm:

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- Disposable coveralls worn over standard outer garments. Personnel will frequently verify the integrity of their coveralls by checking for holes or tears.
- Durable leather steel-toed work boots
- Disposable nitrile gloves. Personnel will frequently verify the integrity of their gloves by checking for holes or tears.
- Rubber boots worn over work boots
- Eye protection
- Hard hat
- Hearing protection

Respirator use is not anticipated for use on this project. If respiratory protection becomes necessary, a determination shall be made regarding each person's physical ability to wear a respirator. Consequently, persons required to wear respirators must provide the Contractor's HSO with current documentation (not older than 6 months) regarding their physical condition and ability to wear a respirator, as certified by a qualified physician. Failure to provide current, complete respirator certification documentation will be sufficient grounds to preclude personnel from conducting work activities where respiratory protection is required.

6.0 PERSONNEL TRAINING

6.1 REQUIREMENTS AND RESPONSIBILITIES

All on-site personnel and visitors will be trained commensurate with their job responsibilities and in accordance with Occupational Safety and Health Administration (OSHA) training and medical surveillance requirements as specified in 29 CFR 1910.120. The Contractor is responsible for providing such training prior to personnel being allowed to engage in activities that could expose them to health and safety hazards. The HSO has the responsibility to assure that this training is provided for the site-conditions and such training is updated, as needed. The HSO and Contractor's on-site Supervisor will be trained in basic first aid, and at least one of these individuals will be present during each work shift while personnel are at the Site.

6.2 SITE ORIENTATION MEETING

The Contractor will be responsible for notifying all on-site personnel of required attendance at a site orientation meeting, which will be organized by the Contractor's HSO. Any subcontractor personnel will also be required to attend the site orientation meeting as well as any other periodic health and safety meeting specified by the HSO. Personnel attending the site orientation meeting are to sign a Site Orientation Meeting Attendance Acknowledgment Form. The following is a listing of general site orientation training topics:

- Names and responsibilities of key personnel
- Safe work practices
- Personal protective equipment
- Chemical and physical hazards
- Site equipment Medical surveillance
- Site hazards
- Site control measures
- Decontamination procedures
- Standard operating procedures
- Emergency response plan

6.3 DOCUMENTATION / RECORDKEEPING

OSHA regulations require medical surveillance in the form of annual medical examinations for certain types of work involving exposure to hazardous or toxic substances. All on-site personnel, visitors, and subcontractors are required to have documented proof on file of OSHA training and medical surveillance requirements as specified in 29 CFR 1910.120 to demonstrate compliance with the training requirements specified in this Section. The HSO is responsible to check all personnel to ensure training is kept current during the project.

7.0 MEDICAL CLEARANCE

Medical clearance refers to OSHA requirements for annual physical reports performed by a licensed physician, which document a worker's physical ability to perform specific job duties. Medical clearance is not required for on-site personnel or visitors at the Site, except for OSHA medical surveillance requirements for workers within the Exclusion Zone or Contamination Reduction Zone.

8.0 STANDARD OPERATING PROCEDURES

Potential chemical and physical hazards exist at the Site. This Section presents Standard Operating Procedures (SOPs) that will be followed during the project. Specific precautions to avoid the potential hazards for each task are presented herein.

8.1 GENERAL SOPS

Workers shall adhere to the established SOP for their respective specialties. Work at the Site will be conducted according to established procedures and guidelines for the safety and health of all involved. General SOPs at the Site include the following:

- All questions should be referred to the Contractor's HSO or Project Manager.
- All on-site personnel will be trained and briefed on anticipated hazards, equipment to be worn, safety practices to be followed, emergency procedures, and communications.
- Inspections of the Site will be conducted to ensure compliance with the HASP, and if any change in operation occurs, the HASP will be modified to reflect any change.
- Be observant of not only one's own immediate surrounding but also that of others.
- On-site personnel in the work zone will act as safety backup to each other, and on-site personnel outside the work zone will provide emergency assistance when necessary.
- Use extra precautions when working near heavy equipment.
- Communications using hand signals or other means will be maintained between on-site personnel, the HSO, and the Project Manager at all times.
- Breaks should be planned to prevent heat, cold, stresses, accidents, and fatigue.
- Work areas for various operational activities will be established.
- Strict pedestrian and vehicular traffic control will be maintained on-site.
- Entrance / exit locations and emergency escape routes will be designated and delineated.
- On-site personnel and equipment in each Work Area will be minimized to maintain effective Site operations.
- Required PPE ensembles must be worn by all on-site personnel entering work areas designated for wearing PPE. At minimum, hard hat, safety glasses, steel-toe boots, durable leather gloves, and hearing protection will be worn on the project Site.
- Work Areas and decontamination procedures will be established based on expected Site conditions.

