



April 8, 2025

Mr. Steve Colquhoun  
New York State Department of Environmental Conservation  
Division of Environmental Remediation  
5786 Widewaters Parkway  
Syracuse, New York 13214

**RE: Response to Comments**  
**Remedial Investigation Work Plan and Citizen Participation Plan Response Letter**  
**GW Syracuse LLC**  
**NYSDEC Site Number C734167**  
**CHA Project No.: 086328.000**

Dear Mr. Colquhoun:

CHA Consulting, Inc (CHA) has reviewed the New York State Department of Environmental Conservation (NYSDEC) comment letter, dated April 4, 2025, regarding the Remedial Investigation Work Plan (RIWP) and Citizen Participation Plan (CPP) submitted on July 25, 2024 and revised and resubmitted March 25, 2025. Please find the revised RIWP and CPP within this correspondence and responses to each comment, below.

**Comment 1 RIWP General:** Please note that if other parcels are investigated outside of this Remedial Investigation (RI) for the intent of adding them into the Brownfield Cleanup Program, usable data (i.e. Category B deliverables) and sufficient coverage across other parcels is necessary for the data to be included in the RI Report.

**Response:** At this time any additional investigation on the adjacent parcels has not been conducted. Any future investigation will include usable data and sufficient coverage as requested.

**Comment 2 RIWP Figures:** Please display the former fuel pump island, two former in-ground lifts, and three concrete pads in the figures.

**Response:** The requested items have been added to Figure 3-5.

**Comment 3 Section 2.5.4 Subsurface Investigations, CHA, 2024:** Please differentiate between investigations completed on the site and investigations performed on the property outside of the BCP area.

**Response:** Clarifying statements have been included in Section 2.5.4. Soil, soil vapor, and indoor air samples collected on the Site are identified and shown on Figures 3 and 5.

**Comment 4 Section 3.2.3 Groundwater:** The first three sentences describe off-site groundwater monitoring. Please omit or describe how off-site groundwater results pertain to on-site.

**Response:** These sentences have been removed from this section for clarity and consistency with what will be completed on the Site.

**Comment 5 Section 3.5 Qualitative Exposure Assessment:** This section states, “*Identification of the reasonably anticipated future groundwater use,*” Please plan to identify “all potential exposure points where actual or potential human contact with a contaminated medium may occur” per Appendix 3B of DER-10.

**Response:** This sentence has been revised in accordance with Appendix 3B of DER-10.

**Comment 6 RIWP Table 3 Sampling Rationale:** Please revise incomplete sentence in the first row’s *Rationale* column.

**Response:** The sentence has been completed to state “to evaluate surface soils for potential contamination.

**Comment 7 RIWP Figure 6 Membrane Interface Probe and Soil Sample Location Map:** Please define the red line in the legend or remove. Please add labels to the MIP locations.

**Response:** The red line has been removed. Labels will be assigned in the order of the investigation as it advances in the field and will be added to the figure upon submission of the RI Report.

**Comment 8 RIWP Appendix C Health and Safety Plan Section 4.1 Site Description:** This section references a car wash and commercial office building on the site. Please clarify which buildings are on-site versus off-site.

**Response:** Reference to the car wash and commercial office building have been removed from the HASP.

**Comment 9 RIWP Appendix D Community Air Monitoring Plan:** Please plan for continuous monitoring during all ground intrusive activities per Appendix 1A of DER-10. Please plan to provide the daily field summary with CAMP report to NYSDEC and NYSDOH.

**Response:** The CAMP has been revised in accordance with Appendix 1A of DER-10. One downwind station will continuously monitor dust and VOC concentrations throughout the duration of the investigation. Upwind VOC readings and visual dust will be assessed prior to the start of each work day and recorded on field logs. Daily field summaries will be provided to NYSDEC and NYSDOH.

**Comment 10 CPP:** Please include the Brownfield Cleanup Program (BCP) site number and name on the cover page and in footers.

**Response:** The site number and name has been added as requested.

**Comment 11 CPP:** Please identify the applicant name, site name, site address, site county, and site number above Section 1 as shown in the CPP template.



**Response:** The applicant and site name, site address, county and site number have been added to page 3, above Section 1.

**Comment 12 CPP 3.0 Major Issues of Public Concern:** Please clarify the investigation that found metals in the groundwater and where they were found on the property.

**Response:** The following has been added to this section, "Select metals were also identified in the groundwater samples collected at locations down and cross-gradient of the Site during a preliminary investigation in February 2024. No groundwater monitoring wells were installed within the boundary of the Site".

**Comment 13 CPP 4.1 Site Description:** Please add the year of the February Phase II investigation.

**Response 13:** This section has been revised to include the date of February 2024 associated with the Phase II investigation.

**Comment 14 CPP 4.2.2 Site Investigations (2016):** Please note that USTs were not found during this investigation.

**Response 14:** This statement has been added as the third sentence to this section.

**Comment 15 CPP Appendix A and B:** Please update the NYSDOH contact to

Kari Pollard  
Bureau of Environmental Exposure Investigation  
Empire State Plaza Corning Tower, Room 1787  
Albany, New York 12237  
[beej@health.ny.gov](mailto:beej@health.ny.gov)  
(518) 486-1443

**Response 15:** The appendices have been updated as requested.

CHA anticipates the revised RIWP and CPP meet the satisfaction of the NYSDEC based on responses to the comments above and modifications to each report. Should you have additional comments, please contact Samantha Miller, P.E. at (315) 257-7154.

Sincerely,



Samantha Miller, P.E.  
Senior Engineer V

SJM/

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# REMEDIAL INVESTIGATION WORK PLAN

## **Gateway Syracuse Apartments**

701 E. Fayette Street  
Syracuse, New York 13210

CHA Project Number: 086328.000

**July 2024**

**Revised March 2025**

**Revised April 2025**

**Prepared for:**  
**GW Syracuse LLC**  
1221 E. Genesee St.  
Syracuse, New York 13201

**Prepared by:**  
**CHA Consulting, Inc.**  
300 South State Street, Suite 600  
Syracuse, New York 13202  
Phone: (315) 471-3920





## CERTIFICATION

I, Samantha J. Miller, P.E., certify that I am currently a New York State 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 DER Technical Guidance for Site Investigation and Remediation (DER-10).

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

**For CHA Consulting, Inc.:**

(Professional Seal)



Samantha J Miller, P.E.

Printed Name of Certifying Engineer

*Samantha J Miller*

Signature of Certifying Engineer

Senior Engineer V

Title

April 15, 2025

Date of Certification

103303

NYS Professional Engineer Registration Number

New York

Registration State

August 31, 2025

Registration Expiration Date

CHA Consulting, Inc.

Company

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Appendix B	Quality Assurance Project Plan
Appendix C	Health and Safety Plan
Appendix D	Community Air Monitoring Plan

## LIST OF ACRONYMS & ABBREVIATIONS

ASP	Analytical Services Protocol
ASTM	American Society for Testing and Materials
AWQS	Ambient Water Quality Standard
BCA	Brownfield Cleanup Agreement
BCP	Brownfield Cleanup Program
BGS	Below Ground Surface
BH	Borehole
CAMP	Community Air Monitoring Program
CHA	CHA Consulting, Inc.
CPP	Citizen Participation Plan
DER-10	Division of Environmental Remediation Technical Guidance for Site Investigation and Remediation
DER-23	Division of Environmental Remediation Citizen Participation Handbook for Remedial Programs
DUSR	Data Usability Summary Report
ELAP	Environmental Laboratory Approval Program
EPA	Environmental Protection Agency
ESA	Environmental Site Assessment
FSP	Field Sampling Plan
GPR	Ground Penetrating Radar
HASP	Health and Safety Plan
HPT	Hydraulic Profiling Tool
LCS	Lender Consulting Services, Inc.
MIHPT	Membrane Interface Hydraulic Profile Tool
MIP	Membrane Interface Probe
NTU	Nephelometric Turbidity Units
NYCRR	New York Codes, Rules and Regulations
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
PCB	Polychlorinated Biphenyl
PFAS	Per and Polyfluoroalkyl Substances
PVC	Polyvinyl Chloride
QAPP	Quality Assurance Project Plan
QA/QC	Quality Assurance/Quality Control
RI	Remedial Investigation
RIWP	Remedial Investigation Work Plan
SCO	Soil Cleanup Objective
SVOC	Semivolatile Organic Compounds
TAL	Target Analyte List
TCL	Target Compound List
TIC	Tentatively Identified Compounds
TMP	Tax Map Parcel
TOGS	Technical and Operational Guidance Series
UST	Underground Storage Tank
VOC	Volatile Organic Compounds

## 1.0 INTRODUCTION

This Remedial Investigation Work Plan (RIWP) was prepared on behalf of GW Syracuse LLC (GW Syracuse) for proposed redevelopment of multiple parcels to be known as the Gateway Syracuse Apartments. GW Syracuse will implement the RIWP upon acceptance into the New York State Brownfield Cleanup Program (BCP), pursuant to the requirements of the Brownfield Cleanup Agreement (BCA). CHA Consulting, Inc. (CHA) has prepared this RIWP to be consistent with the guidance provided in the New York State Department of Environmental Conservation (NYSDEC) Division of Environmental Remediation program policy 10 (DER-10) Technical Guidance for Site Investigation and Remediation, dated May 2010.

The objective of the Remedial Investigation (RI) is to characterize the nature and extent of environmental impacts, provide sufficient information to evaluate remedial alternatives, as required, and identify potential source areas. Previous investigations conducted by CHA and Lender Consulting Services, Inc. (LCS) have been reviewed and incorporated into this RIWP to evaluate the areas of known contamination, as discussed in Section 2.5, and close data gaps that remain after the completion of those investigations, to meet the requirements of an RI.

To facilitate field investigation RI activities in a manner consistent with NYSDEC protocols, CHA has prepared the following site-specific documents:

- Citizen Participation Plan (CPP) (submitted under separate cover)
- Field Sampling Plan (FSP) (Appendix A)
- Quality Assurance Project Plan (QAPP) (Appendix B)
- Health and Safety Plan (HASP) (Appendix C)
- Community Air Monitoring Plan (CAMP) (Appendix D)

These documents are integral to this RIWP and are referenced throughout this report.

## 2.0 SITE BACKGROUND

### 2.1 Site Description

The Gateway Syracuse Apartments is located in the City of Syracuse, Onondaga County, New York and is identified as the following tax map parcels (TMP) consisting of approximately 1.29 acres of land.

**Table 1. Tax Map Parcel Information**

Existing Lot Information	Tax Map Parcel	Parcel Size
701-03 E. Fayette St. & Almond St.	030.-16-18.0	0.43 ± Acres
706-08 E. Washington St.	030.-16-02.0	0.07 ± Acres
712-16 E. Washington St.	030.16-03.0	0.47 ± Acres
705 Fayette St.	030.-16.17.0	0.22 ± Acres
709 Fayette St.	030.-16.16.0	0.10 ± Acres

Upon purchase of the properties, the parcels will be re-subdivided to consist of a singular parcel with the proposed address of 701 E. Fayette Street. The re-subdivision has been approved by the City of Syracuse Planning Board. Hereinafter, the location may be referred to as the “Gateway Syracuse Apartments”. One parcel located at 701-03 E. Fayette Street and Almond Street under TMP 030.-16-18.0 was accepted into the BCP and will be referred to as the “Site” in this RIWP and associated appendices. A Site location map is provided as Figure 1 and a Site layout map is provided as Figure 2.

### 2.2 Site History

According to the Phase I ESA prepared by CHA (dated February 22, 2024), the Site was occupied by various residential dwellings and a carriage house and livery as early as the 1892 records. The Site remained similarly developed until the early 1900s when commercial development began. Various occupants have been located on the Site or within the Gateway Syracuse Apartments development including an automobile garage, parking, religious facilities, a recreation hall, photographic supplies company, and single and multi-family dwellings. The most recent occupant of the Site was a gasoline services station and the Site is currently used for supplemental parking for nearby businesses..

It should be noted the Erie Canal was present to the north of the Site until it was drained and filled within the City of Syracuse. Properties in and around the area were impacted by various debris as a new roadway corridor (Erie Boulevard) took its place in the 1920’s and 1930’s. Urban fill from the demolition of the canal and the construction of Erie Boulevard were often placed and spread on surrounding properties. The proximity of the Site to the canal may result in the potential of urban fill be a source of contamination. Additionally, it is typical for former buildings on the Site to have been razed and low areas or basements filled with demolition debris.

### 2.3 Site Physical Condition

#### 2.3.1 Site Features

The Site is currently occupied by one building surrounded by an asphalt parking lot. The building was constructed in 1960 for use as a gasoline service station and auto repair facility. The building is a single-story steel truss building with brick façade, concrete slab on grade floor, and canopy connecting the building to the fueling island. Two overhead garage doors allow access to the

maintenance garage. At least one floor drain with evidence of contamination is noted within the building. The building is currently vacant.

### **2.3.2 Topography**

Based on a review of the 1973 United States Geologic Survey Map 7.5-minute Quadrangle for Syracuse East and Syracuse West, New York, the Site has an approximate elevation of 405 feet above mean sea level and is relatively flat. The surrounding area is flat with a slight slope to the west toward Onondaga Creek. The Syracuse University hill is located to the east-southeast of the Site.

### **2.3.3 Surficial and Bedrock Geology**

According to the United States Department of Agriculture Web Soil Survey, Site soils consist of Urban Land. The term "Urban Land" indicates that a significant portion of the Site is covered with impervious surfaces such as buildings, asphalt, and concrete, or that the surface features have been significantly altered by development activities.

Review of the Surficial Geologic Map of New York, Finger Lakes Sheet (Cadwell, D.H., 1986) indicates the surficial geology at the Site consists of lacustrine silts and clays with variable thickness up to approximately 50 meters.

Previous investigations confirmed the presence of fill material to a depth of approximately one to six feet below ground surface (bgs). Generally, this fill material is characterized as a mixture of crushed stone, asphalt, and concrete. Beneath the fill material was typically a silty clay layer extending to a depth of approximately 11 feet bgs followed by a sand and gravel layer that was encountered to a depth of 15 feet bgs.

Review of the Geologic Map of New York, Finger Lakes Sheet (Rickard and Fisher, 1970) indicates the bedrock geology of the Site consists of dolostone, shale, gypsum, and salts of the Syracuse Formation.

### **2.3.4 Hydrogeology**

Onondaga Creek is located approximately 0.8 miles west of the Site and flows in a northerly direction towards Onondaga Lake. Based on review of historical investigations at the Site, the estimated depth to groundwater is 21 feet bgs. Groundwater at the Site is assumed to flow to the west-northwest toward Onondaga Creek, which flows northward to discharge to Onondaga Lake. However, localized flow direction in the area of the Site may vary as a result of underground utilities or other heterogeneous subsurface conditions.

The Site is located in flood hazard Zone X indicating a low-risk area with an annual flood risk of 0.2 percent. There are no federal or state regulated wetlands or wetland check-zones located on or near the Site.

## **2.4 Surrounding Property Land Use**

The Site is located in the Central Business District (MX-5) of the City of Syracuse and the area primarily consists of commercial, light industrial, and apartment complex properties. The following is a summary of the surrounding property uses.

**Table 2. Surrounding Property Land Use**

Direction	Tax Map Parcel	Land Use Code and Classification	General Description
North	030.-16-01.0	438 - Parking Lot	Billboard Signs
	030.-16-02.0	438 – Parking Lot	Parking area
	030.-15-01.1	464 – Office Building	Office Building owned by Syracuse University
	030.-15-.03.0	449 – Other Storage, Warehouse and Distribution Facility	U-Box Storage Facility
	030.-17-01.0	449 – Other Storage, Warehouse and Distribution Facility	Storage Facility
	030.-14-01.0	438 – Parking Lot	U-Haul Parking Lot
	030.-14-02.0	330 – Vacant Land Located in Commercial Area	U-Haul Parking Lot
	030.-14-03.1	449 – Distribution Facility	U-Haul Storage Facility
	030.-14-03.2	330 - Vacant Land Located in Commercial Area	U-Haul Parking Lot
East	030.-16-03.0	464 – Office Building	Vacant Office Building
	030.-16-13.1	330 – Vacant Commercial Land	Parking area
	030.-16-14.0	484 – One Occupant Small Structure	XO Taco Restaurant
	030.-16-15.0	620 - Religious	Church
	030.-16-16.0	438 – Parking Lot	Vacant
	030.-16-17.0	435 – Manual Car Wash	Car Wash
	030.-16-12.1	330 – Vacant Land Located in Commercial Area	Parking area
	030.-16-10.1	483 – Part Residential Use	Szechaun Kitchen and Residential property
	030.-17-02.6	612 – School	SUNY Upstate Medical Building
South	048.-01-11.0	414 – Hotel	Crowne Plaza Hotel
	048.-01-10.0	465 – Professional Building	Law Office and Parking area
	048.-01-01.0	411 – Apartments	Apartment Complex
	048.-01-02.0	438 – Parking Lot	Parking Lot
	048.-01-03.1	438 – Parking Lot	Parking Lot
	048.-01-04.1	438 – Parking Lot	Parking Lot
	048.-01-05.0	464 – Office Building	Two Story Office Building
	048.-01-06.0	464 – Office Building	Three Story Office Building



Direction	Tax Map Parcel	Land Use Code and Classification	General Description
	048.-01-07.0	464 – Office Building	Office Building
	048.-01-08.0	414 – Hotel	Parkview Hotel
	048.-01-09.0	464 – Office Building	Law Office
	048.-02-01.4	411 – Apartments	The Laurel Syracuse Apartment Complex
West	103.-23-01.0	438 – Parking Lot	Parking Lot
	103.-22-02.2	426 - Fast Food Franchise	Dunkin' Donuts Drive Through

## 2.5 Previous Investigations and Remediation

This section describes, in chronological order, the investigations and remediation conducted on the Site, to date.

### 2.5.1 Transaction Screen, LCS, August 5, 2016

LCS performed a Transaction Screen in accordance with American Society for Testing and Materials (ASTM) 1528-14, dated August 5, 2016, for the singular parcel TMP 030.-16-18.0, located on the southwest corner of the Site. The historical review identified the following potential environmental concerns, summarized below:

- Presence of an automotive repair facility from at least 1938 through 1968 and a gasoline service station from at least 1978 through 1983.
- During the 2016 site visit, the former fuel pump island, two former in-ground lifts, and a floor drain filled with water were noted.

### 2.5.2 Geophysical Survey and Limited and Focused Subsurface Soil Investigation, LCS, September 22, 2016

LCS conducted a limited subsurface investigation of TMP 030.-16-18.0 in August and September 2016. A limited geophysical survey with ground penetrating radar (GPR) was performed to evaluate the presence of underground storage tanks (USTs) and associated piping. USTs were not apparent in the survey. Three concrete pads were encountered, but due to lack of piping or conduit lines noted, it is expected the concrete pads are not associated with USTs. The effectiveness of the GPR was limited by the presence of steel within the concrete slabs.

Fourteen boreholes were installed to evaluate subsurface soil. Petroleum odors were noted in test boreholes (BH) BH3 through BH8 and BH11 through BH13. Analytical results identified volatile organic compounds (VOCs) in multiple boreholes. Figure 3 presents the detected parameters in exceedance of Part 375 Restricted Residential Soil Cleanup Objective (SCO).

Due to the presence of VOC contamination and field evidence of contamination, the NYSDEC Spills Hotline was notified and spill number 1605568 was assigned to the release. This release was subsequently closed by the NYSDEC on September 28, 2016. The investigation was completed as part of a property transaction and no redevelopment was planned at that time.

### **2.5.3 Phase I Environmental Site Assessment, CHA, February 22, 2024**

CHA performed a subsequent Phase I Environmental Site Assessment (ESA) and identified the following recognized environmental conditions (RECs) associated with the Site.

- An unknown quantity of oil was observed in the floor sump inside the abandoned gas station. The accumulated oil within the sump indicates previous releases on the Site. The quantity of oil and discharge point of the floor sump is unknown. This has the potential to impact the environment and is considered a REC.
- Petroleum contamination discovered at the abandoned gas station during the LCS subsurface investigation. Contamination remains at the abandoned gas station property from past operations as an auto repair shop and a gas station. The NYSDEC issued a No Further Action letter stating no further action was necessary if the use of the Site was to remain a parking lot. If the use changes or excavation work is planned, the removal of impacted soil may be required.

### **2.5.4 Subsurface Investigations, CHA, 2024**

In 2024, CHA conducted two additional investigations across the Gateway Syracuse Apartments property including the Site. The investigations included the collection of three surface soil samples, six subsurface soil samples, and three sub-surface soil vapor samples with corresponding indoor air samples from within the buildings. The investigations revealed the presence of semi-volatile organic compound (SVOC) contamination in excess of the NYSDEC restricted residential soil cleanup objectives (SCOs) in the surface soil, VOC contamination in excess of restricted residential SCOs and SVOC contamination in excess of NYSDEC protection of groundwater SCOs in subsurface soils, and SVOCs in exceedance of the Technical and Operational Guidance Series 1.1.1 (TOGS 1.1.1) standards within groundwater. Lastly, samples of sub-surface soil vapor and indoor air revealed that there are petroleum compounds which require further mitigation and/or evaluation from within the Site structure in accordance with the New York State Department of Health (NYSDOH) Decision Matrices for soil vapor intrusion.

As part of the aforementioned investigation three soil samples, and one set of indoor air/soil vapor samples were collected on the subject parcel. Only results from the sampling effort within the Site boundary are presented on Figures 3, 4 and 5 for soil, soil vapor and indoor vapor, respectively. Please note that no groundwater samples have been collected the Site to date, those shown on Figure 4 were collected downgradient of the Site. The groundwater sampling results from temporary monitoring wells installed to the north of the Site are presented on Table 4.

### **2.5.5 Summary of Previous Investigations**

Based on the investigations described in this Section, a preliminary conceptual site model and description of the nature and extent of contamination are provided, below:

- Petroleum-impacted soil in the area around the fueling island and building of the Former Gasoline Service Station.
- Soil vapor intrusion from the petroleum-impacted soil associated with the Former Gasoline Service Station.

## **2.6 Proposed Site Redevelopment**

Proposed redevelopment of the Site includes demolition of all current structures to construct a mixed-use apartment building with retail and amenity space on the first floor. The building is proposed to be seven stories tall with 291 rental units. The tenant parking garage will be located on the first and second floors of the building with stormwater management systems below the parking garage. Significant removal of soil is expected for the stormwater management system and foundation construction.

## 3.0 PROPOSED REMEDIAL INVESTIGATION

### 3.1 Membrane Interface Hydraulic Profiling Tool Evaluation

The previous subsurface investigations identified soil contamination with petroleum hydrocarbons in the area of the Former Gasoline Service Station. A combination membrane interface probe and hydraulic profiling tool (MIHPT) will be utilized to delineate the plume in real-time. This methodology utilizes a low-level membrane interface probe (MIP) on a direct push technology drilling rig will be utilized to measure VOC contamination in the unsaturated and saturated zone to a depth of 25 feet bgs in the approximate locations identified on Figure 6. The MIP system operates by heating the soil and groundwater adjacent to the probe to 120-degrees Celsius to volatilize VOCs in the immediate vicinity of the MIP membrane. The volatilized VOCs diffuse across the membrane into a closed loop system that plots estimated vapor concentrations with respect to depth and indicates the presence (or absence) of total VOC compounds. When utilized in conjunction with the Hydraulic Profiling Tool (HPT), changes in pressure are recorded and the corresponding hydraulic conductivity is calculated.

Up to 20 locations are proposed with field conditions determining the exact location and number of locations. The low-level MIP measures VOC concentrations, electrical conductivity of soil, and soil permeability and utilizes a pulse-flow controller to enhance the contaminant detection approximately 10 times that of standard MIP. In accordance with DER-10, concurrent subsurface soil samples will be collected for NYSDOH Environmental Laboratory Approval Program (ELAP)-approved laboratory analysis at a rate of 10%, discussed further in Section 3.2.2.

### 3.2 Sampling of Environmental Media

#### 3.2.1 Shallow Subsurface Soil

Based on the surface soil sample results from previous investigations, similar impacts with SVOC and metal contamination are expected across the Site. Additional shallow subsurface soil sampling at the locations identified on Figure 6 are proposed to evaluate areas not sampled previously. Samples from two locations will be collected from 1-2 feet bgs and 4-5 feet bgs using direct push technology drilling rig (e.g. Geoprobe®).

Two soil samples from each location will be collected and submitted under proper chain of custody to an ELAP-certified laboratory for the analyses listed in Table 3 and below:

- Target Contaminant List (TCL) SVOCs via EPA Method 8270, including 1,4-Dioxane
- Target Analyte List (TAL) Metals via EPA Method 6010/7471

To comply with the April 2023 Sampling, Analysis, and Assessment of Per- and Polyfluoroalkyl Substances (PFAS) Under NYSDC's Part 375 Remedial Programs, each location will be sampled at the one to two-foot depth to evaluate PFAS via EPA Method 1633.

Non-disposable equipment will be decontaminated between locations and field personnel will wear PFAS sampling compliant clothing and personal protective equipment in accordance with the FSP. Each sample will be placed in a decontaminated stainless-steel bowl, homogenized, and placed in laboratory-provided PFAS-free containers. Quality assurance samples will be collected in accordance with the frequency described in DER-10, as presented in the QAPP and FSP. The samples will be submitted under proper chain-of-custody to an ELAP-certified laboratory for analysis of PFAS via EPA Method 1633.

### 3.2.2 Subsurface Soil

Subsurface soils across the Site are well characterized, particularly around the suspect sources of contamination: the Former Gasoline Service Station, as discussed in Section 2. However, to comply with the DER-10 requirement to conduct laboratory analysis of split samples at a frequency of 10% of locations where field-testing technology is proposed (aka. MIP), a maximum of four subsurface soil samples will be collected from two soil boring locations at the following intervals:

1. The interval exhibiting field evidence of contamination (MIP and/or PID), or the two-foot interval above the water table in the event field evidence of contamination is not observed.
2. The interval directly beneath the where field evidence of contamination is no longer present.

The soil borings will be installed directly adjacent to MIP locations. These four soil samples will be collected and submitted under proper chain of custody to an ELAP-certified laboratory for analysis of TCL VOCs via EPA Method 8260/5035 including Tentatively Identified Compounds (TICs).

Additionally, the interval exhibiting field evidence of contamination or the two foot interval directly above the water table will be analyzed for:

- PFAS via EPA Method 1633
- 1,4-Dioxane via EPA Method 8270SIM

### 3.2.3 Groundwater

To confirm the presence or absence of contamination in the groundwater, three permanent, stick-up steel casing groundwater monitoring wells will be installed in the locations identified on Figure 7.

The monitoring wells will be installed to screen the shallow water bearing zone and will screen the interval from the bottom of the well to the top of the water table, previously identified at approximately 18 feet bgs.

Wells will be constructed with two-inch diameter polyvinyl chloride (PVC) riser pipe and well screen which will have a slot opening size of 0.010-inches. The screen will be installed within the groundwater zone of interest, as described above. A sand pack will be placed within the annulus between the borehole and the well screen. A two-foot bentonite seal will then be placed above the screen and the remaining borehole between the bentonite seal and the ground surface will be backfilled with bentonite-cement grout. Stick-up steel protective casings will be installed at each well location to protect the PVC riser. The monitoring wells will be surveyed after installation to obtain the top of casing and riser elevations. Soil cuttings from drilling operations will not be used as backfill in any of the monitoring wells and will be containerized for characterization and off-site disposal at a later date.

Once the wells are installed, each well will be developed using a combination of pumping and surging until the turbidity of the groundwater is less than 50 nephelometric turbidity unit (NTUs), or for a maximum of two hours each, whichever is achieved first.

From the three monitoring well locations, samples will be collected for the following parameters, as described in Table 3:

- TCL VOCs via EPA Method 8260 +TICs
- TCL SVOCs via EPA Method 8270 + TICs
- 1,4-Dioxane via EPA Method 8270-SIM
- TAL Metals via EPA Method 6010/7471
- Total Polychlorinated Biphenyls (PCBs) via EPA Method 8082
- PFAS via EPA Method 1633

All purging and sampling of the permanent wells will be conducted in accordance with the FSP. Quality assurance samples will be collected in accordance with the frequency described in DER-10, as presented in the QAPP and FSP.

### **3.2.4 Sub-Slab Vapor/Ambient Air/Soil Vapor**

As previously discussed in Sections 2.5.4 and 2.5.7, sub-slab vapor and ambient air sampling within the buildings on-site has been conducted previously and the data is presented on Figure 5. Tight shallow subsurface soils prevented sufficient air flow to collect soil vapor samples across the parking lot areas of the Site, so soil vapor was unable to be evaluated.

The Site structures will be demolished during redevelopment of the property. Newly constructed buildings will be equipped with a sub-slab ventilation system (SSVS) due to the presence of historical petroleum contamination at the Site. Therefore, no additional concurrent sub-slab vapor and indoor air samples are proposed.

### **3.2.5 Floor Trench Sediment/Sludge**

During the site reconnaissance for the Phase I Environmental Site Assessment, a floor trench with a noticeable petroleum sheen and odor was identified in the garage of the former gasoline service station. One sediment/sludge sample from the floor trench will be collected and analyzed for TCL VOCs via EPA Method 8260 and TCL SVOCs via EPA Method 8270.

**Table 3. Sampling Rationale**

Sample ID	Matrix	Sample Depth(s)	Sample Location	Analytical Parameters	Rationale
SOIL-101 and SOIL-102	Shallow Subsurface Soil	2 samples collected at each location at depths of 1-2 ft and 4-5 ft bgs.	Site-wide evaluation at the locations identified on Figure 6.	TCL SVOCs EPA Method 8270, including 1,4-Dioxane + TICs TAL Metals EPA Methods 6010/7471	Surface soil contamination with SVOCs and Metals was identified in two of three surface soil samples collected on the eastern portion of the Site. To evaluate surface soils for potential contamination.
SOIL-101 and SOIL-102	Shallow Subsurface Soil	Sample collected from 1-2 feet bgs.	Locations will be selected in the field based on recovery of soil with the goal of sampling the locations identified on Figure 6.	PFAS EPA Method 1633	To comply with the April 2023 Sampling, Analysis, and Assessment of PFAS Under NYSDEC's Part 375 Remedial Programs, a limited number of shallow subsurface soil samples will be evaluated for PFAS contamination. Note 1,4-Dioxane will be evaluated in all shallow subsurface soil locations.
MIP-101 through MIP-120	Subsurface Soil	Data logged from the surface to a depth of 25 feet bgs.	Locations identified on Figure 6.	Field screening for qualitative and semi-quantitative evidence of contamination using low-level membrane interface probe technology on a direct push drilling rig.	To delineate the petroleum contamination plume in the region around the Former Gasoline Service station, a membrane interface probe will be utilized.
SOIL-103 and SOIL-104	Subsurface Soil	Two samples collected from each soil boring at the following intervals: 1. collected from the depth exhibiting evidence of	Two locations adjacent to MIP sample points identified on Figure 6.	TCL VOCs EPA Method 8260/5035 + TICs	In accordance with DER-10, field testing technology, such as MIP, is acceptable but should be accompanied by analysis by an ELAP-certified laboratory at a rate of 10% of the samples evaluated by direct-sending down-hole tools. Therefore, two subsurface soil

Sample ID	Matrix	Sample Depth(s)	Sample Location	Analytical Parameters	Rationale
		contamination based on MIP results field observations. 2. collected from the interval directly beneath the where field evidence of contamination is no longer present.			samples are proposed from adjacent to MIP locations to compare the analytical laboratory results to the MIP output.
SOIL-103 and SOIL-104	Subsurface Soil	One soil sample collected from each soil boring at the interval exhibiting field evidence of contamination or the two foot interval above the water table.	Two locations identified on Figure 6.	PFAS EPA Method 1633 1,4-Dioxane EPA Method 8270E-SIM	At the request of the NYSDEC, emerging contaminants PFAS and 1,4-Dioxane were added to the subsurface soil sampling effort.
MW-101 to MW-103	Groundwater	Shallow water bearing zone based on field determination.	Locations identified on Figure 7. MW-101 installed in the presumed upgradient direction. MW-102 installed in the known source of contamination. MW-103 installed south of the source to further assess potential off-site sources of contamination.	TCL VOCs EPA Method 8260 + TICs TCL SVOCs EPA Method 8270 + TICs TAL Metals EPA Methods 6010/7471 Total PCBs EPA Method 8082 PFAS EPA Method 1633 1,4-Dioxane via	Permanent monitoring wells will be installed in accordance with the RIWP and FSP. All monitoring wells will screen the top of the shallow water bearing zone expected to be approximately 18 feet bgs.



Sample ID	Matrix	Sample Depth(s)	Sample Location	Analytical Parameters	Rationale
				EPA Method 8270-SIM	
Floor Trench	Sediment/Sludge	N/A	Floor trench within the former vehicle maintenance garage inside the building.	TCL VOCs via EPA Method 8260/5035 TCL SVOCs via EPA Method 8270	At the request of the NYSDEC, one sludge sample from the floor trench was included to further evaluate a recognized environmental condition identified in the 2024 Phase I ESA prepared by CHA.
SOIL-WC-1	Soil	N/A	Investigation derived waste stored in 55-gallon drums for off-site disposal.	TCLP VOCs EPA Method 8260/1311 TCLP SVOCs EPA Method 8270/1311 TAL Metals EPA Methods 6010/7471/1311 Total PCBs EPA Method 8082 TCLP Herbicides EPA Method 8081/1311 TCLP Pesticides	One waste characterization soil sample will be collected to adequately characterize the soil for off-site disposal at a permitted facility.

Sample ID	Matrix	Sample Depth(s)	Sample Location	Analytical Parameters	Rationale
				EPA Method 8151/1311 Reactivity, Ignitability, Corrosivity	
WATER-WC-1	Groundwater	N/A	Investigation derived waste stored in 55-gallon drums for off-site disposal.	TCL VOCs EPA Method 8260 TCL SVOCs EPA Method 8270 TAL Metals EPA Methods 6010/7471 Total PCBs EPA Method 8082	One waste characterization groundwater sample will be collected to adequately characterize the purged groundwater for off-site disposal at a permitted facility.

### **3.3 Project Plans**

#### **3.3.1 Community Participation Plan**

A CPP, prepared in accordance with DER-23 Citizen Participation Handbook for Remedial Programs, was submitted under separate cover concurrently with the BCP Application.

#### **3.3.2 Field Sampling Plan**

The proposed work described in this RIWP will be performed in accordance with the FSP, included as Appendix A. The FSP details the specific sampling objectives, procedures, and protocols associated with the scope of work, described in Section 3.1. Additionally, the FSP details decontamination procedures and management of investigation derived waste.

#### **3.3.3 Quality Assurance Project Plan**

A QAPP has been prepared for the RIWP. The QAPP presents the policies, organization, objectives, and specific activities designed to achieve the specific data quality goals associated with the RI. Additionally, the QAPP specifies data reporting, data validation, and electronic data deliverable requirements for this scope of work. A project specific QAPP is provided in Appendix B.

Quality Assurance (QA) is defined as the program for assuring the reliability of monitoring and measurement data which includes a system for integrating the planning, assessment, and improvement efforts to meet the data quality requirements.

Quality Control (QC) is defined as the routine application of procedures for attaining the prescribed standard of performance in the monitoring and measurement process.

#### **3.3.4 Health and Safety Plan**

A site-specific HASP was prepared for CHA personnel using the information from previous investigations into known physical and chemical hazards present at the Site and an evaluation of the risks associated with the investigations. Available Site information was examined and adequate warnings and safeguards for field personnel were selected. CHA field personnel are required to review and sign the HASP before entering the field. The site-specific HASP is provided in Appendix C. Subcontractors to CHA are required to develop and implement their own HASP.

#### **3.3.5 Community Air Monitoring Plan**

The purpose of a 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 the proposed remedial investigation activities. A copy of the site-specific CAMP is provided in Appendix D.

CAMP is generally not required for investigation or delineation of site conditions which are not considered intrusive.

### 3.4 Data Usability

A data usability review will be completed for the analytical data generated as part of this investigation to assess for accurateness and defensibility. The review of analytical data provided by an ELAP-certified laboratory will include an Analytical Services Protocol (ASP) Category B deliverable consistent with the NYSDEC Data Usability Summary Report (DUSR) Guidance. Third-party data validation will be conducted and a DUSR will be developed.

### 3.5 Qualitative Exposure Assessment

A Qualitative Exposure Assessment for human health is required to be completed during the RI to identify, evaluate, and document potential exposure to contaminants. The assessment includes the following items and will be developed in accordance with Appendix 3B of DER-10:

- Description of the nature and size of the population currently exposed or which may be reasonably expected to be exposed to the contaminants that are present or migrating from the Site;
- An explanation of the contaminant release and transport mechanisms;
- A determination of the reasonably anticipated future land use of the Site, if applicable;
- Identification of potential exposure point(s) where actual or potential human contact with a contaminated medium may occur; and,
- Characterization of the exposure setting, identifying current and reasonably foreseeable exposure pathways.

Note that GW Syracuse is applying as a Volunteer in the BCP and is not required to evaluate off-site impacts.

## 4.0 REPORTING

An RI Report will be prepared to summarize the information generated during implementation of this RIWP. The report will be prepared in accordance with the New York State Department of Environmental Conservation's "DER-10 Technical Guidance for Site Investigation and Remediation" (May 2010).

The report will also include the following information and data pertaining to the Site:

1. A narrative that summarizes the results of the investigation including a discussion of the physical and analytical results.
2. A characterization of the soil, soil vapor, and groundwater of the site to allow for the confirmation of the source(s) of the contamination, movement of the contamination, and nature and extent of contamination.
3. Figures showing the locations of the surface and shallow subsurface samples, soil vapor points, and groundwater monitoring wells at the Site.
4. Tables and figures summarizing the analytical data for soil, soil vapor, and groundwater samples collected including comparisons to appropriate standards, criteria, and guidance (e.g., 6 NYCRR Part 375 Soil Cleanup Objectives for Restricted Residential Use and NYSDEC TOGS 1.1.1. AWQS)
5. A qualitative exposure assessment for contamination, if any, emanating from the Site.
6. Conclusions and recommendations regarding the environmental status of the site.

## 5.0 SCHEDULE

The following table provides an estimated schedule for completion of the Gateway Syracuse Apartments project. The overall progress of the project will be dependent upon a number of factors including, but not limited to, NYSDEC review and approval timeframes, time of year at which the final design documents are complete, weather conditions at the time of remedial construction, etc.

**Table 4. Proposed Schedule**

<b>Task</b>	<b>Estimated Month Complete</b>
Submit BCP Application Concurrently with this RIWP	Actual: July 2024
NYSDEC 60-Day Comment Period	Actual: September/October 2024
Public 45-Day Comment Period	
NYSDEC Execution of BCA	Actual: February 2025
Approval of the RIWP	April 2025
Conduct the RIWP Field Work Described Herein	April 14-24, 2025
Submit Remedial Investigation Report	June 2025
Submit Draft Remedial Design Work Plan with Alternatives Analysis	July 2025
NYSDEC Selects Proposed Remedy	August 2025
NYSDEC 45-Day Comment Period	October 2025
Public Meeting (optional)	October 2025
Finalize the Remedial Design Work Plan and Issue Construction Notice	December 2026
Construction Complete	June 2026
Submit Draft Final Engineering Report and Draft Site Management Plan	July 2026
NYSDEC Issues Certificate of Completion	September 2026
Begin Operations & Monitoring per requirements of Site Management Plan and Institutional and Engineering Controls	

## 6.0 REFERENCES

6 NYCRR Part 375, Environmental Remediation Programs. December 14, 2006.

*Additional Subsurface Investigation Report*, prepared by CHA Consulting, Inc., dated June 25, 2024.

*Geologic Map of New York: Finger Lakes Sheet*. USGS. Rickard and Fisher, 1970.

*Geophysical Survey and Limited and Focused Subsurface Soil Investigation Report*, prepared by Lender Consulting Services, Inc., dated September 22, 2016.

*Limited Phase II Subsurface Investigation*, prepared by CHA Consulting, Inc., dated February 22, 2024.

NYSDEC DER-10 – “Technical Guidance for Site Investigation and Remediation”, issued May 3, 2010.

*Phase I Environmental Site Assessment*, prepared by CHA Consulting, Inc., dated February 22, 2024.

*Surficial Geologic Map of New York: Finger Lakes Sheet*. Cadwell 1986.

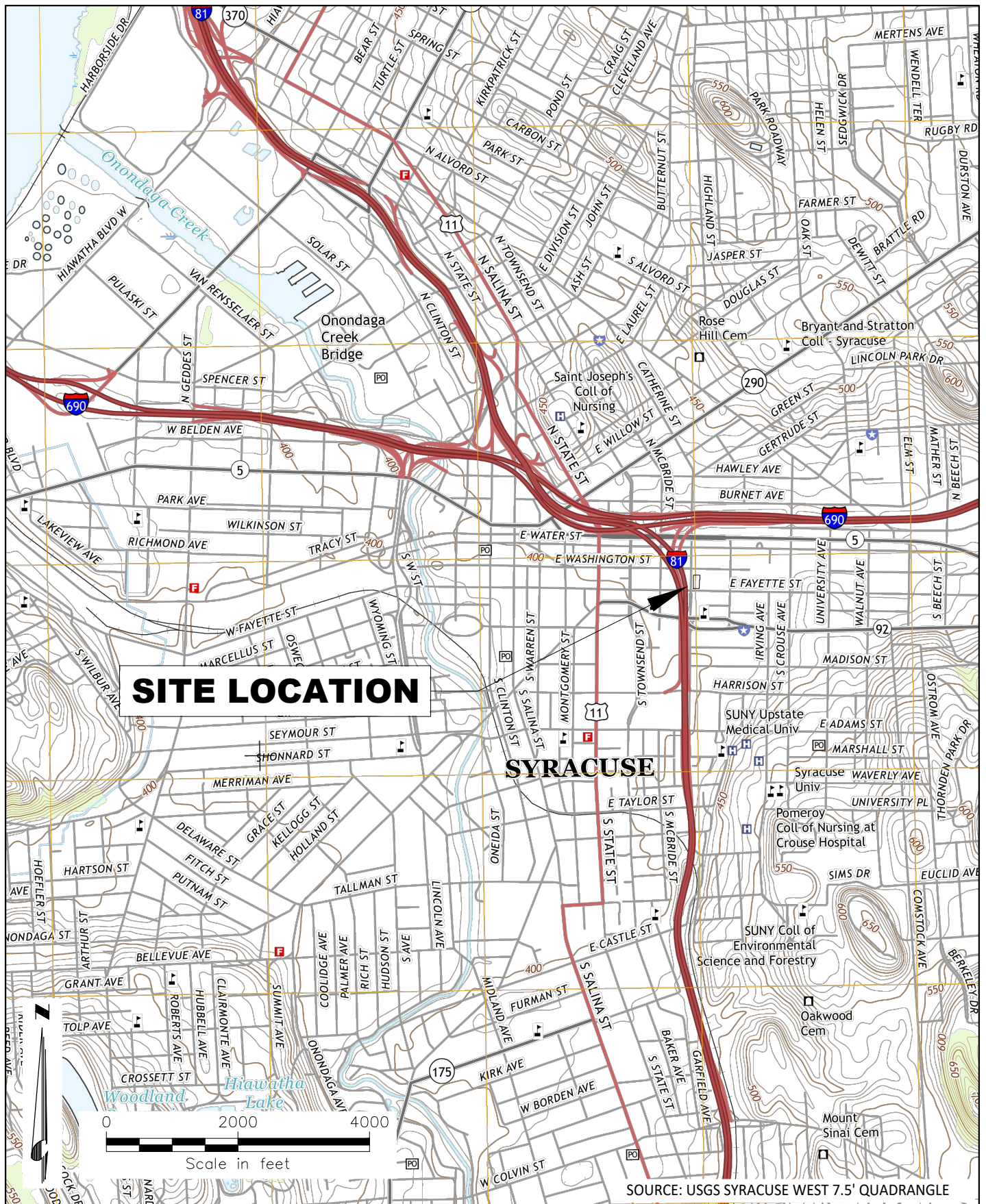
*Transaction Screen*, prepared by Lender Consulting Services, Inc., dated August 5, 2016.

*USDA Soil Survey for Onondaga County*. accessed online July 1, 2024.