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- Plan work procedures and decontamination areas to minimize contamination exposure.
- Contaminated equipment shall not be placed on unprotected surfaces.
- Procedures for leaving a Work Area will be planned prior to entering the Site.
- All electrical equipment (power tools, extension cords, instruments, etc.) will conform to 29 CFR 1926.400 Subpart K.
- Fire prevention and protection (appropriate signs for flammable liquids, smoking areas, storage areas of combustible or flammable materials, etc.) will be in accordance with OSHA 29 CFR 1926.150 Subpart F.

Violation of these SOPs will result in immediate dismissal from the Site.

8.2 SITE CONTROL MEASURES

Site control measures will minimize potential contamination of on-site personnel, protect the public from potential on-site hazards, and prevent vandalism of equipment and materials. Site control measures also enhance response in emergency situation. For this project, the primary site control measure will be a temporary fence or other barrier installed along the Site boundary for the duration of the project.

Areas where intrusive work will occur will be routinely divided into three distinct areas: an Exclusion Zone, a Contamination Reduction Zone (CRZ), and a Support Zone (see Figure 1).

Exclusion Zone

The Exclusion Zone will be designated as the area where the highest potential for exposure by dermal or inhalation routes exists. The Exclusion Zone coincides with areas being excavated. PPE is required and a daily log will be kept of all personnel entering this zone.

The Exclusion Zone for work areas will be demarcated with barrier tape.

Approval for entry into the Exclusion Zone will require compliance with OSHA training and medical surveillance requirements (29 CFR 1910.120). Subcontractor and vendor equipment will not be permitted to enter the Exclusion Zone without prior authorization and will be subject to Site decontamination procedures. All personnel and equipment shall be decontaminated when leaving the Exclusion Zone. No eating, drinking, or smoking will be permitted in the Exclusion Zone.

Contamination Reduction Zone (CRZ)

The Contractor will establish the CRZ in an area between the Exclusion Zone and Support Zone. Approval for entry into the CRZ will require compliance with OSHA training and medical surveillance requirements (29 CFR 1910.120). Access to the Exclusion Zone will be through the CRZ. The CRZ will be designated as the area immediately adjacent to and surrounding the Exclusion Zone. The probability of dermal and inhalation exposure is lower in the CRZ than in the Exclusion Zone. The CRZ includes facilities for personnel and equipment decontamination. PPE worn in the Exclusion Zone may not be worn outside the CRZ, except during emergencies. No eating, drinking, or smoking will be permitted in the CRZ.

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Support Zone

The Support Zone includes all areas outside the CRZ and Loading Zone. The exposure potential in the Support Zone is minimal. The Support Zone provides a changing area for personnel entering the CRZ and Exclusion Zone, as well as an area for the storage of clean equipment and materials. Protective clothing worn in the Exclusion Zone will not be allowed to be worn in the Support Zone, except in emergencies. It is the responsibility of the Project Manager to control access to the Site and to assure proper security. Any evidence of unauthorized entry will be noted in the daily log.

Under no circumstances will the general public be permitted to access the work area. All preapproved visitors will be briefed on the HASP, and shall sign the Daily Site Sign-In / Sign-Out Log. Pre-approved visitors will be permitted in the immediate area of active operations only with approval from the Contractor's HSO or Project Manager. All personal vehicles are restricted to the Support Zone.

8.3 COMMUNICATION PROCEDURES

Personnel in the Exclusion Zone will remain within sight of other project personnel. The commonly used international hand and arm signals are listed below, and will be used when necessary:

Signal	Meaning
Right hand thumbs up	OK, I'm All Right
Right hand thumbs down	No, Negative
Rotating both hands at sides	Situation Under Control
Rotating both hands above head	Need Assistance
Hand gripping throat	Out of Air, Cannot Breathe
Both hands placed on hips	Leave Area Immediately
Rotating both hands at knees	Situation Grave, Evacuate Immediately
Both hands placed on top of head	Returning to Support Zone

8.4 DECONTAMINATION PROCEDURES

On-site personnel performing remediation tasks under the Modified Level D PPE ensemble will perform decontamination operations in accordance with the following steps:

- Remove re-usable boot covers, or discard disposable boot covers.
- Remove coveralls first (if applicable), then remove nitrile gloves and place in the disposal container staged in the CRZ. All disposable PPE (gloves, coveralls), rags, cloths, etc. will be containerized separately from general refuse, and disposed of in accordance with the applicable regulations.
- Remove and discard inner gloves.
- Proceed to the Support Zone bringing decontaminated tools and sampling containers.
- Wash hands, face, and other exposed skin with soap and water. Shower and shampoo as soon as possible at the end of the work day, before any social activities.

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- Place non-disposable coveralls in plastic bags prior to leaving the Site and prior to entering any vehicle.
- Launder non-disposable clothing worn in Exclusion Zone prior to reuse, separately from other laundry items. Impermeable items such as vinyl boots do not need to be laundered prior to reuse; however, they should either be kept in the CRZ or placed in a sealed container prior to leaving the CRZ.

8.5 Periodic Health and Safety Meetings

The HSO will conduct weekly health and safety meetings. These meetings will be a review of existing protocols as well as a means to update personnel on new Site conditions. The meetings will also provide an opportunity for on-site personnel to discuss health and safety concerns. Topics for discussion may include, but are not limited to, the following:

- Review of the type and frequency of environmental and personal monitoring
- Task-specific levels of protection and anticipated potential for upgrading
- Review of existing and new health and safety issues
- Review of emergency procedures

9.0 ACCIDENT AND EMERGENCY RESPONSE PLAN

This Section includes procedures and methods of evaluating and addressing medical, fire, and other emergency situations which may occur at the Site. In any unknown situation, always assume the worst conditions and plan responses accordingly. All emergency situations require concise and timely actions conducted in a manner that minimizes the health and safety risks to on-site personnel and to the public. All on-site personnel shall be familiar with the Emergency Response Plan.

9.1 Responsibilities

The Contractor's HSO and President have the shared responsibility for directing response activities in the event of an emergency or accident, and will be responsible for the following:

- Assess the situation
- Determine required response measures
- Notify appropriate response teams
- Direct on-site personnel during the emergency

The Contractor's HSO or President will coordinate the response activities of on-site personnel with those of public agencies. A list of agencies to be contacted and who may, depending on the nature of the situation, assume authority for emergency response is presented in Section 9.6. This table includes names and telephone numbers of local hospitals, ambulance service, fire and police departments, and other applicable agencies. The HSO will notify emergency response agencies and establish emergency procedures prior to commencing remedial activities at the Site.

9.2 Emergency Procedures

Due to the nature of the tasks to be conducted at the Site, the emergency situations that may occur are most likely limited to personnel accidents (i.e., slip, trip, and fall accidents; equipment related accidents, etc.) requiring first aid. The following procedures shall be followed in the event of an emergency:

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- On-site personnel shall report all accidents and unusual events to the HSO.
- The HSO will assess the situation. If off-site assistance and medical treatment is required, the HSO will designate a person to call the proper authorities.
- First-aid or other applicable treatment will be provided by properly trained individuals.

The HSO will inform the Owner of the injury/accident, and an Accident Report Form detailing the causes and consequences of the injury/accident will be submitted to the Project Manager within 48 hours of the incident. The Accident Report Form shall include:

- Names and social security numbers of accident victims and witnesses
- Date and time of accident
- Location, cause, and duration of accident
- A description of corrective actions implemented
- Off-site persons and agencies notified and time of arrival at the Site.

Personnel shall make all reasonable attempts to conduct themselves in a calm manner in the event of an accident.