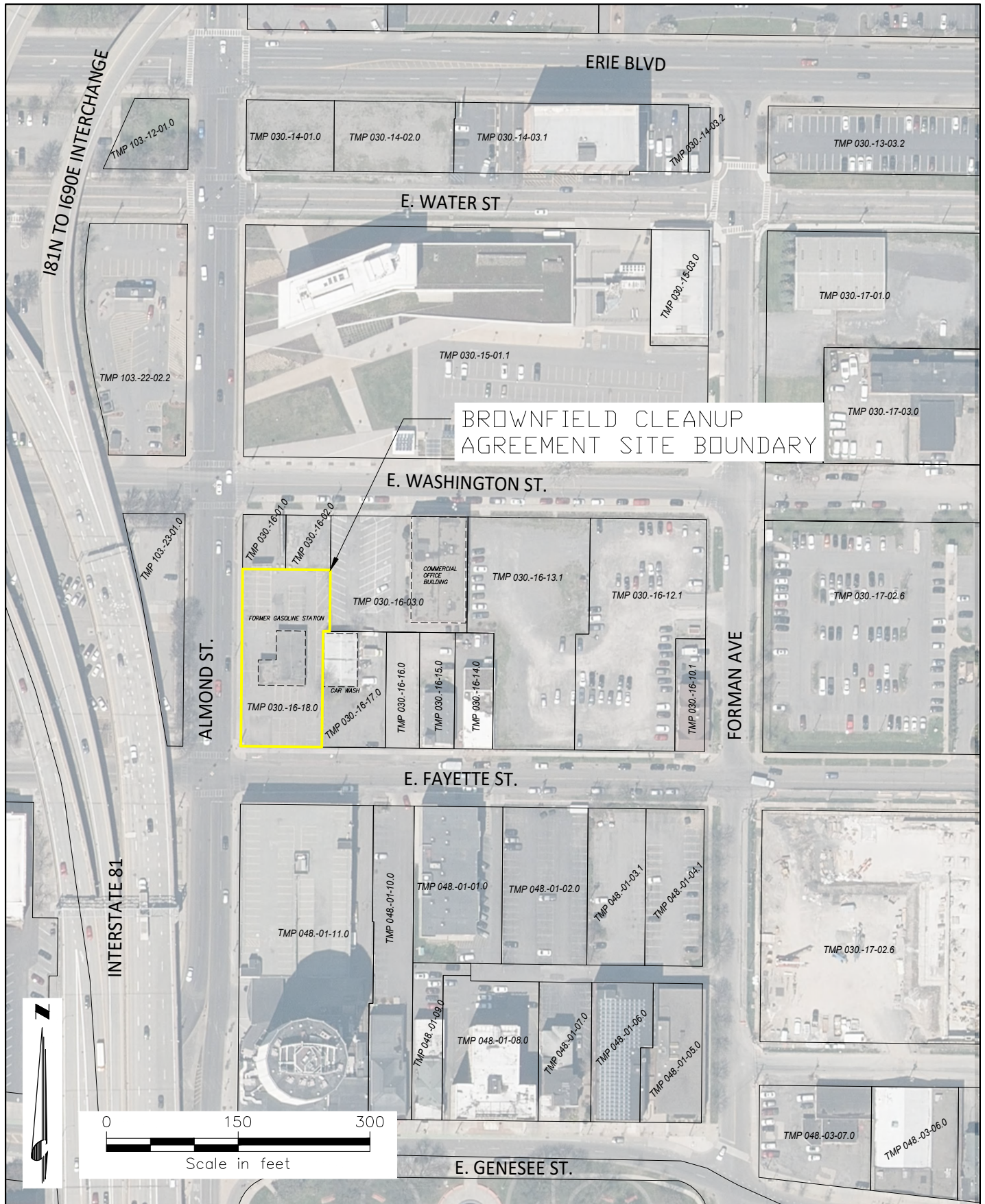
# FIGURES



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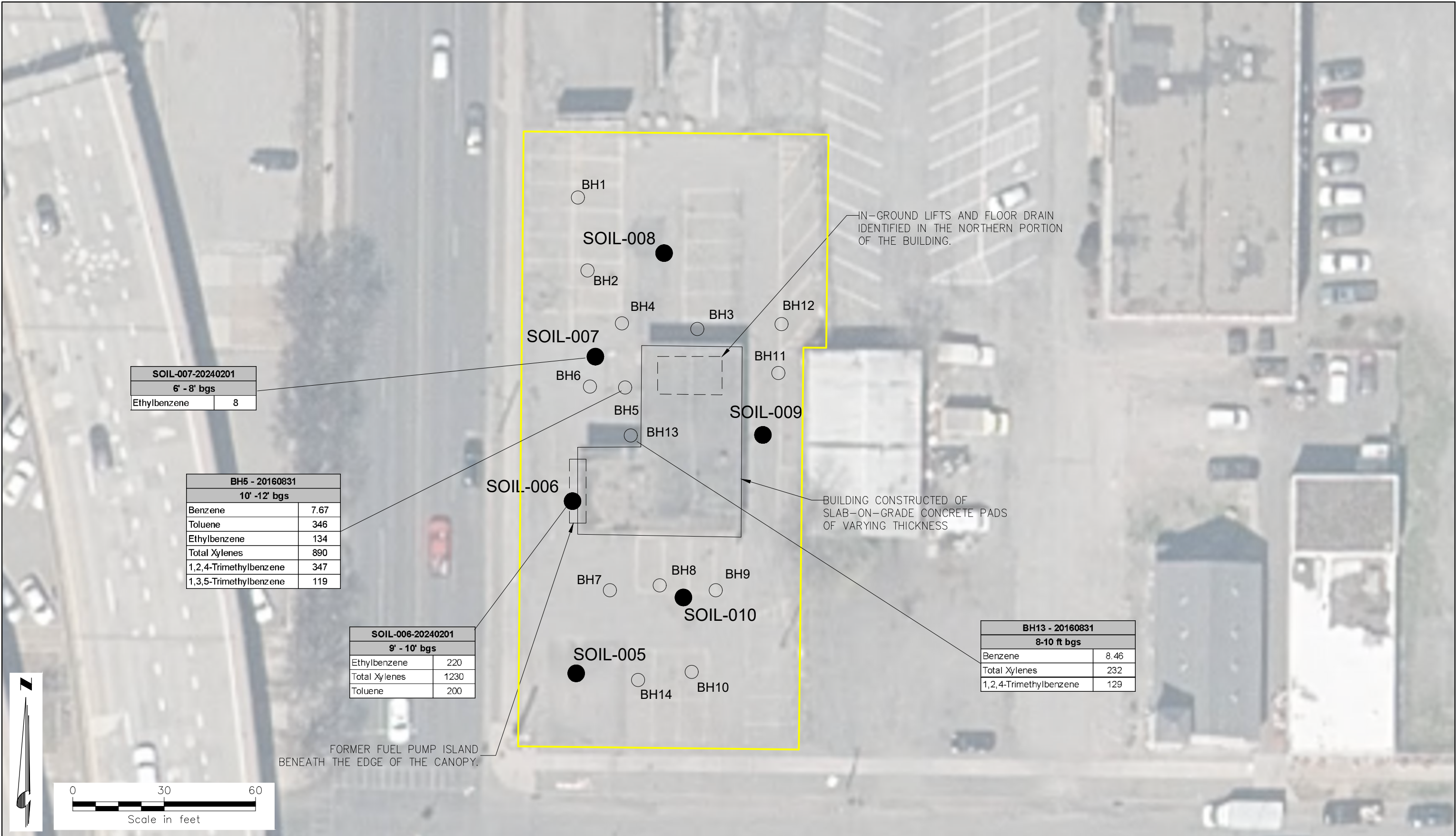








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- CHA SUBSURFACE SOIL SAMPLE
- LCS SUBSURFACE SOIL SAMPLE

- BROWNFIELD CLEANUP AGREEMENT BOUNDARY

DATA PRESENTED IN MILLIGRAMS PER KILOGRAM (MG/KG), APPROXIMATELY EQUAL TO PARTS PER MILLION. DATA PRESENTED EXCEEDS THE TITLE 6 NYCRR PART 375 RESTRICTED RESIDENTIAL SOIL CLEANUP OBJECTIVE.

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Syracuse, NY 13202  
315.471.3920 • www.chasolutions.com

SOIL EXCEEDANCES MAP  
SYRACUSE GATEWAY APARTMENTS  
701 EAST FAYETTE STREET  
SYRACUSE, NEW YORK 13210

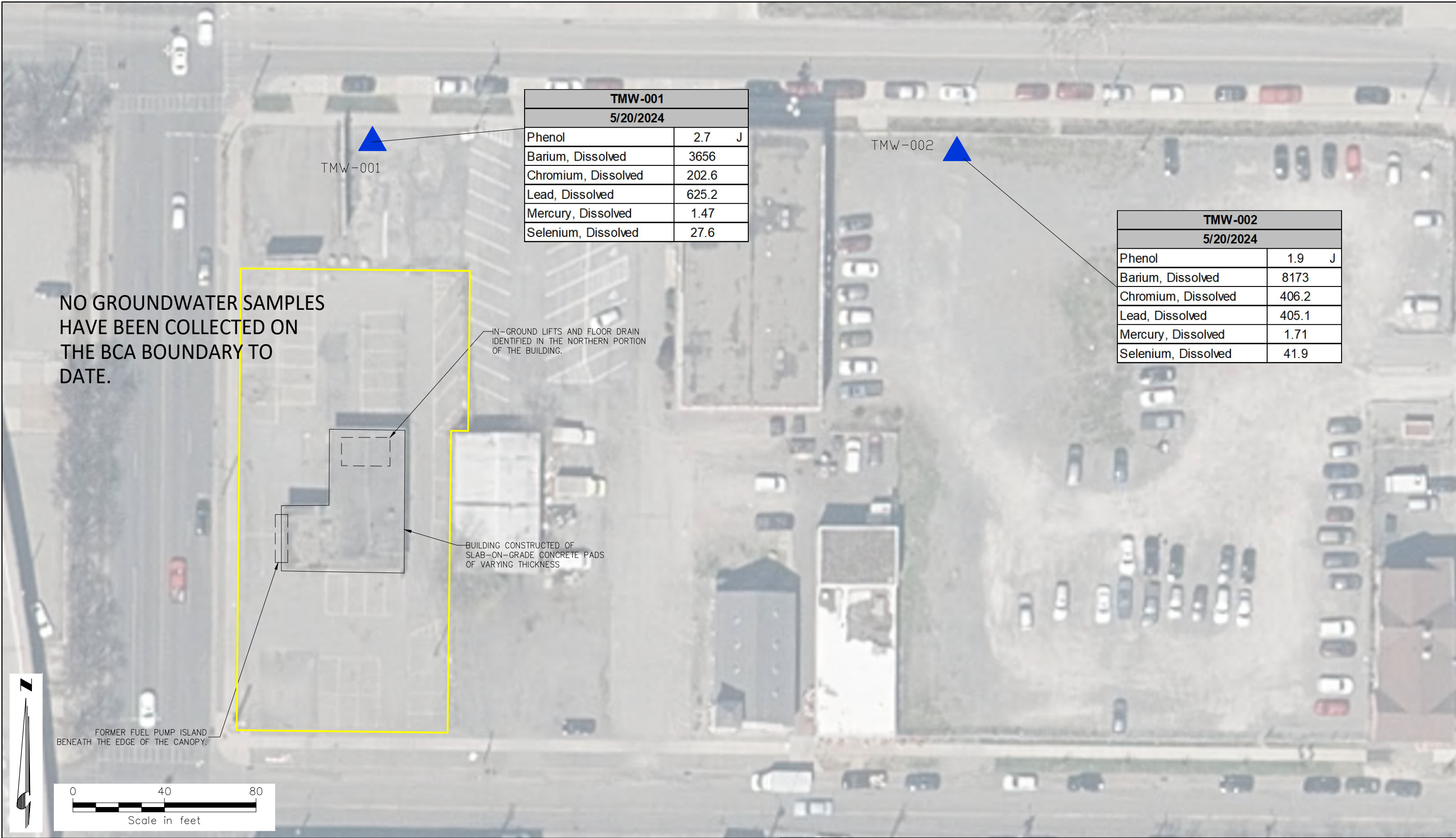
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086328

DATE: 04/2025

FIGURE 3





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TMW-001		
5/20/2024		
Phenol	2.7	J
Barium, Dissolved	3656	
Chromium, Dissolved	202.6	
Lead, Dissolved	625.2	
Mercury, Dissolved	1.47	
Selenium, Dissolved	27.6	

TMW-002		
5/20/2024		
Phenol	1.9	J
Barium, Dissolved	8173	
Chromium, Dissolved	406.2	
Lead, Dissolved	405.1	
Mercury, Dissolved	1.71	
Selenium, Dissolved	41.9	

-  TEMPORARY GROUNDWATER MONITORING WELL
-  BROWNFIELD CLEANUP AGREEMENT BOUNDARY

DATA PRESENTED IN MICROGRAMS PER LITER (UG/L),  
APPROXIMATELY EQUAL TO PARTS PER BILLION.  
DATA PRESENTED EXCEEDS THE TECHNICAL AND OPERATIONAL  
GUIDANCE SERIES 1.1.1. (TOGS 1.1.1) AMBIENT WATER QUALITY  
STANDARDS.  
*J = ESTIMATED VALUE*

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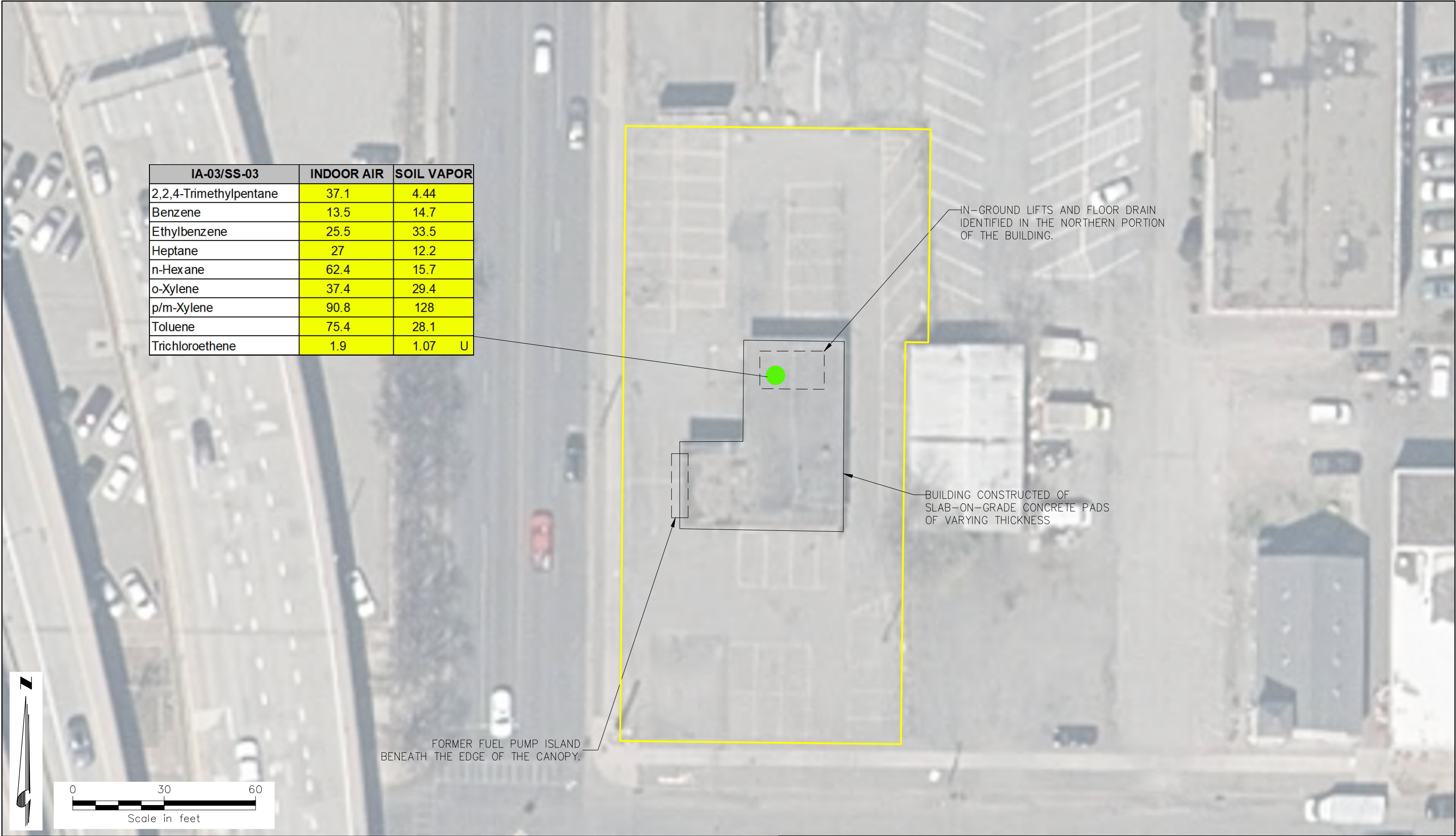
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GROUNDWATER EXCEEDANCES MAP  
SYRACUSE GATEWAY APARTMENTS  
701 EAST FAYETTE STREET  
SYRACUSE, NEW YORK 13210

PROJECT NO. 086328
DATE: 04/2025
FIGURE 4



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INDOOR AIR/SUB-SLAB VAPOR SAMPLE

BROWNFIELD CLEANUP AGREEMENT BOUNDARY

SAMPLE LOCATIONS ARE APPROXIMATE

DATA PRESENTED IN MICROGRAMS PER CUBIC METER (UG/M3). DATA PRESENTED HAVE AN IDENTIFIED ACTION ACCORDING TO THE NYSDOH DECISION MATRICES A THROUGH F. YELLOW INDICATES "IDENTIFY SOURCES AND RESAMPLE, OR MITIGATE" AND ORANGE INDICATES "MONITOR". NO HIGHLIGHT INDICATES MAX CONCENTRATION BUT "NO FURTHER ACTION"

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INDOOR AIR/SUB-SLAB VAPOR RESULTS MAP

SYRACUSE GATEWAY APARTMENTS  
701 EAST FAYETTE STREET  
SYRACUSE, NEW YORK 13210

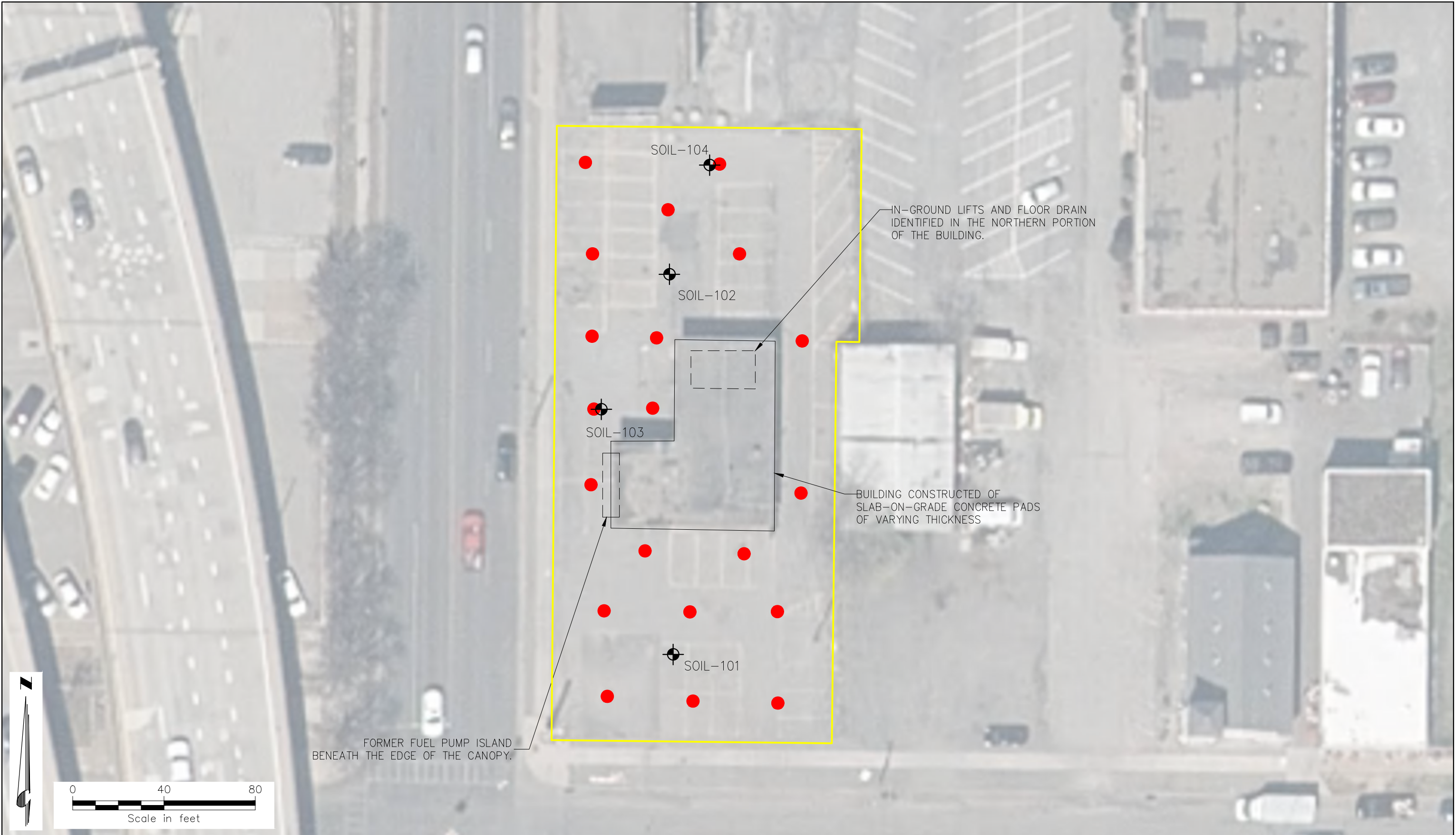
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086328




DATE: 04/2025

FIGURE 5



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-  PROPOSED LOCATION OF MEMBRANE INTERFACE PROBE SAMPLING
-  PROPOSED LOCATION SOIL SAMPLING – SEE RIWP FOR PROPOSED DEPTHS
-  BROWNFIELD CLEANUP AGREEMENT BOUNDARY

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MEMBRANE INTERFACE PROBE AND SOIL  
SAMPLE LOCATION MAP  
  
GATEWAY SYRACUSE APARTMENTS  
REMEDIAL INVESTIGATION WORK PLAN

PROJECT NO. 086328
DATE: 03/2025
FIGURE 6





PROPOSED PERMANENT GROUNDWATER MONITORING WELL



BROWNFIELD CLEANUP AGREEMENT BOUNDARY

# APPENDIX A

Field Sampling Plan



# FIELD SAMPLING PLAN

**Gateway Syracuse Apartments**  
701 E. Fayette Street  
Syracuse, New York 13210

CHA Project Number: 086328.000

**July 2024**

**Revised: March 2025**

**Prepared for:**  
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1221 E. Genesee St.  
Syracuse, New York 13201

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Syracuse, New York 13202  
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## LIST OF APPENDICES

Appendix A CHA Standard Operating Procedures

## LIST OF ACRONYMS & ABBREVIATIONS

BCP	Brownfield Cleanup Program
CHA	CHA Consulting, Inc.
ELAP	Environmental Laboratory Approval Program
FID	Flame Ionization Detector
FSP	Field Sampling Plan
EPA	Environmental Protection Agency
FSP	Field Sampling Plan
HASP	Health and Safety Plan
HDPE	High-Density Polyethylene
HPT	Hydraulic Profile Tool
IDW	Investigation Derived Waste
MIP	Membrane Interface Probe
NTU	Nephelometric Turbidity Units
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
PFAS	Per- and Polyfluoroalkyl Substances
PPE	Personal Protective Equipment
QAPP	Quality Assurance Project Plan
RIWP	Remedial Investigation Work Plan
SOP	Standard Operating Procedures
TAL	Target Analyte List
TCL	Target Contaminant List
TIC	Tentatively Identified Compounds

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## 1.0 INTRODUCTION

This Field Sampling Plan (FSP) has been prepared for the Gateway Syracuse Apartments (Site), located at 701 East Fayette Street in the City of Syracuse, Onondaga County, New York, and is to be utilized during implementation of the Remedial Investigation Work Plan (RIWP). The Site is an applicant into the New York State Department of Environmental Conservation (NYSDEC) Brownfield Cleanup Program (BCP).

This FSP outlines the protocols which will be followed during the remedial investigation activities and has been prepared as an appendix to the RIWP for the project. In general, all activities will be performed in accordance with the CHA Consulting, Inc. (CHA) Standard Operating Procedures (SOPs) that are included in Appendix A.

The following activities will be conducted as part of the site investigation activities:

- Subsurface evaluation with a membrane interface probe (MIP);
- Installation of soil borings and monitoring wells;
- Collection of shallow subsurface surface and subsurface soil samples;
- Collection of groundwater samples;
- Waste characterization sampling;
- Equipment decontamination; and
- Waste handling.

## 2.0 GENERAL SAMPLING PROTOCOLS

The sampling approach and rationale for sample collection is described in the RIWP. The Data Quality Objectives for the project and the quality assurance and quality control procedures for the project are described in the Quality Assurance Project Plan (QAPP), found in Appendix B of the RIWP. Sampling activities will be conducted in a manner to protect both workers in accordance with the Health and Safety Plan (HASP), found in Appendix C of the RIWP.

### 2.1 Sample Designation

Each sample will be uniquely defined by including the media type and sequential number. To avoid confusion with samples collected prior to this RIWP, CHA will start at number 101 on all media types (e.g. SOIL-101). For all soil sample locations, multiple sampling intervals are proposed. Therefore, the interval in which the sample is collected shall be incorporated into the sample nomenclature.

The following abbreviations will be used to identify media types:

Sample Type	Abbreviation	Example Sample ID
Shallow Surface Soil 1 to 2 feet bgs	SOIL	SOIL-101-1'-2'
Shallow Surface Soil 4 to 5 feet bgs	SOIL	SOIL-101-4'-5'
Subsurface Soil	SOIL	SOIL-101-18'-20'
Subsurface Soil direct sensing with Membrane Interface Probe (MIP)	MIP	MIP-101
Groundwater	MW	MW-101

## 2.2 Sample Handling

A new pair of disposable latex gloves will be used at each location sampled for chemical analyses. Additional glove changes will be undertaken as conditions warrant.

Sample containers will be new and delivered from the laboratory prior to the sampling event. Sample containers will come with the proper volume of chemical preservative appropriate for the type of analysis as detailed in CHA SOP#603.

After sample collection, the sample containers will be logged onto a chain of custody record described in the Quality Assurance Project Plan. The sample containers will be placed on ice and/or ice packs in laboratory supplied rigid coolers after collection and labeling. Remaining space will be filled with packing material to cushion the containers during transportation or shipment.

For this project CHA staff will hand deliver the sample coolers to the Pace Analytical Services' facility located in Syracuse, New York, or coordinate with their courier service.

Samples will remain under the control of CHA's field representative until relinquished to the laboratory under chain-of-custody (see QAPP).

## 2.3 Field Documentation

Pertinent field survey and sampling information shall be recorded in a logbook or on field logs during each day of the field effort per CHA SOP#101 Field Logbook and Photographs.

At a minimum, entries in a logbook shall include:

- Date and time of starting work
- Names of all personnel at site
- Weather conditions
- Purpose of proposed work effort
- Sampling equipment to be used and calibration of equipment
- Description of work area
- Location of work area, including map reference
- Details of work effort, particularly any deviation from the field operations plan or standard operating procedures
- Field observations
- Field measurements (e.g., photoionization detector (PID) readings)
- Field laboratory analytical results
- Daily health and safety entries, including levels of protection
- Type, number, and location of samples
- Sampling method, particularly deviations from the standard operating procedures
- Sample location and number
- Sample handling, packaging, labeling, and shipping information (including destination)

In addition to keeping logs, photographs will be taken to provide a physical record to augment the fieldworker's written observations. For each photograph taken, several items shall be recorded in the field logbooks:

- Date and time

- Name of photographer
- General direction faced and description of the subject photographed

Additional protocols specific to each sampling method are presented in the following sections.

## 3.0 PROPOSED REMEDIAL INVESTIGATION ACTIVITIES

### 3.1 Shallow Subsurface Soil

Shallow subsurface soil samples will be collected from surface to final depth using either a Macrocore® sampling device or manually using a slide hammer hand sampler in the locations identified on Figure 6 of the RIWP. The soil samples will then be screened in the field for visual, olfactory, and photoionic evidence of contamination. Soils will be logged in the field using a modified soil classification method on Soil Probe Logs in accordance with CHA SOP#303.

Immediately upon opening the soil sampler, a PID or equivalent meter will be used to obtain readings along the length of the soil sample. One soil sample from each soil boring location will be submitted to an off-site New York State Department of Health (NYSDOH) Environmental Laboratory Approval Program (ELAP)-certified laboratory for a select set of parameters as described in Table 3 of the RIWP.

The sample volume will be homogenized by the following process:

1. Remove rocks, twigs, leaves and other debris from the sampling device.
2. Place the sample into a stainless-steel bowl and thoroughly mix using a stainless-steel spoon.
3. Scrape the sample from the sides, corners and bottom of bowl, roll to the middle of the bowl and mix.
4. Quarter the sample and move to the four corners of the bowl. Each quarter will be individually mixed and rolled to the center of the bowl and then the entire sample will be mixed again.
5. Place the sample into the appropriate glassware require for each parameter in the following order: per- and polyfluoroalkyl substances (PFAS), Target Contaminant List (TCL) semivolatile organic compounds (SVOCs), target analyte list (TAL) Metals.

Before subsurface investigation at each boring location and after drilling at the last location, the drilling or excavation equipment and all non-disposable sampling equipment will be decontaminated in accordance with the protocols established in Section 4. Drill cuttings will be managed as described in Section 5. Soil borings will be backfilled with bentonite.

### 3.2 Source Area – Membrane Interface Probe and Hydraulic Profiling Tool

Direct sensing using downhole equipment attached to a Geoprobe® drilling rig will be utilized to screen subsurface soils for contamination. A subcontractor experienced with this technology will be contracted to perform this work. Generally, low-level MIP screening will be used at approximately 20 locations near the Former Gasoline Service Station to determine the vertical and horizontal extent of contamination. The MIP will be advanced to approximately 25 feet bgs and measure electrical conductivity of soil, total volatile organics with a PID and flame ionization detector (FID). In conjunction with the MIP, a hydraulic profiling tool (HPT) will be utilized downhole to calculate and estimate the corresponding hydraulic conductivity of the soil.

Two subsurface soil samples from depths exhibiting evidence of contamination will be collected using a Macrocore® sampling device on the Geoprobe® drilling rig at locations directly adjacent to MIP locations. These are identified as SOIL-103 and SOIL-104 on Figure 6 of the RIWP. In order to compare the MIP results to laboratory analytical results, samples will be collected from the interval exhibiting evidence of contamination these samples will be analyzed for TCL VOCs via EPA Method 8260, PFAS via EPA Method 1633, and 1,4-dioxane via EPA Method 8270E-SIM. Additionally, two samples will be collected from the depth below the limits of field evidence of contamination and/or MIP detections and analyzed for TCL VOCs via EPA Method 8260, only, to determine the vertical limits of contamination.

### **3.3 Groundwater**

#### **3.3.1 Monitoring Well Installation**

A maximum of three permanent groundwater monitoring wells will be installed in the locations identified on Figure 7 of the RIWP in accordance with CHA SOP#309. The monitoring wells will be installed to an approximate depth of 25 feet below ground surface evaluate the shallow water bearing zone with screen intervals from the bottom of the well to the top of the water table, previously identified at approximately 18 feet bgs.

Wells will be constructed with two-inch diameter PVC riser pipe and well screen and will have a slot opening size of 0.010-inches. A sand pack, consisting of a minimum thickness of one inch, will be placed within the annulus between the borehole and the well screen. A two-foot bentonite seal will then be placed above the screen. The remaining borehole between the bentonite seal and the ground surface will be backfilled with bentonite-cement grout. Flush-mounted or stick-up steel protective casings will be installed at each well location to protect the riser pipes. Soil cuttings from drilling operations will not be used as backfill in any of the monitoring wells.

#### **3.3.2 Monitoring Well Development**

Once the wells are installed, each well will be developed using a combination of pumping and surging in accordance with CHA SOP#311. The newly installed wells will be developed until the turbidity of the groundwater is less than 50 nephelometric turbidity units (NTUs), or for a maximum of two hours each, whichever comes first.

#### **3.3.3 Water Level Gauging**

Groundwater levels will be collected from the monitoring wells and will be used with monitoring well elevation data to determine direction of groundwater flow. Groundwater level measurements will be collected on at least two separate occasions following installation and development: once immediately following development, and once immediately prior to groundwater sampling.

The water level in all monitoring wells will be measured to the nearest 0.01-foot using a Solinst electronic water level meter and recorded prior to the collection of any samples in accordance with CHA SOP#313. Using the well riser elevations and depth to groundwater measurements, CHA will record the water level elevations and construct a groundwater potentiometric surface map. The well depth and depth to water data will be used to calculate the volume of water in the well casing. Water level measuring equipment that contacts groundwater will be decontaminated in accordance with Section 5.0 to minimize the potential for cross-contamination.

### 3.3.4 Groundwater Sampling

Groundwater samples will be collected from proposed wells. Samples will be collected for a select set of parameters, further described in Table 3 of the RIWP. Dedicated/disposable high-density polyethylene (HDPE) tubing will be installed at each well and a certified PFAS-free low-flow pump will be used to collect the sample. All non-disposable equipment will be cleaned in accordance with Section 5.0 to minimize the potential for cross-contamination. Bottle requirements and handling procedures are presented in the QAPP.

Monitoring well sampling will be carried out in accordance with CHA SOP#317 for Low-Flow Groundwater Purging and Sampling and CHA SOP#341 for sampling of PFAS.

All groundwater samples will be analyzed for the parameters listed in Table 3 of the RIWP.

In summary, the sampling procedure includes:

1. Personnel involved in well purging will wear a new pair of disposable nitrile gloves for each well.
2. Flow rate used during purging must be low enough to avoid increasing the water turbidity.
3. Water quality measurements for dissolved oxygen, oxidation-reduction potential, specific conductance, pH, turbidity, and temperature will be taken every 3 to 5 minutes.
4. The well will have reached stability and purging will be considered complete when they are within the following ranges for three consecutive readings:

Dissolved Oxygen	±10%
Oxidation-Reduction Potential (redox)	±10%
Specific Conductance	±3% of reading
pH	±0.1 units
Turbidity	±10%

5. Water will be pumped using a submersible Monsoon pump, or equivalent.
6. Groundwater pumping equipment will be decontaminated in accordance with the protocols presented in Section 4.0.
7. New High Density Polyethylene (HDPE) tubing will be used at each well.
8. Groundwater samples will be analyzed for a select set of parameters as described in Table 3 of the RIWP.
9. Sample preservation details are presented in the QAPP. Sample containers will be prepared by the laboratory and will be pre-labeled and pre-preserved.
10. Calibration of all field instruments will be conducted in accordance with the manufacturer's instructions.
11. QA/QC samples will be collected in accordance with the QAPP.
12. Non-disposable sampling equipment will be decontaminated in accordance with the protocols established in Section 4. Purge water will be managed as described in Section 5.
13. All field personnel shall remove personal protective equipment (PPE) after decontamination of equipment has been completed. Removal of PPE and decontamination of personnel will be in accordance with CHA SOP#505.



### 3.4 Survey

After installation, the elevation of the top of the monitoring well protective casings and riser elevations will be surveyed and tied into the existing Site survey data. The survey data is necessary to determine the overall direction of groundwater flow.

## 4.0 EQUIPMENT DECONTAMINATION

Prior to mobilization, the drill rig shall be thoroughly cleaned to remove oil, grease, mud, and other foreign matter. Subsequently, before initiating drilling at each boring location, samplers, drill steel, and associated equipment will be cleaned to prevent cross-contamination. All cleaning will be conducted at a predetermined on-site location. Cleaning will be accomplished using the procedures outlined in the following sections and in accordance with CHA SOP's.

### 4.1 Small Equipment

For all activities, dedicated sampling equipment is preferred. However, if non-dedicated equipment is used (i.e. Macrocore barrel), the required decontamination procedure for all manual sampling equipment used to collect samples for chemical analysis is provided in CHA SOP#501 and summarized below:

1. Disassemble equipment, as required.
2. Remove gross contamination from the equipment by brushing and then rinsing with tap water.
3. Wash with Alconox and tap water.
4. Rinse with tap water.
5. Rinse with distilled water.
6. Air dry equipment.

Decontaminated equipment will be placed on polyethylene sheeting in order to avoid contacting a contaminated surface prior to use.

Field personnel will use a new pair of outer gloves before handling sample equipment after it is cleaned.

### 4.2 Large Equipment

The permanent components of the drill rig (body, tracks, etc.) are not expected to come into contact with contaminated soils since the work will be performed primarily in an area covered by asphalt and, therefore, will not require decontamination.

Decontamination of any downhole equipment or. The temporary decontamination pad will be constructed with a minimum of two-layers of 10-mil polyethylene sheeting with raised berms and overspray guards around the perimeter to maintain wash fluids on the pad. Wash waters will be containerized with the investigation derived waste discussed in the following section.

## 5.0 INVESTIGATION DERIVED WASTE

Gloves, personal protection equipment, sampling materials, etc. will be collected daily and disposed of as solid waste. All work will be performed in accordance with CHA SOP#507. Soil cuttings from the subsurface investigation and the monitoring well installation will be containerized for off-site disposal as investigation derived waste (IDW) at a permitted disposal facility.

Additionally, all purged water from groundwater sampling and decontamination of large equipment will be containerized in 55-gallon drums, characterized, and disposed of at a permitted disposal facility.

Samples for waste characterization purposes will be collected from both soil and groundwater. One composite soil sample from the drummed soil and one groundwater sample from the drummed water will be collected for a select set of parameters, further described in Table 3 of the RIWP.

# APPENDIX A

CHA Standard Operating Procedures



## **PRE-FIELD ACTIVITY PLANNING AND POST-FIELD ACTIVITY FOLLOW-UP**

### **A. PURPOSE/SCOPE:**

To adequately prepare for conduct field activities and to follow-up after the field work is complete. This SOP generally applies to all field activities and provides a summary of activities to complete both prior to going into and after returning from the field.

### **B. EQUIPMENT/MATERIALS:**

As required for each field task. See individual SOPs.

### **C. PROCEDURE:**

#### **Pre-Field Activity Planning:**

1. Contact property owner/client and obtain authorization to access site, if not already completed by PM.
2. Inquire about field conditions at the Site (access, terrain, overhead clearance, facilities/utilities available, etc.).
3. Consider weather conditions for proper dress and equipment.
4. Consider potential chemical, biological or physical hazards and either prepare, or review the Health and Safety Plan.
5. Review the Project Work Plan (or Pre-sampling Worksheet). Confirm project budget and schedule with PM.
6. If drilling or excavating, verify that CHA and/or our subcontracts have contacted dig-safe (or similar) for marking out public utilities and the property owner for location of private utilities.
7. Complete appropriate checklist for field tasks to ensure all necessary equipment and supplies are available.
8. Schedule the pickup of rental equipment and sample containers from laboratories as necessary.
9. Develop sample naming conventions in advance if samples will be collected. Coordinate with laboratory to get samples containers pre-labeled whenever possible.
10. Review bottle kits sent by laboratory for accuracy and to ensure nothing was broken in shipment (if applicable).
11. Calibrate all equipment per manufacturer's specifications and document calibration is complete.

#### **Post-Field Activity Follow-Up:**

1. Review all forms/paperwork to make sure they are properly filled out. If electronic data tablets were used, download data and review.
2. Decontaminate all equipment that is reusable.
3. Restore site to original condition unless other arrangements have been made.
4. Secure site.



**PRE-FIELD ACTIVITY PLANNING AND POST-FIELD ACTIVITY FOLLOW-UP**

5. Deliver samples (if applicable) to laboratory or courier following chain-of-custody protocols.
6. Return any field equipment utilized for field work.
7. Arrange for disposal of sampling residuals (e.g., PPE, purge water, soil cuttings, etc.).
8. Contact the PM with any unusual information about field activity.
9. Upon returning to the office, scanned forms and electronic data shall be stored in the "Data" folder under the appropriate project number.

**D. QA/QC REQUIREMENTS:**

Not Applicable

**E. SPECIAL CONDITIONS:**

Not Applicable

**F. REFERENCES:**

None

**G. APPENDICES/FORMS:**

Not Applicable

**END OF SOP**

Final Check by C. Burns 10/2/15



## FIELD LOGBOOK AND PHOTOGRAPHS

### A. PURPOSE/SCOPE:

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

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

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

### B. EQUIPMENT/MATERIALS:

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

### C. PROCEDURE:

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



### **FIELD LOGBOOK AND PHOTOGRAPHS**

- o. Sampling method, particularly deviations from the standard operating procedures
- p. Sample location and number
- q. Sample handling, packaging, labeling, and shipping information (including destination)
- r. Time of leaving site.

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

- a. Date and time – Camera set to record on photo
  - b. Name of photographer
  - c. General direction faced and description of the subject
  - d. Sequential number of the photograph
  - e. Always attempt to include an object in the photograph that helps show scale
  - f. Always try to shoot at approximately 50mm focal length (what human eye sees).
2. Each day's entries will be initialed and dated at the end by the author, and a line will be drawn through the remainder of the page.

**D. QA/QC REQUIREMENTS:**

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

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

**E. SPECIAL CONDITIONS:**

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

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

**F. REFERENCES:**

None

**G. APPENDICES/FORMS:**

Not Applicable



## SAMPLE NAMING AND NUMBERING

### A. PURPOSE/SCOPE:

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

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

- a. To ensure that every sample collected at a site has a unique identifier
- b. To enhance clarity in cases of potential ambiguity
- c. To help avoid "naming collisions" that might occur when the data is imported into our Equis or other databases; and
- d. To provide meaningful data to be used in project handovers.

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

### B. EQUIPMENT/MATERIALS:

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

### C. PROCEDURE:

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

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





## SAMPLE NAMING AND NUMBERING

4. All samples collected at a site shall be numbered sequentially for each media type, regardless of the field event or project phase. The use of hyphens to separate segments of a sample name is beneficial for sample name readability. It is also beneficial to use enough leading zeros to accommodate the Sequential Number (or sys\_loc\_code) portion of the sample name, which will assist in sorting sample IDs in the data management program or database (see EQUIS discussion below).
5. Do not include information such as time, sample depths, etc. in the name. This information should be recorded as defined in Section F (below).
6. In no cases shall the multi-field name be longer than 30 characters, including dashes. Ensure that each name is clearly written on both the sample label as well as the Chain of Custody.
7. Do not use special characters (e.g. #, ' , " , @, ! ) when naming samples. Including such characters in the Serial Number (sys\_loc\_codes) or Sample Number (sys\_sample\_codes) can be incompatible with the database.
8. For QA/QC blank samples use the following abbreviations in place of the media type:

Trip Blank .....	TB
Equipment Rinse (Field Blank) .....	FB
Duplicate .....	DUP
Matrix Spike .....	MS
Matrix Spike Duplicate .....	SD

For Duplicate and MS/MSD samples we need to make sure we include the parent sample name. Add the DUP, MS or MSD indicator after the Sequential Number.

For Blind Duplicate samples, use the CHA indicator in place of the Sequential Number. The location should be recorded in the field logs for our evaluation purposes. For example, a blind duplicate sample number for soil collected at the 005 location would be "CS-SOIL-CHA-1."

You would record in the field log that the blind soil duplicate CHA-1 has SOIL-12345-005 as its parent sample.

9. Option to Include the Sample Collection Date - As an option, the date may be included in the sample name. NYS Electronic Data Deliverable guidance suggests using dates in the YYYYDDMM format. Placing the year first provides for ease of sorting data in the database:

However, adding the date adds 9 characters to the sample name thus increasing the complexity of sample numbering. The date is captured on the Chain-of-Custody and in field records.

### D. QA/QC REQUIREMENTS:

All data must be documented on field data sheets or within site logbooks.

Field personnel should verify that all sample data and supporting information in log books is correct prior to leaving the site.



## SAMPLE NAMING AND NUMBERING

### E. SPECIAL CONDITIONS:

NYSDEC EQUIS Considerations:

NYSDEC uses EQUIS for data management and generally requires data to be submitted in EQUIS format. EQUIS has three different sample name related fields, a sample\_name, a sys\_sample\_code and a location\_name. Location\_name will almost always be simplified to something like SW-1, GW-2 etc. and is usually the last field of the sample name.

In terms of the other two, sample\_name is what we record in the field. That is limited to 30 characters of text.

The laboratory generates the sys\_sample\_code by taking the sample\_name field and adding another qualifier, such as the sample delivery group or work order number. EQUIS requires that the sys\_sample\_code field be unique within a database. This is limited to 40 characters of text so it typically will be the sample name plus up to 10 characters.

It is recommended to keep the CHA sample name as short as possible to work with the EQUIS format. The basic sample names identified above are 14 to 17 characters long. If the optional date format is used, sample names will be 23 to 26 characters which is near the limit for what EQUIS can accommodate (and you may have issues physically fitting the sample names legibly into the COC form).

### F. REFERENCES:

NYSDEC, DER-10, Technical Guidance for Site Investigation and Remediation, May 2010,  
[http://www.dec.ny.gov/docs/remediation\\_hudson\\_pdf/der10.pdf](http://www.dec.ny.gov/docs/remediation_hudson_pdf/der10.pdf)

NYSDEC, Electronic Data Delivery Manual, January 2013,  
[http://www.dec.ny.gov/docs/remediation\\_hudson\\_pdf/eddmanual.pdf](http://www.dec.ny.gov/docs/remediation_hudson_pdf/eddmanual.pdf)

New Jersey Department of Environmental Protection, August 2005, Field Sampling Procedures [Manual](#),  
Chap. 6, <http://www.nj.gov/dep/srp/guidance/fspm/>

### G. APPENDICES/FORMS:

Not Applicable

**END OF SOP**

Final Check by C. Burns 12/2/15



## COMPLETING A CHAIN-OF-CUSTODY RECORD

### A. PURPOSE/SCOPE:

This protocol provides a standard operating procedure (SOP) for initiating and maintaining a Chain of Custody (COC) document. A COC is a legal document designed to track persons who are responsible for the preparation of the sample container, sample collection, sample delivery, sample storage, and sample analysis. A COC is an appropriate format to record important data associated with each individual sample. In general, a sample requiring a COC will follow a path as follows:

Sample Collector → Sample Courier/Operator → Sample Custodian

Verification of who has possessed the samples and data and where the samples have been is completed when staff follow chain-of-custody procedures.

### B. EQUIPMENT/MATERIALS:

- Chain of Custody form
- Ball-point, permanent pens
- Gallon-Sized Ziploc Bag (to keep COC dry)
- Field Logbook
- Custody seals
- Padlock(s) (optional)

### C. PROCEDURE:

1. Once a sample has been determined to require a COC, the Sample Collector must initiate the COC. The Sample Collector must fill in the fields provided on the COC. The words “Chain of Custody” must be located in a conspicuous location at the top of the document.
2. The form is generally a three-page carbon copy document, including a white, yellow and pink sheet. While CHA generally uses COCs provided by the applicable laboratory, it is important to ensure that the COC from each lab contains places for all necessary information.
3. The COC at that time should include the fourteen-digit CHA project number and phase, the project name and location.
4. The Client Information Section must be completed. In most cases the “client” will be CHA Consulting, Inc.
5. The first field of information is the Sample Identification or Sample Identification Number. This identification/number must match the identification/number located on the sample container.
6. An information line for the date, time, phone number, printed name of Sample Collector, signature of Sample Collector, organization name (no acronyms), organization’s full mailing address, and sample description must also be included.
7. Sampling personnel should enter the sample number(s) (which should correspond with a unique number on a sample container [SOP #103] if applicable, and parameters to be analyzed. The “Sample ID” must be included and must match the number on the sample.



## COMPLETING A CHAIN-OF-CUSTODY RECORD

8. Subsequent fields must be provided to allow for documentation of information about any subsequent Sample Couriers/Operators or Sample Custodians. These fields must contain the date, time, phone number, printed name of person taking custody of sample, signature of person taking custody of sample and organization name (no acronyms).
9. Field Information - The COC must contain places to enter the following field information: sample number, sampling date, and type of sample. Other field information may be recorded as specified in the field sampling plan or proposal for the project. It is imperative that there be only one sample with a particular sample number per project/study so as to prevent duplicates in Excel files and EQuIS databases.
10. Laboratory Information - Once the sample is delivered to the lab, the laboratory personnel will sign and date the "received by" line located at the bottom of the COC. Other laboratory information may be recorded as specified in the project/study work plan/proposal.
11. Signatures - The COC must contain places for all people who handle the sample to sign his/her name. This is a record of persons who had custody of the sample during all steps of the process from container preparation, sample collection, sample storage and transport, and sample analysis. There should be signature lines to relinquish custody of the sample and to receive custody of the sample.

### D. QA/QC REQUIREMENTS:

The Field Team Leader or senior person on the sampling team will review the completed COC form to verify that all fields are properly completed. For purposes of this SOP, signing the form under Collected/Delivered by is considered evidence that the COC form has been checked for accuracy and completeness.

### E. SPECIAL CONDITIONS:

Whenever samples are split with a source or government agency, a separate chain of custody form should be completed for the samples and the relinquisher (sampler) and recipient should sign. If a representative is unavailable or refuses to sign for the samples, this can be noted in the "remarks" area of the form. When appropriate, as in the case where the representative is unavailable, the custody record should contain a statement that the samples were delivered to the designated location at the designated time. A copy of the chain of custody form for split samples must be kept with the project file.

Samples may require short term storage in field locations prior to delivery to the laboratory for analyses. The storage may be in vehicles or lodging locations. The samples must be secured to limit access to them. A locked vehicle is considered controlled access. However, simply a locked lodging room is not secure due to potential custodial access. If an unattended lodging room is used for sample storage, the samples must be further secured. This may entail a padlock on the ice chest, samples in an ice chest secured in an inner bag with a custody seal on it, and/or ice chest taped shut with custody seal on the outside of it.

### F. REFERENCES:

Sampling Guidelines and Protocols, NYSDEC, <http://www.dec.ny.gov/regulations/2636.html>  
Chain of Custody Protocol is in Appendix 5X.2.



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**Revision #01**  
**02/13/2013**  
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**Author: Sarah Newell, Mark Corey**  
**Reviewer: Keith Cowan, Sandy Warner**

## **COMPLETING A CHAIN-OF-CUSTODY RECORD**

Chain of Custody Procedures for Samples and Data, EPA 50 minute Self Instructional Course:

<http://www.epa.gov/apti/coc/>

SOP for Chain of Custody, EPA Region 1:

[http://www.epa.gov/region6/qa/qadevtools/mod5\\_sops/misc\\_docs/r1\\_chain-of-custody.pdf](http://www.epa.gov/region6/qa/qadevtools/mod5_sops/misc_docs/r1_chain-of-custody.pdf)

G. **APPENDICES/FORMS:**

CHA COC Form

### **END OF SOP**

Final Check by C. Burns 10/7/15



## FIELD DESCRIPTION OF SOILS

### A. PURPOSE/SCOPE:

This objective of this SOP is to establish a consistent method for field staff to follow when completing the description of soil samples and entry onto borehole logs. Consistency with description is important because many employees are involved in logging soils, frequently within the same project. Uniformity is critical to allowing meaningful subsurface interpretations using data generated from multiple sources.

This procedure will be used during all field activities when borehole subsurface drilling or surface soil sampling is occurring. These activities should be documented as described herein.

### B. EQUIPMENT/MATERIALS:

Some or all of the following equipment is may be required for completing the procedures outlined in this SOP:

- Hand lens
- Field notebook and borehole log forms
- Pencils
- Stiff scraper
- Standard grain size examples
- Squirt bottle with water
- Small clear containers with lids

### C. PROCEDURE:

1. CHA utilizes a combination of the USCS and Modified Burmister methods of soil descriptions.
2. The Unified Soil Classification System (USCS) is the most widely used engineering/geotechnical soil classification method. The USCS is based on engineering properties of soil which are effected by grain size, water content, grain size distribution, and compaction. This system is often used for classifying soils encountered in boreholes, test pits, and at the surface. The following properties form the basis of USCS soil classification:
  - Percentage of gravel, sand, and fines;
  - Shape of the grain size distribution curve; and
  - Plasticity and compressibility characteristics.
3. The Modified Burmister Method is used for the verbal description of soil samples. The Modified Burmister classification system is based on grain size and plasticity, but differs from the Unified Soil Classification System in that it includes nomenclature to describe the soil's texture, color, mineralogy, and geological origin.
4. The following step by step procedure will be used for the field classification of soils encountered during subsurface activities (i.e. borehole drilling, trenching, etc.). References to aid in the development of a soil description are included in [Appendix A](#) and [Appendix B](#).

A complete soil description should contain the following information in the order indicated.



## FIELD DESCRIPTION OF SOILS

- Major grain size component
  - Minor grain size component(s) with modifier
  - Gradation or Plasticity
  - Color
  - Soil Moisture
  - Density/Consistency
  - Soil Structure or Mineralogy (if necessary)
  - Evidence of Contamination (odor, staining, etc.)
  - USCS symbol
- a. Grain Size: There are five major grain sizes: Boulders, Cobbles, Gravel, Sand, and Silt/Clay.
- Boulders are > 8"
  - Cobbles are 3" to 8"
  - Gravels range in size from 0.2" to 3.0" in diameter and are subdivided into Fine gravel (>0.2" to 0.75") in diameter and Coarse gravel (>0.75" to 3.0")
  - Sands range in size from 0.002" to 0.2" and are subdivided into coarse, medium and fine. Standard comparison cards are available for field use.
  - Silt and clay are difficult to distinguish in the field. An attempt is made, however, to describe the soil as one of the six following classifications: silt, clayey silt, silt and clay, clay and silt, silty clay, or clay. The field description may be later verified in a lab hydrometer test if required by the project. For field descriptions of silts and clays, the following guidelines should be used:

SILT: -----gritty, no threads can be rolled

Clayey SILT:-----rough to smooth, difficult to roll threads

SILT and CLAY:-----rough to smooth, difficult to roll threads

CLAY and SILT:-----smooth and dull, threads can be rolled readily

Silty CLAY:-----smooth and shiny, threads can be rolled very readily

CLAY: -----very shiny and waxy, threads can be rolled very easily

Grain size descriptions are written with the major grain size component listed first. In order to be considered a major grain size component, the component must constitute greater than 50% of the sample. Major grain size components are written in all capital letters and are underlined. If no grain size component constitutes greater than 50% of the sample, the sample is classified by describing the distribution of the sand component of the sample first (ex. f.m. Sand). Then, the other grain size components are described and the appropriate percentage modifier (see below) is assigned. The reader can then determine the percentage of sand in the sample by subtracting the sum of the modifier percentages from 100%. An example is shown below.

Other grain size components, if present, are listed in order of decreasing percentage.



## FIELD DESCRIPTION OF SOILS

The following modifiers are used to indicate the relative proportion of a minor grain size component in the soil:

Estimated amount: Modifier

- < 10 percent: ..... Trace
- 10 percent to 20 percent: .... Little
- 20 percent to 35 percent: .... Some
- 35 percent to 50 percent: .... And

Minor grain size components assigned a trace or little modifier are written in lower case letters.

Minor grain size components assigned a “some” or “and” modifier are written with the first letter of the grain size capitalized (ex. f. Sand). When multiple minor grain size components are described with the same modifier, finer grain sizes precede coarser grain sizes.

- b. Gradation or Plasticity. Granular soils (i.e., sands or gravels) should be described as well-graded, poorly-graded, uniform, or gap-graded, depending on the gradation of the minus 3-inch fraction. Cohesive soils (i.e., silts and clays) should be described as nonplastic, slightly plastic, moderately plastic, or highly plastic, depending on results of the manual evaluation for plasticity.
- c. Color: Common colors and their abbreviations are listed below.
  - Orange: ---Or
  - Tan: -----Tan
  - Black: -----Blk
  - Brown: ----Br
  - Grey: -----Gr
  - Red: -----Red
- d. Moisture Content: The moisture content is determined in the field and is described using the following terms:
  - Dry: ----- (dab finger in soil, no moisture on finger)
  - Moist: ----- (dab finger in soil, moisture on finger)
  - Wet: ----- (water visible)
  - Saturated: ----- (all pore spaces filled)



## FIELD DESCRIPTION OF SOILS

- e. Density/Consistency: The density or consistency of the soils is classified according to the "N" value of the soil. The "N" value is the sum of the middle two blow counts determined during a standard penetration test (SOP #303). The following classifications are used:

**Table 1**  
**Standard Penetration Test for Soil Density**

N-Blows/Feet	Relative Density
<b>Cohesionless Soils</b>	
0 - 4	Very loose
5 - 10	Loose
11 - 30	Medium
31 - 50	Dense
>50	Very dense
<b>Cohesive Soils</b>	
0 - 2	Very soft
3 - 4	Soft
5 - 8	Medium
9 - 15	Stiff
16 - 30	Very stiff
>30	Hard

- f. Odor (if present): Odor is described from a warm, moist sample. The odor should only be described if it is organic or unusual. An organic odor will have distinctive decaying vegetation smell. Unusual odors such as petroleum product, chemical, etc. should be described appropriately.
- g. Soil Texture and Structure (if present): Description of particle size distribution, arrangement of particles into aggregates, and their structure. This description includes joints, fissures, slicked sides, mottling, bedding, veins, root holes, debris, organic content, and residual or relict structure (laminations, etc.), as well as other characteristics that may influence the movement or retention of water or contaminants.
- h. USCS symbol: A USCS symbol is assigned to each soil. The USCS recognizes 15 soil groups and uses names and letter symbols to distinguish between these groups.

The coarse grained soils are subdivided into gravels (G) and sands (S). Both the gravel and sand groups are divided into four secondary groups. Fine grained soils are subdivided into silts (M) and clays (C).



## FIELD DESCRIPTION OF SOILS

Soils are also classified according to their plasticity and grading. Plastic soils are able to change shape under the influence of applied stress and to retain the shape once the stress is removed. Soils are referred to either low (L) or high (H) plasticity. The grading of a soil sample refers to the particle size distribution of the sample. A well graded (W) sand or gravel has a wide range of particle sizes and substantial amounts of particles sized between the coarsest and finest grains. A poorly graded (P) sand or gravel consists predominately of one size or has a wide range of sizes with some intermediate sizes missing.

Soils which have characteristics of two groups are given boundary classifications using the names that most nearly describe the soil. The two groups are separated by a slash. The same is true when a soil could be well or poorly graded. Again the two groups are separated by a slash.

First and/or second letters	
Symbol	Definition
G	gravel
S	sand
M	silt
C	clay
O	organic

Second letter	
Letter	Definition
P	poorly graded (uniform particle sizes)
W	well graded (diversified particle sizes)
H	high plasticity
L	low plasticity

### Example:

#### A. Sample with Major Component:

**f. SAND**, Some Silt, little m.c. sand and f. gravel, trace c. gravel, brown, wet, m. compact, petroleum odor (SM)

#### B. Sample with No Major Component:

f.m.c. Sand, Some Silt and f. Gravel, brown, moist, v. compact, no evidence of contamination (SM)

*(In this sample, the describer classified the sample as containing 30% silt and 30% f. gravel. The percentage of sand would then be determined as:  $100\% - 30\% - 30\% = 40\%$ ).*

#### D. QA/QC REQUIREMENTS:

Not Applicable

#### E. SPECIAL CONDITIONS:

Not Applicable



## **FIELD DESCRIPTION OF SOILS**

**F. REFERENCES:**

Burmister, D.M., Suggested Methods of Test for Identification of Soils.

The Unified Soil Classification System (USCS).

Classification of Soils for Engineering Purposes: Annual Book of ASTM Standards, D 2487-83, 04.08,  
American Society for Testing and Materials, 1985.

**G. APPENDICES/FORMS:**

ASTM Criteria for Describing Soils

CHA Legend to Subsurface Logs

CHA Test Boring Log

### **END OF SOP**

Final Check by C. Burns 10/07/15

**ASTM CRITERIA FOR DESCRIBING SOIL****Criteria for Describing Angularity of Coarse-Grained Particles**

Description	Criteria
Angular	Particles have sharp edges and relatively plane side with unpolished surfaces
Subangular	Particles are similar to angular description but have rounded edges
Subrounded	Particles have nearly plane sides but have well-rounded corners and edges
Rounded	Particles have smoothly curved side and no edges

**Criteria for Describing Dilatancy**

Description	Criteria
None	No visible change in the specimen.
Slow	Water appears slowly on the surface of the specimen during shaking and does not disappear or disappears slowly upon squeezing.
Rapid	Water appears quickly on the surface of the specimen during shaking and disappears quickly upon squeezing.

**Criteria for Describing Toughness**

Description	Criteria
Low	Only slight pressure is required to roll the thread near the plastic limit. The thread and the lump are weak and soft.
Medium	Medium pressure is required to roll the thread to near plastic limit. The thread and the lump have medium stiffness.
High	Considerable pressure is required to roll the thread to near the plastic limit. The thread and the lump have very high stiffness.

**Criteria for Describing Dry Strength**

Description	Criteria
None	The dry specimen crumbles into powder with mere pressure of handling
Low	The dry specimen crumbles into powder with some finger pressure
Medium	The dry specimen breaks into pieces or crumbles with considerable finger pressure
High	The dry specimen cannot be broken with finger pressure. Specimen will break into pieces between thumb and a hard surface.
Very High	The dry specimen cannot be broken between the thumb and shard surface

**Criteria for Describing Structure**

Description	Criteria
Stratified	Alternating layers of varying material or color with layers at least 6 mm thick; note thickness.
Laminated	Alternating layers of varying materials or color with the layers less than 6 mm thick; note thickness.
Fissured	Breaks along definite planes of fracture with little resistance to fracturing.
Slickensided	Fracture planes appear polished or glossy, sometimes striated.
Blocky	Cohesive soil that can be broken down into small angular lumps which resist further breakdown.
Lensed	Inclusion of small pockets of different soils, such as small lenses of sand scattered through a mass of clay; note thickness.
Homogeneous	Same color and appearance throughout.

## CRITERIA FOR DESCRIBING SOIL (Cont.)

### Criteria for Describing the Reaction with HCl

Description	Criteria
None	No visible reaction
Weak	Some reaction, with bubbles forming slowly
Strong	Violent reaction, with bubbles forming immediately

### Criteria for Describing Consistency

Description	Criteria
Very Soft	Thumb will penetrate soil more than 1 inch (25 mm)
Soft	Thumb will penetrate soil about 1 inch (25 mm)
Firm	Thumb will indent soil about 1/4 inch (6 mm)
Hard	Thumb will not indent soil but readily indented with thumbnail
Very Hard	Thumbnail will not indent soil

### Criteria for Describing Cementation

Description	Criteria
Weak	Crumbles or breaks with handling or little finger pressure
Moderate	Crumbles or breaks with considerable finger pressure
Strong	Will not crumble or break with finger pressure

### Criteria for Describing Particle Shape

The particle shape shall be described as follows where length, width, and thickness refer to greatest, intermediate, and least dimensions of a particle, respectively (see page 104 ).

Flat	Particles with width/thickness ratio > 3
Elongated	Particles with length/width ratio > 3
Flat and Elongated	Particles meet criteria for both flat and elongated

### Criteria for Describing Plasticity

Description	Criteria
Nonplastic	A 1/8 inch (3 mm) thread cannot be rolled at any water content.
Low	The thread can barely be rolled and the lump cannot be formed when drier than the plastic limit.
Medium	The thread is easy to roll and not much time is required to reach the plastic limit. The thread cannot be rolled after reaching the plastic limit. The lump crumbles when drier than the plastic limit.
High	It takes considerable time rolling and kneading to reach the plastic limit. The thread can be rerolled several times after reaching the plastic limit. The lump can be formed without crumbling when drier than the plastic limit.

### Identification of Inorganic Fine-Grained Soils from Manual Tests

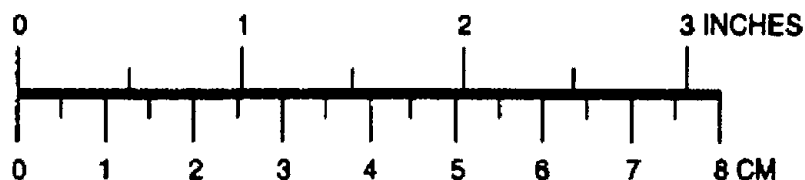
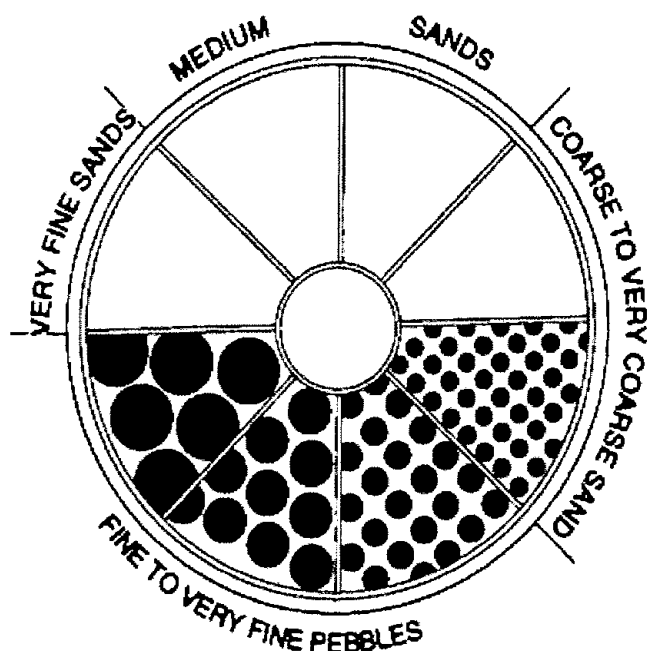
Soil Symbol	Dry Strength	Dilatancy	Toughness
ML	None to low	Slow to rapid	Low or thread cannot be formed
CL	Medium to high	None to slow	Medium
MH	Low to medium	None to slow	Low to medium
CH	High to very high	None	High

### Criteria for Describing Moisture Condition

Description	Criteria
Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but no visible water
Wet	Visible free water, usually soil is below water table

## SEDIMENT PARTICLE SIZE AND SHAPE ESTIMATES

### GRAPH FOR DETERMINING SIZE OF SEDIMENTARY PARTICLES



COBBLES RANGE FROM 6.4 TO 25.6 cm (~2.5 TO 10.1 INCHES)  
BOULDERS ARE LARGER THAN 25.6 cm (>10.1 INCHES)

### SEDIMENT PARTICLE SHAPES

HIGH SPHERICITY						
LOW SPHERICITY						
	VERY ANGULAR	ANGULAR	SUB-ANGULAR	SUB-ROUNDED	ROUNDED	WELL-ROUNDED



# LEGEND TO SUBSURFACE LOGS

Page 1 of 2

SAMP./CORE NUMBER	SAMP. ADV (ft) LEN CORE (ft)	RECOVERY (ft)	Blows per 6" on Split Spoon Sampler	"N" VALUE or RQD%	SAMPLE	DEPTH (Feet)	GRAPHICS	DESCRIPTION AND CLASSIFICATION	ELEVATION (Feet)	Remarks on Character of Drilling, water return, etc	WATER LEVELS AND/OR WELL DATA
S1	2.0	1.8	2-3-4-5	7				f. SAND, Some Silt, trace f. gravel, brown, loose, moist (SM)	100		
R1	2.0	2.0	N/A	88%				Mica SCHIST, gray, soft, slightly weathered, closely fractured, good RQD			

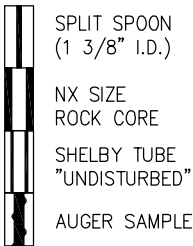
Subsurface Logs present material classifications, test data, and observations from subsurface investigations at the subject site as reported by the inspecting geologist or engineer. In some cases, the classifications may be made based on laboratory test data when available. It should be noted that the investigation procedures only recover a small portion of the subsurface materials at the site. Therefore, actual conditions between borings and sampled intervals may differ from those presented on the Subsurface Logs. The information presented on the logs provide a basis for an evaluation of the subsurface conditions and may indicate the need for additional exploration. Any evaluation of the conditions reported on the logs must be performed by Professional Engineers or Geologists.

- SAMP./CORE NUMBER – Samples are numbered for identification on containers, laboratory reports or in text reports.
- SAMP.ADV/LEN.CORE – Length of sampler advance or length of coring run measured in feet.
- RECOVERY – Amount of sample actually recovered after withdrawing sampler or core barrel from bore hole measured in feet.
- SAMPLE BLOWS/6" – Unless otherwise noted, blow counts represent values obtained by driving a 2.0" (O.D.), 1-3/8" (I.D.) split spoon sampler into the subsurface strata with a 140 pound weight falling 30" as per ASTM International D1586. After an initial penetration of 6" to seat the sampler into undisturbed material, the sampler is then driven an additional 2 or 3 six inch increments. Refusal is defined as a resistance greater than 50 blows per 6" of penetration.
- "N" Value or RQD % – "N" VALUE – The sum of the second and third sample blow increments is generally termed the Standard Penetration Test (SPT) "N" value. Refusal (R) is defined as a resistance greater than 50 blows for 6 inches of penetration. CORE RQD – Core Rock Quality Designation, RQD, is defined as the summed length of all pieces of core equal to or longer than 4 inches divided by the total length of the coring run. Fresh, irregular breaks distinguishable as being caused by drilling or recovery operations are ignored and the pieces are counted as intact lengths. RQD values are valid only for cores obtained with NX size core barrels.
- SAMPLE – Graphical presentation of sample type and advance or core run length. See Table 1.
- DEPTH – Depth as measured from the ground surface in feet.
- GRAPHICS – Graphical presentation of subsurface materials. See Table 4. Dual soil classification and rock graphics may vary and are not shown on Table 4.
- DESCRIPTION AND CLASSIFICATION – SOIL – Recovered samples are visually classified in the field by the supervising geologist or engineer unless otherwise noted. Particle size and plasticity classification is based on field observations, and using the Unified Soil Classification System (USCS). See Table 4. USCS symbols are presented in parentheses following the soil description. Where necessary, dual symbols may be used for combinations of soil types. Relative proportions, by weight and/or plasticity, are described in general accordance with "Suggested Methods of Test for Identification of Soils" by D.M. Burmister, ASTM Special Publication 479, 6-1970. See Table 2. Soil density or consistency description is based on the penetration resistance. See Table 3. Soil moisture description is based on the observed wetness of the soil recovered being dry, moist, wet, or saturated. Water introduced into the boring during drilling may affect the moisture content of the materials. Other geologic terms may also be used to further describe the subsurface materials. ROCK – Rock core descriptions are based on the inspector's observations and may be examined and described in greater detail by the project engineer or geologist. Terms used in the description of rock core are presented in Table 5.
- DIVISION LINES – Division lines between deposits are based on field observations and changes in recovered material. Solid lines depict contacts between two deposits of different geologic depositional environment of known elevation. Dashed lines represent estimated elevation of contacts between two deposits of different geologic depositional environment. Dotted lines depict transitions of deposits within the same depositional environment, such as grain size or density.
- ELEVATION – Elevation of strata changes in feet.
- REMARKS – Miscellaneous observations.
- WATER LEVELS & WELL DATA – Hollow water level symbol, if present, represents level at which first saturated sample or water level was encountered. Solid water level symbol, if present, depicts the most probable static water elevation at the time of drilling or as measured in an installed observation well at a later date. Subsurface water conditions are influenced by factors such as precipitation, stratigraphic composition, and drilling/coring methods. Conditions at other times may differ from those described on the logs. For graphical presentation of observation/monitoring well construction, see Table 6. Elevations of changes in construction are noted at the bottom of each section.



## LEGEND TO SUBSURFACE LOGS

Page 2 of 2

TABLE 1  
TYPICAL SAMPLE TYPESTABLE 2  
SAMPLE MATERIAL PROPORTIONS

ADJECTIVE	PERCENTAGE OF SAMPLE
"and"	35% - 50%
"some"	20% - 35%
"little"	10% - 20%
"trace"	< 10%
Standard split spoon samples may not recover particles with any dimension larger than 1 3/8". Therefore, reported gravel percentages may not reflect actual conditions.	

TABLE 3  
DENSITY/CONSISTENCY

GRANULAR SOILS		COHESIVE SOILS	
Blows/ft.	Density	Blows/ft.	Consistency
< 5	Very Loose	< 2	Very Soft
5-10	Loose	2-4	Soft
11-30	Med. Compact	5-8	Med. Stiff
31-50	Compact	9-15	Stiff
> 50	Very Compact	16-30	Very Stiff
		> 30	Hard

TABLE 4  
USCS CLASSIFICATION, PARTICLE SIZE, & GRAPHICS

MAJOR PARTICLE SIZE DIVISION	USCS SYMBOL	GRAPHIC SYMBOL	GENERAL DESCRIPTION
GRAVEL Coarse: 3"-3/4" Fine: 3/4"-#4  Classification based on > 50% being gravel	GW		Well graded gravels, gravel & sand mix.
	GP		Poorly graded gravels, gravel & sand mix.
	GM		Gravel, sand and silt mix.
	GC		Gravel, sand and clay mix.
	SW		Well graded sand, sand & gravel mix.
	SP		Poorly graded sand, sand & gravel mix.
	SM		Sand and silt mix.
SAND Coarse: #4-#10 Med.: #10-#40 Fine: #40-#200  Classification based on > 50% being sand	SC		Sand and clay mix.
	ML		Inorganic silt, low plasticity.
	CL		Inorganic clay, low plasticity.
	OL		Organic silt/clay, low plasticity.
	MH		Inorganic silt, high plasticity.
SILT & CLAY  Classification based on > 50% passing #200 sieve.	CH		Inorganic clay, high plasticity.
	OH		Organic silt/clay, high plasticity.
	Pt		Peat and other highly organic soils.
ORGANIC SOILS	Pt		Peat and other highly organic soils.
FILL	Fill		Miscellaneous fill materials.

TABLE 5  
ROCK CLASSIFICATION TERMS

## HARDNESS:

Very Soft	Carves
Soft	Grooves with knife
Med. Hard	Scatched easily with knife
Hard	Scatched with difficulty
Very Hard	Cannot be scratched with knife

## WEATHERING:

Fresh	Slight or no staining of fractures, little or no discoloration, few fractures.
Slightly	Fractures stained, discoloration may extend into rock 1", some soil in fractures.
Moderately	Significant portions of rock stained and discolored, soil in fractures, loss of strength.
Highly	Entire rock discolored and dull except quartz grains, severe loss of strength.
Complete	Weathered to a residual soil.

## BEDDING:

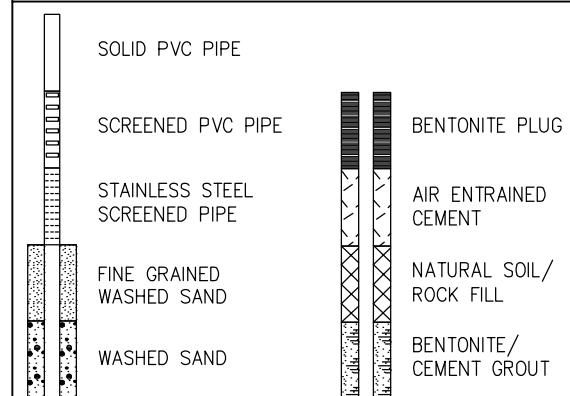
Massive	> 40"
Thick	12' - 40"
Medium	4" - 12"
Thin	< 4"

## FRACTURE SPACING:

Massive/V. Wide	> 6'
Thick/Wide	2' - 6'
Med./Med.	8" - 24"
Thin/Close	2 1/2" - 8"
V. Thin/V. Close	< 2 1/2"

## RQD:

Excellent	> 90%
Good	76% - 90%
Fair	51% - 75%
Poor	25% - 50%
V. Poor	< 25%

TABLE 6  
WELL CONSTRUCTION





## **BOREHOLE INSTALLATION AND SAMPLING**

### **A. PURPOSE/SCOPE:**

The following SOP presents a description of the methods generally employed for the installation of boreholes and the collection of subsurface soil samples. Boreholes are typically advanced to define geologic conditions; allow the installation of monitoring wells and piezometers; and allow the collection of subsurface soil samples (generally above the water table) for chemical analysis. Although several manual methods are available for the collection of subsurface soils samples (e.g. hand augers, post-hole augers [see SOP #305 and SOP #307]), the most common method used by CHA to advance boreholes is a drill rig equipped with hollow-stem augers (HSA) or direct-push technology (DPT). Representative samples are most often collected utilizing split-spoon samplers or Macrocore technology.

The purpose of drilling test borings is typically to characterize the lateral and vertical extent of contamination in the unsaturated zone. The test borings may also be used to allow the installation of ground water monitoring wells. Test borings may also be used to determine the subsurface characteristics for the purpose of geotechnical investigations.

### **B. EQUIPMENT/MATERIALS:**

Drilling will be performed by a licensed drilling firm under the direction of CHA staff. The drilling field crew will consist of a driller, a driller's assistant, and a CHA field geologist/engineer. The field geologist/engineer will supervise drilling operations and conduct the geologic logging of the boreholes. A list of typical equipment needed for installation of monitoring wells at the site is summarized in the table included in SOP #309.

### **C. PROCEDURE:**

1. Subcontractor Responsible for Utility Clearance - Subcontractor shall take all reasonable precautions, including contacting the appropriate utility organizations (USPFO, Dig Safe, etc.), in order to verify there are no buried utilities at the test boring and test pit locations.
2. The drilling rig and sampling equipment may be required to be decontaminated by steam-cleaning (high pressure, hot water) prior to drilling and in between borings, depending on the job requirements
3. The borings will be drilled with direct push technology (DPT), hollow-stem augers, flush joint casing, open hole or any combination depending on the type of information needed, geologic conditions, and other limitations that may be imposed due to contamination or state or federal guidelines. The boring shall be advanced to match the sampling interval (continuous or standard sampling).
4. Drilling progress and information about the formations encountered shall be recorded by the geologist on the field boring log. The information should include total depth drilled, depths and thickness of strata, problems with borehole advancement, fill materials encountered, and water levels.



## **BOREHOLE INSTALLATION AND SAMPLING**

### Hollow Stem Auger/Flush Joint Driven Casing

- a. At the chosen depth interval, drive a clean, standard, 24-inch long, 2-inch O.D. split-spoon sampler into the soil a distance of 24 inches using a 140 lb hammer, free falling 30 inches. Record the number of blows required to drive the sampler every 6 inches on the field boring log. Discontinue driving the sampler if 100 blows have been applied and the sampler has not been driven 6 inches. If 6 inches of penetration has been achieved, discontinue driving the sampler after 50 blows has failed to penetrate fully any of the remaining 6 inch intervals. The first six inches seats the spoon, the next 12 inches represents the Standard Penetration Resistance, and the last six inches is driven to insure sample recovery.
- b. Retrieve the sampler from the borehole and place it on a clean, flat surface. Open the sampler and immediately scan the sample with an air monitoring instrument (e.g., HNu or OVA) if appropriate to the purpose of the investigation. Record instrument readings on the field boring log.

### Direct Push Technology

- a. The DPT is hydraulically powered and mounted in a customized four-wheel drive vehicle. Position the base of the sampling device on the ground over the sampling location and hydraulically raise the vehicle on the base. As the weight of the vehicle is transferred to the probe, the probe is pushed into the ground.
- b. Soil samples will be collected with a Macrocore (or equivalent). The sample tube is pushed and/or vibrated to a specified depth. The interior plug of the sample tube is then removed by inserting small-diameter threaded rods. Drive the sample tube an additional foot to collect the soil sample. Withdraw the probe sections and sample tube.

### Shelby Tube Sampling

- a. Further, describe and record the following properties of the sample: Sample length recovered, presence of any slough in sampler, basic soil type (e.g., sand, gravel, clay), structure, texture, sorting, grain size, grain shape, degree of saturation, competency, color, odor, staining, and presence of foreign material(s). Refer to SOP#301, Field Description of Soils.
  - b. After the soil within the sampler has been described, it will be placed in sealed sample jars directly from the sampling device.
  - c. If appropriate to the investigation, the air space surrounding the borehole shall be scanned with a FID or PID and Explosimeter during all drilling activities to determine the presence or absence of volatile organic compounds. Results of this air monitoring shall be recorded on the Geologic Field Log. Activities shall proceed according to the site HSP if the presence of volatile organic compounds is indicated.
5. Upon completion of the test boring, all drill cuttings shall either be placed back in the borehole or will be drummed based on potential contaminants encountered.
  6. Note the locations of the borings on a site map and/or mark the locations of the boreholes with a labeled wooden stake.



## **BOREHOLE INSTALLATION AND SAMPLING**

D. QA/QC REQUIREMENTS:

Follow QA/QC requirements for field documentation.

E. SPECIAL CONDITIONS:

1. Drilling Subcontract - The Field Team Leader must be familiar with the scope, fee, schedule, and all the terms and conditions of the drilling subcontract. When contractual issues or questions arise during the fieldwork, the Field Team Leader should communicate with the Project Manager and with the owner/client as appropriate.
2. Abandoned Borehole - If the contractor is not able to finish the drilling or has to abandon the borehole due to loss of tools, accidents or any unforeseeable circumstances, the contractor should remove the casings or drive pipes already in the hole and refill it with native soil cuttings, sand, grout, or as approved by the Engineer. All materials extracted from the hole, after refilling it will be managed as investigation derived material and will be disposed of accordingly. Typically, another borehole will be attempted in the area of the initial borehole attempt.
3. Subcontractor/Driller Standby Time - Document any conditions that may result in driller/subcontractor standby time. Such conditions may include adverse weather conditions, lack of access to the property, utilities not marked out, etc. Standby time may result in additional costs from our subcontractor that may not be planned for or approved. Communicate any conditions that may result in standby time to the CHA Project Manager as soon as possible.

F. REFERENCES:

ASTM Standard D 1586

Drilling Subcontract Scope, Schedule, Fee, Terms, and Conditions

NYSDEC DER-10, May 2010 (or current version)

CHA's Legend to Subsurface Logs

G. APPENDICES/FORMS:

Boring Log Form

### **END OF SOP**

Final Check by C. Burns 10/07/15



## SOIL SAMPLING WITH A HAND AUGER

### A. PURPOSE/SCOPE

Hand auger borings are used to collect near surface soil and sediment samples in situations where use of a drill rig is not necessary or not feasible. Typical use includes the collection of samples from zero (0) inches to approximately 36 inches but is ultimately limited by the combined length of the handle and extension (approximately 8 ft). This SOP outlines the methods for using a hand auger to collect samples for field screening and laboratory analysis and should be reviewed in conjunction with SOP #405, *Surface Soil Sampling*, for general soil sampling techniques.

### B. EQUIPMENT/MATERIALS

- Hand (bucket) auger and handle extension
- Shovel
- Plastic sheeting
- Disposable or stainless steel scoops and spatula
- Sample bottles and coolers
- Field screening equipment (PID)
- Disposable gloves
- Tape measure, survey stakes and tape
- Field data sheets
- Decontamination supplies

### C. PROCEDURE:

1. Clear sample site of any vegetation or debris with a shovel. A large enough area should be cleared (approximately one (1) foot square) to prevent surrounding debris and soils from spilling into the auger hole.
2. Plastic sheeting should be laid out for placing removed soils. This step facilitates the sampling process, aids in the return of soils to the hole, and prevents contamination of the surrounding area.
3. Slowly rotate the auger until the bucket has filled or the desired sampling increment has been reached.
4. Carefully remove the auger and turn it upside down on plastic sheeting to remove soil from the bucket.
5. As with a standard boring log, classify major and minor soil components, soil color, moisture content, and any evidence of contamination including PID readings according to the Work Plan. See SOP 301, *Field Description of Soils*.
6. If the Work Plan indicates samples are to be taken for volatile organic compounds (VOCs), collect those samples as soon as possible from the least disturbed soil possible. Note that according to New Jersey Guidance VOC sample collection with a hand auger is not acceptable due to matrix disturbance.
7. Record soil observations on a boring log. For each boring the boring # and location, total depth, and depth at which water is encountered should also be recorded.



## SOIL SAMPLING WITH A HAND AUGER

8. Finish collecting any analytical samples. Parameters such as SVOCs, pesticides, PCBs, metals, or cyanide must be homogenized to create a representative sample. Prior to homogenization, twigs, roots, leaves, rocks, and miscellaneous debris should be removed from the sample using the decontaminated stainless steel spoon or spatula. The soil should be mixed, quartered (divided into 4), and mixed again until a consistent physical appearance over the homogenized soil has been obtained. The soil should be transferred into the appropriate sample container using the decontaminated stainless steel spoon or spatula.
9. When boring is completed, soils can be generally be returned to the hole depending on level of contamination and project specifications.
10. Decontaminate the auger between each boring using an Alconox® wash followed by a tap water rinse.

D. QA/QC REQUIREMENTS:

All data must be documented on field data sheets or within site logbooks.

E. SPECIAL CONDITIONS:

Site soils should be considered prior to developing a work plan that includes extensive auguring by hand. Note that rocky or coarse grained soils are often difficult to sample with a hand auger due to refusal. In contrast, sandy soils may be quite easy to advance the auger through; but sample loss may occur during extraction of the bucket. Different types of bucket designs are available for different soil types such as clay or sand to reduce this problem.

F. REFERENCES:

New Jersey Department of Environmental Protection (2005): *Field Sampling Procedures Manual*:

<http://www.nj.gov/dep/srp/guidance/fspm/>

United States Environmental Protection Agency Environmental Response Team (2000): *Standard*

*Operating Procedures; Soil Sampling, # 2012*: <http://www.dem.ri.gov/pubs/sops/wmsr2012.pdf>

G. APPENDICES/FORMS:

Boring Log Form

## END OF SOP

Final Check by C. Burns 10/07/15



## EXCAVATION OF TEST PITS

### A. PURPOSE/SCOPE:

To evaluate subsurface soils and/or to search for buried objects within 12 to 20 feet of surface grade. Even though these are CHA's standard procedures, each person working in the field is responsible for ensuring that they are following state standards/guidelines where applicable.

### B. EQUIPMENT/MATERIALS:

- Backhoe and operator (subcontractor)
- Wooden stakes
- Indelible ink pens
- Hammer
- Combustible gas meter
- Photoionization detector
- Appropriate sample jars
- Latex gloves
- Test pit field logs
- Clipboard
- Camera
- Tape measure
- Shovel
- Handheld GPS.

### C. PROCEDURE:

1. Personnel should stand at the opposite end of the pit from the backhoe. From this position, it is possible to see in the pit, yet be out of the backhoe operators way.
2. Screening with a photoionization or flame ionization detector and a combustible gas meter should be performed on a continual basis if specified in the Health and Safety Plan. Refer to SOP 205 for instructions on use of the Mini-Rae PID or PGM-7600 photo-ionization detectors and SOP 207 for instructions on use of the V-Rae Landfill Gas or PGM 7800 four gas meters.
3. Record test pit information and field notes as described below.
4. The excavated material should be placed on one side of the pit, at least 4 feet from the edge of the pit.
5. Should buried drums (or other material that presents an immediate threat be encountered in a test pit, work will stop and the Project Manager will be notified.
6. Samples will be collected directly from the backhoe bucket. Volatile organic sample jars will be filled first if testing of volatile organic compounds is specified in the site investigation plan. Then pack all other sample fractions. Refer to SOP #607 for sample field handling procedures. Always wear latex gloves when sampling, and use a new pair for every sample. Latex gloves should also be changed if samples are collected from different depths in one test pit.
7. Photographs of the test pit and material excavated may be taken as necessary. Refer to SOP #101 for photograph instructions. If numerous test pits are installed, print out test pit number identification sheets to photograph in the field to identify each test pit.



## EXCAVATION OF TEST PITS

8. Record location of test pit with handheld GPS.
9. Promptly backfill and compact test pits. When backfilling, soil materials should be placed back in the excavation from the same general strata from which it was removed.

### D. QA/QC REQUIREMENTS:

1. All data must be documented on field data sheets or within site logbooks.
2. All instrumentation must be operated in accordance with operating instructions as supplied by the manufacturer, unless otherwise specified in the work plan.
3. Equipment checkout and calibration activities must occur prior to sampling/operation, and they must be documented. If equipment was rented, save calibration sheet in project folder.

### E. SPECIAL CONDITIONS:

Landfill Applications: If the scope of work involves delineating the limit of waste by installing test pits, pay attention to topography in the field. It may be helpful to acquire a topographic map of the area before working onsite. The Test Pit Log for Landfill applications should also be used. Contaminated soil from each test pit should be segregated from clean soils and placed on plastic if possible to avoid contamination to the surface of the site. When backfilling, waste materials should be placed back in the excavation in the same strata as they were removed. In accordance with DER-10 Technical Guidance for Site Investigation and Remediation, any drums or other containers encountered, as well as NAPL or other free product, will be over packed or otherwise containerized for appropriate off-site disposal. Refer to SOP #607 for information on Drum/Soil Excavation and Stockpiling.

Utility Investigations: Depending on scope of work and site conditions, it may be necessary to install test pits near overhead or underground utilities. A representative from the utility company should be notified in advance of project work, and arrangements for oversight by the utility company may also be required. Check with the utility company to see if any additional equipment is required for use by the subcontractor like grounding rods for work near overhead utilities, or pressure distribution mats for heavy equipment working or crossing over underground utilities.

### F. REFERENCES:

Dig Safely New York Website for UFPO information: <http://www.digsafelynewyork.com/>

NYSDEC DER 10 Technical Guidance for Site Investigation and Remediation:

[http://www.dec.ny.gov/docs/remediation\\_hudson\\_pdf/der10.pdf](http://www.dec.ny.gov/docs/remediation_hudson_pdf/der10.pdf)

### G. APPENDICES/FORMS:

Test Pit Field Logs

**END OF SOP**

Final Check by C. Burns 10/07/15



## MONITORING WELL INSTALLATION

### A. PURPOSE/SCOPE:

The following standard operating procedure (SOP) presents a description of the methods generally employed for the installation of monitoring wells. Monitoring well installation creates access for collection of groundwater samples which are used to define the lateral and vertical extent of groundwater contamination, to determine the elevation and fluctuations in the water table, as an observation point during pump tests, to aid in determining the hydraulic conductivity of screened soil layers, and to establish a background level for the local groundwater chemistry. Wells are also installed for the purpose of environmental remediation projects and include air-sparging wells, soil vapor extraction wells, and groundwater recovery wells.

The most commonly used drilling methods are hollow-stem auger, mud rotary, and air rotary. The procedures described below are intended to provide access to groundwater with minimum disturbance to the aquifer. Additionally, the procedures are intended to prevent cross-contamination between aquifers.

### B. EQUIPMENT/MATERIALS:

Drilling will be performed by a licensed drilling firm under the direction of CHA. The drilling field crew will consist of, at a minimum, a driller, a driller's assistant, and a CHA field geologist/engineer. The field geologist/engineer will supervise drilling operations and conduct the geologic logging of the boreholes. A list of typical equipment needed for installation of monitoring wells is included below.

#### a. Heavy Equipment

- Drill rig
- Water truck (if needed)
- Grout mixer
- Steam cleaner
- Generator for steam cleaner

#### b. Sampling Tools

- 2-Inch I.D split-barrel samplers or 3-Inch I.D. thin-walled sampling tubes

#### c. Well Casing Materials

- Varies with job requirements

#### d. Other Well Construction Materials

- Type I Portland cement
- Bentonite pellets
- Washed sand of various grain sizes depending on screen or geologic conditions

#### e. Miscellaneous Equipment/Materials

- Bore brush
- 55-Gallon drums
- Stainless steel tape (100 feet)
- Tremie pipe
- Shovels





## MONITORING WELL INSTALLATION

### C. METHODS:

#### 1. Hollow Stem Auger

Wells can be installed in unconsolidated formations using hollow-stem augers. The augers are advanced by rotation and the drill cuttings are brought to the surface by travelling up the outside of the auger flights in a screw-like manner. Upon reaching the planned well depth, the casing and screen are placed inside the hollow-stem augers and the flights are individually removed while the annular space around the well is filled with filter pack and grout.

Outside diameters of hollow-stem augers generally range from 6 ¼ inches to 22-inches with corresponding inner diameters ranging from 2 ¼ inches to 13 inches. Auger lengths are usually 5 feet which allows easy handling. Soil samples can be collected using split spoons or Shelby tubes, which can be used inside the augers.

Advantages of hollow-stem auger drilling include:

- allowing the well to be installed inside the hollow stem of the auger, which prevents the borehole from collapsing and representative soil samples can be easily obtained using split-spoon samples
- relatively fast and inexpensive
- well development is usually less difficult than with wells drilled by the mud rotary method

Disadvantages of hollow-stem auger drilling include:

- very slow or impossible to use in coarse materials such as cobble or boulders
- cannot be used in consolidated formations
- generally limited to depths of approximately 100 feet in order to be efficient

#### 2. Air Rotary

The air rotary method uses air as the drilling fluid. Air is forced down the drill rods by an air compressor, escapes out of the bit and returns to the surface in the annular space between the borehole wall and the drill string. Cuttings are moved out of the hole by the ascending air and collect around the rig. The bit is pneumatically driven rapidly against the rock in short strokes while the drilling string slowly rotates. The air supply must be filtered to prevent introduction of contamination into the borehole.

The advantages of air rotary drilling include:

- fast, more than 100 feet of borehole advancement a day is possible
- preliminary estimates of well yields and water levels are often possible
- no drilling fluid to plug the borehole

The disadvantages of air rotary drilling include:

- generally cannot be used in unconsolidated formations
- in contaminated zones, the use of high-pressure air may pose a significant hazard to the drill crew because of transport of contaminated material up the hole
- introduction of air to the groundwater could reduce concentration of volatile organic compounds.



## MONITORING WELL INSTALLATION

### D. PROCEDURE:

#### Wells Installed in Unconfined Aquifers

Refer to SOP #303 for drilling procedures used to advance boreholes.

The following procedure describes construction of a monitoring well using 2-inch diameter water-tight flush threaded PVC well casing and screen. The slot size of the screen will be determined depending on the data required and the type of soil screened. Filter pack sand size used will be dependent on the screen slot size and various state and federal regulations.

It should be noted however, that the diameter and type of well casing material may differ according to different specific applications.

1. Well casing and screens should be new and brought to the site enclosed in plastic. Contact of casing or screen with the ground prior to installation shall be avoided. Plastic sheeting (e.g., visqueen) shall be placed on the ground and used as a cover to protect stockpiled materials from contamination.
2. If monitoring for contaminants less dense than water, drilling will proceed to a depth of several feet below the water table. The well will be screened across the water table, using approximately ten feet of screen.
3. If monitoring for contaminants more dense than water, drilling will proceed until the first confining surface (e.g., clay layer, top of bedrock, etc.) is encountered. In these situations, ten feet of screen will be placed immediately above the confining surface.
4. A sand pack composed of washed sand will be tremmied in the annular space of each monitoring well. The filter pack will be placed at 6 inches below the bottom of the well screen to two feet or 20 percent of the screen length, whichever is greater, above the well screen.
5. A bentonite seal at least 3 feet thick will be placed on top of the filter pack. The preferred method of placing bentonite is by the tremie method, however the bentonite may be poured in boreholes less than 50 feet in depth.
6. The remaining annulus to the ground surface will be filled with a cement-bentonite grout using a tremie pipe. Depending on local requirements, a certain amount of setting time for the bentonite seal may be required before the bentonite/cement grout is placed.
7. The wells shall extend three feet above grade. A four to six inch diameter protective steel surface casing shall be installed over the completed well and will be surrounded by a three-foot square concrete pad extending below the frost line. The pad should be shaped to shed rainwater and the protective casing should be fitted with a lockable water-tight cap. Weep holes should be drilled at the base of the protective steel casing and a vent hole must be drilled at the top of the PVC casing to allow water levels to respond to barometric changes and prevent explosive gas buildup. The annular space of the protective casing should be filled with gravel or coarse sand.
8. In cases where wells must be installed in high traffic areas, the protective steel casing may be replaced with a manhole which is mounted flush with surface grade. The protective casing will be grouted in place and fitted with bolts and rubber gaskets. The well top will be fitted with a locking cap.



## MONITORING WELL INSTALLATION

9. The drilling rig and sampling equipment may be required to be decontaminated by steam-cleaning (high pressure, hot water) prior to drilling and in between borings depending on the job requirements.
10. Drilling progress and information about the formations encountered shall be recorded by the geologist on the field boring log. The information should include:
  - Borehole Depth
  - Well Screen Depth
  - Filter Pack Interval
  - Seal Interval
  - Grout Interval
  - Surface Cap Detail
  - Well Material
  - Well Riser and Screen Length
  - Well Diameter
  - Filter Pack Material
  - Date Installed

### Wells Installed in Confined Aquifers

Wells installed in confined aquifers must penetrate a confining layer. That confining layer may be a clay lens in more porous unconsolidated materials or unfractured bedrock in consolidated materials.