9.3 ACCIDENT AND INJURIES

Every accident is a unique event that must be dealt with by trained personnel working in a calm, controlled manner. In the event of an accident, the prime consideration is to provide the appropriate initial response to assist those in jeopardy without placing additional personnel at unnecessary risk. Several types of emergencies are outlined in the following subsections. These are not intended to cover all emergency situations.

If a person working on the Site is physically injured, basic first-aid procedures will be followed. Depending on the severity of the injury, outside medical assistance may be sought. If the person can be moved, the person will be taken outside of the Work Area, PPE will be removed, and first aid administered. If necessary, transportation to a medical facility will be provided. If the person can only be moved by emergency medical personnel, the HSO will decide what type of PPE (if any) will be required to be worn by emergency personnel.

If the injury to on-site personnel involves chemical exposure, the following first aid procedures will be initiated as soon as possible:

Eye Exposure - If solid or liquid gets into the eyes, wash eyes immediately at the emergency eyewash station using water and lifting the lower and upper lids occasionally. This emergency eyewash station shall be a portable station provided by the Contractor and set up within the CRZ. If an acute exposure is identified, then obtain medical attention immediately. Otherwise, consultation with a doctor shall be discretionary based on the severity of the incident.

Skin Exposure - If solid or liquid gets on the skin causing irritation or pain, wash skin immediately at the emergency eyewash station using water. If an acute exposure is identified, then obtain medical attention immediately. Otherwise, consultation with a doctor shall be discretionary based on the severity of the incident.

Inhalation – In the rare event that a person inhales large amounts of organic vapor or dust, and is overcome, move the person to fresh air at once. Obtain medical attention immediately. If breathing has stopped, appropriately trained personnel and/or medical personnel should perform cardiopulmonary resuscitation. Keep the affected person warm and at rest.

Ingestion - If solid or liquid is swallowed, medical attention must be obtained immediately and the Poison Control Center consulted.

9.4 FIRE

On-site personnel will be knowledgeable in fire-extinguishing techniques. They will be instructed in proper use and maintenance of the fire extinguishers supplied at the work areas. Fire extinguishers should be used only for small fires which are in the early stages of development. Where the fire cannot be controlled through extinguisher use, the area should be evacuated immediately, and the local fire department should be called to extinguish the fire. Fire extinguishers shall be provided by the Contractor.

9.5 EMERGENCY EVACUATION

In extraordinary circumstances, emergency evacuation of the Site may be necessary. On-site personnel will be notified of the need to evacuate verbally or by signaling with an air horn. If the situation is deemed an emergency, personnel will be instructed to leave the Site immediately, using the closest available evacuation route; otherwise, personnel will be expected to go through normal decontamination procedures before leaving the Site.

In either case, personnel will be instructed to meet at a central location to be determined by the HSO prior to the start of Work. A head count will be made to ensure that all personnel are safe and accounted for.

The HSO will contact appropriate response agencies, as warranted. Motorized equipment / machinery will be shut off before the Site is evacuated.

(continued on next page)