1. Drill to the top of the confining surface. Grout the steel casing in place. After the grout has set, proceed drilling until the desired depth is reached.
2. If drilling proceeds through more than one confining layer, repeat the process described above, except the first aquifer will be cased off with a wider casing and the second aquifer will be cased off with narrower diameter casing, etc.
3. A well will then be constructed and installed in this borehole in the same manner as described in the steps for an unconfined aquifer.
4. When install a well in fractured bedrock, it may be possible to leave the open borehole as is, depending upon the competency of the rock.

### E. QA/QC REQUIREMENTS:

Instruments used during groundwater sampling should be calibrated at the beginning of each day. If a measurement falls outside the calibration range, the instrument should be recalibrated so the measurements fall within the calibration range. The calibration should be checked at the end of each day to verify the instruments remained in calibration.



## MONITORING WELL INSTALLATION

### F. SPECIAL CONDITIONS:

We have seen cases where settlement causes the PVC riser to extend above the steel casing over time. Drillers often “rest” the cap of the outer protective casing on the PVC riser (or on an attached gripper plug) when pouring the concrete surface pad. This provides no room for settlement since the PVC is at, or near the top of the steel casing cap. When completing the well installation, recommend that the driller use a block or spacer on top of the riser to provide separation from the cap of the steel casing. Once the concrete for the pad and casing has set, the spacer can be removed.

### G. REFERENCES:

New Jersey Department of Environmental Protection (August 2005), *Field Sampling Procedures Manual*, Chap. 6, retrieved January 5, 2009 from <http://www.nj.gov/dep/srp/guidance/fspm/>.

United States Environmental Protection Agency (March 13, 1996), *Monitor Well Installation*, retrieved March 18, 2009, from <http://www.dem.ri.gov/pubs/sops/wmsr2048.pdf>

### H. APPENDICES/FORMS:

Monitoring Well Construction Log

## END OF SOP

Final Check by C. Burns 10/07/15 (Revised Title 5-30-17)



## WELL DEVELOPMENT

### A. PURPOSE/SCOPE:

Prior to the collection of hydraulic or groundwater quality data, a monitoring well must be developed. Well development is necessary to remove drilling fluid and construction residues remaining in the borehole or surrounding aquifer, restore the hydraulic properties of the formation immediately surrounding the screened interval, and sort the filter pack material to allow groundwater to freely flow into the monitoring well.

Well development can be accomplished using bailing, overpumping, mechanical surging, and air-lift methods. The best methods involve surging water flow back and forth through the well screen to sort the filter pack materials. These methods include bailing, pumping/overpumping/backwashing, and surging with a surge block, or a combination of these methods. Pumping alone will tend to cause particles moving toward the well to form blockages that restrict subsequent particle movement.

Mechanical surging forces water to flow into and out of a screen by operating a plunger up and down in the casing, similar to a piston in a cylinder. The tool normally used is called a surge block, surge plunger, or swab. Silt and sediment loosened by the surging is removed by either a bailer or pump. The combination of mechanical surging and pumping are generally used in 2 to 4-inch diameter monitoring wells.

Compressed air can also be used to develop wells in consolidated and unconsolidated formations. Most air rotary drilling rigs have sufficient air capacity to develop 6-inch to 12-inch diameter wells. Airlift methods may introduce air into the aquifer surrounding the monitoring well, potentially altering groundwater quality, particularly for volatile organics.

Overpumping/backwashing creates an increase in the flow velocity of the water to the well, creating a rapid and effective migration of particulates toward the well. Where there is no backflow-prevention valve installed, the pump can be alternately started and stopped, allowing the column of groundwater that is initially picked up by the pump to be alternately dropped and raised up in a surging action (backwashing).

Bailing is an effective development technique in relatively clean, permeable formations where water flows freely into the well. The bailer is dropped until it strikes the surface of the water, producing an outward surge of water. As the bailer fills and is rapidly withdrawn, the particulate matter outside the well flows into the well. Subsequent bailing removes the particulate matter.

### B. EQUIPMENT/MATERIALS:

- Surge block
- Inertial or submersible pump
- Bailer
- Air compressor and air line
- Well development log



## WELL DEVELOPMENT

### C. PROCEDURE:

#### 1. Mechanical Surging and Pumping

- a. Before starting to surge, the well should be evacuated to ensure water will flow into it.
- b. Lower the surge block into the well until it is 10 to 15 feet beneath the static water level, but above the well screen. The water column will effectively transmit the action of the surge block to the screen section. The initial surging motion should be relatively gentle, allowing any material blocking the screen to break up, go into suspension, and move into the well.
- c. As water begins to move easily both into and out of the screen, the surging tool is usually lowered progressively downward through the entire length of the screen. As the block is lowered, the force of the surging movement is increased.
- d. Continue surging for approximately 20 minutes, then pull the block from the well. A pump or bailer may be used to remove the sediment out of the well. Pumping should continue for approximately 20 minutes.
- e. Continue alternating the surging and pumping action until little or no sand or fines can be pulled into the well. The turbidity of the final discharge water should be below 50 NTU.

#### 2. Airlift Development

- a. Place the airline into the water at a shallow depth. Initially, the airlift should be operated to pump fluids at a reduced rate from the well. Once a constant flow rate from the well has been established, the airline is lowered to within five feet of the bottom of the screen, assuming that sufficient pressure is available to overcome the static head. Development can also start near the top of the screen, depending on the preference of the driller.
- b. A surging action is created by injecting air into the well to lift the water to the surface. As the water reaches the top of the casing, the air supply is shut off, allowing the aerated water column to fall (this procedure is called "rawhiding"). This tends to drive the water outward through the well screen openings.
- c. After surging the well for a period of 20 to 30 minutes, the air should be applied in a continuous manner so that the water is expelled from the casing. The airline should be lowered to the bottom of the well so that accumulated sediment will be expelled. Surging and lifting cycles are repeated until the water is relatively free of sand and fine particles. The turbidity of the final discharge water should be below 50 NTU.

#### 3. Overpumping / Backwashing

- a. Place the pump in the well and lower until it is 10 to 15 feet beneath the static water level.
- b. Pump the groundwater from the well at a rate that substantially exceeds the rate that the formation can deliver the water.
- c. Alternately start and stop the pump to allow the column of water that is initially picked up by the pump to be alternately dropped and raised up in a surging action.
- d. After surging the well for a period of 20-30 minutes, the pump should be lowered to the bottom of the well and operated in a continuous matter so that accumulated sediment will be expelled.



## WELL DEVELOPMENT

- e. Surging and lifting cycles are repeated until the water is relatively free of sand and fine particles. The turbidity of the final discharge water should be below 50 NTU.
- 4. Bailing
  - a. Drop the bailer so it is allowed to fall freely through the monitoring well until it strikes the surface of the water.
  - b. After the bailer fills with groundwater, rapidly withdraw it from the monitoring well.
  - c. Subsequent bailing will remove the sand and other particulate matter from the well.
  - d. Bailing should be continued until the turbidity of the final discharge water is below 50 NTU.
  - e. QA/QC REQUIREMENTS:

If an air compressor is used to develop the wells, make sure a filter is present on the compressor. Otherwise, oil from the compressor will be present in the airstream that enters the well.

### D. SPECIAL CONDITIONS:

The surge block should be operated with care in cases where excessive sand will be introduced through the well screen to prevent the tool from becoming sand locked.

Air development procedures should begin by determining that groundwater can flow freely into the screen. Application of too much air volume in the borehole when the formation is clogged can result in a collapsed screen.

### E. REFERENCES:

New Jersey Department of Environmental Protection (August 2005), *Field Sampling Procedures Manual*, Chap. 6, retrieved January 5, 2009 from <http://www.nj.gov/dep/srp/guidance/fspm/>.

### F. APPENDICES/FORMS:

Well Development Log

## END OF SOP

Final Check by C. Burns 10/07/15



## MEASUREMENT OF WATER LEVEL/ FREE PRODUCT THICKNESS

### A. PURPOSE/SCOPE:

Measurements of static groundwater levels are used to determine the general elevation of groundwater, to evaluate horizontal and vertical hydraulic gradients, and to calculate the volume of water to be purged from a well prior to sampling. Seasonal fluctuations of the water table can also be assessed when water levels are monitored over the long term. Individual measurements of free product thickness are used to evaluate the presence of free product and also to determine the lateral extent of free product contamination in an unconfined aquifer.

### B. EQUIPMENT/MATERIALS:

- Electronic water level meter
- Clear polyethylene or Teflon bailer (for free product measurement only)
- Oil/water interface meter (for free product measurement only)
- Field data sheets
- Well keys if necessary
- Decontamination supplies

### C. PROCEDURE:

1. Identify and inspect the well. Determine if the well cap and lock are present and in good working order. Note any defects in the well casing or surface seal in field notes.
2. If it is known that free product is not present in the well, the electronic water level indicator may be used to measure the depth to water according to the meter instructions.
  - a. Every well should have an established measuring point on the inner well casing that is clearly marked and used during each monitoring event. Measure the depth to the water from the established reference point to the nearest 0.01 foot. For any site, all measurements should be made during the same day, prior to any purging activities that will affect water levels (see Section J, Special Conditions).
  - b. If it is unknown whether free product is present in a well, collect a water level measurement as per Step A above. Then lower a dedicated clear bailer into the well until liquid is encountered, being careful not to fully submerge the bailer. Remove the bailer from the well and measure the thickness of the free product, if present, using a tape measure or ruler. Record the measurement to the nearest 0.01 foot.
  - c. If free product is known to exist in a well, the use of an oil/water interface meter is recommended. The meter incorporates both optical and conductivity sensors to determine if the probe is in product or water, respectively. The probe typically emits two different types of signals; one for free product and one for water. Slowly lower the probe until the first signal indicates the interface between air and free product has been reached. Then continue to lower the probe until the second signal indicates the interface between free product and water. The water/product interface measurement is actually best taken while moving the probe back up from the water toward the floating product interface, as this minimizes the effects of product coating the conductivity probe.





## MEASUREMENT OF WATER LEVEL/ FREE PRODUCT THICKNESS

Repeat the measurements and record all measurements to the nearest 0.01 foot. In the event that an oil/water interface probe is not available, free product measurements may be collected using a clear bailer as described in Step B above.

3. Record all data on the field data sheet or log book. This includes all measured depths and notation of the measuring point on the well casing (i.e., top of inner PVC casing, top of steel protective casing, etc.). Water level measurements are eventually used to calculate water elevations above mean sea level using the surveyed elevations of each well.
4. Decontaminate the probe after each use according to the complete procedures in SOP #501, Small Equipment Decontamination. Field decontamination procedures generally include removal of gross contamination by scraping/brushing and rinsing, followed by a wash with Alconox® to remove all visible contamination, and a re-rinse with potable water to remove the detergent. The water level meter probe and the entire length of tape subject to contamination should be decontaminated. The meter should be decontaminated between each well. Field staff should also consult the site specific work plan for any specialized decontamination requirements.

### D. QA/QC REQUIREMENTS:

Not Applicable

### E. SPECIAL CONDITIONS:

When measuring water levels in multiple wells on a site, all measurements should be collected in as short of time as possible to minimize the effects of daily fluctuations in water levels. This is particularly important in areas where groundwater levels may be tidally-influenced. Other possible causes of fluctuations include precipitation events, changes in barometric pressure, pumping of nearby wells, and changes in river stage or flow in unlined ditches. If any of these conditions are observed they should be recorded in field notes.

For newly installed wells or piezometers, a period of 24 hours should be allowed prior to measurement so water levels stabilize following development. Additionally, any well with a cap capable of producing an air tight seal on the casing may contain a vacuum or pressurized zone that can measurably affect water levels. In this instance, water level measurements should be repeated until the level has stabilized following cap removal.

### F. REFERENCES:

U.S. EPA Environmental Response Team, 2000: Standard Operating Procedures, SOP #2043,  
Manual Water Level Measurements

### G. APPENDICES/FORMS:

Field Data Sheets

**END OF SOP**

Final Check by C. Burns 10/07/15



## LOW-FLOW GROUNDWATER PURGING/SAMPLING

### A. PURPOSE/SCOPE:

Low-flow purging is purging using a pumping mechanism that produces low-flow rates [less than 1 liter per minute (lpm) or less than 0.26 gallon per minute (gpm)] that cause minimal drawdown of the static water table and usually employs a flow cell in which geochemical parameters are continuously monitored. These parameters may include dissolved oxygen content, oxidation-reduction potential (redox), conductivity, turbidity, and pH.

The intent of this sampling protocol is to collect a representative sample from the monitored groundwater zone. A representative sample may be obtained when all the monitored chemical parameters have stabilized, thus qualitatively demonstrating that the groundwater being purged is in equilibrium (refer to Table 3). Samples are collected directly from the pumping mechanism with minimum disturbance to the aquifer groundwater. The low-flow/low volume purging method (purging to parameter stability) tends to isolate the interval being sampled, which provides more accurate water quality measurements and reduces the volume of purge water generated. This method has an advantage in that it can limit vertical mixing and volatilization of volatile organic compounds in solution within the well casing or borehole as compared to high-flow purging and sampling.

An overview of this methodology is presented in Puls and Barcelona, 1996. Low-flow purging and sampling is appropriate for collection of groundwater samples for all groundwater contaminants, including inorganic compounds, metals, pesticides, PCBs, volatile and semi-volatile organic compounds (VOCs and SVOCs), other organic compounds, radiochemical and microbiological constituents. This method is not applicable to the collection LNAPL or DNAPL.

### B. EQUIPMENT/MATERIALS:

- Inertial pump
- Submersible pump
- Disposable bailers
- Generator
- Sample bottles
- Bailing twine and rope
- Field analyses meters
- Sampling gloves
- Water level meters
- Filtration system
- 2-Inch Grundfos rediflow pump and controller
- Well sampling forms

Depending on the purging method to be used, there are specific equipment limitations. [Table 1](#) provides a description of the various methodologies and their applicability. The proper selection of sampling devices or pumps is critical to the quality and representation of the sampling results. The following table provides a summary of the acceptable sampling methods for the various compounds of concern.

**LOW-FLOW GROUNDWATER PURGING/SAMPLING**

**Table 1**  
**Acceptable Sampling Methods for Compounds of Concern**

Method	VOCs	Semi-VOCs	Metals and Inorganics	Petroleum Hydrocarbons		General Chemistry
				C3-C16	C16+	
Peristaltic Pump	X	1	3	X	1	2
Centrifugal Pump	2	3	3	2	2	3
Submersible Impeller Pump (w/ controller)	2	3	3	2	3	3
Bailer	2	2	2	2	2	2
<b>Bladder Pump</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>
DPIS	3	3	2	2	2	2
Diffusion Sampler	2	2	X	2	2	X
<b>1</b> - Not recommended, better methods exist <b>2</b> - Useful with limitations <b>3</b> - Recommended method <b>X</b> - Unacceptable <b>Note:</b> Centrifugal pump - assumed at a low-flow rate (no greater than 1 Lpm)						

**C. PROCEDURE:**

1. The wells will be sampled in order from the least contaminated well to the most contaminated well.
2. Using a decontaminated measurement probe, determine the water level in the well; then calculate the fluid volume in the casing.
3. Setting up the Pump:
  - a. Dedicated Systems

Installation of any device into a well disturbs the stratification typically exhibited in a well due to laminar flow of groundwater in the well. Insertion also potentially mobilizes suspended solids in the water column due to disturbance of settled and solids in the casing and agitation of water in the filter pack. Dedicated systems result in lower initial turbidity values and lower purge volumes to achieve stabilized indicator parameter readings, and should be considered when a well will be sampled multiple times.

- b. Portable Systems

If portable systems are used, they must be placed carefully into the well and lowered into the screen zone as slowly as possible to avoid disturbance of the groundwater resulting in non-equilibrium conditions. As a result, longer purge times and greater purge volumes may be necessary to achieve indicator parameter stabilization. In general, this may require that after installation, the portable pump should remain in place for a minimum of 1-2 hours to allow settling of solids and re-establishment of horizontal flow through the screen zone. If initial turbidity readings are excessive (>50 NTU), pumping should cease and the well should rest for another 1-2 hours before initiating pumping again. In wells set in very fine-grained formations, longer waiting periods may be required.

## LOW-FLOW GROUNDWATER PURGING/SAMPLING

4. The flow rate used during purging must be low enough to avoid increasing the water turbidity. The following measures should be taken to determine the appropriate flow rate:
  - a. The flow rate shall be determined for each well, based on the hydraulic performance of the well.
  - b. The flow must be adjusted to obtain stabilization of the water level in the well as quickly as possible.
  - c. The maximum flow rate used should not exceed 1 liter per minute (0.26 gpm).
  - d. Once established, this rate should be reproduced with each subsequent sampling event.
  - e. If a significant change in initial water level occurs between events, it may be necessary to re-establish the optimum flow rate at each sampling event.
5. Water Level Monitoring:
  - a. Should not fluctuate more than 0.1 meters (~4 inches).
6. Measurement of indicator parameters (Dissolved oxygen content, redox potential, specific conductance, temperature and pH) is required. Continuous monitoring of water quality indicator parameters is used to determine when purging is completed and sampling should begin. Stabilized values, based on selected criteria listed in [Table 2](#) should be met prior to sampling. The use of an in-line flow cell (closed) system is recommended for measuring indicator parameters, except for turbidity.

For turbidity measurement, a separate field nephelometer should be used. Indicator parameter collection is more important when low-flow purging is used compared to the high-flow purging method. Generally, measurements are taken every 3 to 5 minutes and water chemistry parameters are considered to be stable when they are within the following ranges for three (3) consecutive readings:

**Table 2**  
**Stability Criteria for Low-Flow Purging**

Constituent	Criteria
Dissolved Oxygen Content (DO)	± 10%
Oxidation-Reduction Potential (redox)	± 10 mv
Specific Conductance	± 03% of reading
pH	± 0.1 units
Turbidity	± 10%
Temperature	NA

Turbidity should be below 50 NTU, if possible. If sample turbidity can not be reduced below 50 NTU, a field filtered sample shall be collected for metals analysis in addition to an unfiltered sample. Record these readings on the well sampling log.

7. The order in which samples are to be collected is as follows:
  - Volatile Organic Compounds (VOCs)
  - Semi-Volatile Organic Compounds (SVOCs)



## LOW-FLOW GROUNDWATER PURGING/SAMPLING

- Purgeable organic carbon (POC)
  - Purgeable organic halogens (POX)
  - Total organic carbon (TOC)
  - Total organic halogens (TOX)
  - Extractable organics
  - Total metals
  - Dissolved metals
  - Phenols
  - Cyanide
  - Sulfate and chloride
  - Turbidity
  - Nitrate and ammonia
  - Radionuclides
8. When collecting aliquots for analysis of volatile organic compounds, make absolutely certain that there are no bubbles adhering to the walls or the top of the VOA container.
  9. Add appropriate preservatives to samples as described in SOP #605.
  10. Label the sample containers with all necessary information and complete all chain-of-custody documents and seals.
  11. Place the properly labeled and sealed sample bottles in a cooler with ice and maintain at 4oC for the duration of the sampling and transportation period. Do not allow samples to freeze.

### D. QA/QC REQUIREMENTS:

To the extent possible, all samples should be collected using the same type of equipment and in the same manner to ensure comparability of data.

### E. SPECIAL CONDITIONS:

Because the methodology requires that disturbance to the water column in the well be minimized, the same pumping device used for purging should be used for sampling.

Sample collection will be performed utilizing either an inertial pump system or disposable bailer. If the inertial pump system is used, samples will be obtained through the dedicated polyethylene tubing while maintaining a low-flow. Should disposable bailers be utilized, the sampling will be performed as follows:

Attach a new bailer line to the disposable bailer equipped with a single check valve. Check the operation of the check valve assembly to confirm free operation. Lower the single check valve bailer slowly into the well until it contacts the water surface. Then lower the bailer just below the water surface with a minimum of disturbance. When filled with groundwater, slowly raise the bailer to the surface. Discharge the first bailer to the ground. Tip the bailer to allow the water to slowly discharge from the top and to flow gently down the inside of the sample bottle with minimum entry turbulence and aeration.



## LOW-FLOW GROUNDWATER PURGING/SAMPLING

Step 4 (*samples collected*) can be replaced if purging and sampling is being performed with a Grundfos Rediflow pump. In this case, after well purging was completed, the discharge rate for the pump would be reduced to approximately 40 ml/minute. Sampling can then proceed as described above.

F. REFERENCES:

Low-Flow (Minimal Drawdown) Ground-Water Sampling *Procedures*" by Robert Puls and Michael J. Barcelona dated April 1996.

G. APPENDICES/FORMS:

Well Sampling Forms

### END OF SOP

Final Check by C. Burns 11/4/15



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2/29/2024

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Original Author: Joseph Saulsbery

Latest Revisions by: Julia Craner/Karyn Ehmann

Reviewer: Scott Smith

## **SAMPLING PERFLUOROALKYL SUBSTANCES (PFAS) and PERFLUORINATED COMPOUNDS (PFCs)**

### **A. PURPOSE/SCOPE:**

The objective of this SOP is to ensure proper and uncontaminated collection of Perfluoroalkyl Substances (PFAS) and other Perfluorinated Compounds (PFCs). PFAS and PFCs are large groups of manufactured compounds used as surfactants in industrial applications, applied to many household products for grease, water, and stain resistance, and heavily used in Aqueous Film Forming Foams (AFFF) which are often used in firefighting. Although there are no federal regulations currently requiring remedial action for these chemicals, many states are adopting rules and regulation regarding these compounds. As rules continue to develop for these contaminants permitted and non-permitted equipment, materials, and procedure are subject to change. The user of this SOP should consult with applicable regulatory agencies to determine a final list of compounds that need to be analyzed.

Note: This SOP has been developed assuming that there are no elevated concentrations of more toxic chemicals present at the site warranting additional personal protective equipment. However, prior to commencing sampling activities, the sampler should consider all potential contaminants at the site and determine if additional protocols are necessary.

Due to the prevalence of these chemicals in common goods, it is imperative that field personnel are conscious of potential cross contamination. This contamination can be from field equipment, field clothing and PPE, sample containers, decontamination, and food.

### **B. EQUIPMENT/MATERIALS:**

**Equipment/Materials that are NOT PERMITTED:** Field equipment, field clothing, PPE, sample containers, and any other items that may be used or present on site made of or containing the following materials **ARE NOT PERMITTED** in the work area where PFAS and/or PFCs are being sampled:

- Low Density Polyethylene (LDPE)
- Aluminum foil
- Glass
- Polytetrafluoroethylene (PTFE) / Teflon™
- Waterproofed clothing or boots
- Clothing containing PTFE material (i.e. GORE-TEX®)
- New clothing (clothing not washed a minimum of 6 times) or clothing washed with fabric softeners
- Polypropylene coated coveralls and PVC boot covers completely covering personnel's street clothes is an acceptable alternative.
- Tyvek® material
- Waterproof/treated paper or field books
- Plastic clipboards, binders, or spiral hard cover notebooks
- Post-it notes or other adhesives
- Sharpies or other permanent markers
- Paint pens, marking paint, etc.



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Original Author: Joseph Saulsbery

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Reviewer: Scott Smith

## **SAMPLING PERFLUOROALKYL SUBSTANCES (PFAS) and PERFLUORINATED COMPOUNDS (PFCs)**

- Most insect repellents, sunscreens, moisturizers, cosmetics, or other related products
- Decon 90
- Ice packs (blue ice)

A complete list of what is and is not permitted can be found in the Appendix A. This list should be given to personnel well in advance of sampling to ensure compliance.

Materials such as Teflon™ or PTFE may be found in common sampling equipment. It is important that field personnel examine and assess existing equipment to avoid accidental contamination.

**Equipment/Materials that are PERMITTED:** The following materials are **ALWAYS PERMITTED** in sampling equipment and in the work area:

- Stainless steel
- High density polyethylene (HDPE)
- PVC
- Nitrile
- Silicone
- Acetate
- Polypropylene
- Loose paper on aluminum clipboards
- Ballpoint pens
- Regular ice

There are changes necessary in several CHA SOPs when sampling for PFAS and PFCs. The changes relate to the sampling equipment and supplies used and are as follows for each SOP as referenced:

### **Surface Soil Sampling (SOP #405)**

- A stainless steel spoon should be used for surficial soil sampling (0-6”) Turf should be removed prior to soil sampling with a steel trowel or shovel without any coatings.
- A stainless steel spoon and bowl should be used to mix the soil sample prior to filling sample jar since PFAS are SVOCs. Cover the bowl with a stainless steel lid where possible between the addition of each aliquot. Do NOT cover the bowl with aluminum foil.

### **Soil Sampling with a Hand Auger (SOP #305)**

- A stainless steel hand auger without any coatings must be used when sampling. Auger to the appropriate depth and then use a pre-cleaned hand auger or spoon to collect the sample.
- Scoops and spatula used must be stainless steel.





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Reviewer: Scott Smith

## **SAMPLING PERFLUOROALKYL SUBSTANCES (PFAS) and PERFLUORINATED COMPOUNDS (PFCS)**

- A stainless steel spoon and bowl should be used to mix the soil sample prior to filling sample jar since PFAS are SVOCs. Cover the bowl with a stainless steel lid where possible between the addition of each aliquot. Do NOT cover the bowl with aluminum foil.

### **Borehole Installation and Sampling (SOP #303/309)**

- If using hollow stem augers/split spoons or similar, they must be carbon steel and not coated.
- If collecting a soil or sediment core sample (e.g. Geoprobe®), it must be collected directly from single-use PVC liners that must not be decontaminated or reused at different locations.

### **Well Development (SOP #311)**

- Do not use bailers, unless entirely made of PVC or stainless steel. Teflon in any part of the bailer is not acceptable.
- Do not use bladder pumps, most bladders are made of Teflon. Only bladder pumps with a bladder made of natural rubber are acceptable.
- Other pump types are typically okay but should still be examined for Teflon or other prohibited materials.

### **Conventional Groundwater Sampling (SOP #315) / Low-Flow Groundwater Purging/ Sampling (SOP #317) / Residential Well Sampling (SOP #319)**

- Bailers should not be used unless entirely made of PVC or stainless steel. Teflon is not acceptable. Single use disposable polyethylene or silicone materials are also acceptable.
- Tubing can only be made of HDPE or silicone.
- Do not use bladder pumps, most bladders are made of Teflon. Only bladder pumps with a bladder made of natural rubber are acceptable.
- The following pump types are acceptable by NYSDEC:
  - Stainless steel inertia pump with HDPE tubing
  - Peristaltic pump equipped with HDPE tubing and silicone tubing
  - PFAS-free bladder pump with HDPE tubing
- Other pump types are typically okay, but should still be examined for Teflon or other prohibited materials.

### **Small Equipment Decontamination (SOP #501)**

- Use a standard two-step decontamination process using detergent (Alconox and Liquinox are acceptable) and clean PFAS-free water. The PFAS-free water should be verified as PFAS free through lab analysis or certification.



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Reviewer: Scott Smith

## **SAMPLING PERFLUOROALKYL SUBSTANCES (PFAS) and PERFLUORINATED COMPOUNDS (PFCs)**

### **Field Handling, Packaging, and Shipping (SOP #607)**

- Plastic bags must be polyethylene.
- Only ice from water should be used, not chemical (blue) ice and not ice pack.

These equipment changes can be applied to other SOPs if PFAS and/or PFCs are being sampled. If equipment is not specifically mentioned, refer to the list of materials that are always permitted. If the materials are not mentioned DO NOT use that sampling equipment.

### **C. PROCEDURE:**

Standard operating procedures for sampling as outlined in a number of CHA's SOPs should be followed, but with the specific changes listed below for the specific SOPs referenced, if being used:

### **Borehole Installation and Sampling (SOP #303/309)**

- When drilling the well use PFAS-free drilling fluids.
- Don't use detergent to decon drilling equipment with the exception of Alconox and Liquinox. Scrub with equipment a plastic brush to remove heavy soiling and rinse thoroughly in tap water. Use a steam cleaner or a triple-rinse of PFAS-free water as the final step. If large quantities of PFAS-free water are not available from the lab, additional QA/QC sampling may be required to verify the source as a potential source of cross-contamination.
- Collect a representative water sample used during drilling activities.
- If using an auger, it must be carbon steel and un-coated.

### **Conventional Groundwater Sampling (SOP #315) / Low-Flow Groundwater Purging/ Sampling (SOP #317) / Residential Well Sampling (SOP #319)**

- Collect samples from the pump discharge tubing only. Never collect a water sample that has passed through a flow through cell or similar.
- When sampling prioritize drinking water, followed by surface water, followed by groundwater.
- When sampling groundwater; start with the upgradient well(s), then the furthest downgradient of the interpreted or known source, then wells downgradient to the source, and lastly the wells closest to the interpreted or known source.
- When sampling residential wells, any plumber's sealing tape should be noted, as these typically contain PFCs.
- Prior to sample collection, field personnel must wash their hands and wear a new set of nitrile gloves.
- PFAS/PFC samples should be taken first, prior to collecting samples for any other parameters into any other containers. Field personnel should avoid contact with any other type of sample container or package materials.
- When samples are collected and capped, place the sample bottle(s) in an individual sealed plastic bag (i.e. Ziploc®) separate from all other sample parameter bottles, and place in a



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## **SAMPLING PERFLUOROALKYL SUBSTANCES (PFAS) and PERFLUORINATED COMPOUNDS (PFCS)**

shipping container packed only with ice made from frozen water. PFAS samples should be placed in a separate cooler from sample containers for other parameters (e.g. VOCs).

- After collecting PFOA samples conduct the “Shaker Test:” A small portion of the sample (~10-25 ml) should be shaken by the sample collector on site. If foaming is noted within the sample, this should be documented when samples are submitted for analysis.

### **Surface Water Sampling (SOP #401)**

- Surface water must be collected by inserting a capped sampling container with the opening pointing down to avoid the collection of surface films.
- Where conditions permit, sampling devices should be rinsed with site medium to be sampled prior to collection of the sample.

### **Surface Soil Sampling (SOP #405)**

- PFAS/PFC samples should be taken first, prior to collecting samples for any other parameters into any other containers. Field personnel should avoid contact with any other type of sample container or package materials.
- A stainless steel spoon and bowl should be used to mix the soil sample prior to filling sample jar since PFAS are SVOCs. Cover the bowl with a stainless steel lid where possible between the addition of each aliquot. Do NOT cover the bowl with aluminum foil.



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## **SAMPLING PERFLUOROALKYL SUBSTANCES (PFAS) and PERFLUORINATED COMPOUNDS (PFCS)**

### **Large Equipment Decontamination (SOP #503)**

- Don't use detergent to decon drilling equipment, scrub with a plastic brush and rinse thoroughly in tap water, then triple-rinse in distilled or deionized water.

### **Field Handling, Packaging, and Shipping (SOP #607)**

- Ice should be double bagged and secured to avoid meltwater from contacting sample containers, and/or samples should be in an individual sealed plastic bag.
- PFAS samples should be put in a cooler separate from other samples bottles for other parameters (e.g., VOCs).

## **D. LABORATORY REQUIREMENTS**

A laboratory certified under the Environmental Laboratory Approval Program (ELAP) shall be contracted when analyzing for PFAS. The sample will be analyzed under EPA Method 1633 with the reporting limits less than or equal to:

- Aqueous Sample – 2 ng/L (ppt)
- Solid Sample – 0.5 µg/kg (ppb)

## **E. QA/QC REQUIREMENTS:**

A variety of blanks should be collected to trace the sources of any artificially introduced contamination. Rinsate or equipment blanks, field blanks, and trip or travel blanks should all be collected during the sampling event. Rinsate or equipment blanks and field blanks should be collected once per day per matrix or once per 20 samples per matrix, whichever comes first. One trip blank is required per cooler.

Samples should be immediately placed in a cooler maintained at 4±2° Celsius.



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**SAMPLING PERFLUOROALKYL SUBSTANCES (PFAS) and PERFLUORINATED COMPOUNDS (PFCS)**

<b>Sampling Media</b>	<b>NYSDEC Requirements for Field Duplicate</b>	<b>NYSDEC Requirements for Equipment Blank</b>	<b>NYSDEC Requirements for MS/MSD</b>	<b>NYSDEC Requirements for Field Reagent Blank (FRB)</b>	<b>NYSDEC Requirements for Deliverable</b>
Groundwater	1 per sample batch; minimum 1 per 20 samples.	One per day per site; minimum 1 per 20 samples.	One set per sample batch; minimum 1 set per 20 samples.	n/a	Category B Report and EDDs.
Surface Water	1 per sample batch; minimum 1 per 20 samples.	One per day per site; minimum 1 per 20 samples.	One set per sample batch; minimum 1 set per 20 samples.	n/a	Category B Report and EDDs.
Soils/Sediment/Solids	1 per sample batch; minimum 1 per 20 samples.	n/a	One set per sample batch; minimum 1 set per 20 samples.	n/a	Category B Report and EDDs.
Private Potable Water	1 per sample batch; minimum 1 per 20 samples.*	One per day per site; minimum 1 per 20 samples.*	One set per sample batch; minimum 1 set per 20 samples.*	One per 20 samples.*	Category B Report and EDDs.

\* For sampling events where multiple private wells (homes or sites) are to be sampled per day, it is acceptable to collect QC samples at a rate of one per 20 across multiple sites or days.

n/a = not applicable.

**F. SPECIAL CONDITIONS:**

In the event of wet weather field personnel must avoid using personal waterproof or water-resistant rain gear. Instead a gazebo tent that is only touched or moved prior to or after sampling activities should be used.

No food or drink is permitted in the sampling area, except for bottled water and hydration drinks, such as Gatorade. These drinks should only be consumed in the staging area. When field personnel require a break to eat or drink, they should remove their gloves and coveralls and move away from the sampling location,



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**Reviewer: Scott Smith**

## **SAMPLING PERFLUOROALKYL SUBSTANCES (PFAS) and PERFLUORINATED COMPOUNDS (PFCS)**

preferably downwind. When finished eating, field personnel should clean up and put their coveralls back on and don a new pair of gloves prior to returning to the work area.

Visitors to the site are asked to remain at least 30 feet from sampling areas.

### **G. REFERENCES:**

Chiang, D., Ph.D., P.E., Davis, K., Ph.D., Bogdan, D., Ph.D., Aucoin, M., & Woodward, D. (n.d.). PFAS Sampling. AECOM.

National Groundwater Association Press 2017, Groundwater and PFAS: State of Knowledge and Practice, Section 5, Field Sampling and Analysis.

NYSDEC Sampling, Analysis, and Assessment of Per- and Polyfluoroalkyl Substances (PFAS) under NYSDEC's Part 375 Remedial Programs. April 2023.

United States Environmental Protection Agency Office of Water. Method 1633 Analysis of Per- and Polyfluoroalkyl Substances (PFAS) in Aqueous, Solid, Biosolids, and Tissue Samples by LC-MS/MS. January 2024.

### **H. APPENDICES/FORMS:**

Appendix A - PFAS/PFC Sampling – Acceptable and Prohibited Items

**END OF SOP**  
**Final Check – C. Burns**



**APPENDIX A – SOP 341**  
**PFAS/PFC SAMPLING – ACCEPTABLE AND PROHIBITED ITEMS**

<b>PROHIBITED</b>	<b>ACCEPTABLE</b>
<b>Field Equipment</b>	
Teflon containing materials	High-Density Polyethylene (HDPE) Materials
Low density polyethylene (LDPE) materials	Acetate Liners
Fluoropolymer tubing, valves and other parts in pumps	Silicon Tubing
Sharpies (acceptable by EPA) and other markers	Ball point pens
Waterproof field books, Post-it Notes, and any adhesive paper produces	Loose paper (non-waterproof)
Plastic clipboards, binders, or spiral hard cover notebooks	Aluminum field clipboards or with Masonite
Chemical (blue) ice packs	Regular Ice
<b>Field Clothing and PPE</b>	
New cotton clothing or synthetic water resistant, waterproof, or stain-treated clothing, clothing containing GORE-TEX	Well-laundered clothing made of natural fibers (preferably cotton)
Clothing laundered using fabric softener	No fabric softener
Boots containing GORE-TEX or treated for water resistance	Boots made with polyurethane and PVC
Tyvek	Cotton clothing or Polypropylene coated coveralls
No cosmetics, moisturizers, hand cream, or other related products as part of personal cleaning/showering routine on the morning of sampling	<p><b>Sunscreens</b> – Alba Organics Natural Sunscreen, Yes to Cucumbers, Aubrey Organics, Jason Natural Sun Block, Kiss my Face, Baby sunscreens that are “free” or “natural”</p> <p><b>Insect Repellents</b> – Jason Natural Quit Bugging Me, Repel Lemon Eucalyptus Insect Repellent, Herabl Armor, California Baby Natural Bug Spray, BabyGanics</p> <p><b>Sunscreen and Insect Repellent</b> – Avon Skin So Soft Bug Guard Plus – SPF 30 Lotion</p>
<b>Sample Containers</b>	
LDPE or glass containers	HDPE or polypropylene
PTFE or Teflon-lined caps	Unlined polypropylene caps
<b>Equipment Decontamination</b>	
Decon 90	Alconox and/or Liquinox
Water from an on-site well	Laboratory certified “PFAS-free” water
<b>Food Considerations</b>	
All food and drink, with exceptions noted	<p>Bottled water and hydration fluids to be brought and consumed only in the staging areas.</p> <p>Eating should take place away from the sampling location, wash hands well after handling, wear powderless nitrile gloves</p>



## SURFACE SOIL SAMPLING

### A. PURPOSE/SCOPE:

The following SOP presents a description of the methods generally employed for the collection of surface soil samples. Surface soils are generally collected to determine risk associated with exposure to potentially contaminated surface soils or to determine whether contaminants are present above applicable standards.

Surficial soil sampling is generally conducted in potentially contaminated areas of concern, whether relating to former or current uses of the site, to determine whether contaminants are present above applicable standards. Locations should be biased to suspected areas of greatest contamination including stressed vegetation, soil discoloration, odor, etc. Sample locations are also chosen based on area specific requirements. This includes sampling in locations that includes past or present usage or hazardous substances or wastes, discharge points of past or present processes, and former and current containers that may contain or previously contained hazardous substances or waste.

### B. EQUIPMENT/MATERIALS:

The equipment needed for this task will vary depending on the exact nature of the project but needed supplies may include:

- Stainless steel trowel or scoop
- Stainless steel spatula
- Shovel
- Stainless steel bowls
- Wooden stakes and flagging, or wire flags
- Hammer or mallet
- Indelible ink pens (sharpies)
- Measuring tape (length appropriate for the project)
- Appropriate sample jars
- Field logs
- GPS unit for referencing sample locations
- Latex or nitrile gloves
- Non-phosphate detergent, distilled water, and paper towels.

### C. PROCEDURE:

1. Use the shovel to clear any surface debris from the sampling location, including grasses or other vegetation.
2. If appropriate to the investigation, screen the soil with a PID or FID and record the results on the Field Log.
3. Sampling Procedure:

#### Discrete Sample Collection:

- a. Collect the sample from 0-6 inches depth (or as specified by the project). In instances where a soil is collected for VOC analysis as well as other non-VOC parameters, the soil for VOC analysis must be collected first to minimize volatilization and biodegradation.



## SURFACE SOIL SAMPLING

- b. When analyzing for VOCs, the soil sample must be collected directly from the soil sample location into the sample container without disturbing the matrix structure.
- c. Once VOC soil sampling is complete, the remaining soil to be analyzed for non-VOC parameters such as SVOCs, pesticides, PCBs, metals, or cyanide must be homogenized to create a representative sample. Prior to homogenization, twigs, roots, leaves, rocks, and miscellaneous debris should be removed from the sample using the decontaminated stainless steel spoon or spatula. The soil should be mixed, quartered (divided into 4), and mixed again until a consistent physical appearance over the homogenized soil has been obtained. The soil should be transferred into the appropriate sample container using the decontaminated stainless steel spoon or spatula.

### Composite Sampling:

- a. For Composite Sampling (applicable to non-VOC's only) where several discrete samples (of equal volume) are mixed together, collect the sample from 0-6 inches depth (or as specified by the project) from the first composite point. Cover the stainless steel bowl with aluminum foil and proceed to the next sampling point. Repeat between locations. If VOC samples are also being collected at each discrete point, the stainless steel spoon/trowel should be decontaminated between locations (Refer to Step 8). Once equal volumes of soil have been collected from each point which will make up the composite sample, the soil must be homogenized to create a representative sample. Prior to homogenization, twigs, roots, leaves, rocks, and miscellaneous debris should be removed from the sample using the stainless steel spoon or spatula. The soil should be mixed, quartered (divided into 4), and mixed again until a consistent physical appearance over the homogenized soil has been obtained. The soil should be transferred into the appropriate sample container using the stainless steel spoon or spatula.
4. Label the sample bottles (if the bottles are not pre-printed) with the sample location name, collection time, project name, analysis to be performed, and any other field required on the label.
5. Place the properly labeled sample bottles in a cooler with ice and maintain at 4°C for the duration of the sampling and transportation period. Do not allow samples to freeze.

Describe and record the following properties of the sample: basic soil type (e.g., sand, gravel, and clay), structure, texture, sorting, grain size, and grain shape, degree of saturation, color, odor, staining, and presence of foreign material. Refer to SOP#301, Field Description of Soils.

6. After sampling is completed, the sampling location should be marked by a wooden stake and flagging and/or wire flag. The station number and date of sampling should be written on the stake using a permanent marker or other waterproof ink. A properly calibrated GPS unit should be used to mark the sample location (Refer to SOP#107).
7. Decontaminate the sampling equipment as specified in SOP #501 and move to the next sampling location. Repeat steps 1 through 7 for subsequent sampling locations.
8. Soil samples should be packed and shipped/prepared for courier pick up according to SOP#607. The Chain of Custody (COC) document should be completed according to SOP#105.



## **SURFACE SOIL SAMPLING**

### **D. QA/QC REQUIREMENTS:**

When possible, the samples should be collected using the same type of equipment and in the same manner to ensure comparability of data. Field quality control samples must be prepared the same as regular investigation samples with regard to sample volume, containers, and preservation.

QA/QC samples should be collected following the same procedures as described above. The type and quantity of QA/QC samples is to be determined by the project scope, and in accordance with SOP# 605.

### **E. SPECIAL CONDITIONS:**

If testing will be performed for metals, it must be recognized that metals can be present naturally and can be present from man-made sources. Moreover, different metals will be present in different concentrations depending on the soil type. Another class of compounds, polycyclic aromatic compounds, can be widely distributed in urban environments. To determine the natural concentrations of metals and PAHs in a particular area, it is important to collect background samples. At a minimum, one background sample should be collected from an area that is near the site, has similar soil types and similar topography. For some applications (e.g., human health risk assessment), it may be necessary to collect three background samples to provide sufficient statistical information.

### **F. REFERENCES:**

New Jersey Department of Environmental Protection (August 2005), *Field Sampling Procedures Manual*, Chap. 6, retrieved January 5, 2009 from <http://www.nj.gov/dep/srp/guidance/fspm/>.

### **G. APPENDICES/FORMS:**

Surface Soil Sampling Log

## **END OF SOP**

Final Check by C. Burns 11/3/15



## WASTE PILE SAMPLING

### A. PURPOSE/SCOPE:

This SOP reviews general protocol for field screening and sampling waste stock piles of contaminated soils and other mixtures of solid waste with soils. The variable nature of waste materials, site histories, potential contaminants, pile size and shape, etc., necessitates that sampling approaches will differ between projects and requires best engineering judgment. Many of the specifics included in this SOP are written for application to petroleum-contaminated soil sampling; however the main aspects of the approach can be applied to other situations with minor modifications. Standard operating procedure SOP #305, *Hand Auger Sampling*, and SOP #405, *Surface Soil Sampling*, should also be reviewed for general soil sampling techniques.

### B. EQUIPMENT/MATERIALS:

- Shovel or spade
- Disposable scoops or trowel (should not be chrome-plated)
- Hand augers
- Stainless steel mixing bowls
- Sample bottles and coolers
- Ice
- Disposable gloves
- Decontamination supplies (tap water, Alconox®, wash and rinse buckets)
- Survey tape and stakes
- Field note forms
- Soil boring logs (for use with auger).

### C. PROCEDURE:

1. Use a decontaminated spade or shovel to clear the surface soils of any debris or vegetation at the desired sample location.
2. If samples are being taken from the surface, carefully remove and discard the layer that contacted the spade with a disposable scoop and then collect the sample. Note that surface samples are generally not acceptable for VOC sample collection. See SOP #405, *Surface Soil Sampling*.
3. For slightly deeper samples (1 to 2 ft), the spade may be used to access the correct depth. The hole dug should be broad enough to prevent surface soils from spilling into the hole. Collect the sample as described in Step 2 with a disposable scoop. VOC samples should be collected without disturbing the sample matrix.
4. An auger may also be used for sample collection, and may be more efficient for samples taken from relatively deep portions of the pile. A spade or shovel should be used to clear and somewhat level the area to prevent soils from spilling into the auger hole. Use the auger to advance the hole to the desired depth. A second auger can then be used to sample the desired depth. See SOP #305, *Hand Auger Sampling*.
5. Mark all sample locations with stakes.



## WASTE PILE SAMPLING

D. QA/QC REQUIREMENTS:

Not Applicable

E. SPECIAL CONDITIONS:

None

F. REFERENCES:

New Jersey Department of Environmental Protection (2005): *Field Sampling Procedures Manual*:  
<http://www.nj.gov/dep/srp/guidance/fspm/>

New Jersey Department of Environmental Protection Site Remediation Program (1998): *1998 Revised Guidance Document for the Remediation of Contaminated Soils*:  
<http://www.state.nj.us/dep/srp/regs/soilguide/>

New York State Department of Environmental Conservation (1992): *Spill Technology and Remediation Series (STARS) Memo #1, Petroleum-Contaminated Soil Guidance Policy*:  
<http://www.dec.ny.gov/regulations/30902.html#Management>

New York State Department of Transportation (2007): *Engineering Instruction 07-034, Standard Specifications – Section 205 Contaminated Soil*:  
[https://www.nysdot.gov/portal/pls/portal/mexis\\_app.pa\\_ei\\_eb\\_admin\\_app.show\\_pdf?id=6803](https://www.nysdot.gov/portal/pls/portal/mexis_app.pa_ei_eb_admin_app.show_pdf?id=6803)

United States Environmental Protection Agency (1994): *Waste Pile Sampling, SOP #2017*  
<http://www.dem.ri.gov/pubs/sops/wmsr2017.pdf>

G. APPENDICES/FORMS:

Soil Boring Logs (for use with auger)

**END OF SOP**

Final Check by C. Burns 11/3/15





## SMALL EQUIPMENT DECONTAMINATION

### A. PURPOSE/SCOPE:

Proper decontamination of small equipment prevents cross-contamination of samples, introduction of contaminants to clean sites, and the mixture of incompatible substances. Equipment decontamination also assures the health and safety of all equipment users. Procedures for decontamination procedures vary depending on the matrix sampled, level of contamination, type of contaminants, and the target analytes of the sampling event. The procedure outlined in this SOP is a general procedure for field/ warehouse decontamination of equipment associated with water, soil and other surficial sampling activities.

Decontamination should be performed before sampling work commences and after each sampling event. Decontaminated equipment should be protected from contact with surroundings during storage and transport, and should be handled as little as possible before its use and always with disposable gloves. Note that all waste generated by decontamination procedures including liquids, solids, rags, gloves, etc., will be collected and disposed of properly according to the procedures outlined in SOP #507.

### B. EQUIPMENT/MATERIALS:

- Alconox®
- Tap water
- Distilled and deionized water
- 10% Nitric acid rinse
- Acetone (or other pesticide grade organic solvent)
- 1-Gallon pressure spray bottles
- Long-handled brushes
- 5-Gallon plastic buckets

### C. PROCEDURE:

Note that if it is logistically impractical/ impossible to complete all steps listed below at the field site, Steps 1-4 should be performed prior to transport of equipment to a facility where all steps can be completed if required. All field decontamination should take place over a container and liquids should be properly disposed of.

1. Disassemble equipment as necessary.
2. Remove gross contamination from equipment by scraping, brushing and rinsing with tap water
3. Wash with Alconox® or other laboratory grade detergent to remove all visible particulate matter and residual oils and grease.
4. Rinse with tap water to remove detergent.
5. Rinse with distilled and deionized water.
6. Field personnel will use a new pair of outer gloves before handling sample equipment after it is cleaned.
7. If equipment will not be used immediately, wrap in aluminum foil (unless sampling for metals analysis) or seal in plastic bags (unless sampling for organics analysis) and store.
8. Record the date and method of decontamination on foil/bag and equipment log.



## SMALL EQUIPMENT DECONTAMINATION

### D. QA/QC REQUIREMENTS:

When necessary, field equipment rinsate blanks will be collected by pouring analyte-free water over decontaminated equipment and submitting them to the lab with the other blanks and samples. These blanks are used to assess the quality of equipment decontamination.

### E. SPECIAL CONDITIONS:

Reusable PPE such as respirators, chemical-resistant overboots and gloves shall also undergo the equipment decontamination sequence. See SOP #505 for related information on Personnel decontamination.

If acetone is a known or expected contaminant another solvent may be substituted. Note that methanol cannot be used for decontamination when sampling gasoline or its by-products.

Additional decontamination procedures may be required for particular contaminants or when samples are to be analyzed at very low concentrations. Identify methods as needed but see for example Wilde, 2004.

### F. REFERENCES:

New Jersey Department of Environmental Protection, August 2005. *Field Sampling Procedures Manual*.

USEPA, 1994. Sampling Equipment Decontamination. Environmental Response Team SOP #2006, Revision #0.0. Edison, NJ. <http://www.ert.org>.

USEPA, 1996. *Environmental Investigations Standard Operating Procedures and Quality Assurance Manual*. Region 4, Science and Ecosystem Support Division. Athens, GA.  
<http://www.epa.gov/region04/sesd/eisopqam/eisopqam.html>

Wilde, F.D., ed., 2004. *Cleaning of Equipment for water sampling (ver. 2.0)*: U.S. Geological Survey Techniques of Water-Resources Investigations, book 9, chap. A3, April, accessed January 5, 2009 at <http://pubs.water.usgs.gov/twri9A3/>

### G. APPENDICES/FORMS:

Not Applicable

**END OF SOP**

Final Check by C. Burns 10/27/15



## **LARGE EQUIPMENT DECONTAMINATION**

**A. PURPOSE/SCOPE:**

Decontamination of large equipment (drilling rigs, backhoe excavators, bulldozers, etc.) is necessary to prevent cross-contamination between sampling points and to prevent the removal of contaminants from a hazardous waste site.

**B. EQUIPMENT/MATERIALS:**

- Steam cleaner
- Generator
- Decontamination pad or supplies to construct a temporary pad
- Centrifugal pump
- Discharge hose
- 55-Gallon drums
- Alconox®
- Hexane
- Potable water source

**C. PROCEDURE:**

1. Drilling rigs and excavation equipment and materials should arrive on-site in a clean condition, free of oil, grease, and debris. Inspect rigs for any fluid leaks.
2. Unless otherwise approved, all decontamination of large equipment will take place on a decontamination pad designed to collect all rinsate generated during cleaning. Temporary pads should be lined with a water-impermeable material with no seams, and if possible, constructed on a level, paved surface. Pads should be constructed so as to facilitate the collection of wastewater, with a sump in one corner or side, or with one corner generally lower than others. Where appropriate, side shields should be placed around the decon pad to prevent overspray.
3. Steam clean the drill rig/ excavator, tools, drill bits, buckets, etc. prior to the start of work. Smaller equipment and tools should be elevated on saw horses to avoid any splashing. After steam cleaning, the equipment should be inspected for residues such as machine oil. If residues are observed, the equipment should be steam cleaned until such residues are removed. Steam cleaning procedures can be supplemented with manual scrubbing with Alconox® where necessary to remove contamination.
4. In the event that equipment is contaminated with heavy oils or products that cannot be removed by the standard decontamination procedures outlined above, the following modifications will be made. First, wipe all excess oil/tar from the equipment with a paper towel or clean rag. Second, with a paper towel or clean rag that has been soaked in hexane, wipe any residual contamination off the equipment. When equipment is relatively free of gross oil or tar contamination, proceed with the usual decontamination procedure.
5. At the completion of the project, or when required, all rinsate generated from decontamination activities shall be pumped from the decontamination pad to 55-gallon drums for disposal.



## **LARGE EQUIPMENT DECONTAMINATION**

D. QA/QC REQUIREMENTS:

Equipment field blanks may be required depending on job specifics.

E. SPECIAL CONDITIONS:

Not Applicable

F. REFERENCES:

New Jersey Department of Environmental Protection, 2005. *Field Sampling Procedures Manual*. August.

USEPA, 1996. *Environmental Investigations Standard Operating Procedures and Quality Assurance Manual*. Region 4, Science and Ecosystem Support Division. Athens, GA.

<http://www.epa.gov/region04/sesd/eisopqam/eisopqam.html>

G. APPENDICES/FORMS:

Not Applicable

### **END OF SOP**

Final Check by C. Burns 10/22/15



## DECONTAMINATION OF PERSONNEL

### A. PURPOSE/SCOPE:

The objective of decontamination is to prevent the transmission of contaminants to personnel and equipment and to prevent the spread of contaminants off-site. Decontamination is performed as a quality assurance measure and as a safety precaution during sampling. The following SOP outlines general decontamination procedures that apply to personal protection Level C. Projects that necessitate higher levels of protection (Levels B or A) require site-specific decontamination plans as part of the project's Health and Safety Plan.

The decontamination area must be set up before any entry into contaminated areas or the Exclusion Zone. All personnel must undergo decontamination prior to leaving the site. Sites with relatively low contamination levels and no Exclusion Zone activities (Level D PPE) still may require decontamination. At Level D activity sites, decontamination should be provided for the following: washing of boots, or the removal and disposal of boot covers (booties); removal and disposal of disposable coveralls; removal and disposal of outer and inner gloves; and the washing of hands, arms and face prior to leaving the site, or taking any breaks for eating, drinking, etc.

### B. EQUIPMENT/MATERIALS:

- Decontamination pad
- Brushes
- Polyethylene
- Tap water
- Detergent
- Appropriate decontamination solutions
- 55-Gallon drum
- Shallow wash buckets

### C. PROCEDURE:

1. Maximum and minimum decontamination procedures for Level C protection are described in detail in [Tables 1 and 2](#) on the following pages, and the [procedure sequence](#) is shown on associated flow-charts.
2. Arrange disposal of all waste generated during decontamination procedures according to guidelines in SOP #507. Check that all reusable PPE has been adequately decontaminated for future use.

### D. QA/QC REQUIREMENTS:

Not Applicable

### E. SPECIAL CONDITIONS:

Note that decontamination procedures will vary between sites depending on contaminants present.



## **DECONTAMINATION OF PERSONNEL**

**F. REFERENCES:**

New Jersey Department of Environmental Protection *Field Sampling Procedures Manual*, August, 2005.

NIOSH, OSHA, USCG, EPA, *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities*, DHHS (NIOSH) Publication No. 85-115, October, 1985.

**G. APPENDICES/FORMS:**

Associated Flow Charts - The following Tables are included:

- Table 1. Maximum Measures for Level C Decontamination and Procedure Sequence
- Table 2. Minimum Measures for Level C Decontamination and Procedure Sequence

### **END OF SOP**

Final Check by C. Burns 10/22/15



**DECONTAMINATION OF PERSONNEL****Table 1. Maximum Measures for Level C Decontamination**

Station	1:	Segregated Equipment Drop	1.	Deposit equipment used on site (tools, sampling devices and containers, monitoring instruments, radios, clipboards, etc.) on plastic drop cloths or in different containers with plastic liners. Segregation at the drop reduces the probability of cross contamination. During hot weather operations, a cool down station may be set up within this area.
Station	2:	Boot Cover and Glove Wash	2.	Scrub outer boot covers and gloves with decon solution or detergent and water.
Station	3:	Boot Cover and Glove Rinse	3.	Rinse off decon solution from station 2 using copious amounts of water.
Station	4:	Tape Removal	4.	Remove tape around boots and gloves and deposit in container with plastic liner.
Station	5:	Boot Cover Removal	5.	Remove boot covers and deposit in containers with plastic liner.
Station	6:	Outer Glove Removal	6.	Remove outer gloves and deposit in container with plastic liner.
Station	7:	Suit and Boot Wash	7.	Wash splash suit, gloves, and safety boots. Scrub with long-handle scrub brush and decon solution.
Station	8:	Suit and Boot, and Glove Rinse	8.	Rinse off decon solution using water. Repeat as many times as necessary.
Station	9:	Canister or Mask Change	9.	If worker leaves exclusion zone to change canister (or mask), this is the last step in the decontamination procedure. Worker's canister is exchanged, new outer gloves and boot covers donned, and joints taped worker returns to duty.
Station	10:	Safety Boot Removal	10.	Remove safety boots and deposit in container with plastic liner.
Station	11:	Splash Suit Removal	11.	With assistance of helper, remove splash suit. Deposit in container with plastic liner.
Station	12:	Inner Glove Rinse	12.	Wash inner gloves with decon solution.
Station	13:	Inner Glove Wash	13.	Rinse inner gloves with water.
Station	14:	Face Piece Removal	14.	Remove face piece. Deposit in container with plastic liner. Avoid touching face with fingers.



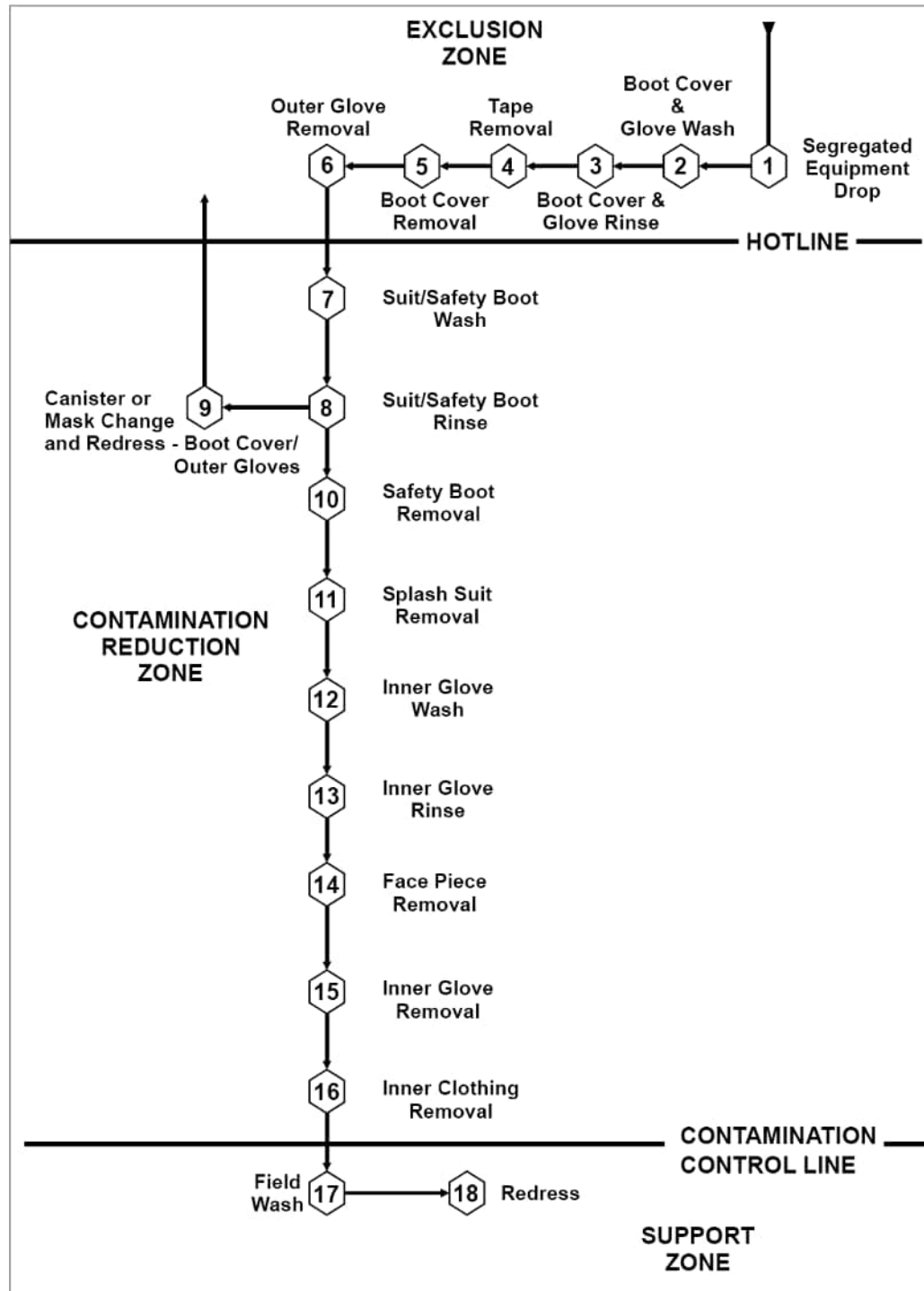
## DECONTAMINATION OF PERSONNEL

**Table 1. Maximum Measures for Level C Decontamination continued**

Station	15:	Inner Glove Removal	15.	Remove inner glove and deposit in lined container.
Station	16:	Inner Clothing Removal	16.	Remove clothing soaked with perspiration and place in lined container. Do not wear inner clothing off-site since there is a possibility that small amounts of contaminants might have been transferred in removing the fully-encapsulating suit.
Station	17:	Field Wash	17.	Shower if highly toxic, skin-corrosive or skin-absorbable materials are known or suspected to be present. Wash hands and face if shower is not available.
Station	18:	Redress	18.	Put on clean clothes.

## DECONTAMINATION OF PERSONNEL

### Maximum Measures for Level C Decontamination

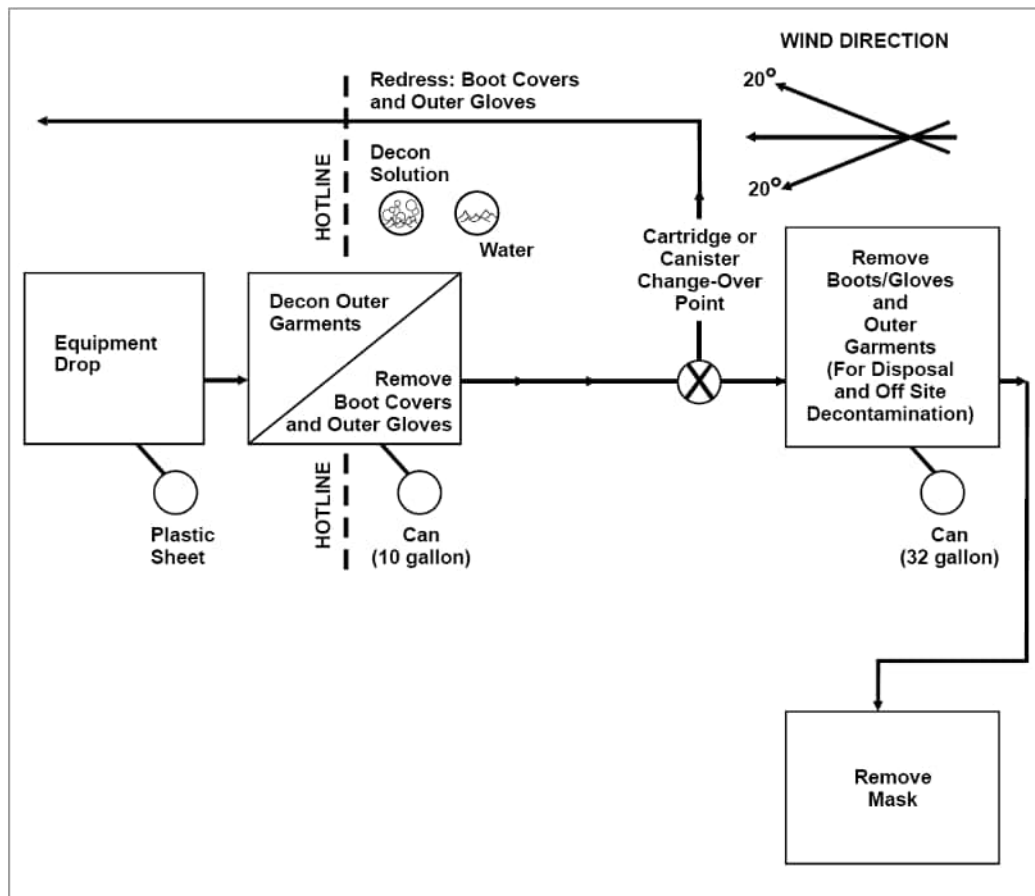


**DECONTAMINATION OF PERSONNEL****Table 2. Minimum Measures for Level C Decontamination**

Station	1:	Equipment Drop	1.	Deposit equipment used on-site (tools, sampling devices and containers, monitoring instruments, radios, clipboards, etc.) on plastic drop cloths. Segregation at the drop reduces the probability of cross contamination. During hot weather operations, a cool down station may be set up within this area.
Station	2:	Outer Garment, Boots, and Gloves Wash and Rinse	2.	Scrub outer boots, outer gloves and splash suit with decon solution or detergent water. Rinse off using copious amounts of water.
Station	3:	Outer Boot and Glove Removal	3.	Remove outer boots and gloves. Deposit in container with plastic liner.
Station	4:	Canister or Mask Change	4.	If worker leaves exclusive zone to change canister (or mask), this is the last step in the decontamination procedure. Worker's canister is exchanged, new outer gloves and boot covers donned, joints taped, and worker returns to duty.
Station	5:	Boot, Gloves and Outer Garment Removal	5.	Boots, chemical-resistant splash suit, inner gloves removed and deposited in separate containers lined with plastic.
Station	6:	Face Piece Removal	6.	Facepiece is removed. Avoid touching face with fingers. Facepiece deposited on plastic sheet.
Station	7:	Field Wash	7.	Hands and face are thoroughly washed. Shower as soon as possible.

## DECONTAMINATION OF PERSONNEL

### Minimum Measures for Level C Decontamination





## RESIDUALS MANAGEMENT

### A. PURPOSE/SCOPE:

The following standard operating procedure (SOP) presents a description of the methods generally employed for the management of residual waste. Field personnel are responsible for ensuring that state-specific standards/guidelines/regulations are followed, where applicable. In addition, field personnel are responsible for coordination efforts associated with the waste disposal facility, if known.

Improper handling and storage of residual waste can result in leaks and spills and pose a serious threat to the quality of the environment. Timely characterization and disposal of residual wastes shall be conducted in order to not exceed onsite quantity and/or storage regulations.

### B. EQUIPMENT/MATERIALS:

Off-Site transportation and disposal of residual waste will be performed by a licensed waste hauler under the direction of CHA. The company will supply the necessary equipment and materials needed to remove the residual waste from the Site and transport it to an approved waste disposal facility.

The field geologist/engineer will obtain the necessary sample bottles with the associated preservatives, if required, from the analytical laboratory. See SOP #603, Sample Containers, Volumes, Preservations and Holding Times, for additional information on these topics. In addition, if a flame ionization detector (FID), photoionization detector (PID) and/or gas meter will be used to screen waste containers soils for the presence of volatile organic compounds (VOCs).

All other equipment required during transportation/disposal activities is the responsibility of the Contractor (waste hauler).

### C. PROCEDURE:

1. During remedial activities all residual waste, including, but not limited to, soil cuttings, decontamination wash/rinse water, purge water and personal protective equipment (PPE) shall be containerized in United States Department of Transportation (USDOT) approved 55-gallon drums or similar waste containers, unless the Work Plan indicates otherwise. Each drum shall contain similar materials/matrices (e.g., soil, water, PPE).
2. Label each waste container using a permanent marker and weather proof label with the following:
  - a. Description of the container contents
  - b. Site name and address
  - c. Name of Site contact and associated phone number

Waste container labels shall be legible and easily understood by those unfamiliar with the Site.

3. Upon completion of remedial activities, the field geologist/engineer will conduct waste characterization of the residual waste prior to off-Site transportation and disposal. Depending upon the type of waste present, various waste disposal facilities may have different testing requirements. CHA will complete the required analytical testing. Upon receipt of analytical data and coordination with the disposal facility, the field geologist/engineer will supervise the removal of the waste from the Site.





## RESIDUALS MANAGEMENT

4. Waste containers shall be transported and stored in a secure location on-Site. All waste containers shall be located in one location, if possible.
5. If waste containers are stored for a period of time prior to collecting waste characterization samples, all waste containers shall be inspected for signs of the potential presence of explosive/flammable gases and/or toxic vapors. These signs include pressurization (bulging/dimples); crystals formed around the drum opening; leaks, holes, stains; labels, marking; composition and type (steel/poly and open/bung); condition, age, rust; and sampling accessibility. Drums showing evidence of pressurization and crystals shall be further assessed to determine proper drum opening techniques.
6. All metal waste containers not in direct contact with the earth shall be grounded.
7. Open the waste container with spark resistant tools (e.g., brass, beryllium).
8. Screen the waste containers for explosive gases and/or toxic vapor with appropriate air monitoring instruments as necessary.
9. Obtain the necessary sample bottles with the associated preservatives, if required, from the analytical laboratory. See SOP #603, Sample Containers, Volumes, Preservations and Holding Times, for information regarding field preservation of sample containers, if necessary.
10. Each matrix (e.g., soil, water) shall be sampled for waste characterization purposes. The field geologist/engineer shall determine the quantity of similar waste characterization samples to be collected from the waste containers in conjunction with the project manager and/or waste disposal facility. Containers with similar wastes (e.g., soil, water) generated from one area of the site may require only one composite sample from each of the waste containers. This determination shall also be made in conjunction with the project manager and/or waste disposal facility.
11. Use a decontaminated spade or shovel to collect representative solid waste samples from each waste container or use a beaker, bailer or similar mechanism to collect representative liquid waste samples from each waste container.
12. Immediately place sample in the pre-preserved sample containers and close the waste container(s).
13. Chill all samples to 4°C from sample collection until laboratory analysis.
14. Package and ship samples per SOP #607.

### D. QA/QC REQUIREMENTS:

This section includes QA/QC requirements associated with tank closure activities. The following general requirements apply to this SOP:

1. All data must be documented on field data sheets or within site logbooks.
2. All instrumentation must be operated in accordance with operating instructions as supplied by the manufacturer, unless otherwise specified in the work plan.
3. Equipment checkout and calibration activities must occur prior to sampling/operation, and must be documented.



## RESIDUALS MANAGEMENT

E. SPECIAL CONDITIONS:

In no case, will CHA be considered the generator of the waste. The site owner shall always take responsibility for waste disposal. Additionally, CHA may only act as agent for the owner relative to signing manifests with specific permission from CHA's in-house counsel. In most every case, the owner should sign waste manifests.

F. REFERENCES:

United States Environmental Protection Agency, Science and Ecosystem Support Division, Waste Sampling Standard Operating Procedure: <http://www.epa.gov/region4/sesd/fbqstp/Waste-Sampling.pdf>

G. APPENDICES/FORMS:

Not Applicable

### END OF SOP

Final Check by C. Burns 10/26/15

## **SAMPLE CONTAINERS, VOLUMES, PRESERVATIONS AND HOLDING TIMES**

### **A. PURPOSE/SCOPE:**

The following standard operating procedure (SOP) presents general guidelines for sample containers, volumes, preservations and holding times associated with air, water and soil/sediment samples. Field personnel are responsible for ensuring that state-specific standards/guidelines/regulations are followed, where applicable.

Improper preserving, storing and handling of air, water and soil/sediment samples are critical if the integrity of the samples are to be maintained. Samples collected in the field may undergo biological, chemical or physical changes following removal from their environment. In order to minimize those changes, many samples must have preservatives in the form of strong acids or bases added prior to delivery to the laboratory. If samples are to be collected as part of a government program, the governing agency typically must be notified 30 days prior to sample collection.

### **B. EQUIPMENT/MATERIALS:**

Pre-cleaned sample containers along with associated preservations within the sample containers will be provided to CHA from the analytical laboratory. The field geologist/engineer will provide the necessary personal protective equipment to place samples collected within the appropriate sample containers per SOPs 300 through 417. However, if field preservation is required the following equipment and materials shall be obtained:

- Hydrochloric (HCl) Acid Reagent A.S.C. 38%
- Nitric (HNO<sub>3</sub>) Acid Reagent A.S.C. 71%
- Sodium Hydroxide (NaOH) 97%
- 10 mL glass pipettes
- Narrow range (0-3 and 12-14) pH paper
- Nitrile gloves

### **C. PROCEDURE:**

1. Review Table 1 which details typical parameters of interest at environmental sites and the associated methods, preservation, container type, holding time and required sample volume.
2. Obtain pre-cleaned and pre-preserved sample containers from the laboratory. If pre-preserved sample containers were provided skip to Step 7; if not proceed to Step 3.
3. Put on a clean pair of nitrile gloves.
4. In a clean, non-dusty environment, remove the cap of the sample container.
5. Using a clean, 10 mL glass pipette draw the required amount of acid or base and insert into the sample container.
6. Volatile Organic Compounds – 2 mL of HCl acid (water samples).
7. Total and Dissolved Metals (including mercury) – 5 mL Nitric acid (water samples).
8. Cyanide – 15-20 Sodium Hydroxide pellets (water samples).



## **SAMPLE CONTAINERS, VOLUMES, PRESERVATIONS AND HOLDING TIMES**

9. Chemical Oxygen Demand, Oil and Grease, Organic Carbon, Phenolics, Total Dissolved Phosphorous, Hydrolyzable Phosphorus, Ammonia, Nitrate and Nitrite – 5 mL Sulfuric acid (water samples).
10. Immediately replace and tighten the sample container cap.
11. Collect sample using equipment and procedures outlined in other SOPs as appropriate. The volume of the sample collected shall be sufficient to conduct the analysis required, as well as associated quality assurance/quality control samples (QA/QC). QA/QC samples shall be collected in accordance with SOP 605.
12. Place samples immediately in the pre-preserved sample containers.
13. Chill all samples to 4°C from sample collection until laboratory analysis.
14. Package and ship samples per SOP #607.

### **D. QA/QC REQUIREMENTS:**

This section includes QA/QC requirements associated with sample containers, volumes, preservations, and holding times. The following general requirements apply to this SOP:

1. All data must be documented on field data sheets or within site logbooks.
2. All instrumentation must be operated in accordance with operating instructions as supplied by the manufacturer, unless otherwise specified in the work plan.
3. Equipment checkout and calibration activities must occur prior to sampling/operation, and must be documented.
4. QA/QC samples shall be collected in accordance with SOP 605.

The following procedure shall be conducted to provide a QA/QC check of water (aqueous) samples to ensure the samples were preserved to the proper pH prior to shipping for laboratory analysis.

#### **Volatile Organic Compounds:**

1. Collect one additional VOA vial at every third aqueous sampling location.
2. Fill the extra vial with the sample.
3. Using the extra VOA vial, remove the cap and using a clean, 10 mL glass pipette extract approximately 1 mL of water.
4. Place two drops of the water on a 1-inch strip of 0-3 range pH paper.
5. Compare pH strip's color while wet with that of the color key included on the pH paper container.
6. If pH is not less than 2, add additional HCL to the remaining 3 VOA vials prior to collecting the sample.
7. Discard the vial used to check the pH.



## **SAMPLE CONTAINERS, VOLUMES, PRESERVATIONS AND HOLDING TIMES**

Total and Dissolved Metals, Mercury, Ammonia, Nitrate plus Nitrite, Total Dissolved Phosphorus, COD, Oil & Grease, Organic Carbon, Phenolics

1. Collect sample and tightly reseal the cap.
2. Agitate the sample by gently shaking the sample bottle to mix the acid and water.
3. Remove the cap and using a clean, 10 mL glass pipette extract approximately 1 mL of sample.
4. Place approximately two drops of sample on a 1 inch strip of 0-3 range pH paper.
5. Compare pH strip's color while wet with that of the color key included on the pH paper container.
6. If pH is not less than 2, add appropriate additional Sulfuric Acid to the sample using a clean pipette.
7. Recheck sample using steps 2 through 6 until sample pH is less than 2.

### Cyanide

1. Collect sample and tightly reseal the cap.
2. Agitate the sample by gently shaking the sample bottle until the NaOH pellets are dissolved.
3. Remove the cap and using a clean 10 mL glass pipette extract approximately 1 mL of sample.
4. Place approximately two drops of sample on a 1-inch strip of 12-14 range pH paper.
5. Compare pH strip's color while wet with that of the color key included on the pH paper container.
6. If pH is not greater than 12, add additional NaOH to the sample using standard procedures.
7. Recheck sample using steps 2 through 6 until sample pH is greater than 12.

### E. SPECIAL CONDITIONS:

Not Applicable

### F. REFERENCES:

Alpha Analytical Aqueous and Soil/Solid Reference Guides.

### G. APPENDICES/FORMS:

Table 1 Laboratory Analysis: Summarizing parameters, methods, preservations, container type, holding times and minimum sample volumes are included as an attachment to this SOP.

**END OF SOP**

Final Check by C. Burns 10/27/15

Laboratory Analysis	EPA Method	Standard Method and/or SW846 Method	Preservation	Container	Holding Time	Minimum Volume
WATER						
Acid Soluble & Insoluble Sulfide	-----	9030B	Cool to 4 deg C No Headspace	P or G	7 Days	8 oz.
Acidity as CaCO <sub>3</sub>	305.1	2310B	Cool to 4 deg C	P or G	14 Days	100 mL
Alkalinity	-----	2320B	Cool to 4 deg C	P or G	14 Days	100 mL
Alkalinity as CaCO <sub>3</sub>	310.1	2320B	Cool to 4 deg C	P or G	14 Days	100 mL
Ammonia	350.2/3	4500-NH <sub>3</sub> B,E	Cool to 4 deg C, H <sub>2</sub> SO <sub>4</sub> to pH<2	P or G	28 Days	400 mL
Aromatic Hydrocarbons	602	8021B	1:1 HCl to pH <2, Cool to 4 deg C 0.008% Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> if residual chlorine present	G, Vial screw cap with center hole Teflon- faced silicone septum	14 Days	40 mL
Biochemical Oxygen Demand	405.1	5210B	Cool to 4 deg C	P or G	48 Hrs.	500 mL
Bromide	300	-----	None	P or G	28 Days	250 mL
Calcium	-----	3120B	HNO <sub>3</sub> to pH<2	P or G	6 Months	100 mL
Calcium- Hardness	200.7	3111B	HNO <sub>3</sub> to pH<2	P or G	6 Months	100 mL
Carbamates	531.1	-----	Cool to 4 deg C, 0.08% Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> if residual chlorine present	G, screw cap Teflon faced silicone septum	14 Days	100 mL mL
Carbonaceous BOD	-----	5210B	Cool to 4 deg C	P or G	48 Hrs.	1000 mL
Chloride	300	4500-CL D 4110	Cool to 4 deg C	P or G	28 Days	100 mL
Chloride, Residual Disinfectant	-----	4500Cl-G	Cool to 4 deg C	P or G	Analyze Immediately	200 mL
COD	410.4	5220D	H <sub>2</sub> SO <sub>4</sub> to pH<2, Cool to 4 deg C	P	28 days	250 mL
Color	-----	2120B	Cool to 4 deg C	P or G	24 Hrs	100 mL
Conductivity	-----	2510B	Cool to 4 deg C	P or G	28 Days	100 mL
Cyanide	335.4	4500-CN C&E	Cool to 4 deg C NaOH pH>12	P or G	14 Days	250 mL
Cyanide	335.2	9010B, 9012A, 9014	Cool to 4 deg C, NaOH to pH>12 0.6 g ascorbic acid if residual chlorine present	P or G	Sulfide absent, 14 days; sulfide present 24 Hrs	250 mL
Cyanide, Amenable	335.1					
Dioxin	-----	8280A	Cool to 4 deg C 0.008% Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> if residual chlorine present	G, Amber Teflon-lined screw cap	7 days until extraction 40 days after extraction	1000 mL
DRO	-----	8015B	Cool to 4 deg C 0.008% Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> if residual chlorine present	G, Amber Teflon-lined screw cap	7 days until extraction 40 days after extraction	1000 mL
Escherichia Coli	-----	9222B	0.008% Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> if residual chlorine present 0.3 mL/125 mL 15% EDTA if > 0.01 mg/L heavy metals	Sterile P or G	30 Hrs. for Drinking Water 6 Hrs. for Waste Water	125 mL
Extractable Org. Compounds			Cool to 4 deg C, Store in dark	G, Amber Teflon-lined screw cap	*7 days	4000 mL



Laboratory Analysis	EPA Method	Standard Method and/or SW846 Method	Preservation	Container	Holding Time	Minimum Volume
Fecal Coliform	-----	9222B or D	0.008% Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> if residual chlorine present 0.3 mL/125 mL 15% EDTA if > 0.01 mg/L heavy metals	Sterile P or G	30 Hrs. for Drinking Water 6 Hrs. for Waste Water	125 mL
Fecal Streptococci	-----	9230C	Cool to 4 deg C 0.008% Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> if residual chlorine present	Sterile P or G	30 Hrs. for Drinking Water 6 Hrs. for Waste Water	125 mL
Fluoride	300	4500 F-B,C S	Cool to 4 deg C	P or G	28 Days	300 mL
Foaming Agents (MBAS)	-----	5540C	Cool to 4 deg C	P or G	48 Hrs	250 mL
Gases	-----	3810	Cool to 4 deg C 0.008% Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> if residual chlorine present 1:1 HCl to pH <2	G, Vial screw cap with center hole Teflon- faced silicone septum	7 days without HCl 14 days with HCl	40 mL
GRO	-----	8015B	1:1 HCl to pH <2, Cool to 4 deg C 0.008% Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> if residual chlorine present	G, Vial screw cap with center hole Teflon- faced silicone septum	7 days w/o HCl 14 days w/HCl	40 mL
Hardness			HNO <sub>3</sub> to pH<2	P	6 months	1000 mL
Heterotrophic Plate Count	-----	9215B	Cool to 4 deg C 0.008% Na <sub>2</sub> S <sub>2</sub> O <sub>3</sub> if residual chlorine present	Sterile P or G	30 Hrs. for Drinking Water 6 Hrs. for Waste Water	125 mL
Hexavalent Chromium	7196A	3500Cr-D	Cool to 4 deg C	P	24 hours	500 mL
HPLC (Explosive)	-----	8330	Cool to 4 deg C	G, Amber Teflon-lined screw cap	7 days until extraction 40	1000mL
HPLC (Explosive)	-----	8310	Cool to 4 deg C	G, Amber Teflon-lined screw cap	days after extraction	1000mL
Mercury	-----	7470A	Cool to 4 deg C	P or G	28 Days	8 oz.
Metals	200.7	-----	HNO <sub>3</sub> to pH<2	P	6 Months	100 mL
Nitrate	300	-----	Cool to 4 deg C	P or G	48 Hrs.	100 mL
Nitrate (Chlorinated)	353.2	4500-NO <sub>3</sub> F	Cool to 4 deg C	P or G	48 Hrs	250 mL
Nitrate (Non- chlorinated)	353.2	4500-NO <sub>3</sub> F	H <sub>2</sub> SO <sub>4</sub> to pH<2, Cool to 4 deg C	P or G	14 Days	250 mL
Nitrite	300, 353.2, 354.1	4500-NO <sub>3</sub> D	Cool to 4 deg C	P or G	48 Hrs	100 mL
Odor	-----	2150B	Cool to 4 deg C	G only	24 Hrs	200 mL
Oil and Grease		1664	HCl to pH<2, Cool to 4 deg C	G, Amber Teflon-lined screw cap	28 days	1000 mL
Organic Nitrogen	351.1	-----	Cool to 4 deg C, H <sub>2</sub> SO <sub>4</sub> to pH<2	G	28 Days	500 mL

Laboratory Analysis	EPA Method	Standard Method and/or SW846 Method	Preservation	Container	Holding Time	Minimum Volume
Organochlorine Pesticides/PCB	608	8081A,8082	Cool to 4 deg C 0.008% Na2S2O3 if residual chlorine present If aldrin is to be determined bind to pH 5-9.	G, Amber Teflon-lined screw cap	7 days until extraction 40 days after extraction	1000 mL
Ortho Phosphate	300	4500 P-E	Cool to 4 deg C	P or G	48 Hrs	50 mL
Orthophosphate	365.2	-----	Filter immediately, Cool to 4 deg C	P or G	48 Hrs.	50 mL
PFAS/PFCs	1633.0		Cool to 4 deg C	P - HDPE only with no teflon liner	28 Days	2(250 mL)
pH, Hydrogen ion	-----	4500-H-B	Cool to 4 deg C	P or G	Analyze Immediately	25 mL
Phenols	420.1	9065, 510ABC	Cool to 4 deg C, H2SO4 to pH<2	G	28 Days	500 mL
Pseudomonas Aeruginosa	-----	9213E	Cool to 4 deg C 0.008% Na2S2O3 if residual chlorine present	Sterile P or G	30 Hrs. for Drinking Water 6 Hrs. for Waste Water	125 mL
Purgeable Halocarbons	601	8021B	Cool to 4 deg C 0.008% Na2S2O3 if residual chlorine present	G, Vial screw cap with center hole Teflon- faced silicone septum	14 Days	40 mL
Radiological	-----	-----	HNO3 to pH<2	P or G	6 Months	100 mL
Residue- Settleable (SS)	160.5	-----	Cool to 4 deg C	P or G	48 Hrs.	1000 mL
Residue-filtered (TDS)	160.1	-----	Cool to 4 deg C	P or G	7 Days	100 mL
Residue-non- filtered (TSS)	160.2	-----	Cool to 4 deg C	P or G	7 Days	100 mL
Residue-Total Volatile Solids	160.4	2540 E	Cool to 4 deg C	P or G	7 Days	100 mL
Salinity	-----	2520 C	Cool to 4 deg C	G	28 Days	100 mL
Semivolatile Organic Compounds (Unregulated)	525.2	-----	If residual chlorine is present, add 40-50 mg Sodium Thiosulfate. If not chlorinated, add 6N HCl to pH<2 Cool to 4 deg C	G, Amber Teflon-lined screw cap	7 Days for extraction, 30 after extraction	1000 mL
Semivolatile Organics	625	8270C	Cool to 4 deg C 0.008% Na2S2O3 if residual chlorine present	G, Amber Teflon-lined screw cap	7 days for extraction 40 days after extraction	1000 mL
Silica	200.7	-----	Cool to 4 deg C	P only	7 Days	50 mL
Specific Conductance	120.1	-----	Cool to 4 deg C	P or G	28 Days	100 mL
Sulfate	300	4500-SO4	Cool to 4 deg C	P or G	28 Days	50 mL
Sulfate	375.4	-----	Cool to 4 deg C	P or G	28 Days	50 mL
Sulfide	376.2	9030 B, 4500S2-AD	Cool to 4 deg C, add zinc plus NaOH to pH>9	P or G	7 Days	50 mL
Sulfite (SO3)	377.1	-----	None Required	G, Bottle and Top	Analyze immediately	50 mL
Surfactants (MBAS)	425.1	-----	Cool to 4 deg C	P or G	48 Hrs.	250 mL
TDS			Cool to 4 deg C	P	7 days	500 mL

Laboratory Analysis	EPA Method	Standard Method and/or SW846 Method	Preservation	Container	Holding Time	Minimum Volume
Temperature	-----	2550B	None	P or G	Analyze Immediately	1000 mL
Temperature	170.1	-----	None Required	G, Bottle and Top	Analyze immediately	1000 mL
Total Kjeldahl Nitrogen	353.3/1	4500Norg-C	H2SO4 to pH<2 , Cool to 4 deg C	P	28 days	250 mL
Total Coliform	-----	9221D	0.008% Na2S2O3 if residual chlorine present 0.3 mL/125 mL 15% EDTA if > 0.01 mg/L heavy metals	Sterile P or G	30 Hrs. for Drinking Water 6 Hrs. for Waste Water	125 mL
Total Dissolved Solids	160.1	2540C	Cool to 4 deg C	P or G	7 Days	100 mL
Total Hardness	130.2 , 200.7	-----	HNO3 to pH<2 H2SO4 to pH<2	P or G	6 Months	100 mL
Total Kjeldahl Nitrogen	351.3	-----	H2SO4 to pH<2	P or G	28 Days	500 mL
Total Metals	200.7 200.8	6010B, 6020, 7000A	HNO3 to pH<2	P	6 months (Hg 28 days)	500 mL
Total Organic Carbon (TOC)	415.1	9060, 5310C	H2SO4 to pH<2, Cool to 4 deg C	G, Amber Teflon-lined screw cap	28 days	80 mL
Total Organic Halides		5320B	1N H2SO4 to pH<2	P or G	28 Days	50 mL
Total Phosphorus	365.2	-----	Cool to 4 deg C, H2SO4 to pH<2	G	28 Days	50 mL
Total Recoverable Oil & Grease	413.1,166 4A	-----	Cool to 4 deg C, HCL or H2SO4 to pH<2	G	Petroleum Based 3 Days; Non-Petroleum Based 24 hours	1000 mL
Total-Residue (TS)	160.3	2540B	Cool to 4 deg C	P or G	7 Days	100 mL
Turbidity	180.1	2130B	Cool to 4 deg C	P or G	48 Hrs	100 mL
Volatile Organics	624	8260B	1:1 HCl to pH <2, Cool to 4 deg C 0.008% Na2S2O3 if residual chlorine present	G, Vial screw cap with center hole Teflon-faced silicone septum	7 days w/o HCl 14 days w/HCl	40 mL
Volatiles (Regulated)	524.2	-----	Cool to 4 deg C HCl to pH<2	G, Vial screw cap with center hole Teflon-faced silicone septum	14 Days	60-120 mL
SOIL						
Acid Soluble & Insoluble Sulfide	-----	9030B	Cool to 4 deg C, no headspace	P or G	7 Days	8 oz.
Amenable Cyanide	-----	9213	Cool to 4 deg C	P or G	14 Days	4 oz.
Bromide	-----	9211	Cool to 4 deg C	P or G	28 Days	8 oz.
Cation - Exchange Capacity	-----	9080, 9081	None	P	-----	8 oz.
Chloride	-----	9212, 9056, 9253	None	P or G	28 Days	8 oz.
Chlorinated Herbicides	-----	8151A	Cool to 4 deg C	G, wide mouth, teflon liner	14 Days	8 oz.
Corrosivity pH Waste>20% water	-----	9040B	Cool to 4 deg C	P	Analyze Immediately	4 oz.
Corrosivity Toward Steel	-----	1110	Cool to 4 deg C	P	14 Days	4 oz.

Laboratory Analysis	EPA Method	Standard Method and/or SW846 Method	Preservation	Container	Holding Time	Minimum Volume
Cyanide		9010B, 4500CN	Cool to 4 deg C	G, Amber	14 Days	4 oz
Dioxin	-----	8280A	Cool to 4 deg C	G	14 Days	8 oz.
DRO	-----	8015B	Cool to 4 deg C	G, Amber	14 Days	4 oz.
Extractable Organic Compounds			Cool to 4 deg C, Store in dark	G	14 days	8 oz
Extractable Sulfide	-----	9031	Cool to 4 deg C, fill top of sample with 2N Zinc Acetate until moistened	P or G	7 Days	8 oz.
Fluoride	-----	9214	None	P	28 Days	8 oz.
Gases	-----	3810	Cool to 4 deg C	G, Amber	14 Days	8 oz.
Grain Size			N/A	G	N/A	8 oz
GRO	-----	8015B	Cool to 4 deg C, check state regulations for proper preservative. NJ (methanol), PA (encore samplers) NY (cool to 4 deg C).	G, Amber VOA vial	14 Days	15 Grams
HPLC (PAH)	-----	8310	Cool to 4 deg C	G, Amber Teflon-lined screw cap	14 days until extraction 40 days after extraction	4 oz.
Ignitability	-----	1010	None	P or G	None	8 oz.
Ignitability of Solids		1030	None	P or G	None	8 oz.
Mercury	245.1	7471A	Cool to 4 deg C	G, Amber	28 Days	4 oz.
Metals	-----	6010B, 6020, 7000A	Cool to 4 deg C	G, Amber	6 Months	8 oz.
Moisture Content			Store in airtight jar 3-30 deg C	G	N/A	8 oz
Nitrate	-----	9210	Cool to 4 deg C	P or G	48 Hrs	8 oz.
Oil & Grease (Sludge, Sludge- Hem)	-----	9071B	Cool to 4 deg C	G	28 Days	8 oz.
Organochlorine	-----	8081A	Cool to 4 deg C	P or G	14 Days	8 oz.
Paint Filter Liquids Test	-----	9095A	Cool to 4 deg C	P or G	-----	8 oz.
PCBs	-----	8082	Cool to 4 deg C	G, Amber Teflon-lined screw cap	14 Days	4 oz.
PFAS/PFCs	1633	-----	Cool to 4 deg C	HDPE w/o lined cap	28 days	8 oz.
pH	-----	9045C	Cool to 4 deg C	G, Amber	Analyze Immediately	4 oz.
pH, Soil and Waste	-----	9045A	Cool to 4 deg C	G	Analyze Immediately	8 oz.
Phenol	-----	9065, 9066, 9067	Cool to 4 deg C	G, Amber	28 Days	4 oz.
Radiological	-----	-----	Cool to 4 deg C	G	6 Months	8 oz.
Reactivity Cyanide	-----	SW-846 7.3.3.2	Cool to 4 deg C	P	14 Days	8 oz.
Reactivity Sulfide	-----	SW-846 7.3.4.2	Cool to 4 deg C	P	14 Days	8 oz.
Semivolatile Organics	-----	8270C	Cool to 4 deg C	G, Amber	14 Days	8 oz.
Sulfate	-----	9035, 9036, 9038	Cool to 4 deg C	P or G	28 Days	8 oz.