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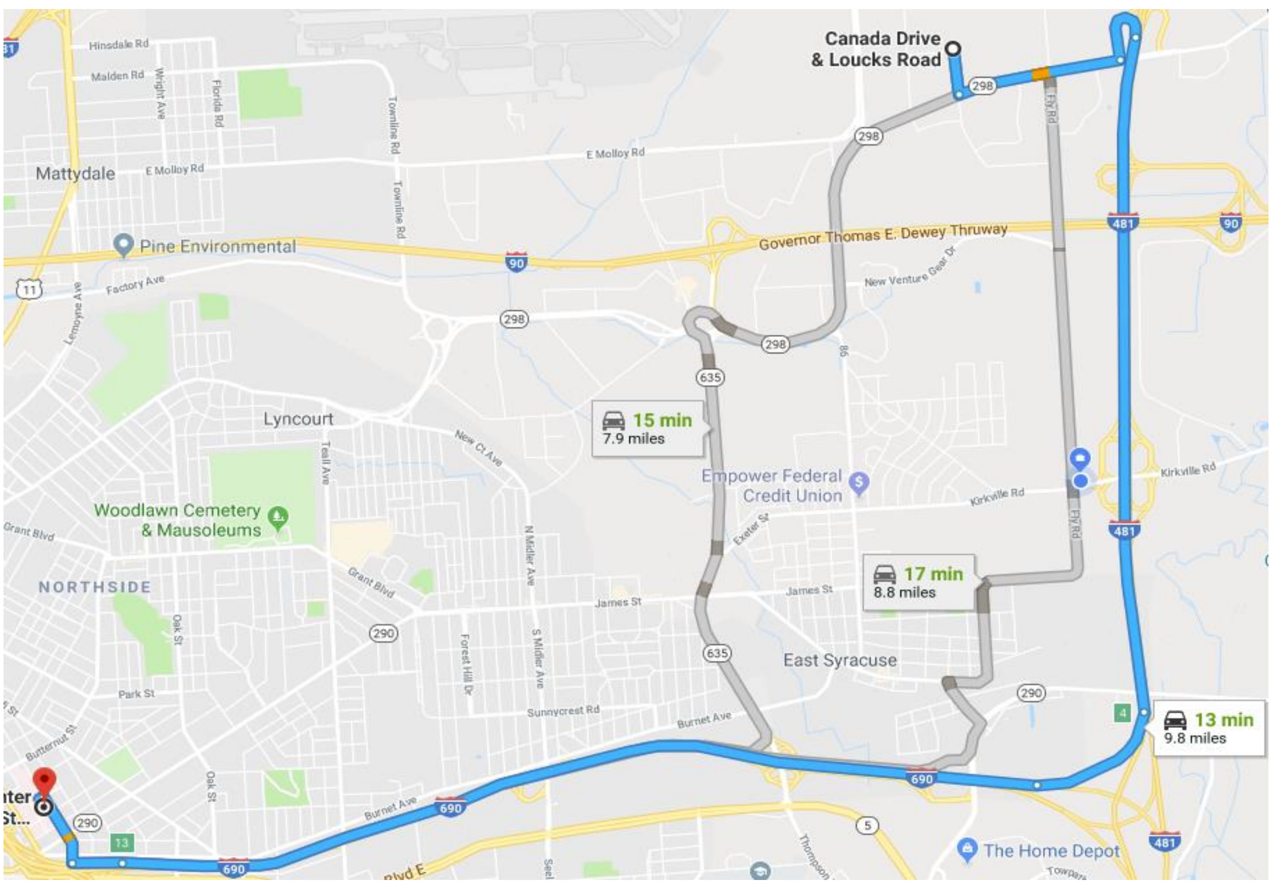
9.6 EMERGENCY RESPONSE AND AREA HOSPITALS

In case of emergency, call 911 or the appropriate individual authority:

EMERGENCY CONTACT NUMBERS	
Nearest Hospital	St. Joseph's Hospital 301 Prospect Avenue Syracuse, New York 13203
Emergency Response Number	911
Poison Control Center	(800) 222-1222
State Police (North Syracuse)	(315) 455 2826

Directions to Nearest Hospital (Distance ~ 9.8 miles, Time ~ 13 minutes)

1. Travel south on Loucks Road Extension
2. Left onto State Route 298
3. Left onto I-481 South on-ramp
4. Take Exit 4 (I-690 West)
5. Take Exit 13 (Townsend Street)
6. Right onto North Townsend Street
7. In 500 stay left on North Townsend Street
8. In 0.3 miles continue straight on North Townsend Street. DO NOT TURN LEFT ON UNION STREET TO MAIN HOSPITAL FACILITY.
9. In 0.1 miles, St. Joseph's Hospital Emergency Room will be on left



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APPENDIX D

COMMUNITY AIR MONITORING PLAN

COMMUNITY AIR MONITORING PLAN

Remedial Investigation Work Plan
Bowers Business Park
Canada Drive
Town of Dewitt, Onondaga County, New York

Parameter	Action Level	Stop Work Level
VOC Monitoring	5 ppm	25 ppm
Particulate Monitoring (PM-10)	100 µg/m^3	150 µg/m^3

February 2022

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ATTACHMENTS

1.0 INTRODUCTION

The New York State Department of Health (NYSDOH) Community Air Monitoring Plan (NYSDEC, 2010) requires real-time monitoring for vapors of volatile organic compounds (VOCs) and respirable particulate matter (PM-10) at the downwind perimeter of the site when certain activities are in progress at contaminated sites.