Laboratory Analysis	EPA Method	Standard Method and/or SW846 Method	Preservation	Container	Holding Time	Minimum Volume
Sulfides	-----	9215	Cool to 4 deg C	P or G	7 Days	8 oz.
TCLP Metals	-----	1311, 6010B, 6020, 7000A, 7470A	Cool to 4 deg C	G, Amber	180 Days (Hg 28 days)	8 oz
TCLP Herbicides	-----	1311	Cool to 4 deg C	G, Amber	14 Days	8 oz.
TCLP Pesticides	-----	1311	Cool to 4 deg C	G, Amber	14 Days	8 oz.
TCLP Semivolatile Organics	-----	1311, 8270C, 8081A, 8151A	Cool to 4 deg C	G, Amber Teflon Lined	14 Days	8 oz.
TCLP Volatile Organics	-----	1311, 8260B	Cool to 4 deg C	G, Amber VOA Vial Teflon Lined	14 Days	8 oz.
Temperature	-----	2550	-----	P	Analyze Immediately	4 oz.
TOC		Lloyd Kahn Method	Cool to 4 deg C	G, Amber	14 days	4 oz.
Total Coliform	-----	9131	Cool to 4 deg C	Sterile, P or G	6 Hrs	4 oz.
Total Coliform	-----	9132	Cool to 4 deg C	Sterile, P or G	6 Hrs	4 oz.
Total Cyanide	-----	9013	Cool to 4 deg C	P or G	14 Days	8 oz.
Volatile Organic Compounds	-----	8260B	Cool to 4 deg C Check individual state regulations for proper preservative. NJ (methanol), PA (encore samplers), NY (cool to 4 deg C)	G, wide mouth, teflon liner	14 Days	4 oz.
Volatile Organic Compounds	-----	8021		G, wide mouth, teflon liner	14 Days	4 oz.
CLP Sampling and Holding Time Information						
Cyanide (aqueous)	ILM04.1		NaOH to pH>12, Cool to 4 deg C	P	12 Days VTSR	1000ml
Cyanide**	ILM04.1		Cool to 4 deg C	G		8 oz
Mercury (aqueous)	ILM04.1		HNO3 to pH<2, Cool to 4 deg C	P	26 Days VTSR	1000ml
Mercury (solid/soils)	ILM04.1		Cool to 4 deg C	G		8 oz
Metals (aqueous)	ILM04.1		HNO3 to pH<2, Cool to 4 deg C	P	180 Days VTSR	1000ml
Metals (solid/soils)	ILM04.1		Cool to 4 deg C	G		8 oz
PCBs (aqueous)	OLM04.2		Na2S2O3, Cool to 4 deg C	G	See Note 7	1000ml
PCBs (solid/soils)	OLM04.2		Cool to 4 deg C	G	See Note 6	8 oz
Pesticides (aqueous)	OLM04.2		Na2S2O3, Cool to 4 deg C	G	See Note 7	1000ml
Pesticides (solid/soils)	OLM04.2		Cool to 4 deg C	G	See Note 6	8 oz
Semivolatile Organic Compounds (aqueous)	OMLO4.2		Cool to 4 deg C	G	See Note 8	1000ml
Semivolatile Organic Compounds (solid/soils)	OLM04.2		Cool to 4 deg C	G	See Note 6	8 oz
Volatile Organic Compounds (aqueous)	OLM04.2		HCL pH < 2, Cool to 4 deg C	G	W/preservative: 10 days VTSR; W/O: 7 days VTSR	40ml
Volatile Organic Compounds (solid/soils)	OLM04.2		Cool to 4 deg C	G	10 Days VTSR	4 oz

Laboratory Analysis	EPA Method	Standard Method and/or SW846 Method	Preservation	Container	Holding Time	Minimum Volume
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Notes:

1. P - Plastic.
2. G - Glass.
3. Minimum volume is the minimum volume required by the laboratory to conduct the analysis. The laboratory will likely require additional sample volume.
4. \* Extraction within seven (7) days of collection; analysis within 40 days of extraction.
5. \*\*When chlorine is present ascorbic acid is used to remove the interference (0.6 g ascorbic acid).
6. VTSR - Validated time of sample receipt.
7. Ten (10) days from VTSR for extraction and 40 days following extraction.
8. Five (5) days from VTSR for extraction 14 days after extraction.
9. Five (5) days from VTSR for extraction 40 days after extraction.
10. Holding times are from the time of sample collection unless otherwise noted.



## QUALITY ASSURANCE/QUALITY CONTROL SAMPLES

### A. PURPOSE/SCOPE:

This standard operating procedure explains the purpose and correct usage of Quality Assurance/Quality Control (QA/QC) samples. QA/QC samples are intended to validate the results of sample analysis by providing the means to determine the influence of outside factors on the sample and analysis. There are several types of QA/QC samples in use to ensure the best practices are being followed by both the laboratory performing the analysis and the sampling team in the field. This is a general procedure for the use of QA/QC samples. Also refer to any guidelines provided by the laboratory.

### B. EQUIPMENT/MATERIALS:

QA/QC samples require the following materials:

- Sample containers:  
They should be the same containers in number and type of preservative as the containers for the samples for which QA/QC samples are being taken.
- Analyte-free water
- Any laboratory supplied QA/QC materials.

### C. PROCEDURE:

The following are types of QA/QC samples.

#### 1. Duplicate Sample

A duplicate sample is a sample that is collected concurrently with the routine samples. It consists of an additional set of sample containers to be analyzed for the same parameters as the routine samples. It is taken at a sample point of the samplers choosing and at the same time as the routine sample for that sample point is taken. It is labeled and included on the Chain of Custody (COC) Form (see SOP 105) with a name unknown to the laboratory.

##### **Example:**

- Sample Point ID is **MW-1**
- Duplicate Sample ID is **CHA-1**

The duplicate sample is submitted as a 'blind' sample to the laboratory. The purpose of a duplicate sample is to allow the sampler to determine the precision of laboratory analysis. The results of the duplicate sample are compared with the results of the concurrent routine sample by the sampler. These results should be within the margin of error for the test being performed.

One duplicate sample should be taken for every twenty (20) routine samples. For example if 16 samples points were sampled, there would be 1 duplicate sample taken at one of the sample points for a total of 17 sample sets submitted to the lab.

#### 2. Field Blank

The Field Blank sample is a type of QA/QC sample used to account for possible external contamination of the routine samples, usually by exposure to the air from being on site. It consists of an additional set of sample containers to be analyzed for the same parameters as the routine samples. It is common to only conduct a Field Blank for volatile organic compound (VOC) parameters even when sampling





## QUALITY ASSURANCE/QUALITY CONTROL SAMPLES

to additional parameters. This is because VOCs are more likely to be present in the atmosphere at the site than a parameter like metals. However a Field Blank can be conducted for any parameter.

The containers are prepared prior to sampling by filling the containers with analyte-free water. The containers are then transported with the routine sample containers to the site. Once at the site the containers are placed in a location representative of the site conditions and their caps are removed. At the end of the sampling event the caps are then replaced. The sample is labeled and included on the COC as **Field Blank** or **FB**.

If any results are positive for the Field Blank it can be assumed that the routine samples have also been exposed to a similar amount of contaminant and that contaminant is probably present in the atmosphere at the site.

One Field Blank should be taken as required for each day of sampling at the site. They are only used for the collection of aqueous samples.

### 3. Equipment Blank

An Equipment Blank is a QA/QC sample designed to measure the effectiveness of the decontamination of field equipment. It consists of an additional set of sample containers being analyzed for the same parameters as the routine samples.

An Equipment Blank is collected by pouring analyte-free water directly over/on/into the decontaminated sampling equipment coming into contact with the samples being collected. The water is then collected in the sample containers. Once the containers are filled they are capped and sent to the lab with the other routine samples. The sample is labeled and included on the COC as **Equipment Blank** or **EQ Blank**.

A positive result for the analysis of the Equipment Blank could signal inadequate decontamination of the equipment which may result in cross-contaminated samples and thus suspect results.

One Equipment Blank should be taken for every twenty (20) routine samples collected. The Equipment Blank is not necessary when using dedicated sampling equipment or sampling equipment that is disposed of between each sample point.

### 4. Matrix Spike/Matrix Spike Duplicate Sample

The Matrix Spike/Matrix Spike Duplicate (MS/MSD) Sample is a quality control system used by the laboratory to check the accuracy of their instruments. It consists of a set of two (2) samples taken at a sample point concurrently with the routine sample for a total of three (3) sets of containers for that sample point. Therefore, the MS/MSD samples should be collected from sample points with sufficient sample volume (e.g., monitoring wells that have low recharge are not good candidates). They are labeled and included on the COC as 'Sample ID' MS and 'Sample ID MSD'.

#### **Example:**

- Sample Point ID is **MW-1**
- Matrix Spike would be **MW-1 MS**
- Matrix Spike Duplicate would be **MW-1 MSD**



## QUALITY ASSURANCE/QUALITY CONTROL SAMPLES

The MS/MSD samples are submitted to the laboratory with the routine samples. Once at the laboratory they will have a known amount of an analyte added, known as the spike. The sample will then be run as a routine sample. Once the results are received they are compared to the results of the routine sample (MW-1 results are compared to MW-1 MS results). There should be a difference in the amount of analyte detected between the samples that should be within the margin of error of the amount of analyte spike that was added to the MS sample. This process is repeated for the MSD sample. This process is an internal review of results for the laboratory to determine the accuracy of their instruments.

One MS/MSD set should be taken for every twenty (20) samples (including Duplicate Samples and Field or Equipment Blank Samples). For example if 12 samples are taken, there should also be a set of MS/MSD samples taken for a total of 14 sample sets submitted to the lab. If 20 samples will be taken, only one set of MS/MSD samples needs to be submitted (total number of samples being 22).

*The following QA/QC samples are used for only specific analyses or functions.*

### 5. Trip Blank

A Trip Blank is a form of QA/QC that is utilized to account for possible exposure to an external source of VOCs during storage and transport of the sample containers and samples to and from the laboratory. It consists of a VOC sample container prepared by the laboratory and filled with analyte-free water. Trip Blanks are only required when aqueous samples are being collected for VOC analysis, all other parameters do not need one.

The Trip Blank is placed in the cooler with the sample containers when they are sent from the lab to the client. The Trip Blanks will remain in the cooler with the sample containers at all times. When the samples are collected they are placed in the cooler and put on ice with the Trip Blanks for shipment to the lab. At no time should the Trip Blanks be opened or removed from the coolers containing VOC samples. The Trip Blank should be labeled and included on the COC as **Trip Blank** or **TB**.

Each cooler that contains samples for VOC analysis must have a Trip Blank. It is good practice to combine all VOC containers from a site into one cooler to minimize the number of Trip Blanks required. For example if there are five coolers of samples, place all the VOC containers into one cooler and the remaining containers in the other four coolers. Thus only the VOC cooler requires a Trip Blank, which saves on the cost of analysis.

A positive result on the Trip Blank for a VOC could indicate the samples had been exposed during transportation which can have an effect on the results of the routine samples.

Different laboratories have different practices concerning their Trip Blanks. For example some laboratories will include just one VOA vial as their trip blank while others will utilize multiple vials for theirs. The extra vials are often included only as a backup in the event one of the Trip Blank vials is broken during transport, and will not be analyzed unless necessary.

### D. QA/QC REQUIREMENTS:

Not Applicable



## QUALITY ASSURANCE/QUALITY CONTROL SAMPLES

### E. SPECIAL CONDITIONS:

**Temperature Blanks** are a type of QA/QC that fall outside of the umbrella of QA/QC Samples.

A Temperature Blank is a container provided by the lab and is used to obtain the temperature of the cooler upon receipt at the lab, usually with an infrared thermometer. It is generally a ~125 mL plastic bottle filled with tap water.

- The Temperature Blank should be left in the cooler during sampling. When the cooler is being prepared for shipment, place the Temperature Blank in the center of the cooler next to the sample containers. There is no need to open the container; it is filled with tap water and therefore harmless unless otherwise noted on the container.
- It should be noted that not all laboratories require a Temperature Blank. There is no cost associated with the Temperature Blanks in the coolers.

### F. REFERENCES:

United States Environmental Protection Agency (July 2007), *Samplers Guide, Contract Laboratory Program Guidance for Field Samplers*, Section 3.4, retrieved April 6, 2009, from [http://www.epa.gov/superfund/programs/clp/download/sampler/clp\\_sampler\\_guidance.pdf](http://www.epa.gov/superfund/programs/clp/download/sampler/clp_sampler_guidance.pdf)

United States Environmental Protection Agency (May 2002), *Ground-Water Sampling Guidelines for Superfund and RCRA Project Managers*, Page 34, retrieved December 15, 2010, from [http://www.epa.gov/tio/tsp/download/gw\\_sampling\\_guide.pdf](http://www.epa.gov/tio/tsp/download/gw_sampling_guide.pdf)

### G. APPENDICES/FORMS:

Not Applicable

**END OF SOP**

Final Check by C. Burns 10/27/15



## **FIELD HANDLING, PACKAGING, AND SHIPPING**

### **A. PURPOSE/SCOPE:**

This procedure describes proper methods for the handling, packaging, and shipping of samples from the field to the laboratory. When preparing samples for transportation to the laboratory it is important to maintain the integrity of the samples in order to obtain the most accurate results possible and to prevent possible contamination of other samples or the package itself. These procedures generally apply to samples collected in the field, any state or federal regulations or guidelines applying to the shipment of hazardous samples must be followed. In addition any guidelines provided by the laboratory should be consulted.

These procedures refer to the shipment of soil, sediment or water samples. For the shipment of air canisters refer to section J: Special Conditions.

### **B. EQUIPMENT/MATERIALS:**

The following materials are required to adequately package samples

- Appropriately sized coolers that can accommodate samples and ice
- Plastic bags (i.e. garbage bags) large enough to contain all samples and ice
- Zip lock bags
- Ice sufficient to keep samples cool. **DO NOT USE DRY ICE**
- Bubble wrap or similar padding material
- Bubble bags or a similar padding material for any glassware
- Packing tape. Do not use duct tape inside coolers as it can contain volatile chemicals which could contaminate samples
- Custody seals and/or tamper-evident tape
- Appropriate labels (including 'UP' Arrows, Ice labels, Regulatory Compliance Labels (49 CFR 173.4), Shipping bills/labels).

### **C. PROCEDURE:**

Once the samples have been collected, properly labeled and documented (See SOP's #103 and #105) the following steps should be followed to pack and ship the samples.

For aqueous, sediment, soil or other solid samples:

#### **1. Prepare the cooler for shipment**

- Seal and/or plug the cooler drain if present.
- Place a layer of bubble wrap or other cushioning material on the bottom of the cooler.
- Use a large plastic bag (liner) to line the cooler. It should fill the cooler with little void space between bag and cooler walls, if not use a smaller cooler or additional cushioning material. Double bag the cooler if using thin plastic bags. Place a thin layer of ice in the bottom of the liner.

#### **2. Prepare the sample containers**

- Ensure all caps and lids are securely attached.
- Check that all labels have been properly filled out and attached
- Check that the samples are properly noted on the Chain-of-Custody (COC) and on any applicable field sheets.
- Place sample containers into zip lock bags if they are being used.



### **FIELD HANDLING, PACKAGING, AND SHIPPING**

3. If the sample is in a glass container place that container in a bubble bag or other cushioning material (bubble wrap roll, foam block, etc.) and secure it with tape. Try to avoid having glass in direct contact with ice as this can lead to the glass breaking (because the ice does melt).
4. Place samples in the cooler inside the liner.
  - All containers should be upright in cooler inside the bag liners.
  - Try to place glass containers towards the middle of the cooler.
  - Do not overfill the cooler. Try to keep weight below 60 lbs. to allow for easier maneuvering of the cooler.
  - Add a Trip Blank and a Temperature Blank if required. Include the Trip Blank on the COC. Place the Temperature Blank in the center of the cooler.
5. Add more ice, making sure that all containers are covered. The samples should arrive at the laboratory at 4° Celsius (+/- 2° C).
6. When all samples are in the cooler, or the cooler is full, gather the bags and tie or twist the loose ends to contain the ice and samples. Use packing tape, and a Custody seal if desired, to seal the bag liner.
7. Place another layer of bubble wrap or cushioning material on top of the bag for further protection and insulation of the samples. Make sure any void space in the cooler is filled to prevent the samples from shifting during transportation.
8. Put the COC along with any other required documentation inside a sealed zip lock bag and place it in the cooler.
9. Seal the cooler.
  - Place a signed and dated Custody seal on the cooler (if being used). The seal should extend from the top of the cooler, across the seam between the lid and the front, and down the front of the cooler. Tape over the custody seal using a length of tape continuously around the cooler. The seal should be placed such that it will be broken if the cooler is opened.
  - Using packing tape, tape around the cooler from front to back crossing both the top and the bottom of the cooler, use a continuous length of tape to help maintain integrity. Tape the cooler in at least two locations (i.e. left and right sides to create two bands of tape encircling the cooler.)
10. Place all required labels on the cooler. These can include 'UP' directional arrows, Wet Ice labels and regulatory labels (49 CFR 173.4). Tape them down as needed.
11. Fill out and affix the necessary shipping labels to the lid of the cooler.
12. All samples should be shipped overnight to the laboratory.
13. Alert the laboratory that the samples are en route. This is especially important for samples being delivered on a Saturday or around a holiday as the laboratory may be closed or have different hours. It is good practice to coordinate with the lab ahead of sampling to determine when the lab will receive samples.



## FIELD HANDLING, PACKAGING, AND SHIPPING

For air samples:

1. Remove any regulators or valves from the canister.
2. Replace the canister and associated equipment in the container they were received in.
3. Place the COC in a zip lock bag with any required documentation and seal the bag. Put the COC into the container.
4. Add any necessary padding materials to fill void space and ensure the canister is protected and cannot shift during transport.
5. Seal the cooler with Custody Seals and packing tape.
6. Affix the necessary labels and shipping bills to the container.
7. Alert the laboratory that the samples are en route.

### D. QA/QC REQUIREMENTS:

If aqueous samples for Volatile Organic Compound (VOC) analysis are being shipped use a Trip Blank (See SOP#605).

Some laboratories require Temperature Blanks (See SOP# 605) in each cooler of samples.

### E. SPECIAL CONDITIONS:

These procedures apply to environmental samples only. An environmental sample usually consists of possibly contaminated water, soil, or sediment or air to be analyzed. In order to comply with regulations (ex. 49 CFR 173), no more the 30 mL of a product may be shipped in any one container inside the cooler (For example you can ship 3 containers with 20 mL of an oil to be tested, but not 2 containers with 40 mL of oil in them). Consult state and federal regulatory agencies and the laboratory receiving the samples if you are unsure of the regulations on the samples being taken.

### F. REFERENCES:

United States Environmental Protection Agency (June 2010), *Sample Collection Information Document*, Section 5, retrieved August 31, 2012 from [http://www.epa.gov/sam/sample\\_collection\\_information\\_document\\_SAM\\_companion.pdf](http://www.epa.gov/sam/sample_collection_information_document_SAM_companion.pdf)

United States Environmental Protection Agency (July 2007), *Samplers Guide, Contract Laboratory Program Guidance for Field Samplers*, Section 3.4, retrieved April 6, 2009 from [http://www.epa.gov/superfund/programs/clp/download/sampler/clp\\_sampler\\_guidance.pdf](http://www.epa.gov/superfund/programs/clp/download/sampler/clp_sampler_guidance.pdf)

Tennessee Valley Authority, *Standard Operating Procedure For: Sample Labeling, Packing, and Shipping* (July 2010), retrieved August 31, 2012 from <http://www.tva.gov/kingston/sap/>

### G. APPENDICIES/FORMS:

Not Applicable

**END OF SOP**

Final Check by C. Burns 10/27/15



## **DRUM/SOIL EXCAVATION AND STOCKPILING**

### **A. PURPOSE/SCOPE:**

The following standard operating procedure (SOP) presents a description of the methods generally employed for the excavation and stockpiling of drums and/or impacted soil. Stockpiling/storing of drums containing petroleum and/or hazardous chemicals must meet minimum standards established by the United States Environmental Protection Agency (EPA) and any state-specific governing agency. Field personnel are responsible for ensuring that state-specific standards, guidelines and/or regulations are followed, where applicable.

Improper handling and storage of drums or soil can result in leaks and spills and pose a serious threat to the quality of the environment. Therefore, most states require that drum contents must be characterized, labeled and transported for disposal/recycling within a specific timeframe. In addition, impacted soil is typically required to be placed within bermed containment areas and covered. State agencies typically must be notified if evidence of a spill or release is identified during soil excavation activities.

### **B. EQUIPMENT/MATERIALS**

The drum/soil excavation and stockpiling activities will be performed by a firm qualified to perform excavation services under a separate contract with the Owner/Client. The company will supply the heavy equipment and materials needed to conduct the excavation and stockpiling activities. The field geologist/engineer will supervise the excavation activities and conduct the post-excavation and/or drum characterization sampling.

### **C. PROCEDURE**

#### **SOIL EXCAVATION**

1. Establish Site Controls, including, but not limited to the following:
  - a. Installation of appropriate sediment and erosion controls
  - b. Identification of appropriate work zones
  - c. Identification of air monitoring station locations as required to comply with the requirements of the Community Air Monitoring Plan (CAMP)
  - d. Construction of containment pads, see Step 4
  - e. Construction of decontamination pads.
2. If material to be excavated will be directly loaded into trucks for immediate hauling to the disposal facility conduct pre-excavation sampling and analysis as described below. Excavate the area described within the work plan using visual, olfactory and instrument-based (e.g. PID) soil screening methods. To minimize potential cross-contamination on-Site via tracking and reduce the amount of required decontamination, the following work practices should be implemented:
  - a. Efforts will be made to advance the excavation face towards the excavator such that the tracks on the machine do not come into contact with the impacted soils.





## **DRUM/SOIL EXCAVATION AND STOCKPILING**

- b. Where possible, all trucks will be loaded adjacent to the excavation. Care will be taken to ensure that impacted soil is not spilled on the sides of the trucks as they are loaded and that the trucks do not drive through contaminated soils. If wet soils are encountered, dry soils will be placed near the rear tailgate of the truck and wetter soils will be placed near the front of the truck. If the soils are saturated, liners will need to be installed in the dump box or the soils will be stabilized prior to loading to avoid drippage out of the truck during the hauling process.
  - c. Efforts will be made to minimize the amount of equipment and machinery that comes into contact with the impacted soils.
3. Stockpile excavated soils on temporary containment pads within the exclusion zone. The temporary containment pads will be of sufficient size to store up to a minimum of 110 percent of the maximum amount of soil that will be stockpiled prior to re-use or off-site disposal. At a minimum, any soil containment pads will include the following:
- a. A sufficiently large area with accessibility for trucks and construction equipment. The area shall be relatively flat and away from drainage inlets or waterfront areas.
  - b. A 10-mil thick polyethylene sheeting liner with a minimum of two-foot wide overlaps between successive rows.
  - c. A minimum of a one-foot high soil berm around the perimeter of each pad to control runoff/run-on to and from the stockpiles. Gravel/stone ramps with gentler slopes at locations of ingress and egress for each pad.
  - d. When handling saturated soils (e.g. soils below the groundwater table), a minimum of a continuous (no laps unless the seams are sealed/welded) 20-mil thick polyethylene sheeting shall line the containment area and the side berms shall be a minimum of two (2) feet high. The Contractor will be responsible for sizing the containment pad area and berm height to ensure that all water is contained and no water drains onto the Site. The berms must be of sufficient height to contain the soils, any water draining from the material, and still provide sufficient freeboard (a minimum of six (6) inches) for precipitation events. All water on the pad will be collected and handled in accordance with Fluids Management.
  - e. Soil stockpiles that will remain in place for more than one (1) week shall be continuously encircled with silt fence.
  - f. Hay bales and other erosion and sediment controls shall be installed as needed near catch basins, surface waters, and other discharge points.
  - g. Stockpiles shall be kept covered at all times with appropriately anchored tarps. Stockpiles shall be routinely inspected and damaged tarps will be promptly replaced.
  - h. Stockpiles shall be maintained at a maximum of 15 feet above surrounding area grades with a maximum slope of 1.5:1 to maintain stability. However, the appropriate slope may vary by material and the contractor performing stockpiling activities shall be responsible for determining the safe allowable slopes for each material stockpiled on Site.
  - i. Stockpiles shall be inspected at a minimum once each week and after every storm event. Results of inspections shall be recorded in a logbook and maintained at the Site and available for inspection by Agency personnel upon request.



## **DRUM/SOIL EXCAVATION AND STOCKPILING**

4. Collect waste characterization samples from on-Site stockpiles at the sampling frequency specified by the disposal facility based upon the total volume of material requiring disposal. Typical sampling frequency is one (1) sample per every 1,000 cubic yards (CY) of material requiring disposal at a minimum; however, in no case should the frequency be less than one (1) sample per work area. The sampling program will require the collection of both grab samples and composite samples. Unless otherwise specified by the disposal facility, samples collected for VOC analysis will be discrete grab samples and other analyses will be performed on composite samples. The basic sampling methodology is described in SOP #417.
5. Identify the locations of each soil sample on a map or sketch.
6. Submit samples to a state-certified laboratory, if necessary, for analysis following appropriate chain-of-custody protocols detailed in SOP #105. The specific analytical waste characterization requirements of the waste disposal facility may vary and shall be verified prior to sampling. Typical parameters required for waste disposal characterization include following:
  - Target compound list (TCL) volatile organic compounds (VOCs) by EPA Method 8260.
  - TCL semivolatile organic compounds (SVOCs) by EPA Method 8270.
  - TCL polychlorinated biphenyls (PCBs) by EPA Method 8082.
  - Pesticides by EPA Method 8081.
  - Herbicides by EPA Method 8151.
  - Target Analyte List (TAL) metals and cyanide by EPA Methods 6010/7471.
  - Toxicity Leaching Characteristic Procedure (TCLP) Extraction
  - Hazardous Waste Characteristics as defined under the Resource Conservation and Recovery Act (RCRA), including ignitability, corrosivity, and reactivity.
  - pH via EPA Method 9045
  - Percent Solids via Method 160.3
  - Paint Filter Test via Method 9095
  - Additional analyses as required by the disposal facility.

## **MATERIALS EXCAVATION & LOAD OUT**

1. If field screening processes indicate a change in material is encountered (e.g. change in color, noticeable odors, etc.), the newly encountered material should be stockpiled and characterized separately.
2. If excavation beneath the water table is required, the material will need to be dewatered prior to placement back on-Site or transportation off-site for disposal. Additional measures should be implemented to collect all water on the containment pads for future off-site disposal (e.g. construction of a sump on containment pad).
3. All excavations faces must be covered with a minimum of 10-mil polyethylene sheeting at the end of each work day at a minimum. Additionally, all excavations shall be backfilled within 48-hours of commencement, unless special circumstances require the excavation to be open longer. In such cases, the anticipated duration of the open excavation should be identified to the NYSDEC during the notification process.



## **DRUM/SOIL EXCAVATION AND STOCKPILING**

4. A truck wash/decontamination pad will be operated on-Site. The qualified environmental professional will be responsible for ensuring that all outbound trucks will be washed at the truck wash before leaving the Site until the activities performed under this section are complete. Locations where vehicles enter or exit the Site shall be inspected daily for evidence of off-site soil tracking.
5. The qualified environmental professional will be responsible for ensuring that all egress points for truck and equipment transport from the Site are clean of dirt and other materials derived from the Site during intrusive excavation activities. Cleaning of the adjacent streets will be performed as needed to maintain a clean condition with respect to Site-derived materials.

### **MATERIALS TRANSPORT OFF-SITE**

The following requirements have been established for all materials being transported off-site:

1. All transport of materials will be performed by licensed haulers in accordance with appropriate local, State, and Federal regulations. Haulers will be appropriately licensed and trucks properly registered and placarded. In addition, all haulers will maintain appropriate shipping papers and/or waste manifests (e.g., 6 NYCRR Part 372). Emergency response procedures and emergency telephone numbers will be maintained in all vehicles, and operators will be trained in emergency response procedures.
2. Loaded vehicles will be in compliance with load height and weight regulations.
3. Loaded vehicles leaving the Site will be appropriately lined, tarped, securely covered, manifested, and placarded in accordance with appropriate Federal, State, local, and NYSDOT requirements (and all other applicable transportation requirements).
4. Material transported by trucks exiting the Site will be secured with tight-fitting covers. Loose-fitting canvas-type truck covers or mesh/open weave type covers will be prohibited. If loads contain wet material capable of producing free liquid, truck liners will be used.
5. All trucks will be washed prior to leaving the Site. Truck wash waters will be collected and disposed of off-site in an appropriate manner.
6. Truck operators shall comply with all applicable regulations, including, but not limited to 6 NYCRR Subpart 217-3, relative to idling engines.
7. Egress points for truck and equipment transport from the Site will be kept clean of dirt and other materials during intrusive activities.
8. Queuing of trucks will be performed on-Site in order to minimize off-site disturbance.

### **MATERIAL DISPOSAL OFF-SITE**

1. All soil/solid waste excavated and removed from the Site will be treated as contaminated and regulated material and will be transported and disposed in accordance with all local, State and Federal regulations.



## **DRUM/SOIL EXCAVATION AND STOCKPILING**

2. Off-site disposal locations for excavated soils will be identified in the pre-excavation notification. This will include estimated quantities and a breakdown by class of disposal facility if appropriate (i.e. hazardous waste disposal facility, solid waste landfill, petroleum treatment facility, etc.). Actual disposal quantities and associated documentation will be reported to the NYSDEC following completion of excavation activities. This documentation will include: waste profiles, test results, facility acceptance letters, manifests, bills of lading and facility receipts.

## **FLUIDS MANAGEMENT**

1. All liquids to be removed from the Site, including excavation dewatering and decontamination water, etc. will be handled, transported and disposed in accordance with applicable local, State, and Federal regulations. Dewatering fluid will not be recharged back to the land surface or subsurface of the Site, but will be managed off-site. Discharge of water generated during large-scale construction activities to surface waters (i.e. a local pond, stream or river) will be performed under a SPDES permit.
2. Water collected will be stored in drums or temporary storage tanks (e.g. polyethylene tanks or frac tanks) that are approved and labeled in accordance with United States Department of Transportation (USDOT) requirements.
3. The water collected will be sampled by persons performing the intrusive activity on a frequency of one sample per every ten drums or one sample per every 2,000 gallons of water collected in larger vessels. However, more frequent sampling may be directed by the NYSDEC or the disposal facility (e.g. a local publicly-owned treatment works (POTW)), should observable changes in the water quality be identified in the field. The water samples will be analyzed for parameters required by the selected disposal facility for characterization purposes.
4. Oil-absorbent pads will be deployed on the water surface if sheens or NAPLs are observed in the groundwater within the excavation area to remove product. If absorbent pads are ineffective at removing the product, additional measures will be required to control the product, including, but not limited to the following:
  - Dewatering of the excavation in its entirety, if feasible (preferred method)
  - The use of floating booms with solid curtains
  - The use of pumps and floating oil skimmers
  - The use of vacuum trucks
5. Under no circumstances will the use of any type of dispersant be permitted to control product observed on water surfaces.



## **DRUM/SOIL EXCAVATION AND STOCKPILING**

6. Additionally, appropriate controls will be used to prevent spills and overflows, including but not limited to, monitoring, gauging, quick-close shut-off valves, and secondary containment. All storage containers will be decontaminated following disposal or discharge activities. Any residual sediment in the storage containers will be dewatered/stabilized, if necessary, and disposed of off-site in a similar manner as other materials requiring off-site disposal.

D. QA/QC REQUIREMENTS:

Not Applicable

E. SPECIAL CONDITIONS:

Not Applicable

F. REFERENCES:

Not Applicable

G. APPENDICES/FORMS:

Not Applicable

### **END OF SOP**

Final Check by C. Burns 11/19/15

[www.chasolutions.com](http://www.chasolutions.com)



# APPENDIX B

Quality Assurance Project Plan



# QUALITY ASSURANCE PROJECT PLAN

## **Gateway Syracuse Apartments**

701 E. Fayette Street

Syracuse, New York 13210

CHA Project Number: 086328.000

**July 2024**

**Revised March 2025**

**Prepared for:**

**GW Syracuse LLC**

1221 E. Genesee St.

Syracuse, New York 13201

**Prepared by:**

**CHA Consulting, Inc.**

300 South State Street, Suite 600

Syracuse, New York 13202

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## LIST OF ACRONYMS & ABBREVIATIONS

ASP	Analytical Services Protocol
CHA	CHA Consulting, Inc.
COC	Chain of Custody
DER	Division of Environmental Remediation
ELAP	Environmental Laboratory Approval Program
EPA	Environmental Protection Agency
FSP	Field Sampling Plan
HDPE	High Density Polyethylene
HPT	Hydraulic Profiling Tool
MIP	Membrane Interface Probe
MS/MSD	Matrix Spike/Matrix Spike Duplicate
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
PCB	Polychlorinated Biphenyl
PFAS	Per- and Polyfluorinated Substances
PID	Photoionization Detector
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
RAA	Remedial Alternatives Analysis
RI	Remedial Investigation
RIWP	Remedial Investigation Work Plan
RPD	Relative Percent Difference
SOP	Standard Operating Procedure
SVOC	Semi Volatile Organic Compound
TAL	Target Analyte List
TIC	Tentatively Identified Compounds
TCL	Target Compound List
VOC	Volatile Organic Compound

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## 1.0 INTRODUCTION

This Quality Assurance Project Plan (QAPP) presents the policies, organization, objectives, functional activities and specific Quality Assurance (QA) and Quality Control (QC) activities designed to achieve the specific data quality goals associated with the Remedial Investigation (RI) that will be conducted on a portion of the Gateway Syracuse Apartments property located at 701 E. Fayette Street, City of Syracuse, New York. Tax map parcel 030.-16-18.0 (Site) was accepted into New York State Department of Environmental Conservation's (NYSDEC) Brownfield Cleanup Program (BCP) and is the focus of this QAPP. The scope of work associated with the investigation activities and specific areas of concern that will be addressed are summarized in the Remedial Investigation Work Plan (RIWP).

This QAPP has been prepared to identify procedures for sample preparation and handling, sample chain-of-custody, laboratory analyses, and reporting to be implemented during this investigation to ensure the accuracy and integrity of the data generated. This QAPP has been prepared in accordance with the NYSDEC Department of Remediation (DER-10) Technical Guidance for Site Investigation and Remediation. Field activities will be performed in accordance with CHA Consulting, Inc. (CHA) standard operating procedures (SOPs), included in Appendix A of the Field Sampling Plan.

A description of the Site history, summary of previous investigations, and a detailed scope of work is included in the RIWP. A brief summary of the scope of work is included in the following section.

### 1.1 Scope of Work

This QAPP has been prepared in accordance with NYSDEC DER-10 (May 2010) to outline the procedures and protocols that will be utilized to conduct a RI that will provide the necessary data to develop a remedial alternative and will ultimately address the environmental conditions associated with the Site. The primary objectives of the RIWP include the following:

- Further define the nature/extent of contamination;
- Assess impacts; and
- Provide additional data necessary for a Remedial Alternatives Analysis (RAA).

In general, the RIWP will include the following activities:

- Evaluation of subsurface conditions and contamination using low-level membrane interface probe (MIP) with the hydraulic profiling tool (HPT) technology;
- Collection of shallow subsurface samples for environmental parameters;
- Collection of groundwater samples for environmental parameters;
- Waste characterization sampling;
- Equipment decontamination; and
- Waste handling.

The data derived from the RI will facilitate an evaluation of the migration or possible future migration of identified contamination, identify potential routes of exposure and populations at risk, and provide the data necessary to develop remedial plans for the Site.

## 2.0 PROJECT ORGANIZATION AND RESPONSIBILITY

The RI activities are being conducted by Gateway Syracuse Apartments under the supervision of GW Syracuse LLC Owner, Mr. Chris Geiger, who is the primary contact for communication with the NYSDEC. Engineering oversight and coordination of these activities are to be provided by CHA. The CHA Project Manager is responsible for the delivery of CHA services.

### **NYSDEC Regulatory Authority**

#### **Stephen Colquhoun, Project Manager**

- Approve the RIWP and all appendices, including this QAPP, and any modifications to the project.

### **GW Syracuse LLC**

#### **Chris Geiger, Owner**

- Responsible for the overall program management of the Gateway Syracuse Apartments Remedial Investigation.

### **CHA Consulting, Inc.**

#### **Samantha Miller – CHA Project Manager, Technical Manager/Project Coordinator**

- Responsible for following the approved RIWP, notifying the NYSDEC of any deficiencies, and obtaining approval by the NYSDEC for all modifications to the project;
- Provide overall and day-to-day project management;
- Ensure all resources of CHA are available on an as-required basis;
- Participate in key technical negotiations with the NYSDEC, as necessary;
- Provide managerial guidance to CHA's technical group;
- Evaluate data;
- Prepare and coordinate the issuance of reports;
- Provide immediate supervision of all on-site activities;
- Assist in preparation and review of final report; and
- Provide technical representation for field activities.

#### **Scott Smith - CHA Quality Assurance/ Quality Control (QA/QC)**

- Conduct internal audit of field investigation and sampling;
- Review laboratory activities;
- Determine laboratory data corrective action;
- Review analytical data validation and assessment;
- Review laboratory QA/QC;
- Assist in preparation and review of final report; and,
- Provide technical representation for analytical activities.

#### **Karyn Ehmann - Field Oversight and Quality Control Coordinator**

- Serve as Field Team Leader;
- Work with field crew to prepare for field activities and conduct investigations; and,
- On-Site to
  1. Provide oversight and coordination of field activities.
  2. Ensure that required QC procedures are followed for soil boring and monitoring well installation activities, material handling, and sample collection.

3. Initiate informal and/or formal corrective actions as necessary.
  4. Maintain and report QC records (i.e. chain-of-custody, field equipment calibration, etc.).
  5. Report to the Project Manager.
- Provide field management of sample collection and field QA/QC;
  - Responsible for maintenance of the field equipment; and
  - Assist in preparation and review of final report.

## **Laboratory**

Pace Analytical Services is the analytical laboratory chosen to perform the proposed work and is certified by the New York State Department of Health (NYSDOH) Environmental Laboratory Approval Program (ELAP) Number 11148 to perform the required analyses in accordance with the most recent version of the NYSDEC Analytical Services Protocol (ASP).

### **Project Manager, Analytical Contractor**

- Ensure resources of laboratory are available on an as-required basis;
- Coordinate laboratory analyses;
- Supervise laboratory's in-house chain-of-custody (COC);
- Schedule analyses of samples;
- Oversee review of data;
- Oversee preparation of analytical reports; and,
- Approve final analytical reports prior to submission to CHA.

### **Quality Assurance/ Quality Control Officer, Analytical Contractor**

- Overview laboratory QA/QC;
- Overview QA/QC documentation;
- Conduct detailed data review;
- Decide laboratory corrective actions, if required; and,
- Provide technical representation for laboratory QA/QC procedures

### **Sample Custodian, Analytical Contractor**

- Receive and inspect the sample containers;
- Record the condition of the sample containers;
- Sign appropriate documents;
- Verify chain-of-custodies and their correctness;
- Notify laboratory project manager and laboratory QA/QC Officer of sample receipt and inspection;
- Assign a unique laboratory identification number correlated to CHA's sample identification number, and enter each into the sample receiving log;
- Initiate transfer of the samples to the appropriate lab sections with assistance from the laboratory project manager; and
- Control and monitor access to and storage of samples and extracts.

Table 1 below, identifies key personnel assigned to the project and provides contact information.

**Table 1: Key Project Personnel**

Name	Address	Responsibilities
Stephen Colquhoun NYSDEC Project Manager	5786 Widewaters Parkway Syracuse, NY 13214 (315) 426-2118	The NYSDEC Project Manager will represent the NYSDEC in its review and oversight function, in its financial sponsorship, and as arbiter on technical matters.
Chris Geiger GW Syracuse LLC Owner	1221 E. Genesee Street Syracuse, NY 13201 <a href="mailto:chris@cuserealestate.com">chris@cuserealestate.com</a>	Mr. Geiger is responsible for review and oversight of the project, participating in citizen participation activities, and will serve as the point of contact.
Samantha Miller, PE CHA Technical Manager/ Project Coordinator	300 South State Street Syracuse, NY 13202 (315) 257-7154 <a href="mailto:smiller@chasolutions.com">smiller@chasolutions.com</a>	Ms. Miller will oversee the project, provide quality control on documents and determinations and mentor the daily task manager. Ms. Miller will provide immediate supervision of all on-site activities, provide field management of sample collection and field QA/QC, assist in preparation and review of final reports.
Scott Smith, PE CHA Quality Assurance/ Quality Control Officer	300 South State Street Syracuse, NY 13202 (315) 257-7227 <a href="mailto:Ssmith2@chasolutions.com">Ssmith2@chasolutions.com</a>	Mr. Smith will act as the QA/QC Officer, which will include providing an internal audit of field sampling procedures, a review of laboratory activities and QA/QC, assistance in the preparation and review of final reports.
Karyn Ehmann CHA Field Team Leader & Health and Safety Officer	300 South State Street Syracuse, NY 13202 (315) 257-7250 <a href="mailto:kehmman@chasolutions.com">kehmman@chasolutions.com</a>	Ms. Ehmann will supervise field investigation activities and will also serve as database manager. Ms. Ehmann will serve as the Health and Safety point of contact for CHA staff.
Melissa Deyo Pace Analytical Services Project Manager	275 Cooper Avenue, Suite 105 Tonawanda, NY 14150 <a href="mailto:Patrick.Filey@pacelabs.com">Patrick.Filey@pacelabs.com</a>	Ms. Deyo will act as CHA's point of contact with the contracted laboratory.



### 3.0 QUALITY ASSURANCE OBJECTIVES FOR MEASUREMENT DATA

The overall QA objective is to develop and implement procedures for sample preparation and handling, sample COC, laboratory analyses, and reporting, in order to provide accurate data. Specific procedures to be followed for sampling, sample custody and document control, calibration, laboratory analyses and data reduction, validation, assessment and reporting are presented in Sections 4.0 through 8.0 of this QAPP.

The purpose of this Section is to define the goals for the level of QA effort; namely, accuracy; precision and sensitivity of analyses; and completeness, representativeness and comparability of measurement data from the analytical laboratories. QA objectives for field measurements are also discussed.

### 4.0 LEVEL OF QA EFFORT

To assess the quality of data resulting from the field sampling program, field duplicate samples, field blank samples, samples for laboratory matrix spike/matrix spike duplicate (MS/MSD) analyses, and trip blank samples will be collected (where appropriate) and submitted to the contract laboratory. CHA SOP#605 will be adhered to for all QAQC procedures.

For field samples collected, field duplicate samples will be submitted at a frequency of one per 20 investigative samples or in the event that a sampling round consists of less than 20 samples, one field duplicate will be collected. MS/MSD samples will be analyzed at a minimum frequency of one set per 20 investigative samples. In the event that a sampling event consists of less than 20 samples, one MS/MSD sample will be collected. Trip blanks will be submitted with each cooler containing aqueous samples to be analyzed for volatile organic compounds (VOCs).

The sampling and analysis program is summarized below and lists the specific parameters to be measured, the number of samples to be collected and the level of QA effort required for each matrix.

Groundwater, and soil samples will be analyzed for all or some of the following:

- Target compound list (TCL) VOCs including Tentatively Identified Compounds (TICs);
- TCL semi-volatile organic compounds (SVOCs) including 1,4-Dioxane including TICs;
- Target Analyte List (TAL) metals;
- Polychlorinated biphenyls (PCBs); and
- Per- and Polyfluorinated Substances (PFAS)

Field duplicate samples for subsurface soil matrices will be collected and analyzed as a check on the aggregate analytical and sampling protocol precision. MS/MSD samples will be analyzed as a check on the analytical method's accuracy and precision. Trip blank samples (for VOCs in groundwater only) will be shipped by the laboratory to the Site and back to the laboratory without opening in the field. The trip blank will provide a measure of potential cross-contamination of samples resulting from shipment, handling and/or ambient conditions at the Site.

#### 4.1 Accuracy, Precisions, and Sensitivity of Analyses

The fundamental QA objective with respect to the accuracy, precision and sensitivity of analytical data is to achieve the QC acceptance of each analytical protocol. The method precision (relative

percent difference of duplicate analysis) will be determined from the duplicate analyses of MS samples. A minimum of one sample will be spiked and analyzed in duplicate. Additional details are provided in CHA SOP#605. Analysis will compare with the criteria presented in the appropriate methods identified in Section 4.0.

The method accuracy (percent recovery) for water and soil samples will be determined by spiking selected samples (matrix spikes) with test compounds. Accuracy will be reported as the percent recovery of the test compound and will compare with the criteria given in the appropriate methods as identified in Section 4.0.

Project-specific accuracy and precision goals are identified in Section 9.0.

#### **4.2 Completeness, Representativeness, and Comparability**

It is expected that all analyses conducted in accordance with the selected methods will provide data meeting QC acceptance criteria for 80 percent of all samples tested. Any reasons for variances will be documented.

The sampling program has been designed to provide data representative of Site conditions. During development of these networks, consideration was given to location of historic activities, existing data from past studies completed for the Site and the physical Site setting. The extent to which existing and planned analytical data will be comparable depends on the similarity of sampling and analytical methods. The procedures used to obtain the planned analytical data are documented in this QAPP. Comparability of laboratory analyses will be ensured by the use of consistent units. Following completion of data collection, the existing database will be evaluated for representativeness.

#### **4.3 Field Documentation**

Pertinent field survey and sampling information shall be recorded in a logbook or on field logs during each day of the field effort per CHA SOP#101 Field Logbook and Photographs.

At a minimum, entries in a logbook shall include:

- Date and time of starting work;
- Names of all personnel at site;
- Weather conditions
- Purpose of proposed work effort;
- Sampling equipment to be used and calibration of equipment;
- Description of work area;
- Location of work area, including map reference;
- Details of work effort, particularly any deviation from the field operations plan or standard operating procedures;
- Field observations;
- Field measurements (e.g., Photoionization Detector (PID) readings);
- Field laboratory analytical results;
- Daily health and safety entries, including levels of protection;
- Type, number, and location of samples;
- Sampling method, particularly deviations from the standard operating procedures;
- Sample location and number; and
- Sample handling, packaging, labeling, and shipping information (including destination).

In addition to keeping logs, photographs will be taken to provide a physical record to augment the fieldworker's written observations. For each photograph taken, several items shall be recorded in the field logbooks:

- Date and time;
- Name of photographer; and,
- General direction faced and description of the subject.

Additional protocols specific to each sampling method are presented in the following sections.

The general QA objective for measurement data is to obtain reproducible and comparable measurements to a degree of accuracy consistent with the use of standardized procedures.

## 5.0 SAMPLING PROCEDURES

The sampling program to be implemented will include the collection and analyses of soil and groundwater. Details regarding specific sampling activities are provided in the RIWP and the procedures for collecting samples and for performing related field activities are described in detail in the FSP, included in Appendix A of the RIWP. The number of samples, analytical methods, sample volumes, preservation techniques and holding times are provided in Table 2, below.