This Community Air Monitoring Plan (CAMP) was prepared for work associated with the Bowers Business Park on Canada Drive in the Town of Dewitt, Onondaga County, New York and supplements the *Remedial Investigation Work Plan* (AECC, 2022).

1.1 Purpose

The intent of the CAMP is to provide a measure of protection for the downwind community (i.e., off-site receptors including residences and businesses and on-site workers not directly involved with the subject work activities) from potential airborne contaminant releases as a direct result of investigative and remedial work activities. Additionally, the CAMP helps to confirm that work activities did not spread contamination off-site through the air. The action levels specified herein require increased monitoring, corrective actions to prevent emissions, and / or work shutdown.

1.2 Objectives

The community air-monitoring will include real time air quality data, which will be collected throughout the duration of all ground-intrusive activities and will include, at a minimum, upwind and downwind measurements at the site perimeter. The CAMP was established to address the following objectives:

- To ensure concentrations of VOCs and PM-10 (particulates having a diameter of less than 10 micrometers) associated with ground-intrusive activities are minimized to protect human health and the environment.
- To provide an early warning system so engineering controls can be enacted to prevent unnecessary exposure of emissions resulting from project activities.
- To measure and document the concentrations of VOCs and PM-10 for determining compliance with the air-monitoring limits established by the NYSDOH.

1.3 Applicability

Continuous monitoring will be required for activities that aggressively disturb contaminated or potentially-contaminated soils in a sufficient quantity as to pose a potential for dispersion of dust or volatile vapors to downwind receptors. Such activities would include, but are not limited to, excavation of test pits, test trenches, or larger holes; site clearing/scraping/grading; and construction site traffic. Continuous monitoring will not be required for activities that disturb “clean” soils or insignificant amounts of contaminated or potentially-contaminated soils, such as use of hand tools, advancement of soil borings, etc. (see Section 5.0).

The CAMP is not intended for use in establishing action levels for worker respiratory protection. This CAMP is a companion document to the site-specific Health and Safety Plan (HASP), which is the document that is directed primarily toward the protection of workers within the designated work zones.

CAMP monitoring will not be required if engineering controls prevent exposure to or disturbance of the contaminated or potentially-contaminated soils. Examples of such controls would include placement of a demarcation fabric over soils prior to backfilling, polyethylene sheeting over a pile of contaminated soil, or clean gravel over a high-trafficked area.

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2.0 GENERAL SITE CONDITIONS

The prevailing wind generally blows from west to east. However, monitoring locations will be adjusted on a daily or more frequent basis based on actual wind direction to provide an upwind and at least one downwind monitoring station. Wind direction may be determined using a weather station or equivalent device, or lightweight flagging affixed at each station. The attached Figure CAMP-1 illustrates the likely location of monitoring stations associated with various work areas at the site.

The primary chemicals of concern associated with the site include the following:

- PCBs

Continuous monitoring of VOCs will serve as the primary method of screening for potential volatile vapors (VOCs and SVOCs). Since PCBs are not volatile (gaseous) compounds, continuous monitoring of particulates will serve as the primary method of (indirectly) screening for these compounds.

As the investigation progresses and additional data is collected for other classes of chemicals (Metals, PAHs,Herbicides, PFAS, etc.), the CAMP may be updated to reflect this information.

3.0 MONITORING, RESPONSE LEVELS, AND ACTIONS

3.1 Volatile Organic Compound Monitoring

VOCs will be monitored continuously at the upwind and downwind perimeters of the work area or exclusion zone at temporary VOC monitoring stations. The monitoring of VOCs will be performed using a photo-ionization detector (PID), which will be calibrated daily. The PID will 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 or exclusion zone exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities will be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities will 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 will be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities will resume provided that the total organic vapor level half the distance to the nearest potential receptor or residential / commercial structure (but not 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 will be shut down until the source of the emissions is identified and controlled.

All 15-minute readings will be recorded and available for State (DEC and DOH) personnel to review. Instantaneous readings, if any, used for decision purposes will also be recorded.