**Table 2: Analytical Methods/Quality Assurance Summary**

Matrix	Type of Sample	Analysis	Parameter	Total Primary Samples	Total Duplicates/MS/MSD	Total Trip Blanks	Total Field Blanks	Total Equipment Blanks	Sampling Locations	Minimum Sample Volume/ Container	Preservation	Technical Holding Time
Soil	Shallow Subsurface Soil	EPA Method 8270	TCL SVOCs including 1,4-Dioxane	4	1/1/1	0	0	0	SOIL-101 and SOIL-102. Samples collected at two intervals at each locations: 1-2 ft bgs and 4-5 ft bgs.	4 oz. glass wide	Cool to 4°C	14 days
		EPA Methods 6010/7471	TAL Metals	4	1/1/1	0	0	0		4 oz. glass wide	Cool to 4°C	180 days (28 days for mercury)
		EPA Method 1633	PFAS	2	0/0/0	0	0	0	SOIL-101 and SOIL-102 1-2 ft bgs.	8 oz HDPE plastic jar	Cool to 4°C	90 days
	Subsurface Soil (concurrent with 2 MIP Locations)	EPA Method 8260/5035	TCL VOCs + TICs	4	1/1/1	0	0	0	SOIL-103 and SOIL-104 at two intervals for each location: 1) Depth exhibiting field evidence of contamination or the two feet above the water table and 2) Below the limits of field evidence of contamination.	Terracore	MeOH or H <sub>2</sub> O, Cool to 4°C	14 days
		EPA Method 1633	PFAS	2	0/0/0	0	0	0	SOIL-103 and SOIL-104 at the interval exhibiting field evidence of contamination or the two feet above the water table.	8 oz. HDPE plastic jar	Cool to 4°C	90 days
		EPA Method 8270E-SIM	1,4-Dioxane	2	0/0/0	0	0	0		4 oz. glass wide	Cool to 4°C	14 days
Water	Groundwater	EPA Method 8260	TCL VOCs	3	1/1/1	1	1	1	MW-101, MW-102, MW-103	2- 40mL - Glass, Vial	1:1 HCl to pH<2; Cool to 4°C	14 days
		EPA Method 8270	TCL SVOCs	3	1/1/1	0	1	1		2-1 liter amber	Cool to 4°C	7 days
		EPA Methods 6010/7471	TAL Metals	3	1/1/1	0	1	1		1- 500 mL plastic	HNO <sub>3</sub> to pH<2; Cool to 4°C	180 days (28 days for
		EPA Method 8082	Total PCBs	3	1/1/1	0	1	1		2-1 liter amber	Cool to 4°C	7 days
		EPA Method 8270E-SIM	1,4-Dioxane	3	1/1/1	0	1	1		2-250 mL Glass	Cool to 4°C	7 days
		EPA Method 1633	PFAS	3	1/1/1	0	1	1		2-250 mL HDPE plastic	Cool to 4°C	28 days
Sediment/Sludge in Floor Trench	Sediment from Floor Trench	EPA Method 8260/5035	TCL VOCs	1	0/0/0	0	0	0	Floor Trench inside former Gasoline Service Station Garage	Terracore	MeOH or H <sub>2</sub> O, Cool to 4°C	14 days
		EPA Method 8270	TCL SVOCs	1	0/0/0	0	0	0		8 oz. amber jar	Cool to 4°C	14 days
Soil Waste Characterization		EPA Method 8260/1311	TCLP VOCs	1	0/0/0	0	0	0	SOIL-WC-1	8 oz. amber jar	Cool to 4°C	14 days

Matrix	Type of Sample	Analysis	Parameter	Total Primary Samples	Total Duplicates/MS/MSD	Total Trip Blanks	Total Field Blanks	Total Equipment Blanks	Sampling Locations	Minimum Sample Volume/ Container	Preservation	Technical Holding Time
	Investigation Derived Waste - Soil	EPA Method 8270/1311	TCLP SVOCs	1	0/0/0	0	0	0		8 oz. amber jar	Cool to 4°C	14 days
		EPA Methods 6010/7471/1311	TCLP Metals	1	0/0/0	0	0	0		8 oz glass wide	Cool to 4°C	180 days (28 days for mercury)
		EPA Method 8082	Total PCBs	1	0/0/0	0	0	0		4 oz glass wide	Cool to 4°C	14 days
		EPA Method 8081/1311	TCLP Herbicides	1	0/0/0	0	0	0		4 oz. amber jar	Cool to 4°C	14 days
		EPA Method 8151/1311	Pesticides	1	0/0/0	0	0	0		4 oz. amber jar	Cool to 4°C	14 days
		N/A	Reactivity, Ignitability, Corrosivity	1	0/0/0	0	0	0		8oz plastic jar	Cool to 4°C	14 days
Water Waste Characterization	Investigation Derived Waste - Water	EPA Method 8260	TCL VOCs	1	0/0/0	0	0	0	WATER-WC-1	2- 40mL - Glass, Vial	1:1 HCl to pH<2; Cool to 4°C	14 days
		EPA Method 8270	TCL SVOCs	1	0/0/0	0	0	0		2-1liter amber	Cool to 4°C	7 days
		EPA Methods 6010/7471	TAL Metals	1	0/0/0	0	0	0		1- 500 mL plastic	HNO3 to pH<2; Cool to 4°C	180 days (28 days for mercury)
		EPA Method 8082	Total PCBs	1	0/0/0	0	0	0		2-1 liter amber	Cool to 4°C	7 days



## 6.0 SAMPLE CUSTODY AND DOCUMENT CONTROL

### 6.1 Chain-of-Custody

As per CHA SOP#105, a COC will be maintained to document the transfer of all samples. Each sample container will be properly sealed. Sample container labels will include the sample name, required analysis, and date and time of collection. Sample containers will be taken to the Contract Laboratory courier center at 4°C (±2°C) in sealed coolers.

Each sample cooler will contain an appropriately completed COC form. One copy will be returned to CHA upon receipt of the samples by the laboratory. One copy will be returned to CHA with the data deliverables package.

Upon receipt of the cooler at the laboratory, it will be inspected by the designated sample custodian. The condition of the cooler and sample containers will be noted on the COC record sheet by the sample custodian. The sample custodian will also document the date and time of receipt of the container and sign the form.

If damage or discrepancies are noticed, they will be recorded in the remarks column of the record sheet, and be dated and signed. Any damage or discrepancies will be reported to the lab supervisor who will inform the lab manager, QA Officer and CHA Project Manager.

### 6.2 Sample Documentation in the Laboratory

Each sample or group of samples shipped to the laboratory for analysis will be given a unique identification number by the laboratory. The laboratory sample custodian will record the client name, number of samples and date of receipt of samples in the Sample Control Log Book.

The Contract Laboratory will be responsible for maintaining analytical log books and laboratory data as well as sample inventory on hand for submittal to CHA on an "as required" basis. Samples will be maintained by the laboratory for a period of 30 days, under the conditions prescribed by the appropriate USEPA methods, for additional analyses, if necessary. Raw laboratory data files will be inventoried and maintained by the Contract Laboratory for a period of five years, at which time CHA will advise them as to the need for additional storage.

### 6.3 Storage of Samples

Evidentiary files for the entire project will be inventoried and maintained by CHA and will consist of the following:

1. Project related plans;
2. Project log books;
3. Field data records;
4. Sample identification documents;
5. Chain-of-Custody records;
6. Report notes, calculations, etc.;
7. References, literature;
8. Miscellaneous - photos, maps, drawings, etc.; and
9. Copies of all final reports pertaining to the project.

The project file materials will be the responsibility of CHA's Project Manager with respect to document maintenance and management.

## 7.0 CALIBRATION PROCEDURES AND FREQUENCY

### 7.1 Instrument Calibration and Tuning

Calibration of instrumentation is required to ensure that the analytical system is operating correctly and functioning at the proper sensitivity to meet established reporting limits. Each instrument is calibrated with standard solutions appropriate to the type of instrument and the linear range established for the analytical method. The frequency of calibration and concentration of calibration standards is determined by the manufacturer's guidelines, the analytical method, or the requirements of special contracts.

### 7.2 Field Instrument Calibration

Calibration of the field instruments will be completed prior to each day's use in accordance with the manufacturer's instructions. During groundwater sampling activities if the data indicates a change ( $> \pm 10$  percent) in pH and/or conductivity from the last location sampled, the field equipment will be recalibrated. The field equipment will be maintained, calibrated, and operated in a manner consistent with the manufacturer's guidelines and EPA standard methods. However, since the majority of field measurements will be limited to organic vapor readings (PID readings), pH, conductivity, turbidity and depth (water level) the calibration procedures will be conducted at a minimum frequency of once per day. Records of calibration, repair or replacement will be filed and maintained by the Field Team Leader.

## 8.0 DATA REDUCTION, VALIDATION, ASSESSMENT AND REPORTING

### 8.1 General

The Contract Laboratory will perform analytical data reduction and validation in-house under the direction of the laboratory QA Officer. The laboratory's QA Officer will be responsible for assessing data quality and advising of any data which were rated "preliminary" or "unacceptable" or other qualifications based on the QC criteria outlined in the methods, which would caution the data user of possible unreliability.

Assessment of analytical and field data will include checks for data consistency by looking for comparability of duplicate analyses, laboratory QA procedures, adherence to accuracy and precision criteria, transmittal errors and anomalously high or low parameter values. The results of these data validations will be reported to the project managers, noting any discrepancies and their effect upon acceptability of the data.

### 8.2 Field Data

Raw data from field measurements and sample collection activities that are used in project reports will be appropriately identified and appended to the report. Where data have been reduced or summarized, the method of reduction will be documented in the report. Field data will be reviewed for anomalously high or low values that may appear to be inconsistent with other data.

Field sampling data will be reviewed by the CHA QA/QC Officer to ensure the following information has been properly documented:

- Sample identification;
- Source;
- Date and time of sampling;



- Sampling equipment;
- Person(s) collecting the sample; and
- Results of field monitoring and/or observations.

In addition, the field sampling data will be evaluated to ensure:

- The use of approved sampling and sample handling procedures;
- Proper packing/shipping procedures were used; and
- Proper COC was maintained.

### **8.3 Laboratory Reporting**

Reporting and deliverables for groundwater and soil samples will be in accordance with NYSDEC July 2005 ASP, Category B. Reports will be received by CHA within 30 days of the last day of sampling. Sample data and its corresponding QA/QC data shall be maintained accessible to CHA either in hard copy or on disk. All other reporting and deliverables (i.e. waste characterization samples) will be in accordance with Standard Laboratory Procedure.

### **8.4 Electronic Data**

The laboratory will also provide the analytical data in an electronic format. The data will be processed and compared to existing standards using Excel. An electronic copy of the analytical data in Category B format and in EQUIS format (including the XY coordinates and collection methods) will be provided to NYSDEC.

### **8.5 Data Validation**

A qualified third party will conduct an independent evaluation of the Category B data reduction and reporting by the laboratory. The data validation will be performed in accordance with the following documents: "USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review EPA 540/R-99-008, October 1999" and "USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review EPA 540/R-04-004, October 2004". Data analyzed using methods not covered in these documents will be validated using the general principles used in these documents, and the analytical requirements specified in the methods pertaining to USEPA Region 2 Data Validation.

## 9.0 INTERNAL QUALITY CONTROL CHECKS AND FREQUENCY

### 9.1 Field Quality Control

QC procedures for field measurements will be limited to checking the reproducibility of the measurement in the field by obtaining multiple readings and by calibrating the instruments (where appropriate).

QC of field sampling will involve collecting field duplicates and trip blanks with the applicable site activities described in the RIWP/FSP. Field QC samples are also discussed in Section 4.0.

The MIP contractor will conduct response testing for their instrumentation prior to and after each boring. The response test provides a traceable indication that the MIP system detectors are adequately responding and allows the carrier gas trip time to be calculated. Results of the response tests will be recorded for field quality control purposes.

### 9.2 Laboratory Quality Control

Specific procedures related to internal laboratory QC samples (namely blanks, MS/MSD, surrogates and QC check samples) are described in the following subsections.

#### 9.2.1 Blank Samples

A reagent blank will be analyzed by the laboratory at a frequency of one blank per 10 analyses, or in the event that an analytical round consists of less than 10 samples, one reagent blank will be analyzed. The reagent blank, an aliquot of analyte-free water or solvent, will be carried through the entire analytical procedure.

#### 9.2.2 Matrix Spike/Matrix Spike Duplicates

An MS/MSD sample will be analyzed at a minimum frequency one sample for every 20 investigative samples that are collected. For sampling events consisting of less than 20 investigative samples, one MS/MSD sample set will be collected. Acceptable criteria and compounds that will be used for matrix spikes are identified in the appropriate methods. Percent spike recoveries will be used to evaluate analytical accuracy while percent relative standard deviation or the relative percent difference (RPD) between matrix spike analyses will be used to assess analytical precision.

#### 9.2.3 Surrogate Analyses

Surrogates are organic compounds which are similar to the analytes of interest, but which are not normally found in environmental samples. Surrogates are added to samples, by the laboratory, to monitor the effect of the matrix on the accuracy of the analysis. Every blank, standard and environmental sample analyzed by gas chromatography or gas chromatography-mass spectrometry, including MS/MSD samples, will be spiked with surrogate compounds prior to sample preparation.

Surrogates will be spiked into samples according to the appropriate analytical methods. Surrogate spike recoveries will be compared with the control limits set by procedures specified in the method (or from laboratory specific control limits) for analytes falling within the quantification limits without dilution. Dilution of samples to bring the analyte concentration into the linear range of calibration

may dilute the surrogates out of the quantification limit; assessment of analytical quality in these cases will be based on the quality control embodied in the check and MS/MSD samples.

## 10.0 PROCEDURES USED TO ASSESS PERFORMANCE

### 10.1 Precision

Precision will be assessed by comparing the analytical results between duplicate spike analyses. Precision as RPD will be calculated as follows:

$$\text{Precision} = \frac{[D2 - D1]}{(D1 + D2)/2} \times 100$$

D1 = matrix spike recovery

D2 = matrix spike duplicate spike recovery

Acceptance criteria for duplicate soil samples will be ≤30% RPD. Acceptance criteria for duplicate water samples will be ≤20% RPD between field and laboratory data.

Percent relative standard deviation or the RPD between matrix spike analyses will be used to assess laboratory analytical precision. Acceptable criteria and compounds that will be used are identified in the appropriate EPA methods.

### 10.2 Accuracy

Accuracy will be assessed by comparing a set of analytical results to the accepted or "true" values that would be expected. In general, MS/MSD and surrogate spike recoveries will be used to assess accuracy. Accuracy as percent recovery will be calculated as follows:

$$\text{Accuracy} = \frac{A-B}{C} \times 100$$

A = The analyte determined experimentally from the spike sample.

B = The background level determined by a separate analysis of the unspiked sample.

C = The amount of spike added.

Percent spike recoveries in MS/MSD and surrogate spike recoveries will be used to evaluate analytical accuracy. Acceptable criteria and compounds that will be used for matrix spikes are identified in the appropriate EPA methods.

The evaluation of accuracy of field measurements will be limited to checking the reproducibility of the measurement in the field by obtaining multiple readings and by calibrating the instruments (where appropriate).

### 10.3 Representativeness, Completeness, and Comparability

Completeness is a measure of the amount of valid data obtained from a measurement system compared with the amount that was expected to be obtained under normal conditions.

To be considered complete, the data set must contain all QC check analyses verifying precision and accuracy for the analytical protocol. In addition, all data are reviewed in terms of stated goals in order to determine if the database is sufficient.

When possible, the percent completeness for each set of samples will be calculated as follows:

$$\text{Completeness} = \frac{\text{valid data obtained} \times 100 \text{ percent}}{\text{total data planned}}$$

A completeness goal of 100 percent has been established for this project. However, if the completeness goal is not met, site decisions may be based on any, or all of, the remaining, validated data. Representativeness will be addressed by collecting the samples as described in this document. Comparability will be addressed by collecting, analyzing, and reporting the data as described in this document.

#### **10.4 Outliers**

Procedures discussed previously will be followed for documenting deviations. In the event that a result deviates significantly from method established control limits, this deviation will be noted and its effect on the quality of the remaining data will be assessed and documented.

## 11.0 QUALITY ASSURANCE REPORT TO MANAGEMENT

The CHA Project Manager will receive reports on the performance of the measurement system and the data quality following each sampling round and at the conclusion of the project.

At a minimum, these reports will include:

- 1) Assessment of measurement quality indicators; (i.e. data accuracy, precision and completeness);
- 2) Results of systems audits; and
- 3) QA problems and recommended solutions.

CHA's QA/QC Officer will be responsible within the organizational structure for preparing these periodic reports. The final report for the project will also include a separate QA section which will summarize data quality information contained in the periodic QA/QC reports to management and present an overall data assessment and validation in accordance with the data quality objectives outlined in this QAPP.

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# APPENDIX C

Health and Safety Plan



# HEALTH AND SAFETY PLAN

**Syracuse Gateway Apartments**  
**701 E. Fayette Street**  
**Syracuse, New York**

CHA Project Number: 086328.000

**July 2024**

**Updated March 2025**

**Updated April 2025**

**Prepared for:**  
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## LIST OF ACRONYMS & ABBREVIATIONS

C	Ceiling Value
Ca	Potentially Cancerous
CAMP	Community Air Monitoring Plan
CFR	Code of Federal Regulations
CHA	CHA Consulting, Inc.
CPR	Cardiopulmonary Resuscitation
CRZ	Contaminant Reduction Zone
EZ	Exclusion Zone
FTL	Field Team Leader
HASP	Health and Safety Plan
HAZWOPER	Hazardous Waste Operations and Emergency Response
HSC	Health and Safety Coordinator
IDLH	Immediately Dangerous to Life and Health
JHA	Job Hazard Analysis
NIOSH	National Institute for Occupational Health and Safety
NYSDEC	New York State Department of Environmental Conservation
OSHA	Occupational Safety and Health Administration
PEL	Permissible Exposure Limit
PID	Photoionization Detector
PM	Project Manager
PPE	Personal Protection Equipment
REL	Recommended Exposure Limit
RIWP	Remedial Investigation Work Plan
SDS	Safety Data Sheet
SSO	Site Safety Officer
ST/STEL	Short Term Exposure Limit
SZ	Support Zone
TCE	Trichloroethene
TWA	Time Weighted Average
ppm	Part per Million
mg/m <sup>3</sup>	Milligram per Cubic Meter

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## 1.0 INTRODUCTION

The following Health and Safety Plan (HASP) has been created for the protection of CHA Consulting, Inc. (CHA) staff conducting remedial investigation activities at the Syracuse Gateway Apartments (Site), located at 701 E. Fayette Street in the City of Syracuse, New York. Remedial investigation activities will be performed in accordance with the approved Remedial Investigation Work Plan (RIWP) and on behalf of the Brownfield Cleanup Program (BCP) applicant, GW Syracuse LLC. This project's various assignments require CHA employees to perform tasks where personal safety could be endangered due to chemical, physical, and/or biological hazards. While conducting field work, CHA employees may be exposed to hazards including, but not limited to:

- Chemical exposure due to the presence of subsurface contamination during activities such as the installation of soil borings.
- Slip/Trips/Falls
- Cold Stress/Heat Stress
- Excessive noise for certain operations
- Heavy equipment operation
- Environmental and Biological hazards (e.g. insects, plants, ultra-violet exposure, etc.)

The requirements and guidelines in this HASP are based on a review of available information and an evaluation of potential on-Site hazards, including subsurface contamination data from the Lender Consulting Services, Inc. (LCS) and CHA subsurface investigation reports from 2016 and 2024, respectively. This HASP will be discussed with Site personnel and will be available on-Site for review while work is underway. CHA personnel will report to the Project Manager (PM) and consult with the Health and Safety Coordinator (HSC) in matters of health and safety. The Site Safety Officer (SSO) and Field Team Leader (FTL) is the same person for this project and is responsible for compliance with this HASP, stopping work when necessary, and for implementation of this HASP for daily site activities.

Non-intrusive activities within CHA's Scope of work are those that do not have the potential to jeopardize the health and safety of Site workers, the public, or the environment with respect to Site contaminants in the soil or groundwater.

Intrusive activities within CHA's Scope of Work are those that have the potential to cause health and safety concerns to Site workers, the public, or the environment in regard to Site contaminants. These activities and any non-intrusive activities conducted in an Exclusion Zone require training per 29 CFR 1910.120 on a NYSDEC Brownfield Cleanup Program Site.

## 2.0 KEY PERSONNEL

### 2.1 Off-Site Personnel

**Title: CHA Corporate Director of Health & Safety**

**Description:** Responsible for the CHA's corporate health and safety program and developing procedures, policies, and coordinating training programs. Additionally, provides senior level guidance on development of HASPs and interpretation of regulations.

**Contact:**

Anthony Tremblay  
(518) 302-9452 (Office)  
(617) 908-7058 (Cell)

**Title: Project Manager and Project Engineer**

**Description:** Reports to upper-level management, provides sufficient authority and resources to satisfy health and safety requirements, and assumes total control over Site activities. The Project Manager is ultimately responsible for ensuring field implementation of this HASP. The Project Manager may visit the Site from time to time to check status of fieldwork. Responsible for engineering related decisions regarding environmental investigations and remediation.

**Contact:**

Samantha Miller, P.E.  
(315) 257-7154 (Office)  
(915) 329-9898 (Cell)

**Title: Client Account Manager**

**Description:** Acts as an advocate for the client and assists the Project Team Leaders in management of the project as needed.

**Contact:**

Laura Cassalia, P.E.  
(315) 228-0717 (Office)

**Title: Technical Advisor**

**Description:** Guides the Project Team Leader in engineering/scientific matters if project engineer is not available or a second opinion is needed.

**Contact:**

Scott Smith, P.E.  
(315) 257-7227 (Office)  
(315) 427-1033 (Cell)

### 2.2 On-Site Personnel

**Title: Site Safety Officer/Field Team Leader**

**Description:** Advises the field team on all aspects of health and safety issues, recommends stopping work if any operation threatens worker or public health and safety. Responsible for coordinating project requirements in the field. The Field Team Leader oversees daily activities of the project and are, therefore, responsible for implementing health and safety requirements and

following safety procedures in the field. The Field Team Leader will contact the local emergency response organizations to notify concerned affiliates of the hazards associated with this project.

**Contact:**

Karyn Ehmann  
(315) 257-7250 (Office)  
(585) 721-2402 (Cell)

**Title: Work Party**

**Description:** Performs field operations.

**Contacts:**

Karyn Ehmann  
(315) 257-7250 (Office)  
(585) 721-2402 (Cell)

Andrew Hodgins  
(315) 228-0915 (Office)  
(315) 414-8675 (Cell)

## 2.3 Optional On-Site Personnel

**Title: Health and Safety Coordinator**

**Description:** Responsible for making recommendations regarding the work area to the SSO. Inspections may be periodically conducted to monitor worker health and safety and will address such issues as appropriate PPE, required air monitoring, decontamination procedures, and worker safety. The Health and Safety Coordinator is only expected to visit the site if higher levels of contamination are encountered requiring unusual mitigation or an accident occurs.

**Contact:**

Anthony Tremblay  
(518) 302-9452 (Office)  
(617) 908-7058 (Cell)

**Title: Project Manager**

**Description:** Reports to upper-level management, provides sufficient authority and resources to satisfy health and safety requirements, and assumes total control over Site activities. The Project Manager is ultimately responsible for ensuring field implementation of this HASP. The Project Manager may visit the Site from time to time to check status of fieldwork.

**Contact:**

Samantha Miller, P.E.  
(315) 257-7154 (Office)  
(915) 329-9898 (Cell)

## 2.4 As-Needed Personnel

**Title: Fire Department**

**Description:** Responds to fires and performs rescues.

**Contact:**

911  
Syracuse Fire Department (315) 473-5525



**Title: Ambulance**

**Description:** Responds to medical emergencies.

**Contact:**

911

American Medical Response of Central New York (315) 471-0102

**Title: Police**

**Description:** Responds to emergencies and performs rescues.

**Contact:**

911

(315) 442-5200

**Title: New York State DEC Spill Hotline**

**Description:** Responds to all petroleum and other hazardous releases into the environment, anywhere in New York State.

**Contact:**

(800) 457-7362

**Title: EPA National Response Center**

**Description:** Responds to all oil, chemical, radiological, biological and etiological discharges into the environment, anywhere in the United States and its territories.

**Contact:**

(800) 424-8802

## **2.5 Client-Specific Contacts**

**Title: GW Syracuse LLC**

**Description:** Point of contact for onsite field work, emergencies, and compliance matters.

**Contact:**

Chris Geiger

(516) 413-6689

## 3.0 SITE ENTRY

### 3.1 Objectives

This HASP has been developed for the protection of CHA employees on the Site. Subcontractors will be responsible for developing a HASP to protect their employees. Modifications to this HASP and its PPE requirements must occur if Site activities indicate higher levels of exposure than previously encountered or anticipated.

The objectives of the Site entry are to provide the following services, as needed/requested by GW Syracuse:

- Delineate vertical and horizontal contamination in areas where contamination has been previously identified across the Site.
- Further investigate shallow subsurface soils.
- Evaluate the extent of groundwater impacts upgradient of the contamination and in the known contaminated soil area.

The Site activities may include the following:

- Use of direct sensing downhole equipment (Membrane Interface Probe) on a Geoprobe® drilling rig.
- Installation of soil borings for subsurface soil investigation.
- Installation of shallow soil borings or shallow test pits for shallow subsurface soil investigation.
- Groundwater monitoring well installation, development, and sampling.

### 3.2 Safety Meetings

To ensure that the HASP is being followed, the SSO shall conduct a safety meeting prior to entry to the Site or the initiation of any Site activity, if any conditions change, and before each workday. The attached Daily Jobsite Safety Brief Form should be utilized to document these daily jobsite briefings. The Daily Job Site Safety Brief form in Appendix A will be utilized to document the daily job Site safety briefings.

### 3.3 Safety Training

The SSO will confirm that every person assigned to a task has had adequate training for that task and that the training is up to date by checking with the CHA Safety Coordinator and online database. CHA staff working on this project shall have a minimum of:

- 40-Hour Initial Hazardous Waste Operations and Emergency Response (HAZWOPER) training in accordance with 29 Code of Federal Regulations (CFR) 1910.120;
- Current 8-hour HAZWOPER Refresher Training;
- Field equipment safety training where applicable
- CHA Respiratory Protection Plan;
- Field equipment safety training where applicable; and
- Applicable Job Hazard Analyses (JHAs).

Training will have been conducted and certified by CHA in accordance with Occupational Safety and Health Administration (OSHA) regulations.

### 3.4 Medical Surveillance

All CHA personnel will have had a medical surveillance physical consistent with OSHA regulations and performed by a qualified occupational health physician if deemed necessary by project requirements. The SSO shall confirm prior to initiation of work on this Site that every CHA person assigned to a task has had an annual physical, has passed the medical examination, and has been determined medically fit by the occupational health physician for respirator use and this type of work if deemed necessary by the Project Manager.

### 3.5 Site Mapping

Site mapping has been included in the Figures section of the RIWP. Figure 1 of the RIWP illustrates the location of the subject Site. Directions and a map illustrating the route to the nearest hospital from the Site is provided in Appendix B of this HASP.

## 4.0 SITE CHARACTERIZATION

### 4.1 Site Description

The Site is located at 701 E. Fayette Street in the City of Syracuse, Onondaga County, New York. Most recently, the Site was occupied by the following uses:

- **Former Gasoline Service Station** – This building was constructed in 1960 for use as a gasoline service station and auto repair facility. The building is a single-story steel truss building with brick façade, concrete slab on grade floor, and canopy connecting the building to the fueling island. Two overhead garage doors allow access to the maintenance garage. At least one floor drain with evidence of contamination is noted within the building. The building is currently vacant.

Subsurface soil contamination was previously identified during initial investigations, particularly around the Former Gasoline Service Station and in surface soils Site-wide. Additional description of the Site and a summary of previous investigations have been included in the RIWP.

Appropriate personal protective equipment (PPE), as discussed in Section 10.0, is required for working anywhere within the Site boundaries.

Alterations to this HASP and its PPE requirements may occur if air monitoring and soil screening activities indicate higher levels of contamination are present than the previous investigations noted.

### 4.2 Neighboring Properties

The Site is bordered by the following:

- **North:** E. Washington Street, Syracuse Center of Excellence (Environmental Restoration Program Site Number B00003), U-Haul buildings, vacant parcel (BCP Site Number C734111), and asphalt-paved parking lots.

- **East:** Commercial properties including a car wash, a church, and XO Taco restaurant, and continuation of the block with parking lot and mixed-use building and a restaurant and residential apartments, Forman Avenue, Upstate Biotech Accelerator
- **South:** E. Fayette Street, Crowne Plaza Syracuse hotel and parking garage, the Parkview Hotel, apartment building with café, commercial offices, and asphalt paved parking lots.
- **West:** Almond Street, Interstate 81, and the parking lots beneath the elevated interstate.

#### 4.3 Meteorologic Data

Field work is expected to be conducted in the spring of 2025. The weather and temperature for that time of year is expected to vary, but mild temperatures are typically expected this time of year. Prior to each day's activities, the daily forecast should be monitored for indications of adverse work conditions. If poor weather hinders the continuation of the day's activities the Field Team Leader may notify the Project Manager and stop work for the day.

### 5.0 HAZARD EVALUATION

Hazards are generally divided into three categories, exposure to chemicals and hazardous materials, safety/physical hazards, and biological hazards. Safety/physical hazards are generally hazards such as electrical shock, slips/trips/falls, and confined spaces. Chemical hazards are further segregated by their routes of exposure that may cause adverse health effects. Biological hazards typically include plants, animals, and insects.

## 5.1 Chemical Hazards

Chemical	OSHA PEL	NIOSH REL	IDLH	Ionization Potential (I.P)	Characteristics	Routes of Exposure	Symptoms of Exposure and Health Effects
Benzene	TWA 1 ppm ST 5 ppm	Ca TWA 0.1 ppm	CA 500 ppm	9.24 eV	Colorless to light-yellow liquid with an aromatic odor	Inhalation, skin absorption, ingestion, skin and/or eye contact.	Irritation eyes, skin, nose, respiratory system; dizziness; headache, nausea, staggered gait; anorexia, lassitude (weakness, exhaustion); dermatitis; bone marrow depression; [potential occupational carcinogen].
Toluene	TWA 200 ppm, C 300 ppm and 500 ppm 10-minute max peak	TWA 100 ppm (375 mg/m <sup>3</sup> ), ST 150 ppm (560 mg/m <sup>3</sup> )	500 ppm	8.82 eV	Colorless liquid with a sweet, pungent, benzene-like odor	Inhalation, skin adsorption, ingestion, skin and/or eye contact	Irritation eyes, nose; lassitude, confusion, euphoria, dizziness, headache, dilated pupils, lacrimation (discharge of tears); anxiety, muscle fatigue, insomnia; paresthesia; dermatitis; liver, kidney damage
Ethylbenzene	TWA 100 ppm (435 mg/m <sup>3</sup> )	TWA 100 ppm (435 mg/m <sup>3</sup> ), ST 125 ppm (545 mg/m <sup>3</sup> )	800 ppm [10% LEL]	8.76 eV	Colorless liquid with an aromatic odor.	Inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, mucous membranes; headache; dermatitis; narcosis, coma
Xylenes	TWA 100 ppm (435 mg/m <sup>3</sup> )	TWA 100 ppm (435 mg/m <sup>3</sup> ), ST 150 ppm (655 mg/m <sup>3</sup> )	900 ppm	8.56 eV	Colorless liquid with an aromatic odor.	Inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, nose, throat; dizziness, excitement, drowsiness, incoordination, staggering gait; corneal vacuolization; anorexia, nausea, vomiting, abdominal pain, dermatitis
Benzo[a]pyrene, Chrysene, Anthracene	TWA 0.2 mg/m <sup>3</sup>	Ca TWA 0.1 mg/m <sup>3</sup>	Ca 80 mg/m <sup>3</sup>	N/A	Black or dark-brown amorphous residue.	inhalation, skin and/or eye contact.	dermatitis; bronchitis; carcinogenic.

Chemical	OSHA PEL	NIOSH REL	IDLH	Ionization Potential (I.P)	Characteristics	Routes of Exposure	Symptoms of Exposure and Health Effects
Lead	TWA 0.05 mg/m <sup>3</sup>	TWA 0.05 mg/m <sup>3</sup>	100 mg/m <sup>3</sup>	NA	Heavy, ductile, soft and gray solid. Non-combustible in solid form	Inhalation, ingestion, skin and/or eye contact	Lassitude; insomnia; facial pallor; anorexia; weight loss; malnutrition; constipation; abdominal pain; colic; anemia; gingival lead line; tremor; paralysis of the wrist, ankles; encephalopathy; kidney disease; irritation of the eyes; hypertension

C – Ceiling value

Ca – Potentially Cancerous

IDLH – Immediately Dangerous to Life and Health

NIOSH – National Institute for Occupational Safety and Health

OSHA – Occupational Safety and Health Administration

PEL – Permissible Exposure Limit

REL – Recommended Exposure Limit

ST – Short Term Exposure Limit

TWA – Time Weighted Average

## 5.2 Dispersion Pathways

The potential exposure mechanism that can transport particulates and volatile organic compounds (VOCs) from the areas of the intrusive Site activities to other areas of the Site as well as beyond the boundaries of the Site are:

- Contact with contaminated groundwater or soil;
- Projection of contaminated material in air;
- Conveyance in water runoff;
- Failure to adhere to decontamination procedures; and
- Failure to adhere to the Field Sampling Plan and/or Standard Operating Procedures.

Visible emissions can be a problem at any Site that involves intrusive activities and should be controlled to the extent feasible. To monitor VOC and particulate emissions during intrusive work, CHA will implement a Community Air Monitoring Plan (CAMP) in accordance with Section 6.0 below and the NYSDOH generic CAMP. In support of CAMP requirements, and to control VOC and particulate emissions in the work area, the following corrective actions can be implemented if emissions are produced:

- Minimizing the amount of exposed ground surface/covering exposed surfaces;
- Lightly wetting surfaces;
- Using chemical or foam dust suppressants (with authorization only),
- Reducing vehicle speeds.

## 5.3 Physical Hazards

Physical hazards such as the following may be encountered on-Site:

- Slip/trip/fall;
- Excavations;
- Heat stress;
- UV radiation;
- Heavy equipment operation;
- Excessive noise;
- Moving parts or equipment (including heavy construction equipment);
- Lifting (generators, drums, equipment); and
- Traffic – on access roadways at the facility.

## 5.4 Biological Hazards

Biological hazards such as the following may be encountered on-Site:



- Ticks, mosquitoes, stinging insects, arachnids, chiggers (allergic reactions and/or infectious diseases that can be transmitted to humans by animals)
- Rodents, snakes, zoonotic diseases (physical contact and/or infectious diseases that can be transmitted to humans by animals)

## 5.5 Hazard Identification and Control

Hazard controls generally consist of following specific safety procedures, training, engineering controls, air monitoring, and PPE selection. CHA employees are required to use the PPE appropriate to their work task and potential exposures as outlined in this HASP.

The levels of PPE assigned to each activity are based on available information on the estimation of exposure potential associated with each work task.

Affected Personnel	Task/Operation	Hazards	Hazard Control
All personnel in Exclusion Zone and Contamination Reduction Zone	Investigate potential impacts of the UST.	<ul style="list-style-type: none"> <li>• Inhalation of organic vapors, dusts, and other airborne particulates.</li> <li>• Skin and/or eye contact with contaminated soil and/or groundwater, decontamination solutions, and sample preservation agents.</li> </ul>	<ul style="list-style-type: none"> <li>• Conduct air monitoring in accordance with Section 6.0. Wear the required personal protective equipment when conditions or activities indicate the need for it. Stand upwind to extent possible to reduce inhalation hazard.</li> <li>• Keep airborne dust levels to a minimum by wetting down surfaces.</li> <li>• Maintain eye contact with equipment operator when moving in or around the excavation.</li> </ul>
All personnel in Exclusion Zone and Contamination Reduction Zone	Collection of soil samples.	<ul style="list-style-type: none"> <li>• Inhalation of organic vapors, dusts, and other airborne particulates.</li> <li>• Skin and/or eye contact with contaminated soil, decontamination solutions, and sample preservation agents.</li> </ul>	<ul style="list-style-type: none"> <li>• Conduct air monitoring in accordance with Section 6.0. Wear the required personal protective equipment when conditions or activities indicate the need for it. Stand upwind to extent possible to reduce inhalation hazard.</li> <li>• Keep airborne dust levels to a minimum by wetting down surfaces.</li> </ul>

Affected Personnel	Task/Operation	Hazards	Hazard Control
All personnel in Exclusion Zone and Contaminant Reduction Zone	Installation of soil borings.	<ul style="list-style-type: none"> <li>Inhalation of organic vapors, dusts, and other airborne particulates.</li> <li>Skin and/or eye contact with contaminated soil and/or groundwater, decontamination solutions, and sample preservation agents.</li> </ul>	<ul style="list-style-type: none"> <li>Conduct air monitoring in accordance with Section 6.0. Wear the required personal protective equipment when conditions or activities indicate the need for it. Stand upwind to extent possible to reduce inhalation hazard.</li> <li>Maintain eye contact with equipment operator when moving near or around the drill rig.</li> </ul>
All personnel	All field activities	Slips, trips, & falls	<ul style="list-style-type: none"> <li>Wear appropriate work boots.</li> <li>Avoid slippery surfaces.</li> <li>Remind field personnel to exercise good housekeeping practices.</li> <li>Be observant of activities around.</li> </ul>
All personnel	All field activities	Physical injuries, such as abrasions or cuts	<ul style="list-style-type: none"> <li>Use safe work practices.</li> <li>Don proper PPE.</li> <li>Have a first aid kit readily available at site.</li> </ul>
All personnel	Heavy lifting	Back injuries from lifting	<ul style="list-style-type: none"> <li>Practice safe lifting techniques.</li> <li>Always use a minimum of 2 people for heavy lifts.</li> <li>Lift with legs. Do not twist while carrying the load.</li> </ul>
All personnel	Heat stress	Exposure to elevated temperatures associated with working outdoors in warm/hot weather conditions.	<ul style="list-style-type: none"> <li>Wear lightweight clothing.</li> <li>Drink lots of water.</li> <li>Take breaks in the shade or cool areas.</li> </ul>
All personnel	Cold stress	Exposure to low temperatures associated with working outdoors in variable weather conditions	<ul style="list-style-type: none"> <li>Wear warm, dry clothing &amp; layers.</li> <li>Take frequent breaks in warm areas.</li> </ul>
All personnel	All field activities	Fire (general)	<ul style="list-style-type: none"> <li>Identify location of fire extinguisher(s) – contractor sourced.</li> <li>Keep ignition sources away from flammable materials and atmospheres.</li> </ul>

Affected Personnel	Task/Operation	Hazards	Hazard Control
All personnel	All field activities	Noise Exposure	<ul style="list-style-type: none"> <li>• Wear hearing protection if you must shout to hear someone who is standing one foot or less away.</li> </ul>
All personnel	All field activities	Contact with heavy equipment and traffic	<ul style="list-style-type: none"> <li>• Do not stand unnecessarily close to the excavator when it is operating.</li> <li>• Do not stand in lanes of traffic. Use cones or barricades to delineate work areas when work within access roads is required.</li> <li>• Wear a hard hat and high visibility clothing.</li> <li>• Make eye contact with the operator/drivers.</li> </ul>
All personnel	All field activities	Security	<ul style="list-style-type: none"> <li>• Stay alert to all on-site activities.</li> <li>• Report suspicious activities to PM and/or client.</li> </ul>
All personnel	All field activities	Ticks	<ul style="list-style-type: none"> <li>• Avoid unnecessary entry into tall grass and brushy areas.</li> <li>• Wear insect repellents containing DEET or Permethrin.</li> <li>• Wear light colored clothing to easily identify ticks.</li> <li>• Inspect yourself throughout the day and following completion of field activities.</li> <li>• Tuck pants into socks or boots, wear long sleeves and minimize skin exposure.</li> </ul>
All personnel	All field activities	Stinging insects (bees, hornets, wasps and yellow jackets)	<ul style="list-style-type: none"> <li>• Do not agitate nests unless absolutely necessary.</li> <li>• Be aware of holes in the ground within the work area.</li> <li>• Avoid wearing bright or patterned clothing.</li> <li>• Avoid wearing/using scented items (e.g., perfume, cologne, soaps).</li> <li>• Inspect food and drinks prior to consumption.</li> <li>• Use insecticide when necessary.</li> </ul>
All personnel	All field activities	Zoonotic diseases	<ul style="list-style-type: none"> <li>• Avoid dermal contact with animals, droppings, or carcasses.</li> <li>• Avoid inhalation of dust that is contaminated with droppings or carcasses.</li> <li>• See Appendix D for information regarding the SARS-COV-2 (COVID-19) pandemic.</li> </ul>

Affected Personnel	Task/Operation	Hazards	Hazard Control
All personnel	All field activities	Hantavirus	<ul style="list-style-type: none"> <li>• Avoid dermal contact with rodent droppings.</li> <li>• Avoid inhalation of dust that is contaminated with rodent droppings.</li> </ul>
All personnel	All field activities	Mosquitos/West Nile Virus	<ul style="list-style-type: none"> <li>• Eliminate mosquito breeding areas (standing water) at the work site.</li> <li>• Apply insect repellent containing DEET to exposed, unbroken skin per the manufacturer's instructions.</li> <li>• Wear light colored clothing (pants, long sleeved shirts and socks).</li> </ul>
All personnel	All field activities	Snakes	<ul style="list-style-type: none"> <li>• Avoid actions which increase the risk of encountering a snake (e.g., overturning logs, rocks, etc.).</li> </ul>
All personnel	All field activities	Rodents	<ul style="list-style-type: none"> <li>• Avoid contact with rodents and burrowing animals.</li> </ul>
All personnel	All field activities	Arachnids	<ul style="list-style-type: none"> <li>• Avoid actions which increase the risk of encountering arachnids (e.g., overturning logs, placing hands in dark places).</li> </ul>
All personnel	All field activities	Physically Damaging Plants (e.g., briars, thistles)	<ul style="list-style-type: none"> <li>• Remove plants prior to implementing the work activity.</li> <li>• Use briar resistant pants or chaps if working in dense thorny vegetation.</li> </ul>
All personnel	All field activities	Ultraviolet Exposure	<ul style="list-style-type: none"> <li>• Cover skin and limit time in sun to extent practical.</li> <li>• Apply sunscreen.</li> </ul>

## 6.0 AIR MONITORING & ACTION LEVELS

### 6.1 Air Monitoring

The CAMP will be implemented during the intrusive activities at the Site. The purpose of the CAMP is to provide a measure of protection for the downwind community, more specifically off-Site receptors including residents and workers, from potential airborne contaminant releases as a result of excavation activities performed at the Site. The CAMP will be implemented following NYSDOH's Generic CAMP protocol with one upwind and one downwind air monitoring station.

In support of the CAMP and to monitor air quality in the immediate work area, the following environmental monitoring instruments will be used within the Exclusion Zone:

- Photoionization Detector (PID) with 10.6 eV lamp or higher

The (PID) shall be used to detect volatile organic compounds in the ambient air in the work zone and will be calibrated and setup prior to the start of the days' activities.

Contaminant/Method	Frequency	Action Level	SSO Action
VOC Meter	Intermittently. Morning readings prior to beginning work. Periodic readings throughout work activities.	Downwind meter is 5 ppm or more above background/upwind meter sustained for 5 minutes.	Stop work and notify PM. PM will notify GW Syracuse contact.

Monitoring instruments will be calibrated at the start each full day of equipment usage or more frequently in accordance with manufacturer's recommendations.

## 6.2 Action Levels

Should action levels be reached, work operations shall cease until further evaluation is performed and safe levels are prevalent. If through engineering controls and monitoring, safe levels (below action levels) cannot be achieved, an upgrade in personal protection equipment shall be mandated by the SSO, or operations shall cease in that portion of the Site. The PM will be notified of any changes in PPE.

## 7.0 SITE CONTROL MEASURES

**Exclusion Zone (EZ):** Will include a 25-foot buffer around all boring areas and all areas where subsurface activities will occur. This will be delineated by cones/flagging or positioning field vehicles to block off the area.

Hazards within the EZ include excessive noise, slips/trips/falls, contact with heavy equipment, and hazards associated with proximity to boring activities; including direct contact with contaminated soil or water and inhalation of vapors from contamination.

**Contamination Reduction Zone (CRZ):** Will be established immediately adjacent to the Exclusion Zone and will be utilized for decontamination of personnel and equipment donning and doffing of PPE. Whenever possible, the CRZ shall be placed upwind of the EZ. The CRZ will also be coned/flagged to prevent facility personnel from entering the area.

Hazards within the CRZ include contact with contaminated soil or water, inhalation of vapors from contamination, and slips/trips/falls. Physical hazardous within the facility may pose a risk and good judgement should be utilized.

**Support Zone (SZ):** Will include all areas outside the EZ and CRZ.

Hazards within the support zone include slips/trips/falls, contact with heavy equipment, and other physical hazards associated with the work area and physical setting at the Site. Personnel within the SZ do not require HAZWOPER training.

## 8.0 HAZARD COMMUNICATION

In compliance with 29 CFR 1910.1200, any hazardous materials brought on Site by any personnel (CHA or its sub-contractors) shall be accompanied with the material's Safety Data Sheet (SDS). The SSO shall be responsible for maintaining the SDSs on Site, reviewing them for hazards that working personnel may be exposed to, and evaluating their use on Site with respect to compatibility with other materials including personal protective equipment, and their hazards. Should the SSO deem the material too hazardous for use on the subject Site, the party responsible for bringing the material on Site will be required to remove it from the Site.

## 9.0 CONFINED SPACE

During this project CHA personnel will not be permitted to enter any confined space. No confined space work is anticipated during this project.

If a confined space entry becomes necessary, this HASP will be revised to outline all confined space entry procedures, techniques, and equipment to be consistent with OSHA regulations in 29 CFR 1910.146. Additionally, all entrants and attendants will be trained in Confined Space Awareness training consistent with 29 CFR 1910.146.

## 10.0 PERSONAL PROTECTIVE EQUIPMENT

At this time, Level A, B and C PPE are not expected to be needed. If Site conditions change and contamination is present at levels above the action level, this HASP will be updated to reflect greater protection of personnel. The following is a list of required PPE at this time.

Task/Operation	Level of PPE	Equipment
General Site observation at a distance greater than 25 feet from intrusive activities. <ul style="list-style-type: none"><li>No drums present</li><li>No free product visible</li><li>2-Minute Breathing Zone PID Readings &lt; 5 ppm with the 10.6 eV bulb</li><li>No strong odors present</li></ul>	D	<ul style="list-style-type: none"><li>Long pants (no shorts)</li><li>Hard hat</li><li>Safety glasses</li><li>Reflective vests or yellow safety shirt</li><li>Work boots with safety toe</li><li>Hearing protection (where required)</li><li>Gloves (as appropriate)</li></ul>

## 11.0 DECONTAMINATION

Personnel working in the Exclusion Zone (within 25 feet of Site activities) will be required to enter and exit the work area through the Contamination Reduction Zone. Personnel engaged in decontamination will wear protective equipment including appropriate disposable clothing and respiratory protection and will also undergo decontamination procedures prior to leaving the decontamination area. The decontamination area will be placed upwind of the Exclusion Zone and may change based on the wind direction that day. The following equipment is needed for decontamination:

- Alconox®
- Distilled water
- Clean 5-gallon buckets
- Impermeable containers
- Polyethylene sheeting
- Garbage bags

The following list summarizes typical decontamination steps for personnel exiting the Exclusion Zone. Additional steps may be warranted based upon specific Site conditions.

### ***Level D***

- Remove any protective equipment within the decontamination area, as needed.
- Discard disposable garments.
- Wash/rinse boots.
- Containerize wash and decontamination water for disposal, as necessary.

### ***Level C***

- Will not be used at this time.

### ***Level B***

- Will not be used at this time.

### ***Level A***

- Will not be used at this time.

PPE will be decontaminated with soap (i.e. Alconox®) and water. Expendable, non-reusable items will be disposed of in garbage bags and disposed off-site as solid waste. Heavily contaminated PPE will be drummed with soil cuttings for offsite disposal.

Equipment and vehicles used by the Contractor in the Exclusion zone to handle contaminated materials will undergo decontamination procedure in the Contamination Reduction Zone prior to leaving the Site. The SSO will document that each piece of equipment has been decontaminated prior to removal from the Site. The decontamination procedures will include but are not limited to:



- Movement of equipment to the temporary decontamination pad;
- Removal of heavily-caked material with brushes or shovels; and
- Triple-rinsing with high pressure water or steam.

**Small Equipment:**

For soil sampling, dedicated sampling equipment is preferred. However, if non-dedicated equipment is used (i.e. stainless steel soil sampling equipment), the required decontamination procedure for all manual sampling equipment used to collect samples for chemical analysis is:

- Disassemble equipment, as required;
- Remove gross contamination from the equipment by brushing and then rinsing with tap water;
- Wash and scrub with low phosphate detergent (e.g. Alconox®);
- Tap water rinse;
- Distilled water rinse;
- Air dry.

All decontaminated equipment will be placed on or wrapped in polyethylene sheeting in order to avoid contacting a contaminated surface prior to use. Field personnel will use a new pair of outer gloves before handling sample equipment after it is cleaned. During periods of transportation and non-use, all decontaminated sampling equipment will be wrapped in polyethylene sheeting or aluminum foil.

**Large Equipment:**

CHA personnel are not responsible for the decontamination of large equipment. Information for large equipment decontamination will be provided by the drilling subcontractor. Decontamination of heavy construction equipment will be performed by the contractor under the contractor's HASP.

## 12.0 EMERGENCY PROCEDURES

On-Site emergencies can range in intensity from minor to serious conditions. Various procedures for responding to Site emergencies are listed in this section. The designated SSO is responsible for contacting the CHA Project Manager who will notify the GW Syracuse representative in emergency situations (however, others must assume responsibility if the situation warrants). An injured person shall be accompanied by another worker at all times.

Should an on-Site emergency occur at the project Site (related to the project or otherwise) the following procedures shall be followed:

- Call 911 for additional emergency response.
- If the emergency occurs and is project specific, notify your assigned HSC after emergency care is provided to activate the appropriate actions.

- Properly trained personnel will determine if the emergency can be contained or remediated and initiate the appropriate action(s). Personnel shall not respond beyond their level of training.
- Employees are not to risk their health or life in taking aggressive action(s) to fight fire or stop releases. Only defensive actions shall occur until an action plan is resolved.
- Choose an exit route that provides fast, and safe, egress from the work area. The route taken should always be away from obvious obstructions or other hazardous conditions. Consult an evacuation map if you are unsure of where the nearest exit route is located.
- Do not delay evacuation to retrieve personal items or equipment.
- Persons shall exit areas in groups and attempt to stay together during evacuation procedures.
- While evacuating, notice any conditions which should be reported to emergency personnel. Be alert for the location of smoke, fire and/or vapors. Report any of these conditions to emergency personnel.
- Be aware of emergency response vehicles and avoid interference with these.

Remain calm, keep voices low and wait for instructions from the Incident Commander. Do not leave the scene prior to notifying your assigned Project Manager and Field Team Leader. An incident report form is included in Appendix C.

## 13.0 EMERGENCY MEDICAL CARE

In general, if emergency care is needed, personnel will call 911. However, if necessary, transport injured personnel to the nearest hospital using the following directions (map available in Appendix B):

Address: Crouse Hospital  
736 Irving Ave  
Syracuse, NY 13210

Emergency Room Telephone Number: (315) 470-7111

### Directions from Site:

1. From the Site, leave through E. Fayette St. to the south.
2. Turn left onto E. Fayette St.
3. Turn right onto Irving Ave
4. Following Irving Ave for 0.5 miles to Crouse Hospital on your right.
5. Follow signs to the Emergency Department.

### 13.1 Emergency Notification Numbers

CHA Contact: Samantha Miller, (915) 329-9898 (Cell)  
GW Syracuse LLC Contact: Chris Geiger, (516) 413-6689 (Cell)  
Fire Dept.: 911  
Police Dept.: 911  
Department of Emergency Services: 911  
Poison Control: (800) 222-1222

### 13.2 On-Site First Aid

First aid kits will be available in the Support Zone (e.g. vehicles). General first aid procedures include:

**Skin/Eye Contact:** Flush eyes and/or skin thoroughly with water for 15 minutes. Remove contaminated clothing. If skin was contacted with a dry material, brush it off first, then flush with water. Seek medical attention if irritation develops.

**Ingestion:** Do not induce vomiting. Call Poison Control Center. Tell them what was swallowed, if possible. Follow instructions. Have SDS available for reference.

**Inhalation:** Remove person from contaminated environment without risking your own safety. **DO NOT ENTER A CONFINED SPACE. DO NOT ENTER EXCLUSION ZONE UNLESS WEARING ONE LEVEL HIGHER PROTECTION THAN VICTIM WAS WEARING.**

Administer cardiopulmonary resuscitation (CPR) if victim does not have a pulse and if you are currently certified in CPR.

**Injuries:** Do not move a victim who may have a back injury. Cover them with coats, blankets, or other appropriate items to keep them warm. Personnel will immediately dial emergency services (i.e. 911).

Apply pressure to bleeding wounds. If the victim is able, have the victim apply pressure to the wound. If they are not able, wear gloves to protect from exposure to blood. Put gauze bandages or other clean cloth over the wound. Do not remove blood-soaked bandages or cloth - instead put additional bandages or cloths over the blood-soaked bandages. Elevate the limb with the injury above the heart.

Administer CPR if victim does not have a pulse and if you are currently certified in CPR. Have someone call for an ambulance immediately if there is any possibility that the victim is having or had a heart attack.

Shock is likely to develop in any serious injury or illness. The following are signals of shock: restlessness or irritability; altered consciousness; pale, cool, moist skin; rapid breathing; and/or rapid pulse. In the event of shock, do the following: Immediately have someone call for an ambulance; have the victim lie down; elevate legs 12 inches unless you suspect head, neck, or back injuries; if victim is cool, cover the victim to prevent chilling; do not give the victim anything to drink, even if thirsty. Note time symptoms began and report to emergency responders.

# APPENDIX A

Daily Job Briefings



## DAILY JOBSITE SAFETY BRIEF

### PROJECT INFORMATION

Project Name: Gateway Svracuse Apartments	CHA Project No. 086328.000
Project Start Date:                      Completion Date:	Weather:
Project Location: 701 E. Fayette Street, Syracuse, NY	Project Task:
	<i>Complete a Site Health &amp; Safety Plan per Task</i>

#### Description of Work:

*Be Specific:*

Key Personnel:			
Responsibilities:	Project Manager: Sam Miller	Field Team Leader: Karyn Ehmann	Site Safety Officer: Karyn Ehmann

#### Description of Hazards:

*\*The Daily Jobsite Safety Brief must be completed before work begins daily or Scope of Work changes\**

Weather: \_\_\_\_\_

All staff have reviewed and signed site and safety plan	<input type="checkbox"/> Yes <input type="checkbox"/> No	All staff have proper PPE	<input type="checkbox"/> Yes <input type="checkbox"/> No
Hazards and precautions have been discussed	<input type="checkbox"/> Yes <input type="checkbox"/> No	Safety Controls in place	<input type="checkbox"/> Yes <input type="checkbox"/> No

Additional Notes/Comments: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Signed: \_\_\_\_\_ Date/Time: \_\_\_\_\_

Signed: \_\_\_\_\_ Date/Time: \_\_\_\_\_

Signed: \_\_\_\_\_ Date/Time: \_\_\_\_\_

Weather: \_\_\_\_\_

All staff have reviewed and signed site and safety plan	<input type="checkbox"/> Yes <input type="checkbox"/> No	All staff have proper PPE	<input type="checkbox"/> Yes <input type="checkbox"/> No
Hazards and precautions have been discussed	<input type="checkbox"/> Yes <input type="checkbox"/> No	Safety Controls in place	<input type="checkbox"/> Yes <input type="checkbox"/> No

Additional Notes/Comments: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Signed: \_\_\_\_\_ Date/Time: \_\_\_\_\_

Signed: \_\_\_\_\_ Date/Time: \_\_\_\_\_

Signed: \_\_\_\_\_ Date/Time: \_\_\_\_\_

Weather: \_\_\_\_\_

All staff have reviewed and signed site and safety plan	<input type="checkbox"/> Yes <input type="checkbox"/> No	All staff have proper PPE	<input type="checkbox"/> Yes <input type="checkbox"/> No
Hazards and precautions have been discussed	<input type="checkbox"/> Yes <input type="checkbox"/> No	Safety Controls in place	<input type="checkbox"/> Yes <input type="checkbox"/> No

Additional Notes/Comments: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Signed: \_\_\_\_\_ Date/Time: \_\_\_\_\_

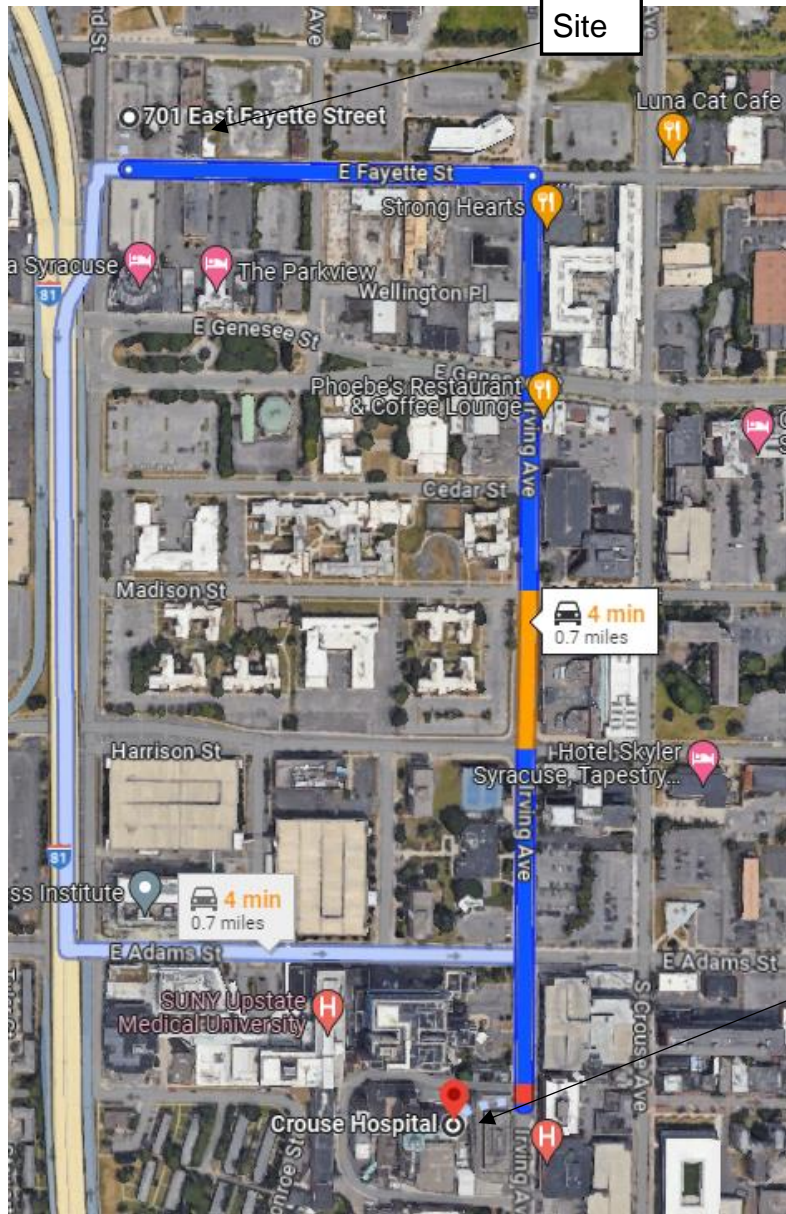
Signed: \_\_\_\_\_ Date/Time: \_\_\_\_\_

Signed: \_\_\_\_\_ Date/Time: \_\_\_\_\_

# APPENDIX B

Hospital Route





Directions from site:

1. Head south from the Site to E. Fayette St.
2. Turn left on E. Fayette St. to head east for 0.2 miles.
3. Turn right onto Irving Ave.
4. Continue for 0.5 miles.
5. Hospital will be on the right.
6. Follow signs to the Emergency Department.

SOURCE: Google Maps

Crouse Hospital

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300 South State Street Suite 600 Syracuse, New York 13202  
Main: (315) 471-3920 • www.chacompanies.com

**HOSPITAL ROUTE**  
SYRACUSE GATEWAY APARTMENTS  
701 E. FAYETTE STREET  
SYRACUSE, NEW YORK

PROJECT NO.  
086328.000

DATE: 07/2024

Appendix B

# APPENDIX C

Incident Report



## Incident Report

Please Note: this form must be completed within 24 hours of an employee's injury or illness during the workday. This form can be completed by the employee or supervisor (or a witness if his/her supervisor is unavailable).

Employee	Date of Incident		Employee's Name		Employee #	Full Address where Incident Occurred		County
	Time Started Work (on the day of injury)		Number of Years of Experience in Completing the Task Related to Injury		Working alone and the only one on-site?	Client	Project Number	
	Time of Incident		Employee's Sector and Group		Employee's Occupation/Title			
	Please describe, in detail, what happened to cause the incident (conditions working under, how accident happened, etc.)							
	List the Nature of the Employee's Injury and Body Parts Affected (Describe here):							
	Injury type		Body Part		Indicate whether a similar work-related injury occurred in the past			
	What Was Employee Doing When Incident Occurred? (Be specific. If any tools/equipment involved, list them.)							
	How Did the Incident or Exposure Occur? (Describe fully the events, which resulted in the injury/illness.)							
	Object or Substance That Directly Injured Employee or Caused Illness? (Describe what caused injury/illness.)							
	Were there any witnesses to the incident? <input type="checkbox"/> Yes <input type="checkbox"/> No							
If Yes, list contact information here								
Signature						Date		
Supervisor	Was this a first aid only incident?		Was Medical Care Beyond First Aid Treatment Provided?		Was employee treated in ER and/or hospitalized?		Summarize first aid or medical care received. (Be specific with procedures performed, medication provided, etc.)	
	Name & Address of Medical Treatment Facility		Doctor Name		When was the date of treatment?	Date Supervisor First Notified of Employee Injury/Illness	Has employee provided supervisor with work status/discharge papers?	
	Describe the reason(s) why the incident occurred - unsafe acts and conditions.					Root Causes (Select the primary root cause for this injury)		
	Immediate Actions Taken (List actions that will successfully prevent recurrence.)							
	Does the Client have injury notification requirements?					If yes, has CHA notified client?		
	Print Name				Signature:		Date	
H&S	Is Case OSHA Recordable?		If Yes, OSHA Case/File No.		Lost Time		Restricted Duty	
					<input type="checkbox"/> Yes <input type="checkbox"/> No		<input type="checkbox"/> Yes <input type="checkbox"/> No	
	Date H&S First Notified Of Injury/Illness							
Comments:								
Print Name				Signature:		Date		

RETURN COMPLETED FORM WITHIN 24 HOURS OF THE INCIDENT TO [Sherry Lingle](#), [Tony Tremblay](#), [Michael Platt](#), [Lauren Perry](#)

# APPENDIX D

Job Hazard Analyses

## Decibel (Loudness) Comparison Chart

Here are some interesting numbers, collected from a variety of sources, that help one to understand the volume levels of various sources and how they can affect our hearing.

Environmental Noise	
Weakest sound heard	0dB
Whisper Quiet Library at 6'	30dB
Normal conversation at 3'	60-65dB
Telephone dial tone	80dB
City Traffic (inside car)	85dB
Train whistle at 500', Truck Traffic	90dB
Jackhammer at 50'	95dB
Subway train at 200'	95dB
<i>Level at which sustained exposure may result in hearing loss</i>	<i>90 - 95dB</i>
Hand Drill	98dB
Power mower at 3'	107dB
Snowmobile, Motorcycle	100dB
Power saw at 3'	110dB
Sandblasting, Loud Rock Concert	115dB
<i>Pain begins</i>	<i>125dB</i>
Pneumatic riveter at 4'	125dB
<i>Even short term exposure can cause permanent damage - Loudest recommended exposure <u>WITH</u> hearing protection</i>	<i>140dB</i>
Jet engine at 100'	140dB
12 Gauge Shotgun Blast	165dB
Death of hearing tissue	180dB
Loudest sound possible	194dB
OSHA Daily Permissible Noise Level Exposure	
Hours per day	Sound level
8	90dB
6	92dB
4	95dB
3	97dB
2	100dB
1.5	102dB
1	105dB
.5	110dB

.25 or less	115dB
<b>NIOSH Daily Permissible Noise Level Exposure</b>	
Hours per day	Sound level
8	85dBA
6	86dBA
4	88dBA
3	89dBA
2	90dBA
1.5	92dBA
1	94dBA
.5	97dBA
.25 or less	100dBA
0	112dBA
<b>Perceptions of Increases in Decibel Level</b>	
Imperceptible Change	1dB
Barely Perceptible Change	3dB
Clearly Noticeable Change	5dB
About Twice as Loud	10dB
About Four Times as Loud	20dB
<b>Sound Levels of Music</b>	
Normal piano practice	60 -70dB
Fortissimo Singer, 3'	70dB
Chamber music, small auditorium	75 - 85dB
Piano Fortissimo	84 - 103dB
Violin	82 - 92dB
Cello	85 -111dB
Oboe	95-112dB
Flute	92 -103dB
Piccolo	90 -106dB
Clarinet	85 - 114dB
French horn	90 - 106dB
Trombone	85 - 114dB
Tympani & bass drum	106dB
Walkman on 5/10	94dB
Symphonic music peak	120 - 137dB
Amplifier, rock, 4-6'	120dB
Rock music peak	150dB

NOTES:

- One-third of the total power of a 75-piece orchestra comes from the bass drum.
- High frequency sounds of 2-4,000 Hz are the most damaging. The uppermost octave of the piccolo is 2,048-4,096 Hz.
- Aging causes gradual hearing loss, mostly in the high frequencies.
- Speech reception is not seriously impaired until there is about 30 dB loss; by that time severe damage may have occurred.
- Hypertension and various psychological difficulties can be related to noise exposure.
- The incidence of hearing loss in classical musicians has been estimated at 4-43%, in rock musicians 13-30%.
- Recent NIOSH studies of sound levels from weapons fires have shown that they may range from a low of 144 dB SPL for small caliber weapons such as a 0.22 caliber rifle to as high as a 172 dB SPL for a 0.357 caliber revolver. *Double* ear protection is recommended for shooters, combining soft, insertable ear plugs and external ear muffs.

Statistics for the Decibel (Loudness) Comparison Chart were taken from a study by Marshall Chasin, M.Sc., Aud(C), FAAA, Centre for Human Performance & Health, Ontario, Canada. There were some conflicting readings and, in many cases, authors did not specify at what distance the readings were taken or what the musician was actually playing. In general, when there were several readings, the higher one was chosen.

### **Additional Resources**

The National Institute for Occupational Safety and Health (NIOSH) -<http://www.cdc.gov/niosh/topics/noise/>

[American Tinnitus Association](#) – Information and help for those with tinnitus

[Hear Tomorrow](#) – The Hearing Conservation Workshop

[H.E.A.R.](#) – Hearing Education and Awareness for Rockers

[American Tinnitus Association](#) – for musicians and music lovers

[Turn It to the Left](#) – from the American Academy of Audiology

[Listen to Your Buds](#) – from the American Speech-Language-Hearing Association

[Binge Listening: Is exposure to leisure noise causing hearing loss in young Australians? \[pdf\]](#) – report from Australian Hearing, National Acoustic Laboratories

[Hearing Aids and Music: Interview with Marshall Chasin, AuD](#) – from the American Academy of Audiology

[Safe Listening Resources](#) – from the National Hearing Conservation Association

[OSHA Noise and Hearing Conservation](#) -



## Job Hazard Analysis

<b>Task</b>	<b>Hazard Type and Description</b>	<b>Hazard Control</b>
Working in hot environments	Heat disorders including heat cramps, heat exhaustion, and heat stroke  Sunburn	Employers can control this hazard by providing heat stress training to exposed employees, providing access to shade, and allowing employees to gradually get used to hot environments. Employees working in hot environments are advised to take breaks in cool rest areas, rotate physically demanding tasks, save most demanding work for cooler times of day, and utilize the heat index chart to determine exposure risk. Be sure that every employee working in the hot environments is drinking one cup of water ever fifteen minutes. Recognize the signs such as above normal body temperature, headaches, nausea, cramping, fainting, increased heart rate, and pale as well as clammy skin  The risk of sunburn is higher when working at high elevations, or when working around water (from reflection). In these conditions, you can be burned even in overcast conditions; therefore, wear protective clothing and use sunscreen
High wind events	Severe wind events can create	Employees should avoid areas

	“wind throws” where strong winds can blow down trees	during high wind occurrences that exhibit previous wind damage
Working at high altitudes	Altitude sickness	Recognize signs of acute mountain sickness including headaches, light-headedness, inability to catch one’s breath, nausea, and vomiting. Practice prevention by acclimating slowly to high elevations and staying hydrated. If the following symptoms progress, immediately descend to lower elevations and seek medical attention: difficulty breathing, chest pain, confusion, decreased consciousness, and loss of balance
Electrical storms	Being struck by lightning	While working outside, watch the sky for thunderstorms and seek shelter before the weather deteriorates. Stop working in streams and lakes. Someone at the job site must be able to begin revival techniques (i.e. CPR) if someone is struck by lightning. Do not use telephones. If caught in electrical storms, seek shelter inside a vehicle or building. When in a building, keep away from doors, windows, plugged in appliances, and metal. When in a vehicle, avoid contact with metal objects inside. If outside with no shelter, obey the following procedures: do not congregate, do not use metal objects, avoid standing near isolated trees, seek lower elevations such as valleys or canyons, and avoid being on peaks as well as trees. If you feel your hairs standing on end and your skin tingling, this is a sign that lightening might be about to strike so crouch immediately (feet together, hands on knees). Wait a minimum of 20-30 minutes after the last lightning flash to return to the field or outside area.



limited access to clean drinking water		Do not drink untreated water from streams, lakes or springs.
Working outdoors	Rattlesnakes	Be alert and do not put your feet or hands where you cannot see what is on the ground (for example if you are stepping over a log and you cannot see what's on the other side). If you encounter a rattle snake do not pick it up- give it a wide berth and walk around it. If bitten, seek immediate professional medical attention and remove jewelry. If bitten on an extremity lower than the heart, cover wound with a sterile band while seeking medical attention.
	Bears	If you encounter a bear, be alert but stay calm, and give it as much room as possible. Try to leave the area, but DO NOT RUN. Back away slowly. If the bear follows, stop and hold your ground: wave your arms to make yourself look big and talk in a normal voice. Work in teams of two to deter bear attacks. If the bear makes contact, surrender: fall to the ground and play dead (a bear will break off an attack once it feels the threat has been eliminated). If the bear continues to bite after you assume a defensive posture. Their attack is predatory and you should fight back vigorously
	Mountain Lions	Be alert, calm, and do not panic. If you see a mountain lion, do not run as it may stimulate its predatory nature. Instead, shout and wave arms to let it know that you are not prey: fight back

	<p>Tick bites</p> <p>Roughskin Newts</p> <p>Bee stings</p>	<p>Use DEET based repellants on exposed skin and/or permethrin on clothes. Check for ticks during and after field work. If you find a tick remove it with tweezers within 24 hours, preferably immediately: do not leave the head embedded or extract the tick with matches, petroleum jelly, or other coatings (e.g. motor oil)</p> <p>Avoiding handling them as their skin contains a potent neurotoxin. If necessary for the protocol, handle only when wearing gloves. Do not “lick” for “killer buzz” as people have died from attempting to eat roughskin newts</p> <p>If you know or suspect you are allergic to bee stings, carry appropriate allergy kits prescribed by a doctor for treating anaphylactic shock. Carry and take diphenhydramine (Benadryl). Follow the label instructions for allergy control. Inform your supervisor if you suspect you are allergic. Watch for ground nests</p>
Travel movement or work in area with poison oak or poison ivy	Allergic reaction to poison oak/poison ivy plants	<p>Learn to recognize poison oak. Avoid contact by using ivy block and wearing long pants and long-sleeve shirts if traveling in dense areas. If skin contact is made, flush the area with cold water as soon as possible. Do not flush your skin with warm water or soap as it can open your pores and increase the reaction. To wash and rinse use</p>

		Tecnu or similar product with cold water to remove oils
Encountering irrigation pipes, marijuana plantation, or grow operations	Unfriendly encounters with criminal elements	Do not wear uniforms and carry a radio backpack that is not visible. Do not confront strangers and act like a tourist if you must speak. Work in pairs or groups. If working in areas likely to contain operations, check in with park staff when leaving vehicle and returning to vehicle. Watch for black piping or other signs. If you find a definite grow operation, leave immediately, note the location, and report it to the authorities

# CHA Consulting, Inc.

## Job Hazard Analysis

### Excavations

Task	Hazard Type and Description	Hazard Control
Noise exposure	Hearing loss & psychological stress	Utilize muffler systems and other engineering controls with increasing working distance. Wear approved safety ear plugs when working close enough to heavy equipment/backhoe
Drilling	Inhalation hazards from dust and dirt.  Struck-by and caught between.	Wear appropriate PPE to protect from dust such as a fit- tested half-face air purifying respirator with appropriate dust cartridges. The respirator should be worn whenever field instruments indicate the need, or when wind-blown dust is obvious in combination with detected contaminants  Stay alert and maintain safe distance from operating parts.
General excavation activity	Contact of dirt or dust after work activities on one's skin	Wear coveralls or tyvek suits to protect clothing, boots, hair, and skin. Remove work clothes including boots before entering environments outside of the work site
Being near moving parts of machinery	Physical injury from moving parts  Struck-by and caught between	Avoid moving parts of machinery. Keep finger, hand and arms away from backhoe bucket and other pinch points. Wear leather gloves when using hands for activities other than sampling, and steel-toed boots. Wear hard hat at all times
Working in the vicinity of heavy machinery	Struck-by and caught between	Personnel on the ground should keep away from the work area and backhoe unless they are required for the task. Ask for assistance when

		<p>carrying or moving heavy loads. Use legs to lift. Do not carry heavy equipment without first establishing eye contact with the operator. Use standard hand signals when noise levels inhibit auditory communication. Ensure that all heavy machinery have audible back-up signals. All workers must wear reflective traffic vests when appropriate. Barricade work area and permit only excavation personnel in the area</p>
Working where there is site vehicle traffic	Struck-by and caught between	Restrict outside vehicular traffic on the job site. Use flaggers and a specific traffic route if necessary
Digging where there are unknown underground utilities and pipes	<p>Striking underground utilities or other significant obstructions</p> <p>Running into an electrical duct bank</p> <p>Potential for fires, spills, damaged underground utilities, high noise</p> <p>Slips, trips and falls walking in general vicinity of planned excavation</p>	<p>Observe marked locations of underground utilities if marked. Excavate by hand when within five feet in any direction of known underground obstructions. Machine digging allowed within two feet after visual identification and de-energized. If utilities can be confirmed as abandoned, hand digging is not required. Use detection systems if applicable!</p> <p>Hand digging required to visually establish location. Machine digging per competent person evaluation and JSA/STA</p> <p>Utilize a qualified spotter probe bar, appropriate PPE (hard hat, safety glasses, steel toed boots, Nomex coveralls, ear plugs and gloves as necessary)</p> <p>Review general terrain and evaluate surface conditions. Look for ruts, large rocks, and uneven terrain</p>
Scanning with electronic	Trips and falls, strain from	Have an assistant help spot various



equipment	lifting heavy instruments	hazards in area if focusing on instrument is too distracting. If lifting or pushing scanning instruments of heavier weights, get assistance with movements to avoid strains
Probing with metal tipped fiberglass rods	Slips, trips, and falls walking in general area of intended excavation  Back strains, hand injury from probing rod	Review overall terrain and identify surface conditions. Look for ruts, large rocks, and uneven terrain  Avoid excessive force attempting to penetrate deeper with rods. Wear leather gloves to avoid blisters and other hand injuries
Working in the Ditch	Potential for cave-in, atmospheric hazards, struck by/caught-between.  Ladder safety  Water accumulation	Have a competent person evaluate the excavations. Excavations over 5 feet deep shall properly protected from cave-ins (protective systems – sloped, benched, shoring, A competent person shall oversee all excavation safety issues and properly assess working conditions. shielding). Utilize a 4 way calibrated monitor at all times while employees are in the ditch. Only one person act as signalman, but anyone can call emergency stop. The spoil pile shall be located at least two feet from the edge of the trench if not as far away as possible and slope the pile away from the excavation  Ladders used for access must be tied off and extend 3' over landing. When ascending/descending employee must face ladder and maintain three (3) points of contact. Angle ladder at a ¼ of working length (75degrees) for safe climbing.  The competent person shall inspect the installation of the protective

		<p>barrier and the conditions of trenching before it is entered and daily before every shift thereafter, or after a rain storm. Thus, the competent person shall also monitor the water level, and determine when safe limits have been exceeded. Any accumulation of water in the trench shall be kept at a minimum by portable pumps</p>
Working near the ditch	Falling into eight foot deep trench	<p>At a minimum, barricades shall be erected six feet away from the edge of the trench. Such barricades must be made visible by using high visibility methods when left unattended. Anyone within a six feet boundary must be protected from falls utilizing fall protection (i.e. railing or fall restraint by tethering workers). Provide a walkway or bridge with standard guardrails if employee must cross over the excavation</p>
Equipment Damage	Excavations left open and unattended near roadways & walkways, equipment roll over hazard, high noise, airborne dust	<p>Confirm location of all power lines. If lines are unable to shut-in maintain a minimum of ten feet clearance from equipment. Verify and increase distance (per approach charts) for lines in excess of 50,000 volts. Maintain spotter with no other duties than watching for interference, if power lines are within swing radius. Inform local operations and any remote operation of activities. Do not use cell phones while operating equipment. Tape and/or barricade unattended excavations.</p>
Working outside	Bad weather (rain, cold/heat, etc..)	<p>If rain and/or lightning starts, stop all activities and allow competent person to advise further regarding safety practices and procedures.</p>
Excavator with grapple attachment	Employees working near building(s) can potentially have a crushing injury and atmospheric hazard. Striking	<p>Keep personnel at a safe distance from the equipment. Monitor atmospheric conditions. Make eye contact with the operator before</p>

	a person within radius of boom	approaching equipment. Only one person is to act as signalman; however, anyone can call emergency stop
--	--------------------------------	--

# CHA Consulting, Inc.

## Job Hazard Analysis

### Heavy Equipment

Task	Hazard Type and Description	Hazard Control
Heavy equipment	Pinch points Struck-by/Caught between	Never work or walk under loads, and only one person is to act as the signal person. Avoid working near swing radius's. Maintain eye contact with operators when approaching equipment. Rigger s and Operators must possess additional safety training for competency. (Competent/Qualified Training)
Road grading and material cleanup	Potential for personnel to be run over with equipment Struck-by/Caught between	Ensure equipment is operated by qualified operator, and all personnel working on or near roadway wear reflective vests. Be sure that equipment back-up alarms are working properly. Always make eye contact with equipment operators prior to approaching
Personnel working near heavy equipment	Slips and falls Struck-by/Caught between	Make sure there is a good working surface. Cover or barricade excavations as soon as practical. Wear a hard hat, safety glasses, ear plugs, a Class II ANSI safety vest as well as steel toed boots when necessary
Operation	Strains and sprains	Think about your body position; avoid over- reaching, hyper-extending, location/ position of extremities, and think if you are in the best position for leverage

## Protecting Workers from Heat Stress

### Heat Illness

Exposure to heat can cause illness and death. The most serious heat illness is heat stroke. Other heat illnesses, such as heat exhaustion, heat cramps and heat rash, should also be avoided.

There are precautions that can be taken any time temperatures are high and the job involves physical work.

### Risk Factors for Heat Illness

- High temperature and humidity, direct sun exposure, no breeze or wind
- Heavy physical labor
- No recent exposure to hot workplaces
- Low liquid intake
- Waterproof clothing

### Symptoms of Heat Exhaustion

- Headache, dizziness, or fainting
- Weakness and wet skin
- Irritability or confusion
- Thirst, nausea, or vomiting

### Symptoms of Heat Stroke

- May be confused, unable to think clearly, pass out, collapse, or have seizures (fits)
- May stop sweating

### To Prevent Heat Illness:

- Establish a complete heat illness prevention program.
- Provide training about the hazards leading to heat stress and how to prevent them.
- Provide a lot of cool water to workers close to the work area. At least one pint of water per hour is needed.



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- Modify work schedules and arrange frequent rest periods with water breaks in shaded or air-conditioned areas.
- Gradually increase workloads and allow more frequent breaks for workers new to the heat or those that have been away from work to adapt to working in the heat (acclimatization).
- Designate a responsible person to monitor conditions and protect workers who are at risk of heat stress.
- Consider protective clothing that provides cooling.



## How to Protect Workers

- Know signs/symptoms of heat illnesses; monitor yourself; use a buddy system.
- Block out direct sun and other heat sources.
- Drink plenty of fluids. Drink often and BEFORE you are thirsty. Drink water every 15 minutes.
- Avoid beverages containing alcohol or caffeine.
- Wear lightweight, light colored, loose-fitting clothes.



## What to Do When a Worker is Ill from the Heat

- Call a supervisor for help. If the supervisor is not available, call 911.
- Have someone stay with the worker until help arrives.
- Move the worker to a cooler/shaded area.
- Remove outer clothing.
- Fan and mist the worker with water; apply ice (ice bags or ice towels).
- Provide cool drinking water, if able to drink.

IF THE WORKER IS NOT ALERT or seems confused, this may be a heat stroke. CALL 911 IMMEDIATELY and apply ice as soon as possible.



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For more information:



Occupational  
Safety and Health  
Administration

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Protect Yourself  
**Construction  
Personal Protective  
Equipment (PPE)**

**Eye and Face Protection**

- Safety glasses or face shields are worn any time work operations can cause foreign objects to get in the eye. For example, during welding, cutting, grinding, nailing (or when working with concrete and/or harmful chemicals or when exposed to flying particles). Wear when exposed to any electrical hazards, including working on energized electrical systems.
- Eye and face protectors – select based on anticipated hazards.

**Foot Protection**

- Construction workers should wear work shoes or boots with slip-resistant and puncture-resistant soles.
- Safety-toed footwear is worn to prevent crushed toes when working around heavy equipment or falling objects.

**Hand Protection**

- Gloves should fit snugly.
- Workers should wear the right gloves for the job (examples: heavy-duty rubber gloves for concrete work; welding gloves for welding; insulated gloves and sleeves when exposed to electrical hazards).

**Head Protection**

- Wear hard hats where there is a potential for objects falling from above, bumps to the head from fixed objects, or of accidental head contact with electrical hazards.
- Hard hats – routinely inspect them for dents, cracks or deterioration; replace after a heavy blow or electrical shock; maintain in good condition.

**Hearing Protection**

- Use earplugs/earmuffs in high noise work areas where chainsaws or heavy equipment are used; clean or replace earplugs regularly.

**For more complete information:**

 **Occupational  
Safety and Health  
Administration**  
**U.S. Department of Labor**  
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OSHA 3260-09N-05

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## **Job Hazard Analysis**

### **Slips/Trips/Falls**

#### **Common hazards**

- Slippery surfaces (e.g., wet, oily or greasy)
- Seasonal trip hazards (snow and ice)
- Spills of wet or dry substances
- Changes in walkway levels and slopes
- Unsecured mats
- Poor lighting
- Debris and items stored in walkways
- Trailing cables in pedestrian walkways
- Smoke, steam or dust obscuring view
- Unsuitable footwear

#### **Controlling hazards**

When establishing safe work practices, consider:

- Characteristics of physical work area
- Weather conditions (snow, ice, rain)
- Tasks performed
- Workers' work practices
- Equipment

#### **Hazard Control/Engineering Controls**

- Type of flooring
- Slope of surface (ramps, handrails)
- Surface free of obstructions/holes
- Drainage
- Lighting levels, non-glare, contrast
- Equipment to be used/not carrying too much at once
- Signage
- Sufficient space
- Minimizing environmental influences, e.g., blocking wind to prevent wet surfaces icing at entrances



## **Hazard Control/Administrative Controls**

- Training workers/awareness
- Safe practices such as a procedure for cleaning spills or requirement for two workers to transport a large equipment that one worker cannot see around or can't handle
- Reporting hazards
- Prompt maintenance
- Job design (identifying tasks requiring excessive pushing/pulling, line-of-sight obstruction)
- Equipment readily available
- Addressing poor work practices
- Inspections
- Review slips, trips and same-level fall hazards

## **Hazard Control/Housekeeping**

- Clean spills
- Remove debris, snow and ice
- Keep equipment clean
- Keep wires, etc. controlled, taped, etc.

## **Hazard Control/Personal Protective Equipment**

- Appropriate footwear for task, which may include appropriate heels, soles and anti-slip boots

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# APPENDIX D

Community Air Monitoring Plan

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## Community Air Monitoring Plan (CAMP)

**Syracuse Gateway Apartments  
701 E. Fayette Street  
Syracuse, New York**

The following Community Air Monitoring Plan (CAMP) will be implemented for the Remedial Investigation activities to be performed at the Site known as the Syracuse Gateway Apartments and described in more detail within the Remedial Investigation Work Plan (RIWP). Air monitoring will be conducted in general accordance with the New York State Department of Health (NYSDOH) *Generic Community Air Monitoring Plan (CAMP)*. Air monitoring will be conducted on a real-time basis, using both hand-held field instruments and perimeter air monitoring stations, for volatile organic compounds (VOCs) and particulate levels at the perimeter of the exclusion zone or work area.

- Continuous monitoring will be performed during ground intrusive activities
- Data will be recorded electronically by the monitoring units and will be downloaded from the CAMP air monitoring stations onto a flash drive or laptop and field logged daily.
- CAMP data records will be maintained on-site for New York State Department of Environmental Conservation (NYSDEC) and NYSDOH review and provided daily.
- All CAMP monitoring records will be submitted as part of the Project Report.

This CAMP is not intended for use in establishing action levels for worker respiratory protection which is described in the Site-specific Health and Safety Plan (HASP) included as Appendix C to the RIWP. Rather, its intent is to provide a measure of protection for the downwind community (i.e., off-Site receptors including residences and businesses and on-Site workers not directly involved with the subject work activities) from potential airborne contaminant releases as a direct result of the proposed RI activities. Reliance on this CAMP should not preclude simple, common-sense measures to keep volatile organic compounds (VOCs) at a minimum around the work areas. The action levels specified herein require increased monitoring, corrective actions to abate emissions, and/or work shutdown. Additionally, this CAMP helps to confirm that the RI activities did not spread contamination off-Site through the air.

### **Particulate Monitoring, Response Levels, and Actions**

Particulate monitoring must be employed during ground intrusive activities associated with excavation/exposition of subsurface soils. CAMP monitoring will not be considered necessary for indoor activities, unless odors and/or dust generation is noted outside of the building due to the project work being performed.

Particulate concentrations will be monitored continuously at the downwind perimeter of the exclusion zone at temporary particulate monitoring stations (one placed upwind and one placed downwind). The particulate monitoring will be performed using real-time monitoring equipment capable of measuring particulate matter less than 10 micrometers in size (PM-10) and capable of integrating over a period of 15 minutes (or less) for comparison to the airborne particulate action level. The equipment will be equipped with an audible alarm to indicate exceedance of the action level. In addition, fugitive dust migration will be visually assessed during all work activities.

1. Reasonable fugitive dust suppression techniques must be employed during all Site activities which may generate fugitive dust. Fugitive dust is expected to be minimal.
2. Particulate monitoring must be employed during the handling of contaminated soil.
3. Particulate monitoring will be performed using real-time particulate monitors and will monitor particulate matter less than ten microns (PM<sub>10</sub>) with the following minimum performance standards:
  - a. Objects to be measured: Dust, mists or aerosols;
  - b. Measurement Ranges: 0.001 to 400 milligrams per cubic meter (mg/m<sup>3</sup>) or 1 to 400,000 micrograms per cubic meter (µg/m<sup>3</sup>);
  - c. Precision (2-sigma) at constant temperature: +/- 10 grams per cubic meter (g/m<sup>3</sup>) for one second averaging; and +/- 1.5 g/m<sup>3</sup> for sixty second averaging;
  - d. Accuracy: +/- 5% of reading +/- precision (Referred to gravimetric calibration with SAE fine test dust (mass median diameter (mmd)= 2 to 3; g-2.5, as aerosolized);
  - e. Resolution: 0.1% of reading or 1g/m<sup>3</sup>, whichever is larger;
  - f. Particle Size Range of Maximum Response: <0.1 to 10 microns (µm);
  - g. Total Number of Data Points in Memory: 10,000 or greater;
  - h. Logged Data: Each data point with average concentration, time/date and data point number
  - i. Run Summary: overall average, maximum concentrations, time/date of maximum, total number of logged points, start time/date, total elapsed time (run duration), short-term exposure limit (STEL) concentration and time/date occurrence, averaging (logging) period, calibration factor, and tag number;
  - j. Alarm Averaging Time (user selectable): real-time (1-60 seconds) or STEL (15 minutes), alarms required. Personnel conducting air monitoring must be immediately notified of any alarms by remote sensors, text messaging, or other similar equipment. Utilizing periodic checks of instrumentation in alarm mode only is not acceptable monitoring practice.
  - k. Operating Time: 48 hours (fully charged NiCd battery); continuously with charger;
  - l. Operating Temperature: 0 to 50 °C (14 to 122 °F); and
  - m. Operating Humidity: 10 to 99 percent Relative Humidity.
4. Particulate levels will be monitored immediately downwind at the intrusive activities and integrated over a period not to exceed 15 minutes. Consequently, instrumentation shall require necessary averaging hardware to accomplish this task.
5. The action level will be established at 150 µg/m<sup>3</sup> (15 minutes average). While conservative, this short-term interval will provide a real-time assessment of on-Site air quality to assure both health and safety. If particulate levels are detected in excess of 150 µg/m<sup>3</sup>, the upwind background level must be confirmed immediately. If the working Site particulate measurement is greater than 100 µg/m<sup>3</sup> above the background level, additional dust suppression techniques must be implemented to reduce the generation of fugitive dust and corrective action taken to protect Site personnel and reduce the potential for contaminant migration. Corrective measures may include increasing the level of personal protection for on-Site personnel and implementing additional dust suppression techniques. Should the action level of 150 µg/m<sup>3</sup> continue to be exceeded work must stop and Project Managers from Curia, CHA, and NYSDEC must be notified. The notification shall include a description of the control measures implemented to prevent further exceedances.

6. Methodologies (e.g., wet drilling methods) will be employed during intrusive Site work to minimize the generation of dust. However, it must be recognized that the generation of dust from contaminated soil that migrates off-Site, has the potential for transporting contaminants off-Site. There may be situations when dust is being generated and leaving the Site and the monitoring equipment does not measure PM10 at or above the action level. Since this situation has the potential to allow for the migration of contaminants off-Site, it is unacceptable. While it is not practical to quantify total suspended particulates on a real-time basis, it is appropriate to rely on visual observation. If dust is observed leaving the working Site, additional dust suppression techniques will be employed.
7. All readings will be recorded and be available for review immediately by the NYSDEC, NYSDOH and County Health personnel, if requested. The compiled data will be provided within the final summary report at the end of each project.

The following techniques have been shown to be effective for the controlling of the generation and migration of dust during investigation activities:

- Wetting equipment and exposed soil faces;
- Covering soil cuttings with polyethylene sheeting or drumming soil cuttings in 55-gallon drums with lids.
- Moving soil in properly tarped or watertight containers; and
- Restricting vehicle speeds to 10 mph.

When techniques involving water application are used, care must be taken not to use excess water, which can result in unacceptably wet conditions. Using atomizing sprays will prevent overly wet conditions, conserve water, and provide an effective means of suppressing the fugitive dust.

The evaluation of weather conditions is necessary for proper fugitive dust control. When extreme wind conditions make dust control ineffective, as a last resort, activities excavation and/or soil handling may need to be suspended. There may be situations that require fugitive dust suppression and particulate monitoring requirements with action levels more stringent than those provided above. Under some circumstances, the contaminant concentration and/or toxicity may require additional monitoring to protect Site personnel and the public. This must be evaluated when a health and safety plan is developed and when appropriate suppression and monitoring requirements are established for protection of health and the environment.

### **Organic Vapor Monitoring and Control**

Based on the nature of the Site contaminants, it is anticipated that organic vapors may be emitted during RI activities. VOCs will be monitored at one upwind and one downwind location adjacent to the ground intrusive and/or outdoor soil handling work area. VOCs will be monitored on a continuous basis, concurrently with fugitive dust monitoring. The monitoring work will be performed using a 10.6 electron volt (eV) PID. The equipment will be calibrated at least daily for the contaminant(s) of concern or for an appropriate surrogate. The equipment will be capable of calculating 15-minute running average concentrations, which will be compared to the levels specified below.

1. If the ambient air concentration of total organic vapors at the downwind perimeter of the work area or exclusion zone exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities must be temporarily halted and monitoring continued.

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If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities can resume with continued monitoring.

2. If total organic vapor levels at the downwind perimeter of the work area or exclusion zone persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities must be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities can resume provided that the total organic vapor level 200 feet downwind of the exclusion zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less - but in no case less than 20 feet, is below 5 ppm over background for the 15-minute average.
3. If the organic vapor level is above 25 ppm at the perimeter of the work area, activities must be shutdown.
4. All 15-minute readings will be recorded and be available for NYSDEC and NYSDOH personnel to review if requested. Instantaneous readings, if any, used for decision purposes will also be recorded.
5. The compiled data from all intrusive excavation activities will be provided within the final summary report at the end of the project.

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