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3.2 Particulates Monitoring

Particulate concentrations will be monitored continuously at the upwind and downwind perimeters of the work area or exclusion zone at temporary particulate monitoring stations. The particulate monitoring will be performed using a DUSTTRAK™ Aerosol Monitor Model 8520 (or similar). The device will be capable of measuring particulate matter less than 10 micrometers in size (PM-10), integrating over a period of 15 minutes for comparison to the airborne particulate action level, for comparison to the following action levels:

* If the downwind PM-10 particulate level is 100 micrograms per cubic meter (mcg/m^3) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques will be employed. Work may continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed 150 mcg/m^3 above the upwind level, and provided that no visible dust is migrating from the work area.
* If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than 150 mcg/m^3 above the upwind level, work will be stopped, and an evaluation of activities will be initiated. Work will resume if dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within 150 mcg/m^3 of the upwind level and in preventing visible dust migration.

In addition, fugitive dust migration will be visually assessed during all work activities by a qualified environmental professional.

3.3 Recording of Data

All readings will be recorded and available for State (DEC and DOH) personnel to review. Instantaneous readings, if any, used for decision purposes will also be recorded.

4.0 MONITORING DURING NON-INTRUSIVE AND MINIMALLY-INTRUSIVE ACTIVITIES

4.1 Volatile Organic Compounds

CAMP monitoring for VOCs will not be required for this project during non-intrusive and minimally-intrusive activities that do not have the potential to release volatile vapors. Typical non-intrusive and minimally-intrusive activities related to site investigation that have the potential to release volatile vapors include:

- Advancing of borings
- Installation of monitoring wells
- Development of monitoring wells
- Collecting groundwater samples from monitoring wells
- Opening of vaults/manholes
- Opening of chemical or petroleum tanks, etc.

If these activities occur, then periodic monitoring of VOCs will be performed during the non-intrusive activity. Each of the periodic measurements will occur directly at the location (i.e. – no upwind or downwind sampling). If the action level at the location is exceeded, then upwind and downwind concentrations will measured (with the same device) to verify that the exceedance is a discrete/local condition.

Boring Advancement

Periodic monitoring during boring advancement will consist of taking a reading upon arrival at the boring location, and monitoring periodically during advancement of the boring.

Groundwater Well Installation / Development

Periodic monitoring during groundwater well installation and/or development will consist of taking a reading upon arrival at a sample location, monitoring periodically during the installation of the well, and monitoring periodically during the well development process.

Groundwater Well Sampling

Periodic monitoring during groundwater sample collection will consist of taking a reading upon arrival at a sample location, monitoring while opening a well cap, and monitoring periodically during well baling/purging/sampling.

Vaults/Manholes

Periodic monitoring during opening of vaults/manholes will consist of taking a reading upon opening of the vault/manhole cover, and monitoring periodically while the vault/manhole remains open. *Note that these measurements are not intended to be used in conjunction with confined space entry procedures.*

Chemical/Petroleum Tanks

Periodic monitoring during opening of chemical or petroleum tanks will consist of taking a reading upon opening of the vault/manhole cover, and monitoring periodically while the vault/manhole remains open.

4.2 Particulates

Due to the limited risk of dust generation, CAMP monitoring for particulates will not be required for non-intrusive activities, and the following minimally-intrusive activities (provided that such activities do not occur during extremely dry or windy conditions):

- Use of hand tools for shallow soil sampling
- Installation of soil borings
- Installation of monitoring wells

Furthermore, CAMP monitoring for particulates will not be required during handling of the existing on-site crushed wall/slab material, as sampling has deemed this material inert.

If localized visible dust is observed during operations, then dust suppression techniques will be employed. Examples of dust suppression techniques would include wetting the surface at boring locations, and wetting of crushed wall/slab material. If visible dust is still observed after implementation of dust suppression techniques, then continuous CAMP monitoring for particulates will be implemented.

5.0 REPORTING

CAMP data summary tables (see figure 2) will be provided electronically to the NYSDEC and NYSDOH on a weekly basis (at a minimum), and any exceedances of CAMP action levels and corrective measure taken will be reported to the Departments immediately (within 24 hours).

CAMP data will be provided as an attachment within the Remedial Investigation report.

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